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FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

BAR-BOLJARE MOTORWAY

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE

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EXECUTIVE SUMMARY

This is the revised final report of the project entitled "Feasibility Study for Two Highways in Montenegro". It is the conclusion of 8 months technical work by the Consultants Louis Berger SAS of Paris. It contains important technical revisions to the Final report that was issued on 22nd April 2008. The Consultants were retained in September 2007 under contract to the Ministry of Transport, Maritime Affairs and Telecommunications. From the beginning of the project, the Consultants kept a close liaison with the Client and were guided by the Client (in particular by the MTMAT technical committee) as to the concentration of effort and the expected priorities for work tasks.

The team has been formed as a blend of international experts and local specialists. The balance of foreign skills and experience coupled with the in-depth local knowledge has proven to be of great benefit. The study results and the team's ability to keep pace with the planned schedule reflect this close working relationship.

The Consultants provided a number of reports to the Client. The key reports were a requirement of the Terms of Reference.

At the beginning of the work, the Consultants undertook a detailed review of available information and concluded that further design work was required in order to prepare the relevant project designs. This work was sub-contracted to a local design house under the supervision of the Consultants.

The most important aspects of the project- are the two feasibility studies – for economic and financial feasibility. The analysis has been presented below in two parts; one for the Bar-Boljare Motorway and one for the Ionian-Adriatic Motorway.

BAR – BOLJARE MOTORWAY

Economic Feasibility Study

The preliminary economic analysis presented in the Draft Final report was completely revised following the conclusion of a panel of experienced construction engineers that, principally for engineering logistical reasons in the severe mountainous terrain, the full motorway should be built in one stage only. The main finding of the economic analysis (see Chapter 3) is that, using a test discount rate of 5 percent, the net present value (NPV) of the project would be €318 million and the economic internal rate of return (EIRR) 6.5 percent. Principal components of social benefit would be travel time savings (about 48%) and vehicle operation and accident reduction benefits (about 22% each). Generated traffic represents a comparatively minor element of benefit and excluding this the project NPV would still be some €212 million with EIRR 6.0 percent. A sensitivity test showed that should construction costs increase by 20 percent NPV would still be positive at €56.7 million. Another test showed that for the median traffic growth scenario, there would be a lower but still positive benefit, of about €61 million in net present value.

In this analysis the benefit to long-distance freight traffic is a quite small proportion of benefits, at about 6 percent of total benefits. However, completion of the Bar-Boljare motorway is effectively an imperative, a *sine qua non* - for further development of the Port of Bar. The motorway will be a crucial factor in development of the Port, which is currently handling just over 2 million tonnes per year, but has a capacity of 4.5 million tonnes. The Serbian authorities have indicated that their seaborne commerce would be transferred from Thessaloniki to Bar, once the complete motorway link from Belgrade to Bar is ready. This development has not been explicitly included, and thus benefits accruing to generated traffic, at about 7 percent of traffic benefits in the current economic analysis, may turn out to be underestimated.

Improvements to the existing road

There is an argument that, instead of a new North-South motorway, the solution (at least in the medium term) may be to upgrade the existing road. Improvements are ongoing, and will continue to be made, for example in the vehicle safety area, but the terrain difficulties in this corridor mean it is not possible to provide a major increase in capacity along this alignment. Therefore this idea as a medium term solution has been discarded, although recommending considerable investment in safety improvements which are estimated to cost about €8 million (see Chapter 3).

Safety Aspects of the existing road from Bar to Serbian border

On the existing road from Bar to Serbia (M-2 Bar-Barski Most) road safety conditions at present are clearly unsatisfactory. A road safety inspection was carried out (in February 2008) and based on the results it is strongly recommended that Government should spend about an estimated €7.6 million on various types of safety improvements. This will yield about €8 to €30 million of social-economic benefit in present value terms (discounted net benefits) over a fifteen year period. In addition, since this is one of the most heavily trafficked main roads in the country, high benefit-cost ratios indicate that a high priority should be given to the project (Chapter 4).

PPP Aspects

Finally, the options for tolling strategies are examined in detail in Chapter 5.

Acknowledgement

The Consultant wishes to thank Ms Angelina Zivkovic who coordinated all aspects of the study's technical work, together with the MTMAT appointed technical committee, and in particular for her constant interest and encouragement.

TABLE OF CONTENTS

ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
B/C ratio	Benefit / Cost ratio (project ranking mechanism)
BiH	Bosnia & Herzegovina
BOQ	Bills of Quantities for engineering cost
BOT	Build-Operate-Transfer
CGP	Crnagoraput - Montenegro road maintenance company
EIA	Environmental Impact Assessment
EIRR	Internal Rate of Return (for economic analysis)
FYRR	First year rate of return (for economic analysis)
FYRR	First year rate of return
HDM-4	Highway Design and Maintenance Management Model
LED	Light emitting diode (for road signs)
MTMAT	Ministry of Transport, Maritime Affairs and Telecommunications
NPV	Net Present Value (for economic analysis)
New Jersey barrier	Separates lanes of traffic to minimize vehicle crossover accidents
O-D	Origin-to-Destination
OYRR	Opening year rate of return
PPM	Physical (or Spatial) Plan of Montenegro (official document)
PPP (orP3)	Public-Private Partnership
R-P	Revealed Preference Surveys
RSA	Road Safety Audit (generally for planned new roads)
RSI	Road Safety Inspection for existing roads
SEA	Strategic Environmental Assessment
SEETO	Southeast Europe Transport Observatory
S-P	Stated Preference (Surveys)
TD	Traffic Directorate (of MTMAT)
TEM	TransEuropean Motorway
VISUM	Traffic Assignment Model
VMS	Electronic variable message sign
VOC	Vehicle operating costs
VOTT	Value of travel time
WOP	Without project (case for economic analysis)
WP	With project (case for economic analysis)
WTP	Willingness to pay (of road users)

1 INTRODUCTION

This is the **Revised Final Report Report** of the **Feasibility Study of the Bar – Boljare Motorway** which is the part of the **Feasibility Study for two Highways in Montenegro** prepared by the Consultants appointed to advise the Government of the Republic of Montenegro. For the sake of brevity, the project name as defined will be referred to later as the "**Feasibility Study**". For the purposes of clarity the contract for consultancy services is entered into by the two parties referred to as **"The Consultant"** [namely Louis Berger SAS] and the Government [represented by the Ministry of Transport, Maritime Affairs and Telecommunications] which is hereafter referred to as **"The Client"**.

1.1 Subject of the Study

Specific link has been studied under the Feasibility Study:

a) **Bar – Boljare** (border with Republic of Serbia), in the length of about 183 km. The link will combine some existing highway sections, length 10 km, (Sozina Tunnel) with the construction of a completely new highway.

1.2 Issues and problems under the present traffic conditions

Montenegro's road infrastructure extends for 6,848 km, out of which 964km are regional roads and 884 km are highways. The total network also contains 312 bridges, 136 tunnels, and about 5000 km of local roads. There are currently around 100,000 registered vehicles in Montenegro out of which 89 percent are private passenger vehicles. The physical characteristics of most of the regional roads (steep slopes, absence of shoulders, tight curves, low radii, relatively high pavement degradation) results in an average speed of less than 50 kilometres per hour, results in higher costs for road users, reducing Montenegro's competitive advantage against other transit corridors, and inhibits economic development.

In Montenegro there is difficult mountain terrain throughout virtually the whole country and so road construction and maintenance costs are very costly. The transport infrastructure has suffered from lack of investment for at least the past 15 years and in general the technical and geometrical standards of the existing network are out-dated, especially given the fact that international tourism is an important and fast-growing component of the national economy.

The existing route Bar – Podgorica – Kolasin – Barski Most represents an essential national traffic corridor for Montenegro. Stretching from one end of its territory to another, this road functionally and spatially integrates gravitational entities (settlements, natural and economic resources) within its wider hinterland, since the national road network in this part of the territory has not much alternative road links.

Total length of the existing road is around 180 km. Most of the route (around 75%) is of hilly-mountainous character, and sections north of Podgorica are being constructed and operated under very complex ambiance conditions.

These include many structures (bridges, tunnels, galleries) and in the terms of safety they represent relatively serious traffic "task" for drivers. The map on the next page (Figure 1-1) shows position and configuration of analyzed route along with the key toponyms.

Figure 1-1 Map of the road Bar – Barski most (Serbian border)

This highway was constructed 50 years ago, according to the former Yugoslavian Standards. The design speed varies from one section to other from 30 km/h[1] (in the difficult mountainous part) to 70 km/h on other part.

The highway passes through mountainous massifs. The first is between Petrovac and Podgorica and the difference in level is over 650m (from 30m to 700m).

From Tanki Rt to Smokovac via Podgorica the highway passes through the flat area over about 30 km.

The second massif is between Smokovac practically to Barski most on the Serbian border. On this section the difference in level is over 1000m (from 22m to 1045m).

The pavement of the road was designed for the Axle load equal to 10T which today is insufficient for the heavy trucks.

Unfortunately, in most of places the slopes of cut and embankments are not protected and are deteriorating by erosion.

All intersections were designed according to the former Yugoslavian Standards from 1950s or 1960s which today are very dangerous with high traffic flows of the speediest cars.

In 2002 a rehabilitation works started on this highway. Most of the “black spots” were improved. On the section from Bar to Tanki Rt the tolled tunnel Sozina of over than 4km length was constructed and open for traffic in 2005.

At the present on the section of M-2 road from Mioska to Kolasin there are some rehabilitation works on the pavement, retaining walls and inside tunnels. On the M-2.4 road in Kufin there is curvature construction and the third lane in Sutomore.

For the purpose of reducing traffic jams in the cities, construction of bypasses of Bar, Podgorica, Kolasin and Bijelo Pole will be performed in the following two years.

Today the highway is in good technical condition, with the pavement of 7m width and hard shoulders from 0.5m to 0.75m within different sections. Only a section from Ribarevina to Barski most on the Serbian border has 6m of pavement with 0.70 to 1.0m of shoulders. This information the Consultant found in the Road Database prepared by BCEOM in 2002.

Nevertheless, the difference of cross section width between the former Yugoslavian Standards and the situation on terrain is explained by the fact that the road was improved before 2003.

The road is equipped with safety barriers, while some sections have climbing lanes (Ulici, Jankovici, Seoce 1, Seoce 2, Crkvine, Krstac) . The avalanche protection galleries were constructed on some of the sections.

[1] The Administrative speed limitation is 40 km/h but on the hairpin bends it is difficult and risky to maintain the speed over 30 km/h.

The following pictures show the existing road.

Figure 1-2
Section Kolasin – Smokovac

Figure 1-3
Section Mojkovac - Kolašin

Figure 1-4
Sozina Tunnel entrance

The accident rate on the existing highway is reportedly very high. The reasons for this are multiple. Generally this kind of road is still difficult for drivers for some reasons like the limited distance of visibility linked to the curvature of the road. It is also very important that some drivers have not experience of driving on the mountainous road and others are too sure of their capacity as drivers. Note that the psychological aspect for some drivers, to have a modern, speedy and "safe" car - also should not be neglected.

Generally, the main safety problems are as follows:

- Difficulty linked to the typical mountainous road;
  - Inadequate curve radius;
  - Steep gradients with lack of climbing lanes;
  - Too few overtaking opportunities;
  - Inadequate crash barriers;
  - Inadequate bus stopping facilities, and
  - Dangerous cliffs.

- Weather conditions often bad or difficult for driving;
    - Inadequate lighting.
- Mixed traffic flows of speedy modern cars and old slower cars;
- High rate of truck in the traffic flows during the day and night and,
    - Congestion during peak hours;
    - Long journey times;
    - Many private accesses with slowing and turning movements;
    - Many at-grade junctions – i.e., junction density too high;
    - High speeds in built-up areas;
    - Lack of safety zones along road, and
    - Conflicts between vehicles and pedestrians.

The completion of this project will be considered as a major engineering achievement in any country. There are planned to be more than 38 km of tunnels and nearly 16 km of bridges and viaducts, as shown in the table below. Well over 150 structures, measuring just over 54 km in total length, will be built in mostly difficult mountainous terrain.

Table 1.1

Section	Overall Length (m)	Bridges		Tunnels		Bridges & Tunnels (%)
		nos.	L (m)	nos.	L (m)	
Bar - Virpazar	24,951	24	2,430	12	10,060	50%
Virpazar -Smokovac	38,231	22	4,242	9	5,510	26%
Smokovac-Matesevo	43,500	na	4,640	na	13,392	41%
Matesevo-Berane	34,352	22	2,900	8	5,735	25%
Berane-Boljari	41,300	24	1,460	7	3,690	12%
Total	**182,334**	**92**	**15,672**	**36**	**38,387**	**30%**

1.3 Tasks of the Study

Consultant services included analyses and revisions of existing planning and project documentation, as well as finishing necessary project documentation.

Corridor Bar – Boljare Highway (border with Serbia) is planned as two separate carriageways with two traffic lanes each and appropriate stop lanes. Tentative project speed should be 100 km/h. The task of the Consultant was to analyze possible advantages of a phased construction or realization of another kind of savings, subject to approval by the Client. In analysing the design options of the highway route, the European standards have been applied. Client will give its final consent for the route layout proposed by the Consultant.

The Consultant was expected to analyse the offered alternatives and to use a multi-criteria method of optimisation evaluating at least three possible alternatives of the highway route including already constructed section of the semi-highway:

- construction of two separate roads with two-lane each and appropriate stop lanes;
- construction of the highway in phases (2+1 traffic lanes); and

- construction of a new roadway and reconstruction of the existing (2+1 traffic lanes).

Results of the environmental scoping of the highway and necessary protection measures were supposed to be separately included in analysis.

Designs and construction of the highway Bar-Boljare need to be in compliance with all European standards and recommendations related to these kind of infrastructure facilities including resting places, service locations, area for recreation, hotels and etc. Consultants can suggest grouping of activities in the best way possible. For example, main groups of activities are (i) elaboration of engineering geology and geo-technical conditions, hydrological and hydrographical conditions, and associated studies and elaborations on area topography, land use and creation of a technical study of the highway in a the best possible scale; (ii) preparation of spatial-traffic studies, selection of the optimal route using the appropriate multi-criteria analysis.

1.4 Documentation to be prepared by the Consultant

The responsibility of the Consultant was to prepare the relevant missing parts of the project documentation and to upgrade the existing project documentation to the level necessary to obtain accurate cost estimates that would allow preparing the feasibility study. In particular for the missing sections in this link the project documentation was supposed to be prepared in line with the requirements of the national legislation.

The Design shall respect the limitations deriving from cultural heritage, use of water potentials, preservation of national parks, as well as respecting planned construction zones. Apart from these limitations, Consultant took into consideration geological, hydro graphic and hydrologic conditions of the terrain, climate characteristics of the area, existing and planned infrastructure structures, etc. in defining the highway route layout.

1.5 Environmental Scoping

The environmental scoping was to be done in line with the contents of the Law on Environmental Impact Assessment, as well as in line with the contents of the EU directives related to environment.

The environmental scoping within the Feasibility study shall include the following: analysis on the environmental impact of the investment, measures on environment protection and its tentative cost.

APPENDIX 1 – A

Master List – Project Documents Received Register

Brief Title	Source	Remarks
General Design of the highway: Bar – Tanki Rt		
Volume 1. Alignment and general documentation	TD/FoCE	HC
Volume 2. Studies (Traffic and Economic, Climate Parameters, Hydrological and hydrographical parameters, Environmental Impact Analysis)	TD/FoCE	HC
Volume 3. Engineering – Geological and Geotechnical conditions	TD/FoCE	HC
Volume 4.Techno – economical indicators and evaluations	TD/FoCE	HC
Volume 5. Presentation	TD/FoCE	HC
Volume 6. Presentation (Eng)	FoCE	HC
Revision Commission Final Report	FoCE	HC
General Design of the highway: Tanki Rt – crossing with the Podgodica-Cetinje road, scale 1:5000		
Volume 1. Alignment and general documentation	TD/FoCE	HC
Volume 2. Conditions of responsible Republic and Municipal Bodies and Organizations	TD/FoCE	HC
Volume 3. Engineering – Geological and Geotechnical conditions	TD/FoCE	HC
Volume 4. Climate, Hydrological and Hydrographical parameters	TD/FoCE	HC
Volume 5. Environmental Impact Analysis Report	TD/FoCE	HC
Volume 6. Report on seismic parameters	TD/FoCE	HC
Volume 7. Techno – economical parameters and evaluations	TD	HC
Volume 8. Presentation	TD/FoCE	HC
General Design of the highway: Tanki Rt – crossing with the Podgorica – Cetinje road		
Volume 1. Alignment - textual part	FoCE	HC
Volume 2. Alignment and Graphical Documentation	TD/FoCE	HC
Volume 3. Previous Environmental Impact Analysis	FoCE	HC
Volume 4. Geotechnical Conditions Study	FoCE	HC
Volume 5. Conditions of Responsible Bodies	FoCE	HC
Volume 6. Presentation	FoCE	HC
Revision Commission Final Report	FoCE	HC

General Design of the Highway: Andrijevica - Berane - Boljare		
Volume 1. Traffic Analysis and Projections	FoCE	HC
Volume 2. Climate, Hydrological and Hydrographical parameters	FoCE	HC
Volume 3. Environmental Impact Analysis	FoCE	HC
Volume 4. Alignment (Graphical documentation)	TD/FoCE	HC
Volume 5 (Techno – economical indicators and evaluations)	FoCE	HC
Volume 6. Engineering – Geological and Geotechnical conditions	FoCE	HC
Volume 7. Presentation	FoCE	HC
Volume 7. Presentation (English)	FoCE	HC
Volume 7. Presentation II	FoCE	HC
Revision Commission Final Report	FoCE	HC
General Design of the highway: Verusa - Matesevo	TD	HC
OTHER DOCUMENTATION		
Review of technical and other highway documentation in Montenegro by 1997	FoCE	HC
Analysis and inspection of existing technical and other documentation reconciliation	FoCE	HC
General Design of highway: Bar – Tanki Rt section, presentation	TD	CD
Preliminary Design of highway: Djurmani – Tanki Rt section	TD	CD
General Design of highway: Andrijevica – Berane – Boljare section	TD	CD
Spatial Plan of the Republic of Montenegro (draft)		CD
Smokovac – Verusa		CD
General Design Verusa – Matesevo section		CD
Highway: Djurmani – Tanki Rt		CD

Section: Sozina Tunnel – Virpazar		
General Design of highway: Smokovac – crossing with the Podgorica – Cetinje road, presentation		CD
Tanki Rt – layout		CD
Bypass Podgorica presentation		CD
Topographic maps in scale 1:25000 /analog maps/	TD	CD
Adriatic-Ionian highway corridor /digital form/	TD	CD
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro 2002.	TD	HC
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro in 2001.	TD	HC
"PILOT" TRAFFIC COUNTING 2006., along main and regional roads in the Republic of Montenegro	TD	HC
"PILOT" TRAFFIC COUNTING 2005., along main and regional roads in the Republic of Montenegro	TD	HC
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro 2000.	TD	HC
EAR Feasibility Study for Belgrade - Montenegro Road, Serbia (Serbia and Montenegro), dated March 2006.	TD	HC
CD 13Traffic counting, 2007.	TD	CD
CD 14 Topographic maps	TD	CD
TRAFFIC INTENSITY along road network in the Republic of Montenegro 2000.	TD	HC
SMOKOVAC - VERUŠA, DIGITAL MAP	TD	CD
VERUŠA MATEŠEVO, MAIN DESIGN	TD	CD

ANDRIJEVICA - BERANE - BOLJARE, GENERAL DESIGN	TD	CD
SMOKOVAC - WITH ROAD PODGORICA-CETINJE, GENERAL DESIGN	TD	CD
BAR - TANKI RT, GENERAL DESIGN	TD	CD
DJURMANI - TANKI RT, TEMPORARY JUNCTION, MAIN DESIGN	TD	CD
PODGORICA - MATEŠEVO - KOLAŠIN	TD	CD
SOZINA TUNNEL, VIDEO PRESENTATION	TD	CD
ADRIATIC - IONIAN HIGHWAY, DIGITAL AND TOPOGRAPHIC MAPS	TD	CD
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL MAIN REPORT, JULY 2003.	Volume 0, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ROAD SURVEYS**, JULY 2003.	Volume 1, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ROAD DATA BASE**, JULY 2003.	Volume 2, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **TRAFFIC**, JULY 2003.	Volume 3, TD	HC

STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **TRAFFIC FORECASTS AND INPUTS INTO HDM**, JULY 2003.	Volume 4, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **CALIBRATION OF ROAD USER EFFECTS INPUTS TO HDM-4**, JULY 2003.	Volume 5, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **HDM-4 ANALYSES AND GIRR IMPLEMENTATION**, JULY 2003.	Volume 6, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ENVIRONMENT**, JULY 03.	Volume 7, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENENCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT,**HIGHWAY PLANNING AND DESIGN CRITERIA GUIDLINE**, JULY 2003.	Volume 8, TD	HC
Road Design Standards	Put Inzenjering	HC

FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; CONCEPT DESIGN REPORT, SEPTEMBER 2004.	Volume 1, Podgorica Municipality	HC
FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; TRAFFIC SURVEY REPORT, SEPTEMBER 2004.	Volume 3, Podgorica Municipality	HC
FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; ENVIRONMENTAL SCOPING REPORT, SEPTEMBER 2004.	Volume 4, Podgorica Municipality	HC
ADRIATIC-IONIAN CORRIDOR COMMITEE REPORT	TD	HC
ToR FOR CONCEPTUAL DESIGN PODGORICA-VERUŠA	TD	E-MAIL
LEVEL OF DEVELOPMENT AND QUALITY OF TRANSPORT SYSTEM OPERATION IN THE ECONOMY OF MONTENEGRO, draft	SIMM Eng.	HC
ToR FOR PREPARATION OF DETAIL SPATIAL PLAN, BAR - BOLJARE MOTORWAY	Ministry for Economic Development	HC

2 ANALYSIS OF TRAFFIC FLOWS FOR THE BAR-BOLJARE CORRIDOR

2.1 Traffic surveys in October 2007

In the 16 point traffic surveys in October 2007, traffic was counted by vehicle type for 12 hours per day on seven consecutive days, including for one 24-hour continuous period. Generally the count station locations were the same, or quite close to, the regular CGP stations. The table below gives a summary of AADT estimated for the five links in the existing network that are directly related to the motorway corridor Bar-Boljare. For the Sozina tunnel, data were supplied by Monteput d.o.o., the tunnel operator. Note that for count station no. 14, traffic count data for the link Bijelo Polje to the border (near Barski Most) was adjusted to allow for 50 percent of the traffic counted being local short-distance urban traffic circulating around the town of Bijelo Polje. Examination of responses in the Origin-Destination (O-D) survey at this location showed that this estimate is correct, although since the O-D survey does not include the very high seasonal traffic peak in July and August, the overall AADT estimate is likely to be biased downwards.

Table 2.1 Summary of traffic counts in 2007
(Results in estimated AADT for 2007)

Vehicle type	Bar - Petrovac (RSI 4)	Sozina Tunnel (Monteput)	Podgorica - Bioče (RSI 9)	Kolašin-Mojkovac (RSI 10)	Bijelo Polje - Barski Most (RSI 14)
Private Car	6.373	5.016	4.131	4.930	4.563
Light Delivery & Microbus	501	362	367	490	198
Bus (>30 seats)	118	56	142	135	47
Small truck (2-axle)	319	157	147	148	64
Medium truck (2-axle)	390	145	273	236	173
Heavy truck (5-axle art.)	518	303	464	727	267
Total	8.219	6.039	5.524	6.666	5.312
Light vehicles & microbuses	83,6%	89,1%	81,4%	81,3%	89,6%
Trucks & buses	16,4%	10,9%	18,6%	18,7%	10,4%

Source: LB traffic counts 23-29 October 2007, and Monteput d.o.o.

The AADT was determined using weekly factors and seasonal factors based on 2002 and 2003 data from CGP and the BCEOM surveys[2] of 2003. The weekly factor was estimated as 0.99 and the October seasonal factor as 1.20. Daily (24/12 hour) adjustment factors were determined for each vehicle type using the Consultant survey data.

2.2 Traffic counts in 2008

Over an eight-day period from 27th July to 3rd August, the Traffic Directorate of MTMAT carried out 24-hour counts at a location near the Manastir Moraca, on the M-2 about 26km south of Kolasin. The results are given in the table below.

[2] *Strategic Plan for Road Infrastructure Development, Montenegro* (BCEOM Final Report Volume 4, July 2003)

Table 2.2 Traffic counts on M-2, July 2008

Date		24h count
Sun	27-Jul	12,131
Mon	28-Jul	10,084
Tue	29-Jul	9,520
Wed	30-Jul	11,098
Thu	31-Jul	11,644
Fri	1-Aug	14,815
Sat	2-Aug	14,481
Sun	3-Aug	14,533
Average daily (July)		12,288

Source: Traffic Directorate MTMAT

Using a July/annual average factor of 1.96 (see below) the AADT for 2008 would equal 6,270, and then, assuming a general growth rate of 8 percent during the past year, the 2007 AADT at this location would be 5,805. This is reasonably consistent with the traffic estimates for Bioce-Podgorica (5,524) and Mioska-Kolasin (6,666) derived from the October 2007 traffic surveys (see Table 2.1).

2.3 Sozina Tunnel traffic 2005-2008

Average daily traffic for Sozina tunnel, average by month, since opening in August 2005, is shown in the table below.

Table 2.3 AADT by month at Sozina tunnel 2005-2008

	2005	2006	2007	2008
Jan		2,712	3,634	4,034
Feb		3,006	3,765	4,254
Mar		3,578	4,132	4,483
Apr		4,078	4,907	4,950
May		4,395	5,305	5,842
Jun		5,454	7,534	7,775
Jul		9,635	11,797	
Aug	8,383	9,855	11,702	
Sep	4,144	5,244	6,202	
Oct	2,976	4,013	4,616	
Nov	2,843	3,829	4,404	
Dec	3,014	3,899	4,485	

Source: Monteput d.o.o.

As shown above, there is a marked variation in monthly traffic total depending on season, as shown in the graph below. The high seasonal variation for Sozina tunnel is very consistent with the seasonal variations elsewhere in the corridor reported by Crnagoraput. In July and August traffic totals are nearly double (about 96% higher) the overall year-round average; while January and February traffic is little more than half the average.

Comparing 2006 traffic for the last four months of the year with the same period in 2005, up by some 31% in 2006, and assuming that the underlying annual traffic growth rate (for 2007 compared with 2006) was about 10 percent, there appears to have been a generated traffic effect of about 20 percent. The year-on-year changes for each month are given in the table below.

Table 2.4 Year-on-year traffic changes at Sozina (by month)

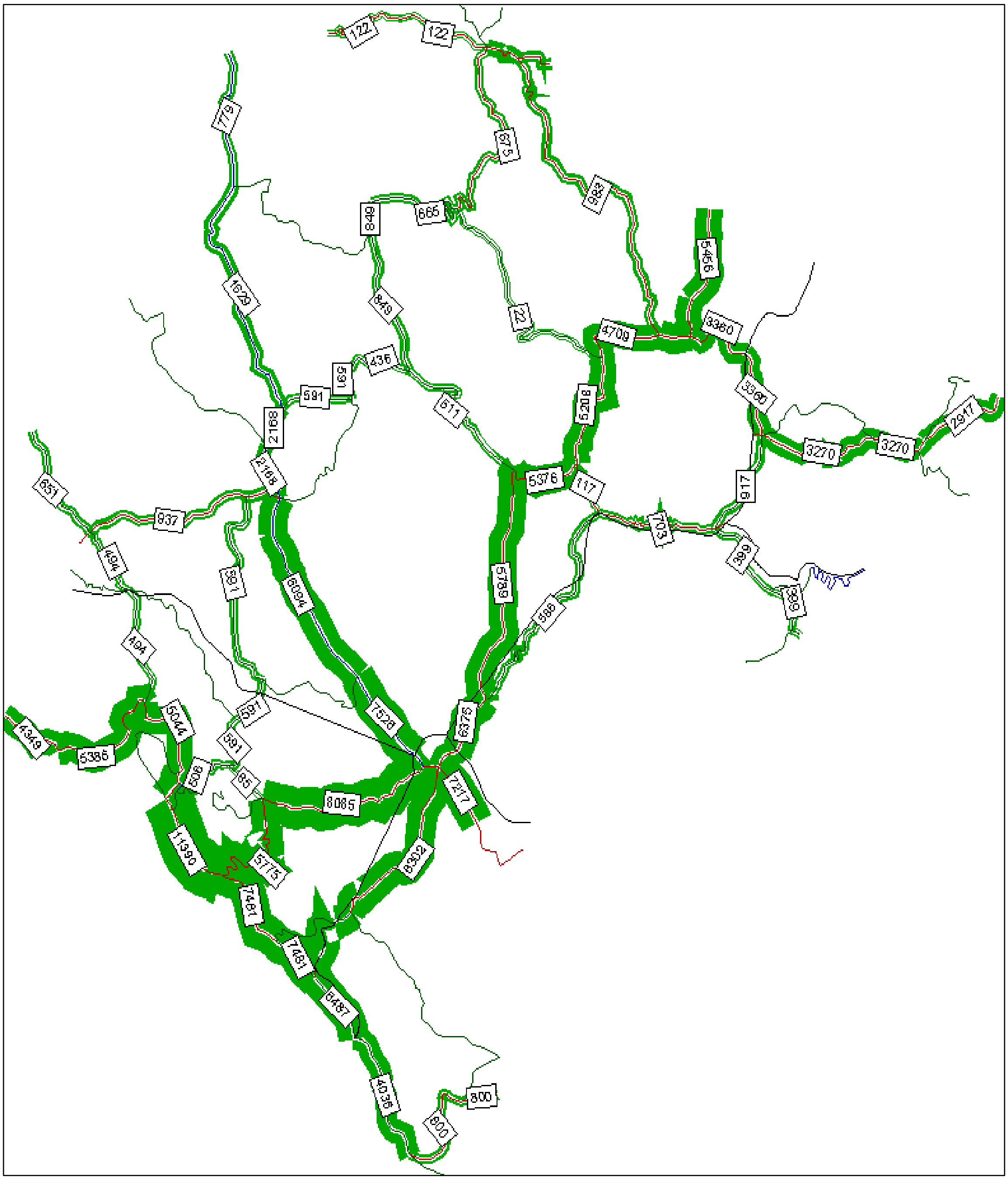
	2006/2005	2007/2006	2008 /2007
Jan		34.0%	11.0%
Feb		25.2%	13.0%
Mar		15.5%	8.5%
Apr		20.3%	0.9%
May		20.7%	10.1%
Jun		38.1%	
Jul		22.4%	
Aug		18.7%	
Sep	26.5%	18.3%	
Oct	34.8%	15.0%	
Nov	34.7%	15.0%	
Dec	29.4%	15.0%	

At Sozina the AADT adjustment factors for October (AADT /October daily average) were 1.240 in 2006 and 1.309 in 2007. These compare to the factor of 1.20 used for adjustment of AADT from the consultant's traffic counts in the corridor (see section 2.1 above).

2.4 Estimation of base year and horizon year traffic volumes in the traffic model

The VISUM traffic assignment model was used to simulate the existing traffic network in 2007 and for the horizon year, 2027, the expected network characteristics at that date, including the planned improvements listed in the Physical Plan of Montenegro (PPM), and including the proposed motorway. Comparing with the traffic count data for the base year (see tables above) the assignment model allocated approximately equal traffic volumes on the network. The figure below shows the traffic modeling results in map-diagram form for the base year, 2007.

Figure 2-1 Modeled base year traffic flows in 2007



The next phase of modeling procedure was the creation of matrices and future corridor options for an intermediate year (year 2012) and for the horizon year 2027. The results are shown in the following map-diagram figures.

Figure 2-2 Modeled traffic flows in 2012 – with 6c/km Toll
(Generalized cost including Fuel consumption)

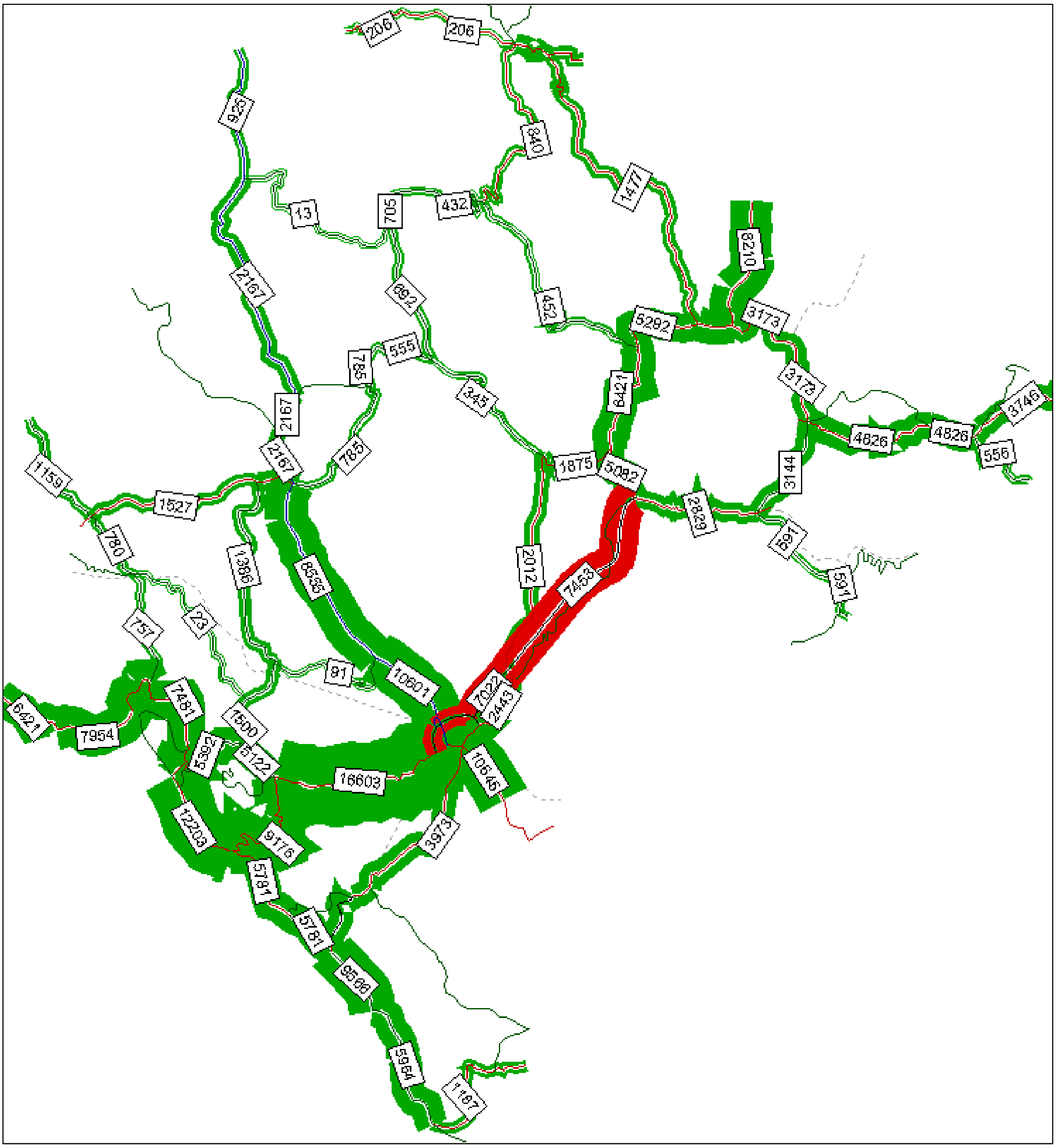


Figure 2-3 Modeled traffic flows in 2012 with 6c/km Toll
(Generalized cost including Fuel consumption)
Podgorica Bypass

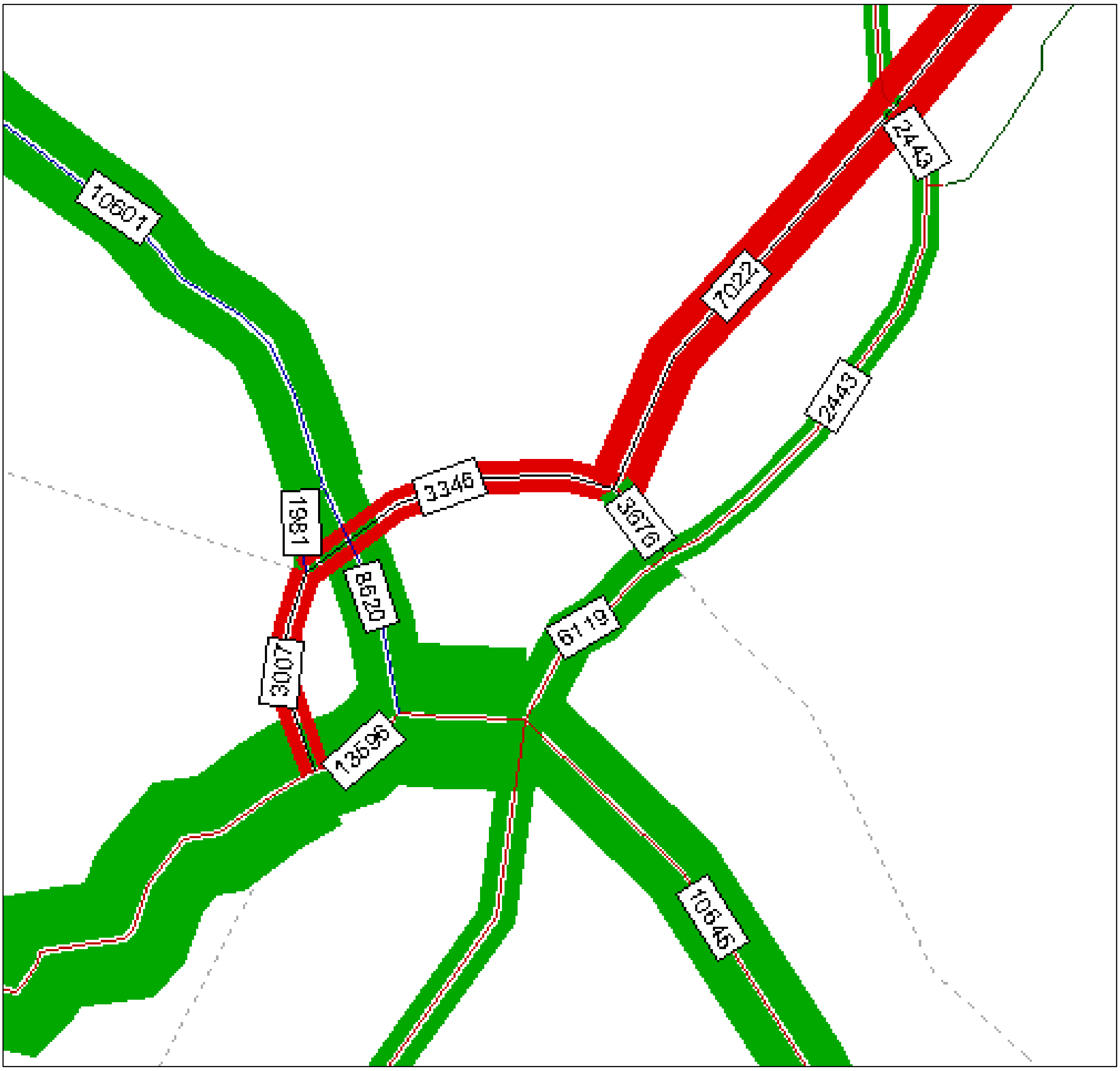


Figure 2-4 Modeled traffic flows in 2027 NO Toll
(Generalized cost including Fuel consumption)

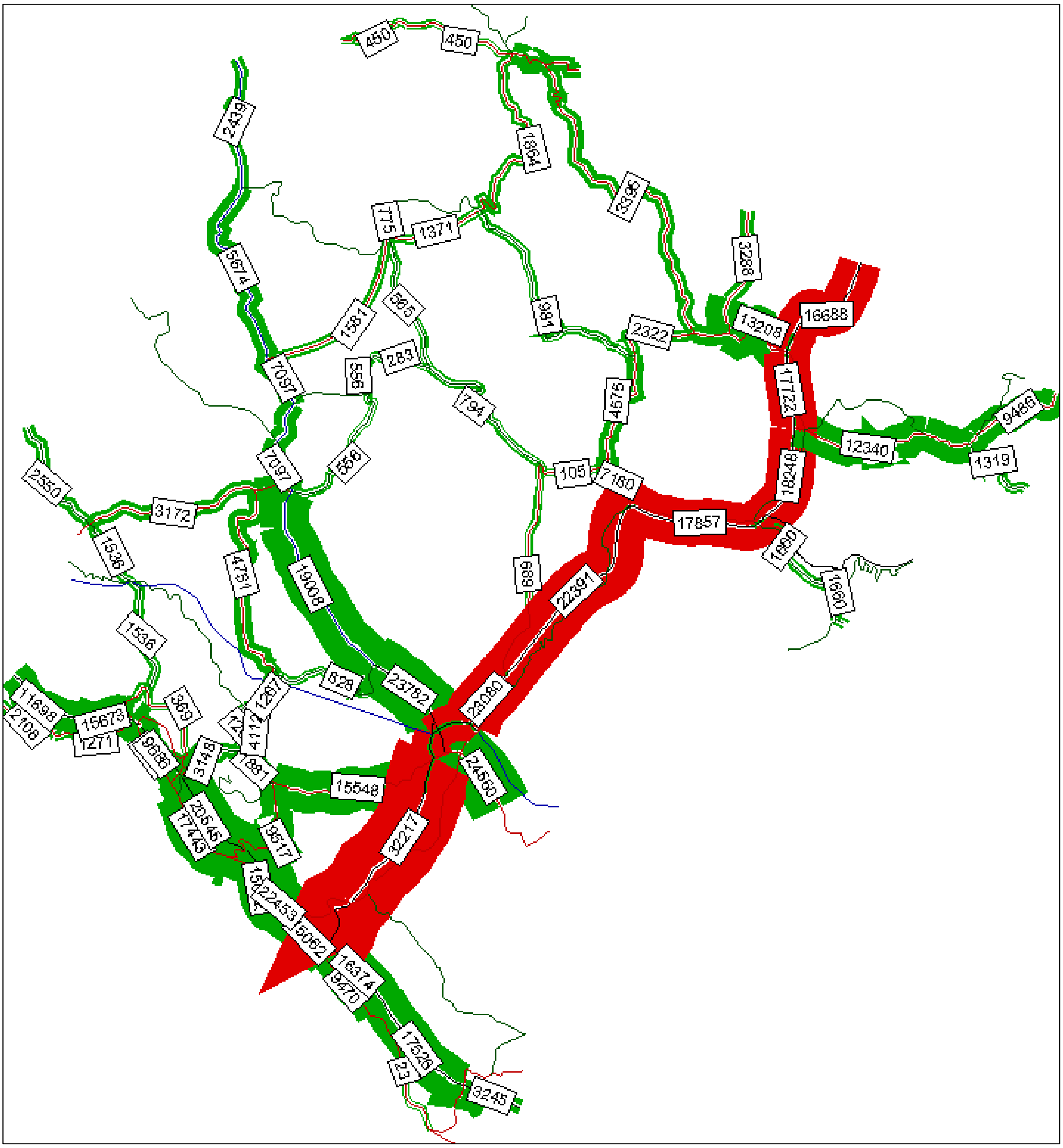


Figure 2-5 Modeled flows for Podgorica By-pass in 2027 - NO Toll
(Generalized cost including Fuel consumption)

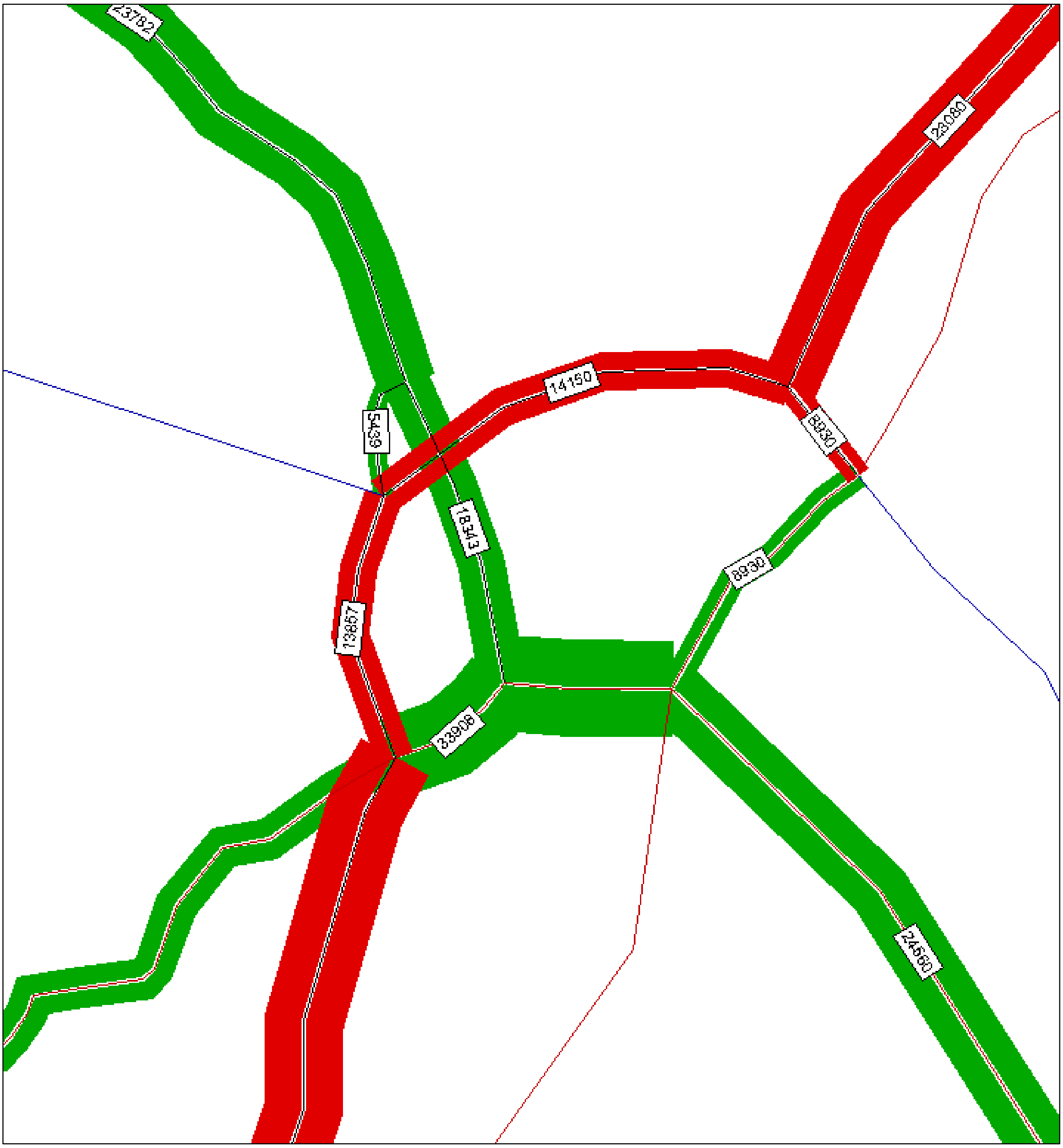


Figure 2-6 Modeled traffic for 2027 Toll = 6 Eurocent/km
(Generalized cost with Fuel consumption)

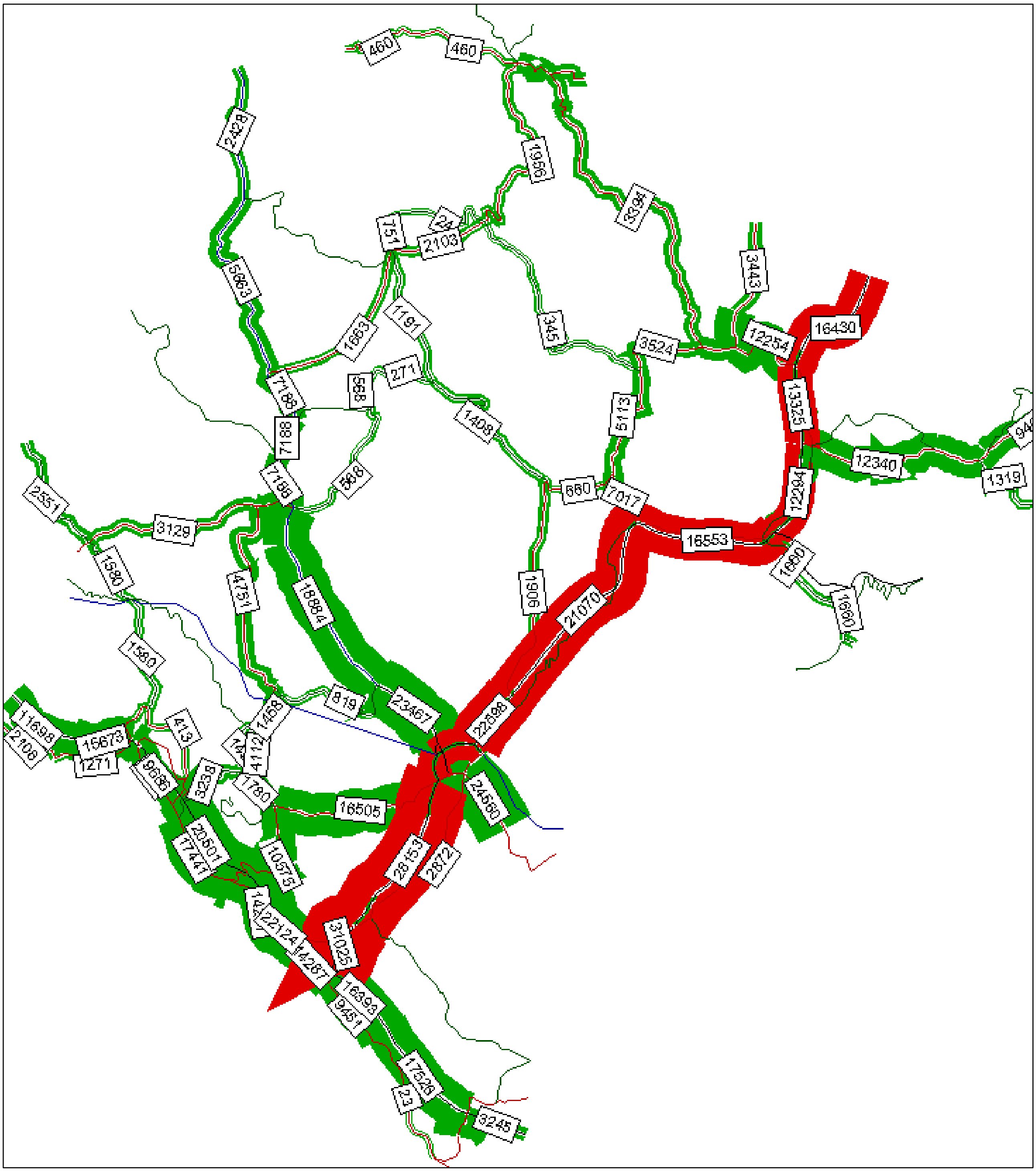


Figure 2-7 Modeled traffic for 2027 Toll = 6 Eurocent/km
(Generalized cost with Fuel consumption)
Podgorica By-pass

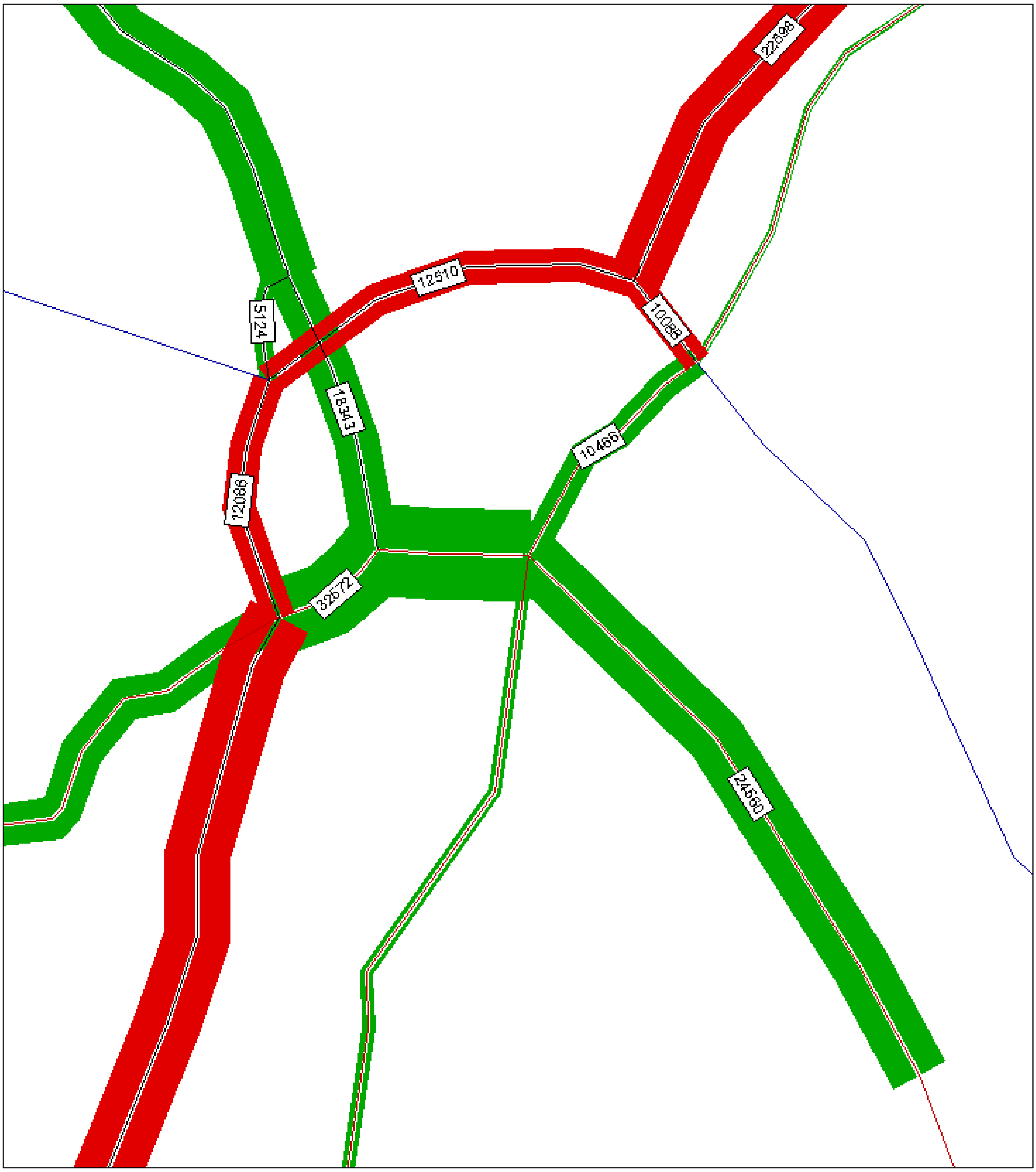


Figure 2-8 Traffic flows in 2027 Toll = 8 Eurocent/km
(Generalized cost with Fuel consumption)

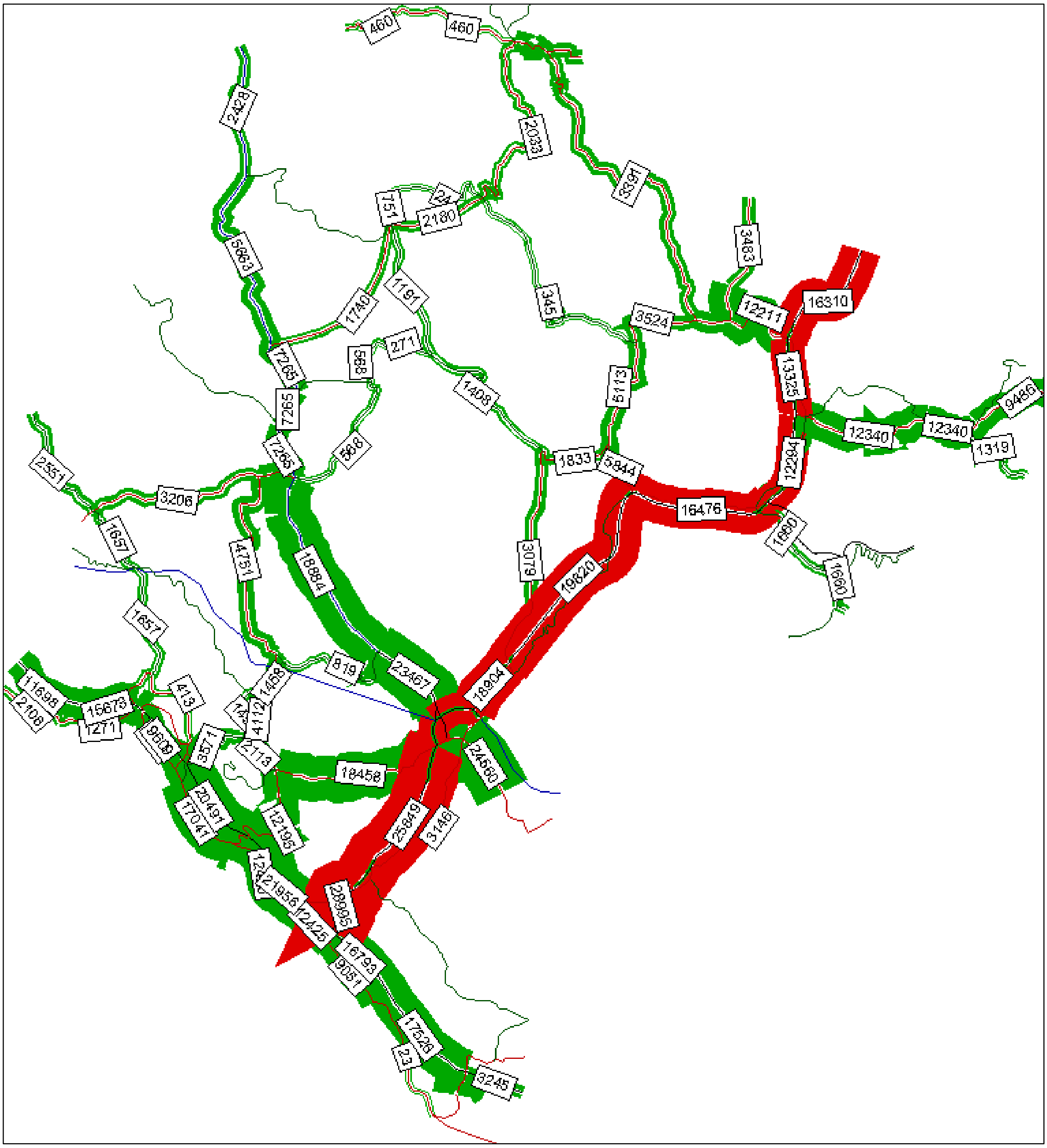


Figure 2-9 Traffic flows in 2027 Toll = 8 Eurocent/km
(Generalized cost with Fuel consumption)
Podgorica By-pass

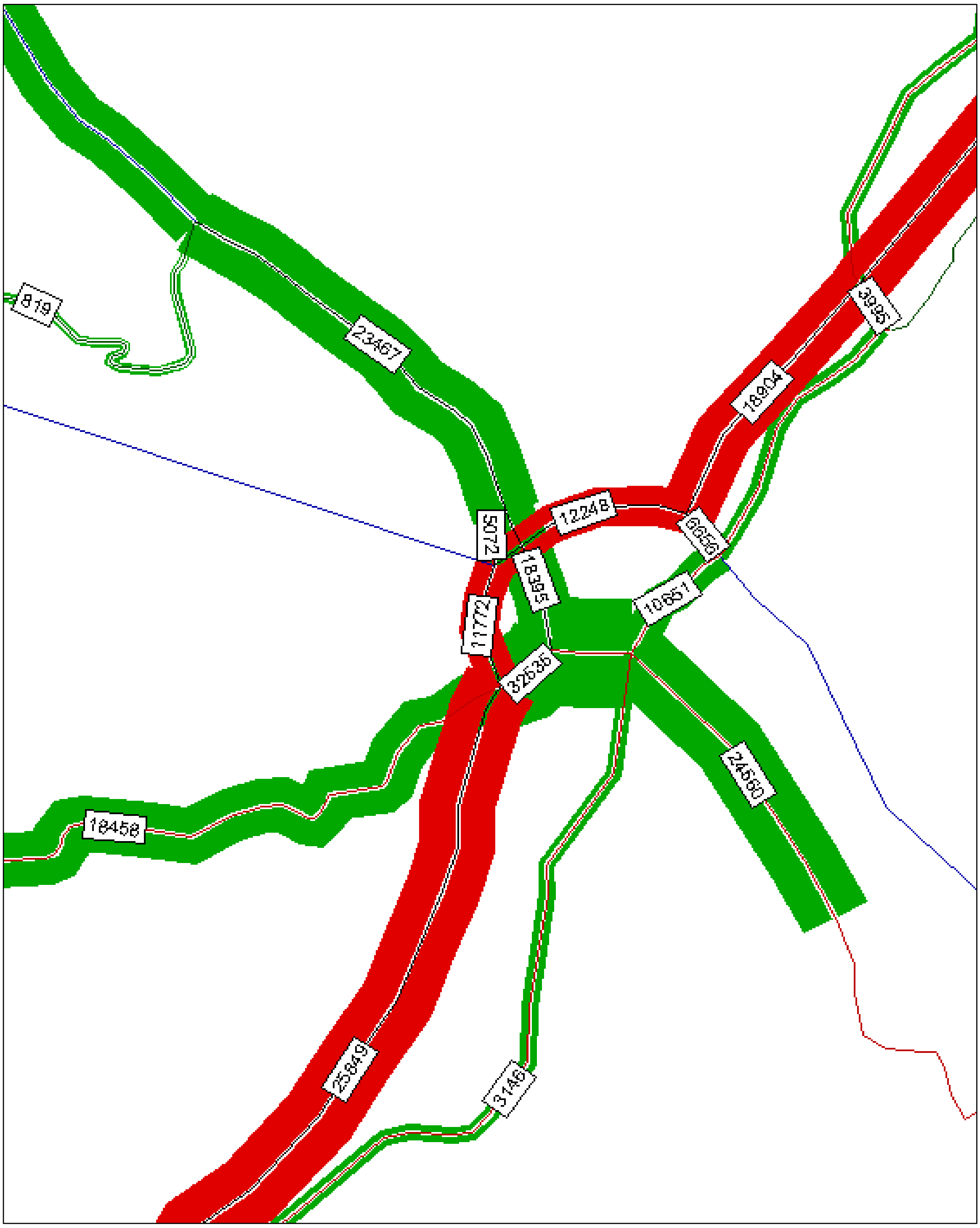


Figure 2-10 Traffic flows in 2027 Toll = 10 Eurocent/km
(Generalized cost with Fuel consumption)

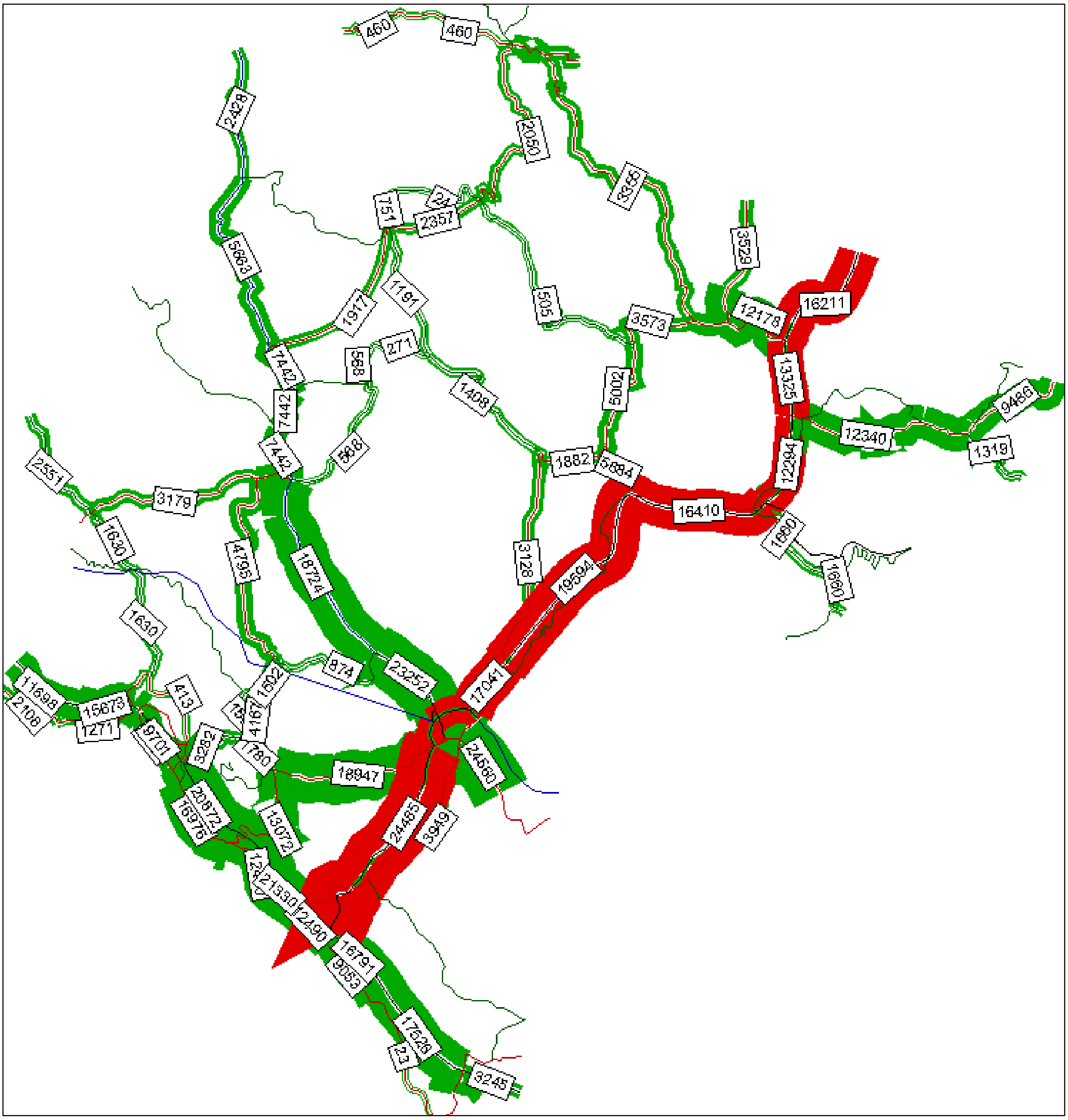
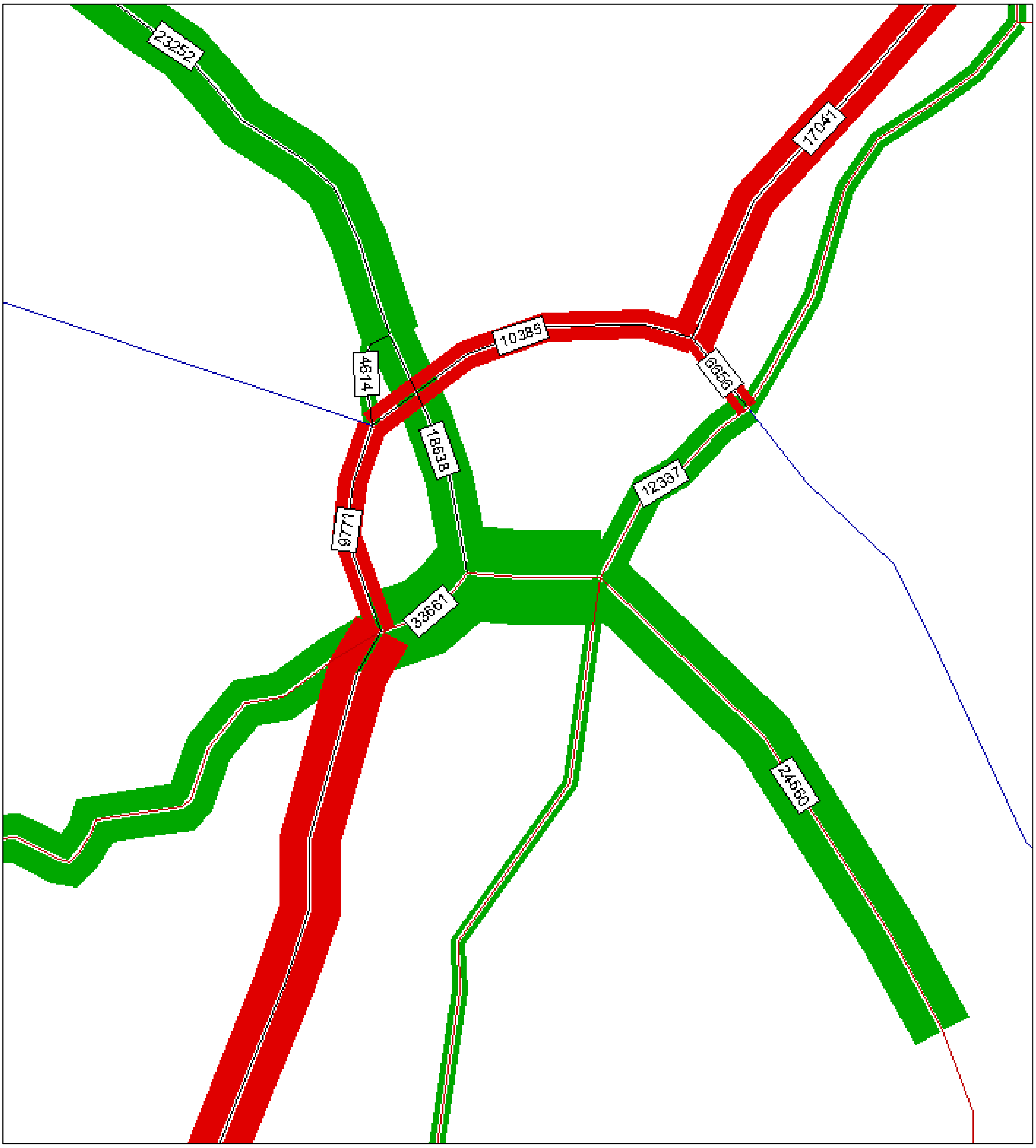


Figure 2-11 Traffic flows in 2027 Toll = 10 Eurocent/km
Podgorica By-pass



2.5 Tests for differing toll rates

Traffic assignment model tests were carried out to see the effects of changes in toll rates on traffic volumes on the different motorway sections for the 2027 scenario. Results in terms of motorway traffic volume (AADT) are shown in the table below.

Table 2.5 Modeled traffic volumes under various toll rates, 2027

Section	No toll	6 c/km	8 c/km	10 c/km
Durmani-Virpazar	32.217	31.025	28.955	28.434
Virpazar-Farmaci	32.217	28.153	25.849	24.485
Farmaci-Komani	13.857	12.086	11.772	9.771
Komani-Smokovac	14.150	12.510	12.248	10.385
Smokovac-Bioce	23.080	22.698	18.904	17.041
Bioce-Matesevo	22.391	21.070	19.820	19.594
Matesevo-Andrijevica	17.857	16.553	16.476	16.410
Andrijevica-Berane	16.246	12.294	12.294	12.294
Berane-Poda	17.722	13.325	13.325	13.325
Poda-Boljare	16.688	16.430	16.310	16.211

The following table gives the results in percent differences and the measured point[3] elasticity ratios for changes in toll rate from 6 eurocents/km to 10 eurocents/km.

Table 2.6 Toll rate changes and estimated point elasticity ratios, by section

Section	Change in traffic volume (%)			Elasticity
	No toll - 6c/km	6c - 8c/km	8c -10c/km	6c -10c/km
Durmani-Virpazar	-3.7%	-6.7%	-1.8%	-0.17
Virpazar-Farmaci	-12.6%	-8.2%	-5.3%	-0.27
Farmaci-Komani	-12.8%	-2.6%	-17.0%	-0.40
Komani-Smokovac	-11.6%	-2.1%	-15.2%	-0.35
Smokovac-Bioce	-1.7%	-16.7%	-9.9%	-0.57
Bioce-Matesevo	-5.9%	-5.9%	-1.1%	-0.15
Matesevo-Andrijevica	-7.3%	-0.5%	-0.4%	-0.02
Andrijevica-Berane	-24.3%	0.0%	0.0%	--
Berane-Poda	-24.8%	0.0%	0.0%	--
Poda-Boljare	-1.5%	-0.7%	-0.6%	-0.03

As shown (and as expected) the elasticities are highest for the sections around Podgorica, namely Farmaci-Komani, Komani-Smokovac and Smokovac-Bioce, which comprise the bypass. For the central motorway section from Bioce to Matesevo, and for Matesevo to the north, elasticities are low because the alternative route is of poor standard. It is not clear why the sections Andrijevica-Berane–Poda (Poda is the junction for access to Bijelo Polje) would lose about 25 percent of traffic going from 'no toll' to a 6c toll, but thereafter, traffic on these sections is apparently insensitive to increases in toll rate.

[3] Elasticity calculated in regression equations, using the log (ln) of traffic volume.

3 ECONOMIC ANALYSIS – BAR (ĐURMANI)- BOLJARE

3.1 Introduction

The economic analysis as presented in the Final Report dated June 2008 has been substantially revised to take account of the following: i) a revision to the traffic model assignments for 2027 to include fuel consumption in the impedance (behavioural cost) function. This change has the effect of slightly reducing predicted traffic levels on the motorway in 2027 compared to the earlier analysis. And ii) in the HDM-4 model the economic cost of fuel has been substantially increased, based on the latest US Government long term forecasts.

Based on advice from a panel of experienced construction engineers, the full motorway should be built in one stage only. The analysis in the draft final report (April 2008) assumed it would be possible to construct in two stages: building a 'half motorway' with two lanes first, and later, adding a second carriageway with two more lanes. Such a strategy would be possible in many countries where there are no special terrain difficulties. However in Montenegro the mountainous terrain for most of the route Durmani-Boljare is particularly severe, such that well over half of construction cost will consist of building tunnels (38,000m) and bridges (17,000m) which together extend for more than one-third of the total length. Engineering logistics, traffic disruption in a second (upgrading) phase of construction, and safety considerations all mean it is better and less costly to build the full motorway in one stage. (see Technical Memo no. 30).

3.2 Construction Schedules

For economic analysis purposes the assumed construction schedules, and financial costs by section, are shown in the table below.

Table 3.1 Construction schedules and financial costs (Million Euros)

Section	km	2011	2012	2013	2014	2015	2016	2017	2018	Total
Matesevo - Boljare	75.7	146.2	146.2	146.2	146.2					584.6
Smokovac - Matesevo	43.5	160.2	160.2	160.2	160.2					640.8
Durmani-Virpazar	11.7				38.6	38.63	38.6			115.9
Virpazar-Farmaci	22.9	69.1	69.1	69.1	69.1					276.3
Farmaci-Smokovac	15.4						61.7	61.7	61.7	185.1
Totals	169.2	375.4	375.4	375.4	414.0	38.6	100.3	61.7	61.7	1802.6

Note: Totals may differ due to rounding

3.3 Works and Engineering costs

Details of engineering costs are given in the tables below. The costs were derived from a common set of unit costs and are for the Montenegrin geometric design standards as used in the 1:25000 scale outline designs that were recently prepared, together with bills of quantities (BOQ) by SIMM Engineering. Should the TEM (Trans-European Motorway Standards & Recommended Practice 3rd Edition Feb. 2002) standards eventually be employed, it has been estimated that works and engineering costs would be less than 2 percent different from those given below.

The two tables below give unit costs and details of the estimated engineering costs, including design and supervision (8%) and environmental mitigation provisions (5%). For economic analysis purposes the conversion factor used is 0.80.

Table 3.2 a) Unit costs of engineering works

No.	Construction works	Unit	Unite Price
1.	Preliminary works	km	€ 25,000.00
2.	Excavations		
	a) material class III & IV	m³	€ 4.50
	b) material class V & VI	m³	€ 7.50
3.	Embankment		
	a) material class III & IV	m³	€ 3.50
	b) material class V & VI	m³	€ 4.50
4.	Drainage	m'	€ 120.00
5.	Cut and side cut slope protection	m²	€ 11.00
6.	Drainage channels	m'	€ 22.50
7.	Shoulders	m²	€ 1.80
8.	Water source development	pcs	€ 2,700.00
9.	Mechanically stabilized bottom bearing course 40 cm.	m³	€ 12.00
10.	Carriageway		
	a) Pavement (2 x 8 cm);	m²	€ 22.00
	b) Wearing course (4 cm)	m²	€ 8.50
11.	Concrete curb dim. 18/24.		€ 16.00
12.	Concrete gutter width 75 cm.	m'	€ 20.00
13.	Edge marking line 0,35x0,20.	m'	€ 15.00
14.	Edge marking line 0,20x0,20.	m'	€ 12.00
15.	Concrete retaining walls MB 20 base excavation	m³	€ 200.00
16.	Culverts f 1-5 m	m'	€ 400.00
17.	Storm drainage	m'	€ 150.00
18.	Road equipment	km	€ 8,000.00
19.	Bridges and Viaducts		
	a) 10-30 m';	m'	€ 15,400.00
	b) 30-50 m';	m'	€ 18,700.00
	c) 50-100 m';	m'	€ 23,100.00
	d) over 100 m'.	m'	€ 26,400.00
20.	Tunnels:		
	a) to 200 m';	m'	€ 17,500.00
	b) 200 - 500 m';	m'	€ 18,700.00
	c) 500 - 1500 m';	m'	€ 19,500.00
	d) "Sozina" 4150 m' (1 tube)	m'	€ 12,500.00
21.	Illumination / open alignment and bridges	m'	€ 50.00
22.	Telecommunication / open alignment and bridges	m'	€ 60.00
23.	Toll booths	pcs	€ 375,000.00
24.	Gas stations	pcs	€ 187,500.00
25.	Grade separated interchanges	pcs	€ 2,750,000.00

Table 3.2 b) Full Motorway Construction Costs (Cost in Euros)

	MOTORWAY BAR-BOLJARE				
SECTION	Djurmani - Virpazar	Virpazar -Smokovac	Matesevo-Berane	Berane-Boljari	* TOTAL :
	km 13+241- km 24+951	km 24+951 - km 63 + 182			
	L=11.71 km	L= 38.231 km	L= 34.352 km	L=41,300 km	L=125.593 km
Alignment	12,012,772	149,276,451	89,282,246	119,941,092	**370,512,560**
Tunnels	71,102,500	105,829,000	103,668,800	71,219,000	**351,819,300**
Bridges	12,127,500	100,416,800	74,019,000	35,684,000	**222,247,300**
Junctions	5,500,000	11,000,000	5,500,000	5,500,000	**27,500,000**
Other activities (gas stations,maintanance bases ,toll booths...)	1,312,500	5,422,000	2,352,000	3,000,000	**12,086,500**
Illumination,telecomunication	494,934	3,599,310	3,096,060	4,137,100	**11,327,404**
Connection with A-I motorway		32,800,000			**32,800,000**
TOTAL: construction works	**102,550,206**	**408,343,561**	**277,918,106**	**239,481,192**	**1,028,293,064**
Design and supervision (8%)	8,204,016	32,667,485	22,233,448	19,158,495	**82,263,445**
Environmental protection (5%)	5,127,510	20,417,178	13,895,905	11,974,060	**51,414,653**
TOTAL: Other costs	**13,331,527**	**53,084,663**	**36,129,354**	**31,132,555**	**133,678,098**
TOTAL (EUR) :	**115,881,733**	**461,428,224**	**314,047,459**	**270,613,747**	**1,161,971,163**
Costs per km (Eur)	**9,895,964**	**12,069,478**	**9,142,043**	**6,552,391**	**9,251,878**

Note: This table excludes the Smokovac-Matesevo section, currently under detailed design by the University Engineering Faculty. This section has been provisionally costed at Euros 640.8 million.

At first sight the construction works may appear costly. However, for four sections totaling 127.9 km (namely Virpazar-Smokovac, Matesevo–Andrijevica, Berane-Boljare, and Durmani-Virpazar) there are 25 kilometres of tunnels and 10.8 km of bridges or viaducts. Thus, nearly one-third of the length of these sections consists of tunnels or bridges. Additionally, up to about half of the central section from Smokovac to Matesevo, where the terrain is even more difficult, will also consist of tunnels and bridges.

3.4 Economic growth and traffic forecasts

The GDP forecast by the Central Bank (CBCG) for the period 2006-2020 is given in the table below, together with estimates for GDP per capita growth rates. The CBCG 'most likely' scenario for this period is 6% per annum for total GDP, or 5.4% p.a. in per capita terms, assuming the population growth rates used in the Physical Plan of Montenegro (PPM).

Table 3.3 CBCG forecasts for GDP 2006-2020 (%/year)

Scenario	GDP	GDP/capita
Optimistic	7.0%	6.4%
Most likely	6.0%	5.4%
Pessimistic	4.0%	3.4%

Source: CBCG document, Table 7.1 & PPM Table 16

After 2020, there is no official forecast, and more conservative growth rates are anticipated. For the periods 2021-2027 and 2028-2037, lower rates of growth are used, to allow for the greater level of uncertainty that is inherent in long term forecasts. In the table below the 'most likely' and 'pessimistic' CBCG scenarios (to 2020) for income per capita are shown.

Table 3.4 Income per-capita growth forecasts to 2037 (% per year)

from/to	Most Likely	Pessimistic
2006-2020	5.40%	3.40%
2021-2027	3.60%	2.30%
2028-2037	2.40%	1.50%

Source: CBCG to 2020, and consultant estimates.

Based on the above, demand elasticity ratios (w.r.t personal income) for passenger travel have been estimated and utilized to produce the traffic growth forecasts shown in the table below. Between the 'standard' (CBCG most likely) and the low growth forecasts, a median forecast is included.

Table 3.5 Passenger traffic growth forecasts

Period from - to	Demand elasticity	Annual passenger traffic growth		
		Standard	Median	Low growth
2007-2012	1.40	7.5%	6.1%	4.7%
2012-2017	1.30	7.0%	5.7%	4.4%
2017-2020	1.20	6.5%	5.3%	4.1%
2021-2027	1.20	4.3%	3.5%	2.8%
2028-2032	1.20	2.9%	2.3%	1.8%
2032-2037	1.20	2.9%	2.3%	1.8%

For freight traffic, demand is assumed to increase in direct proportion to total GDP growth, thus truck traffic is forecast to grow at 6% per year until 2020, and at 3.5% per year thereafter in the standard forecast case, and by 4% until 2020 and 2.5% thereafter in the low growth case.

3.4.1 Other GDP forecasts

Other recent GDP forecasts for Montenegro are from SEETO (Southeast Europe Transport Observatory) and the World Bank. The SEETO forecasts of GDP and traffic growth for countries in the region are given in the table below.

Table 3.6 SEETO Regional GDP & Traffic growth 2010-12

	GDP (a)	Traffic (b)	Elasticity (b/a)
Albania	6.5%	10.8%	1.66
Bosnia & Herzegovina	5.5%	8.9%	1.62
Croatia	3.7%	6.1%	1.65
Serbia	4.9%	8.0%	1.63
Montenegro	5.0%	8.1%	1.62

Source: SEETO, 2007

World Bank estimates of GDP growth, in the medium term from 2007 to 2014, are as follows: 7.5% in 2007 and 6.5% in 2008, then gradually slowing to 5% from 2012 onwards. (*Country Partnership Strategy for the Republic of Montenegro for FY07-FY10. May 15, 2007 Report No. 39800 –ME*). In the outturn, the annual GDP increase in Montenegro for 2007 has been provisionally measured as 7.2 percent. (Monstat, May 2008 provisional)

3.4.2 Traffic volumes by section

Projected traffic volumes (AADT) for each section are given in the table below. The volumes (rounded to 00s below) are for the standard economic growth case, but excluding the generated traffic (new traffic that will flow only as result of motorway completion) that is expected to arise.

Table 3.7 Forecast traffic volumes by section and by year

Year	Matesevo-Boljare	Smokovac-Matesevo	Durmani-Virpazar	Virpazar-Farmaci	Farmaci-Smokovac
2015	8,017	9,073	11,549	9,841	4,357
2020	10,378	12,566	16,946	14,715	6,766
2025	13,436	17,404	24,865	22,005	10,506
2030	15,937	20,987	30,334	26,946	13,421
2035	18,494	24,449	35,337	31,390	16,328
2040	21,461	28,480	41,164	36,567	19,866

Source: HDM-4 reports

For economic analysis using the HDM-4 model, the sections from Matesevo to Berane and Berane-Boljare) were combined into one (named Motorway North) since firstly: traffic volumes in both base year (2007) and the horizon year 2027 were closely similar, and second: the rationale for extension of the motorway beyond Matesevo depends principally on the assumption that the motorway in Serbia, from Pozega to Boljare, will be open by the time of completion. Should the Serbian section be delayed, traffic benefits for the Matesevo-Berane-Boljare section would be severely reduced, and the NPV certainly negative. In this analysis it is assumed that border crossing delay at the new motorway border post will be the same as at Barski Most (Dobrakovo). However this may be a rather conservative assumption. In reality by 2015, it may be expected that on the motorway, border delays to vehicles will be kept to the very minimum, probably using new processing technologies, and will be certainly less than on the old road to Serbia from Bijelo Polje.

For the median economic growth case, and in the 'low' or pessimistic GDP scenario, aggregate traffic volumes during the period 2015–2027 would be lower by 18% and 29% respectively.

3.5 Discount rate

The EAR study of upgrading (to motorway standard) of two links between Belgrade and Montenegro (COWI-BCEOM, March 2006) adopted a discount rate of 7 percent. However, a discount rate of 5 percent could be used, based on an observation in the EC Guide that *"eventually, for regions lagging behind, a 5 percent return is compatible with the approach where a standard benchmark discount rate is used reflecting a required real growth objective"* (EC, op cit. p 105).

A test discount rate of 5 percent is therefore considered suitable for this analysis.

3.6 Economic analysis

The economic comparison is made by deducting the 'with project' (WP) costs of traffic on motorway and the existing road from the 'without project' (WOP) costs. In the with project case there are two traffic flows, being i) traffic that transfers to the motorway, and ii) traffic that elects to continue using the existing road. The latter traffic flow benefits to the extent that congestion will be considerably less after the motorway is in use.

Smokovac–Matesevo (Central motorway). The starting point for traffic flows is Smokovac, and the ending point is Kolasin. Thus, the link from the Matesevo junction of the motorway to Kolasin is taken into account in the economic comparison. The sections for analysis are as follows:

- Existing road Smokovac–Kolasin 57.7km
- Motorway Smokovac–Matesevo junction 43.5 km
- Existing road Matesevo junction–Kolasin 8.5 km

For Matesevo to Boljare, the Northern motorway section, the comparison is based on drivers' decisions for two alternatives on arrival at Matesevo. **Alternative A**: Matesevo–Berane -Boljare–Serbian motorway. In this case there will be a motorway link direct to Pozega. **Alternative B**: Matesevo–Kolasin–Serbian border at Gostun–Serbian motorway. Choosing this alternative drivers will face an additional 15.9 km of travel in order to enter the Serbian motorway at Pozega. This 'penalty' link is therefore included in the HDM analysis for both the 'with project' and 'without project' case. In the case of the remaining sections, to Podgorica and the south, drivers' decision points, and lengths of the existing road and the motorway, are equal.

Principal details of the economic analysis are given in the table below, showing economic costs, lengths (in km) the start and end years of construction, the net present values (NPV) at the test discount rate of 5 percent, and the economic internal rate of return (EIRR).

Table 3.8 Economic analysis by section & combined analysis

Costs in million Euros (Meur)

sections	Djurmani Virpazar	Virpazar Farmaci	Farmaci Smokovac	Smokovac Matesevo	Matesevo Boljare	**All sections**
Economic cost	€ 92.7	€ 221.0	€ 148.1	€ 512.6	€ 467.7	€ 1,442.1
Length km	11.71	22.90	15.35	43.50	75.70	169.16
Cost /km	€ 7.92	€ 9.65	€ 9.65	€ 11.78	€ 6.18	€ 8.53
Start construction	2104	2011	2015	2011	2011	2011
End construction	2016	2014	2018	2014	2014	2018
NPV (Meur)	€ 62.9	€ 46.1	€ 14.7	€ 121.6	€ 118.2	€ 317.7
EIRR (%)	11.9%	6.2%	5.7%	6.5%	6.7%	6.5%
Components of benefit (%)						
Vehicle costs	16.5%	11.7%	20.0%	31.8%	29.9%	26.2%
Travel time savings	53.0%	54.2%	49.7%	46.3%	45.0%	47.4%
Generated traffic	0.0%	6.6%	7.0%	7.8%	7.5%	6.9%
Accident savings	30.5%	27.5%	23.4%	14.1%	17.6%	19.2%
memo item						
Financial cost	€ 115.9	€ 276.3	€ 185.1	€ 640.8	€ 584.6	€ 1,802.7
Financial cost/km	€ 9.90	€ 12.06	€ 12.06	€ 14.73	€ 7.72	€ 10.66

As noted earlier, this analysis used traffic forecasts based on the Central Bank 'most likely' or standard GDP growth scenario for the period until 2020. Using a median traffic growth forecast (i.e., mid-way between this 'standard' forecast and the Central Bank 'pessimistic' scenario) would result in about 17 percent less traffic volume on average, and would mean that to be socially profitable construction starts would need to be postponed until later years than those given in the table above. Cost-benefit analysis output tables from HDM-4 for each section are given in Appendix 3-A

3.7 Sensitivity tests

For the tests shown in the table below, the NPV (€ million) is shown, the change (%) in NPV in the second column, and lastly the economic internal rate of return (EIRR).

Table 3.9 Summary of sensitivity tests

Sensitivity tests	NPV (Meur)	EIRR (%)
Standard case (discount r =5%)	***€ 317.70***	***6.46%***
All traffic benefits reduced by 20%	€ 11.60	5.06%
Capital cost increase of 20%	€ 56.70	5.23%
Value of travel time reduced by 33%	€ 74.50	5.36%
Generated traffic = zero	€ 212.00	5.99%
Discount rate = 10%	€ (453.70)	6.46%
Discount rate = 7%	€ (94.10)	6.46%

Switch value for construction costs	plus 22%
Switch value for value of travel time	minus 39%

The two primary fields of sensitivity are: capital costs, and the expected level of opening year traffic flows, as in any road analysis. As shown above, the value for costs that reduces (or 'switches') the net present value (NPV) to zero or slightly negative is 22% meaning, total financial cost rising to some Eur 2199 million from the estimated Eur 1802 million.

The 'switch' value for traffic benefits is minus 22 percent in the standard growth case. For the median growth scenario, there would be a much lower but still positive benefit, at about Eur 43.3 million NPV. The low economic growth scenario is considered unlikely - it is a decidedly 'pessimistic' outlook in the view of the Central Bank.

3.8 Summary of estimates of value of travel time

Values of travel time for cars & private vehicles were derived from results of the Stated Preference (S-P) roadside surveys carried out in October 2007. The value of travel time (VOTT) is of importance since the classified traffic counts showed that private cars represent 85-90 percent of total traffic flows on the north-south corridor. The VOTT derived from the surveys is used as a value representing the drivers' 'willingness to pay', and since the 1980s S-P surveys have become part of the accepted methodology for economic analysis of road projects in general. Analysis of the survey data – consisting of 1494 valid responses from drivers - showed the overall perceived value of time to be €3.54 per driver-hour, averaged across all respondents from the 16 country-wide survey stations. In the S-P surveys, average car-occupancy was found to be 2.14 persons (including driver) per vehicle. However, for the car passengers, it cannot be assumed they would perceive the value of a travel time saving the same as the driver, and hence a workable hypothesis is needed. In the S-P surveys only drivers were interviewed[4], and so there is no direct evidence on the willingness-to-pay (WTP) value of passenger time saving.

For car passengers, the hypothesis is that some passengers will have a WTP value at least as high as the driver (€3.54/hour) while others will have a value of close to zero. Then, assuming a normally distributed range of choices, the mean value for passengers would be [3.54/2] or €1.77 per hour. The overall value of time for cars and private vehicles is therefore €5.56 per car-hour, of which, car passengers (average 1.14 per vehicle) contribute about 36 percent. In real terms time saving values will increase in line with the GDP per-capita forecast and thus the values above are adjusted by a factor of 1.296 to reflect the average annual growth of personal incomes in the analysis period (2.58% per year) and the discount rate of seven percent. (See TM No. 16 section 2). The HDM input value is thus €7.21 per car-hour, or € 3.37 per occupant-hour.

Bus Passengers - Bus passengers were not included in the S-P surveys, and so a standard wage-based approach to estimating VOTT was used. For users of buses and micro-buses, reference was made to data on average monthly earnings. The gross wage rate (including employer contributions) average for 2007 is estimated as €484 per month[5] thus giving a value of €2.77 per hour at an average 175 working hours per month. From World Bank[6] recommendations, the value of non-working time is taken as 30 per cent of the gross value

[4] For practical reasons it was not possible to interview all vehicle occupants.
[5] Source: Montenegro Business Outlook, Sept. 2007.
[6] Professor K. Gwilliam, Paper no. OT-5, Transport Department, World Bank.

of working time. This value is therefore estimated as €0.83 per person-hour. Based on the BCEOM 2003 studies[7] it is estimated that 25 percent of bus passengers travel for a work or business purpose, and there are an average 22 persons per bus trip. The overall value of travel time is therefore €28.90 per bus-hour, of which, the non-working time element contributes 47 percent. Adjusted for future increases in real per-capita incomes as for cars (see previous paragraph) the HDM input values become €3.58 per working hour and €1.08 per person-hour for non-working trips on buses.

3.9 Summary of accident prevention parameters and social values

3.9.1 Accident prevention parameters and social values

The rates of accidents, fatalities, and injuries per 100 million vehicle-km (100mvkm) traveled on the roads concerned in the project evaluation were evaluated using Police reports for the period 2006-2007. For the Bar-Barski Most (Serbian border) existing main road, injury-accident rates in 2006, as assessed from Police data available so far, are shown below.

Table 3.10 Injury-Accident rates per 100 million vehicle-km (100mvkm) in 2006

Road	from -	to -	Accidents 2006	AADT in 2006	Length km	mvkm 2006	Accidents /100 mvkm
M2-1	Barski Most	Bijelo Polje	46	4,949	16.2	29.3	157
M2-1	Bijelo Polje	Ribarevina	36	4,949	6.2	11.2	321
M2	Kolasin	Mojkovac	41	4,338	20.2	32.0	128
M2	Mojkovac	Slijepac Most	9	3,314	17.3	20.9	43
M2	Bioce	Monastir Moraca	31	3,886	40.0	56.7	55
	Northern	***Totals***	*163*		*99.9*	*150.1*	***109***
M2-4	Bar	Petrovac	150	6,589	19.3	46.3	324
M2	Petrovac	Virpazar	41	4,900	24.8	44.4	92
M2	Virpazar	Podgorica	55	5,649	33.0	68.0	81
	Southern	***Totals***	*246*		*77.1*	*158.8*	***155***

Source: Police data and Consultants estimates

In general, the accident rates above tend to confirm anecdotal evidence: that the safety record on the existing main road from Bar to Barski Most is indeed substandard. The very high accident rates for two sections, namely Bijelo Polje-Ribarevina, and Bar-Petrovac, may be attributed to these sections being largely urban or sub-urban in character. Road accident rates for this study are given in the table below.

Table 3.11 Accident rates by road type for this study
(Personal injuries per million vkm)

Road type / route	Fatal	Non-fatal
Motorway	2.0	40.0
Bar-Podgorica	6.8	148.2
Podgorica - border	4.8	104.2

[7] BCEOM/COWI, 2003, Final Report, Vol. 5 *Calibration of Road User Effects Input to HDM-4*.

A review of motorway fatal accident rates in nine countries in Western Europe is given in the table below.

Table 3.12 Fatal injury rates on motorways in selected European countries

Country	Motorway travel (mvkm) 1999	Fatalities / 100 mvkm
Denmark	9,164	0.098
Great Britain	93,400	0.216
Finland	3,693	0.244
Sweden	9,853	0.254
Holland	48,883	0.270
France	102,586	0.480
Belgium	30,083	0.708
Austria	16,207	0.901
Portugal	8,156	1.508
Total	322,025	**0.420**

The data above show a wide variance around the mean. Denmark, Finland and Great Britain are well below average, but Austria and Portugal are about 2 or 3 times above the average, indicating that, even on motorway-standard roads much can be done (e.g., enforcing speed limits, seat belts, etc.) to reduce fatality rates. There is evidence that in some south-eastern European countries, motorway fatality rates can be considerably higher than those above. For example in Romania for 2003, the fatal injury rate was estimated[8] at 3.2 per 100mvkm. Low fatality rates in northern Europe may be the product of long experience and of efficient police enforcement procedures. Evidence from Hungary[9], where the motorway experience is fairly recent, indicates that motorway fatality rates are one-third of those for other main roads. This ratio is considered reasonable for all personal-injury accidents in this study and is therefore utilized. It is concluded that the fatality rate used in this study for the motorway, 2.0 per million vehicle-km (mvkm) is fairly conservative; for example, as shown above, Portugal has the highest fatality rate of the European motorways examined, has a fatality rate of 1.51 per mvkm.

Using the 'gross output' approach, the basic social values of road injury-accident prevention were estimated and are given in the table below. (see TM no. 12A).

Table 3.13 Social values of injury-accident prevention on roads

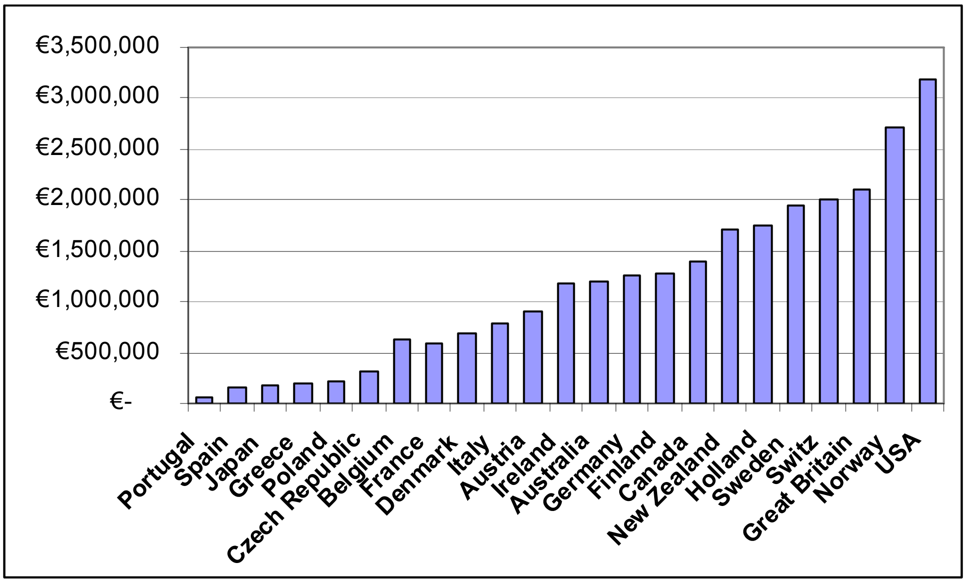
Social costs	Fatality		Severe injury		Minor injury	
a) Lost output	€	70,570	€	16,820	€	3,264
b) Human cost	€	105,855	€	33,640	€	-
Total	**€**	**176,425**	**€**	**50,460**	**€**	**3,264**

3.9.2 Comparative data for value of preventing a fatality

The value of preventing a road fatality, in 2002 Euros, adjusted for purchasing power parity, are shown in the chart below.

8 Source: CESTRIN, Romania Highway Agency, August 2004.
9 State Motorway Management Company Ltd. (SMMC Ltd. Hungary)

Figure 3-1 Comparative national values of preventing a road fatality



Source: www.erso.eu/knowledge/content/08_measures/monetary_valuation_of_road_safety.htm

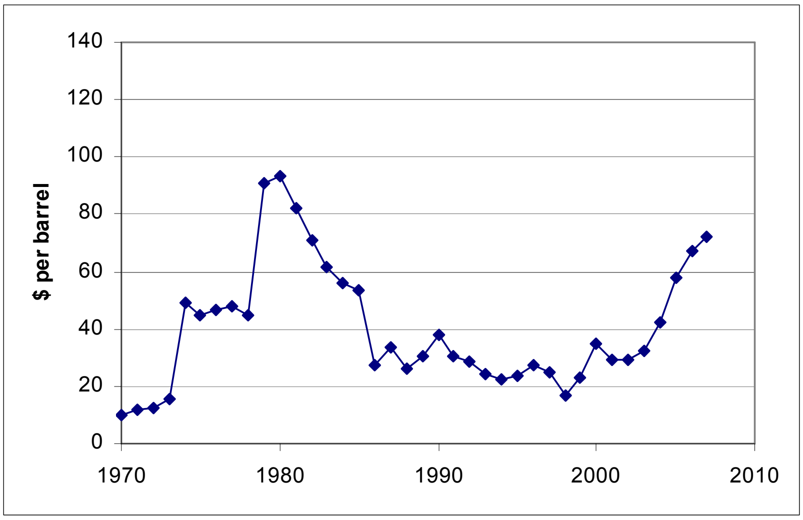
The valuations vary substantially. An interesting pattern is that some of the countries that have a good safety record, such as Norway, Great Britain, Sweden and the Netherlands, assign a high monetary value to the prevention of a traffic fatality. Other countries, with a rather bad road safety record like Portugal, Spain and Greece, assign a low monetary value to the prevention of a fatality.

A study of 68 countries published in the Journal of Transport Economic and Policy "Variations between Countries in Values of Statistical Life" by Ted Miller (JTEP Vol 34 Part 2, May 2000, pp 169-188) found that values are typically about 120 times GDP per capita; this would indicate that the current value of preventing a road death in Montenegro should be of the order of Eur 360,000. It is thus considered that the values adopted in this study (see Table 3.10 above) are relatively conservative.

3.10 Fuel prices

There is considerable uncertainty in forecasting prices of many commodities over a long period, and this is certainly the case with crude oil. The graph below shows how average annual prices of crude (adjusted to 2007 dollars) have changed significantly over the last 30 years. The right-most point on the graph shows the average price during 2007, nearly $73, while so far during 2008 the average is about $120 per barrel, well exceeding the previous historic high point of 1980.

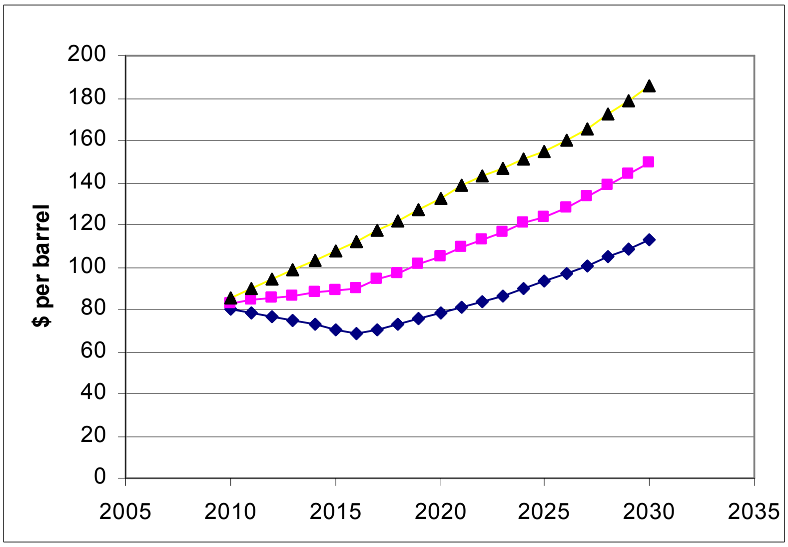
Figure 3-2 Average annual crude oil prices 1970-2007



Source: BP Review, 2008.

For a projection of crude oil prices in future, the U.S. Energy Information Agency (EIA) 'high' and 'reference' forecasts (triangles and diamonds) are shown in the graph below. The median (squares) of these projections is used.

Figure 3-3 EIA forecasts (July 2008) of crude oil prices, 2010-2030



Source: www.eia.doe.gov/oiaf/ieo/index.html.

The median of the EIA forecasts implies that crude prices will attain about $149 per barrel by year 2030, that is, rising at an average of about 2.7% per year from 2010. Based on this forecast, a calculation of fuel costs for HDM economic analysis is made, although recognizing that there is a large degree of uncertainty in the forecast. For analysis purposes the long term price of crude oil is assumed at US$120 per barrel. Based on information obtained from the Ministry of Economic Development, refinery manufacturing margins are estimated at €0.114 per litre for both diesel and gasoline, and sea transport costs at €23.30 per tonne or €.020 per litre. Inland distribution costs including retailing margins are added to give the economic cost of gasoline and diesel fuel, as shown in the table below. The traditional trading currency for oil is the US dollar and for this calculation the average long term exchange rate for dollars is assumed as $1.40 per Euro.

Table 3.14 Long term economic cost of fuel (Euro/litre)

Long term crude oil price	€	0.539
Manufacturing cost	€	0.114
Sea transport	€	0.020
Inland transport	€	0.025
Retailing margin	€	0.047
Total	**€**	**0.746**

Source: Consultant estimates (see text)

3.11 Other vehicle cost inputs for HDM analysis

The HDM-4 input data for the road user effects (RUE) model are given in the table below. Data on vehicles, tyres, unit costs for crew and workshop labour, were obtained from official agencies and dealers in new vehicles and tyres in Podgorica and Kotor. Other RUE elements, such as ESAL (equivalent standard axle load, or road damage factor) factors for trucks and buses, and annual working hours, are from the BCEOM 2003 *Study of Road investments in Montenegro*. Vehicle occupancy data are from the 16 point traffic and origin-destination surveys carried out in October 2007 by this study. (See Technical Memos 6 and 8A).

Table 3.15 Road User HDM-4 Input data summary

Model Input Parameter	Car	Light delivery vehicle	Microbus	Bus	Small truck	Medium truck	Articu-lated truck
Vehicle class	*Car*	*Utility*	*Bus*	*Bus*	*Truck*	*Truck*	*Truck*
PCSE	1.0	1.0	1.0	1.8	1.5	2.0	3.0
Number of axles	2	2	2	2	2	2	5
Number of wheels	4	4	4	6	6	6	12
Annual km	16,000	20,000	40,000	40,000	40,000	40,000	80,000
Annual work hours	500	600	1,200	1,200	1,200	1,200	2,000
Average life (years)	12	12	12	12	12	14	14
ESAL factor	0	0	0	0.92	0.02	0.60	3.23
Operating weight (tonnes)	1.10	2.60	2.50	11.84	4.13	7.50	28.85
number of passengers	2.1	-	4.5	22.0	-	-	-
New vehicle price	€11 200	€14 500	€18 800	€94 900	€30 000	€51 000	€106 000
Replacement tyre price	€ 78	€ 96	€ 96	€ 227	€ 96	€ 181	€ 341
Workshop labour / hour	€ 6.00	€ 6.00	€ 6.00	€ 9.00	€ 7.00	€ 9.00	€ 9.00
Crew cost per hour	-	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50
Overheads (annual)	€ 200	€ 220	€ 300	€ 700	€ 380	€ 770	€ 1,180
Passenger work time/ hour		-	€ 3.58	€ 3.58	-	-	-
Non-working time /hour	-	-	€ 1.08	€ 1.08	-	-	-

Notes: Articulated truck semi-trailer tyres (6) are super-singles.
Costs are expressed in economic terms, exclusive of VAT and all other taxes and duties.
PCSE = passenger car space equivalent.
ESAL = equivalent standard axle load.

3.12 Daily Traffic histogram

Data from the 24-hour traffic counts at stations nos. 4, 9, 10, and 14 were examined to check the daily traffic profile (a 24 hour histogram) against default histograms provided in HDM-4. For the four stations on the N-S existing road in October 2007 the mean traffic flow profile in vehicles/hour throughout the day, is shown in the graph below. The HDM model default profiles consist of: free-flow, commuter, seasonal, and inter-urban. However these were found not to correspond sufficiently well with profiles observed at the count stations on the N-S existing road. A new daily histogram was therefore created for HDM modelling purposes.

The HDM input traffic profile is shown in the table below, consisting of three flow-periods of 2,190 hours each per year (denoted HRYR) one period of 1790 hours, and one period of 400 hours to account for seasonal traffic on this route when in July and August average traffic volumes are double the normal daily flow. Percentages of total traffic in the flow-period for the year are denoted PCNADT, and in the table average hourly flows in percent of total (denoted HV) are also shown, For reference purposes the annual average hourly traffic ratio (AAHT) for each flow-period are also given, expressing flows as a ratio of the 24 hour average, i.e., of 1/24 or 4.17 percent per hour.

Table 3.16 Daily traffic histogram for HDM-4 input

FLOW_NAME	HRYR	PCNADT	HV	AAHT
Period 1	400	11.0	10.4%	2.500
Period 2	1,790	32.0	6.7%	1.600
Period 3	2,190	30.0	5.4%	1.300
Period 4	2,190	21.0	3.3%	0.800
Period 5	2,190	6.0	1.0%	0.250

3.13 Vehicle emissions effects of the motorway

In conventional cost-benefit analysis, exhaust emissions and pollution from road vehicles is treated as an externality, along with other external effects from road transport, particularly in urban areas, such as noise and vibration, etc. They are called external effects or dis-benefits[10], because the people involved, as road users, are not directly concerned, they are passing on the loss of utility to the community in general. That is, unless government action is taken to make road users pay, in some form of tax or charge for the social cost of emissions, noise, etc. In fact, the government regulates the retail price of road fuels and includes a small charge per litre in the price for environmental effects. The government plans to increase environmental charges for vehicles in the near future, imposing an annual charge, of € 10 for cars, and up to €130 for heavy trucks. This is expected to raise revenues of about € 20 million per year. It should also be noted that Montenegro has already adopted the EURO-3 standard, an EU regulation which puts a limit on passenger car emissions[11].

From this study the evidence available so far is insufficient to enable the social costs of increased vehicle emissions, in particular carbon-dioxide (CO2) to be included as part of the

[10] Occasionally an external benefit may arise, but this is not often in road transport.

[11] Effectively means that cars more than 10 years old can no longer be sold by dealers in Montenegro.

cost-benefit analysis. An analysis carried out using the HDM-4 version 2.04 (reportedly with much improved vehicle emissions models compared to HDM-4 versions 1.xx) indicates that CO_2 emissions on the motorway may increase by about 400 tonnes per 100,000 vehicle-km (due to faster speeds[12] and consequently increased fuel consumption) but although this increase seems alarming, it is only slightly – about 4 percent - above the estimated level of CO_2 emissions output for the existing road. Turning to indicative social costs (i.e., which might be used in a CBA) the carbon offsets market has been extremely volatile in recent times. Carbon prices are difficult to predict because of the large number of factors that influence emissions and emission reductions. The pace of economic growth, changes in fuel prices, availability and cost of abatement options, and access to carbon offsets are just a few of the factors that determine the dynamics of supply and demand in carbon markets. For example, in Phase I of the European Union Emissions Trading Scheme (EU ETS) the cost of CO_2 rose to more than €30 per tonne in October 2005, but then fell to less than €11 per tonne in April 2006. Current predictions for 2008 vary considerably, making the price between €6 to €18 per tonne. The conclusion therefore at this stage is that it would not be meaningful to include emissions effects directly into the economic analysis.

3.14 Complementary road improvements in the North

In order to maximize use of the motorway, it is recommended that a number of adjacent road links in the north be improved in the near future, if possible before completing motorway construction. The proposed link improvements and approximate lengths (km) are given below. As noted in the table, some of the links, totaling about 142 km, are already included for upgrading in the Physical Plan of Montenegro (PPM).

Table 3.17 Proposed complementary improvements

Link from /to	km (approx)
Kolasin – Mojkovac	20
Mojkovac – Zabljak	46
Zabljak – Savnik (1)	37
Mojkovac - Bijelo Polje	24
Rasova – Plevlja (1)	39
Berane - Rozaje	30
Andrijevica – Plav (1)	37
Berane - Bijelo Polje (1)	29
Total approx length (km)	262

For the remainder, the proposed improvements would consist of:-

- Re-surfacing and resealing, shape corrections and pothole filling, etc.
- Safety related measures, as those proposed for the existing M-2 road from Bar to Bijelo Polje; and including,
- Other small scale works such as widening on sharp bends and for bus stops.

[12] In 2017, average traffic speeds are expected to be 60 km/hour on the old road and 86 km/hour on the motorway.

- Junction layout improvements (as required) for minor roads.

An approximate cost estimate for the improvements is given in the table below.

Table 3.18 Approximate cost of proposed improvements

Type of works	km	Cost/km (000s)	Total (000s)
Re-surfacing, resealing etc	130	€ 30	€ 3,900
Additional safety measures	262	€ 45	€ 11,790
Other works - junctions etc.	30	€ 70	€ 2,100
Total approximate cost			€ 17,790

Thus, about €18 million could be set aside for such complementary projects. If funds are not available to complete improvements for all these eight links within the motorway building period, the projects could be given priority rankings using a simple ratio such as: [annual traffic in vehicle-km / capital cost] which is comparable to the benefit/cost ratio B/C. Improving these links as the motorway construction proceeds would clearly demonstrate commitment to economic development of the northern municipalities and would help (perhaps considerably) to maximize toll revenues on the motorway, and to make the motorway more attractive to investors, since it would create an effectively enlarged catchment area of potential motorway users.

APPENDIX 3 – A

Cost –Benefit analysis tables

Table 3-A-1

			Disc rate =	5.0%	generated =	20%	RV =	33%
Matesevo - Boljare				**Costs & Benefits in Eur millions**				
							B / C ratio	1.31
Econ cost	-467.700			Length (km)	75.70		NPV =	€ 118.2
switch =	100%	-467.7					EIRR =	6.66%
	Road Agency Costs			**Road User Benefits**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-116.925							-116.925
2012	-116.925							-116.925
2013	-116.925							-116.925
2014	-116.925							-116.925
2015		0.000	-0.149	6.670	9.985	1.665	4.665	22.836
2016		0.000	-0.149	7.107	10.639	1.775	4.918	24.289
2017		0.000	-0.149	7.565	11.339	1.890	5.185	25.830
2018		0.000	-0.149	8.027	12.090	2.012	5.466	27.445
2019		0.000	-0.149	8.444	12.893	2.134	5.762	29.083
2020		0.000	-0.149	9.008	13.749	2.276	6.074	30.957
2021		0.000	-1.374	9.666	14.655	2.432	6.403	31.783
2022		-6.288	-0.107	10.608	15.628	2.624	6.750	29.214
2023		-6.413	-0.150	11.036	16.914	2.795	7.115	31.297
2024		0.000	-0.149	12.173	18.115	3.029	7.500	40.669
2025		0.000	-0.149	13.046	19.414	3.246	7.906	43.463
2026		0.000	-0.149	13.998	20.821	3.482	8.334	46.485
2027		0.000	-0.149	14.564	21.665	3.623	8.586	48.289
2028		0.000	-0.149	15.199	22.549	3.775	8.845	50.219
2029		0.000	-0.149	15.982	23.474	3.946	9.113	52.365
2030		0.000	-0.149	17.037	24.440	4.148	9.388	54.864
2031		0.000	-0.149	18.030	25.447	4.348	9.671	57.347
2032		6.413	-0.039	19.103	26.491	4.559	9.964	66.490
2033		-12.701	-0.149	13.520	27.455	4.097	10.265	42.487
2034		0.000	-0.149	18.728	28.963	4.769	10.575	62.885
2035		-6.413	-0.151	19.422	30.247	4.967	10.894	58.966
2036		0.000	-0.149	21.881	32.981	5.486	11.223	71.422
2037		0.000	-0.149	24.453	36.531	6.098	11.562	78.495
2038		0.000	-0.149	28.329	41.542	6.987	11.912	88.620
2039	154.341	0.000	-0.149	31.869	45.808	7.768	12.271	251.907
NPV =	(308.36)	(13.05)	(2.90)	183.05	274.91	45.80	107.44	118.22
25			benefits %	29.9%	45.0%	7.5%	17.6%	

Table 3-A-2

		Disc rate =	5.0%	generated =	20%		RV =	33%
Smokovac - Matesevo				**Costs & Benefits in Eur millions**				
							B / C ratio	1.28
Econ cost	-512.600			Length (km)	43.50		NPV =	€ 121.6
switch =	100%	-512.6					EIRR =	6.49%

	Road Agency Costs (RAC)			**Road User Benefits (RUE)**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-128.150							-128.150
2012	-128.150							-128.150
2013	-128.150							-128.150
2014	-128.150							-128.150
2015		0.000	-0.088	6.016	8.304	1.432	3.601	19.264
2016		-0.714	-0.088	6.470	9.039	1.551	3.849	20.107
2017		0.000	-0.088	7.256	9.853	1.711	4.112	22.843
2018		0.000	-0.088	7.836	10.732	1.857	4.392	24.729
2019		0.000	-0.088	8.431	11.692	2.012	4.688	26.735
2020		0.000	-0.088	9.130	12.736	2.187	5.003	28.967
2021		0.000	-0.792	9.943	13.874	2.382	5.337	30.743
2022		-7.300	-0.088	10.942	15.126	2.607	5.691	26.978
2023		0.000	-0.047	14.098	16.720	3.082	6.067	39.920
2024		0.000	-0.088	12.435	18.193	3.063	6.465	40.067
2025		0.000	-0.088	13.387	19.929	3.332	6.888	43.447
2026		0.000	-0.088	14.425	21.862	3.629	7.336	47.164
2027		-0.714	-0.088	14.971	22.937	3.791	7.563	48.459
2028		0.000	-0.088	16.530	24.712	4.124	7.798	53.076
2029		0.000	-0.088	18.217	27.347	4.556	8.040	58.071
2030		0.000	-0.088	20.567	30.894	5.146	8.289	64.808
2031		0.000	-0.088	23.743	35.409	5.915	8.546	73.524
2032		0.000	-0.088	24.769	36.711	6.148	8.811	76.350
2033		-7.300	-0.088	25.850	38.003	6.385	9.084	71.934
2034		4.508	0.012	30.110	39.679	6.979	9.365	90.654
2035		-4.508	-0.091	26.298	40.993	6.729	9.656	79.077
2036		0.000	-0.088	27.829	42.601	7.043	9.955	87.339
2037		0.000	-0.088	28.721	44.256	7.298	10.264	90.451
2038		-0.714	-0.088	29.579	45.873	7.545	10.582	92.777
2039	169.158	0.000	-0.088	31.245	47.535	7.878	10.910	266.637
NPV =	(337.97)	(9.00)	(1.68)	208.19	302.58	51.08	91.97	121.58
25			benefits %	31.8%	46.3%	7.8%	14.1%	

Table 3-A-3

			Disc rate =	5.0%	generated =	20%	RV =	33%	
Farmaci - Smokovac				**Costs & Benefits in Eur millions**					
							B / C ratio	1.07	
Econ cost	-148.100			Length (km)	15.35		NPV =	€	14.7
switch =	100%	-148.1					EIRR =	5.67%	

Year	Constr.	Capital2	Recurrent	Vehicle Operation	Travel Time	Generated Traffic	Accident Savings	Net Benefits
	Road Agency Costs			**Road User Benefits**				
2010								
2011								
2012								
2013								
2014								
2015								-
2016	-49.367							(49.367)
2017	-49.367							(49.367)
2018	-49.367	0.000						(49.367)
2019		0.000	0.003	1.009	2.607	0.362	1.258	5.238
2020		0.000	0.003	1.091	2.845	0.394	1.373	5.706
2021		0.000	-0.246	1.194	3.103	0.430	1.500	5.980
2022		-2.579	0.003	1.332	3.386	0.472	1.637	4.251
2023		2.873	0.003	1.883	3.734	0.562	1.788	10.842
2024		0.000	0.003	1.612	4.084	0.570	1.953	8.221
2025		0.000	0.003	1.766	4.471	0.624	2.132	8.996
2026		0.000	0.003	1.937	4.898	0.683	2.328	9.850
2027		0.000	0.003	2.017	5.101	0.712	2.422	10.254
2028		0.000	0.003	2.099	5.312	0.741	2.518	10.674
2029		0.000	0.003	2.181	5.532	0.771	2.619	11.106
2030		0.000	0.003	2.257	5.760	0.802	2.724	11.546
2031		0.000	0.003	2.340	5.997	0.834	2.833	12.006
2032		0.000	0.003	2.459	6.241	0.870	2.946	12.519
2033		-2.579	0.003	2.591	6.493	0.908	3.064	10.481
2034		2.873	0.003	3.444	6.822	1.027	3.187	17.355
2035		0.000	0.003	2.835	7.109	0.994	3.314	14.255
2036		0.000	0.003	2.957	7.413	1.037	3.447	14.857
2037		0.000	0.003	3.086	7.730	1.082	3.585	15.485
2038		0.000	0.003	3.220	8.061	1.128	3.728	16.140
2039		0.000	0.003	3.357	8.407	1.176	3.877	16.821
2040		0.000	0.003	3.495	8.768	1.226	4.032	17.524
2041		0.000	0.003	3.625	9.144	1.277	4.193	18.242
2042		0.000	0.003	3.737	9.428	1.316	4.323	18.808
2043		0.000	0.003	3.853	9.720	1.357	4.457	19.391
2044	48.873	0.000	0.003	3.973	10.021	1.399	4.596	68.865
NPV =	(98.94)	0.20	(0.17)	31.64	78.45	11.01	36.90	14.65
			benefits %	20.0%	49.7%	7.0%	23.4%	

Table 3-A-4

			Disc rate =	5.0%	generated =	20%	RV =	33%
Virpazar - Farmaci				**Costs & Benefits in Eur millions**				
							B / C ratio	1.24
Econ cost	-221.000			Length (km)	22.90		NPV =	€ 46.1
switch =	100%	-221.0					EIRR =	6.22%
	Road Agency Costs			**Road User Benefits**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-55.250							-55.250
2012	-55.250							-55.250
2013	-55.250							-55.250
2014	-55.250							-55.250
2015		0.000	-0.025	0.390	2.924	0.331	2.588	6.209
2016		0.000	-0.037	-0.183	3.212	0.303	2.805	6.099
2017		0.000	-0.037	-0.192	3.543	0.335	3.040	6.688
2018		0.000	-0.037	-0.218	3.913	0.369	3.294	7.321
2019		0.000	-0.037	-0.300	4.326	0.403	3.570	7.962
2020		0.000	-0.037	-0.452	4.788	0.434	3.869	8.602
2021		0.000	-0.408	-0.629	5.301	0.467	4.194	8.925
2022		-3.842	-0.037	-0.748	5.878	0.513	4.545	6.309
2023		0.000	-0.037	0.501	6.675	0.718	4.926	12.782
2024		0.000	-0.037	0.946	7.608	0.855	5.339	14.712
2025		0.000	-0.037	2.995	10.962	1.396	5.786	21.101
2026		1.803	0.040	4.288	13.020	1.731	6.271	27.153
2027		-1.803	-0.038	2.781	13.359	1.614	6.466	22.378
2028		0.000	-0.037	3.012	13.772	1.678	6.666	25.092
2029		0.000	-0.037	3.019	14.202	1.722	6.873	25.778
2030		0.000	-0.037	2.938	14.652	1.759	7.086	26.398
2031		0.000	-0.037	2.743	15.119	1.786	7.305	26.917
2032		0.000	-0.037	2.537	15.603	1.814	7.532	27.448
2033		-3.842	-0.037	2.355	16.083	1.844	7.765	24.168
2034		0.000	-0.037	4.372	16.806	2.118	8.006	31.264
2035		0.000	-0.037	5.747	18.975	2.472	8.254	35.412
2036		0.000	-0.037	8.247	22.726	3.097	8.510	42.542
2037		1.803	0.064	12.489	28.761	4.125	8.774	56.015
2038		0.000	-0.037	15.296	36.251	5.155	9.046	65.710
2039	72.930	-1.803	-0.040	15.514	37.144	5.266	9.326	138.337
NPV =	(145.71)	(4.02)	(0.70)	32.27	148.83	18.11	75.46	46.09
25			benefits %	11.7%	54.2%	6.6%	27.5%	

Table 3-A-5

			Disc rate =	5.0%	generated =	0%	RV =	40%
Durmani - Virpazar (& 2nd tunnel)				**Costs & Benefits in Eur millions**				
							B / C ratio	1.71
Econ cost	-92.710			Length (km)	11.70		NPV =	€ 62.9
switch =	100%	-92.71					EIRR =	11.89%
	Road Agency Costs (RAC)			**Road User Benefits (RUE)**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011								
2012								
2013								
2014	-30.903							(30.903)
2015	-30.903							(30.903)
2016	-30.903							(30.903)
2017		0.000	-0.190	-0.146	1.438	-	1.797	2.899
2018		0.000	-0.190	-0.244	1.589	-	1.940	3.095
2019		0.000	-0.190	-0.378	1.757	-	2.095	3.285
2020		-1.966	0.000	-0.533	1.942	-	2.262	1.705
2021		0.000	0.000	0.088	2.211	-	2.442	4.741
2022		0.000	0.000	0.170	2.471	-	2.637	5.277
2023		0.000	0.000	0.326	2.769	-	2.847	5.942
2024		0.000	0.000	0.775	3.466	-	3.074	7.314
2025		0.000	0.000	2.111	5.293	-	3.319	10.723
2026		0.983	0.000	2.459	5.729	-	3.583	12.754
2027		0.000	0.000	1.421	5.846	-	3.694	10.961
2028		0.000	-0.190	1.260	6.022	-	3.809	10.901
2029		0.000	0.000	1.121	6.203	-	3.927	11.251
2030		-1.966	0.000	0.899	6.385	-	4.049	9.367
2031		0.000	0.000	1.904	6.663	-	4.174	12.741
2032		0.000	0.000	2.001	6.891	-	4.303	13.195
2033		0.000	0.000	2.145	7.133	-	4.437	13.715
2034		0.000	0.000	2.690	7.926	-	4.574	15.191
2035		0.000	0.000	3.889	9.557	-	4.716	18.162
2036		0.000	0.105	5.918	12.194	-	4.862	23.079
2037		0.983	0.000	9.228	16.567	-	5.013	31.791
2038		0.000	0.000	7.824	16.925	-	5.169	29.917
2039		0.000	-0.190	7.646	17.278	-	5.329	30.063
2040		0.000	0.000	7.517	17.641	-	5.494	30.652
2041	37.084	0.000	-0.190	7.970	19.723	-	6.208	70.795
NPV =	(56.33)	(1.65)	(0.70)	26.09	83.83	-	48.23	62.88
			benefits %	16.5%	53.0%	0.0%	30.5%	

Table 3-A-6 Median traffic growth scenario – Matesevo-Boljare

			Disc rate =	5.0%	generated =	20%	RV =	33%	
Matesevo - Boljare				**Costs & Benefits in Eur millions**					
		Median growth forecast					B / C ratio	1.08	
Econ cost	-467.700			Length (km)	75.70		NPV =	€	26.3
switch =	100%	-467.7					EIRR =	5.40%	
	Road Agency Costs			**Road User Benefits**				**Net Benefits**	
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**		
2010									
2011	-116.925							-116.925	
2012	-116.925							-116.925	
2013	-116.925							-116.925	
2014	-116.925							-116.925	
2015		0.000	-0.149	5.963	8.926	1.489	4.171	20.400	
2016		0.000	-0.149	6.315	9.452	1.577	4.370	21.564	
2017		0.000	-0.149	6.679	10.012	1.669	4.578	22.789	
2018		0.000	-0.149	7.043	10.608	1.765	4.796	24.063	
2019		0.000	-0.149	7.362	11.241	1.860	5.024	25.338	
2020		0.000	-0.149	7.804	11.911	1.972	5.262	26.800	
2021		0.000	-1.374	8.321	12.616	2.094	5.512	27.168	
2022		-6.288	-0.107	9.073	13.367	2.244	5.773	24.061	
2023		-6.413	-0.150	9.378	14.373	2.375	6.046	25.610	
2024		0.000	-0.149	10.277	15.294	2.557	6.332	34.311	
2025		0.000	-0.149	10.942	16.282	2.722	6.631	36.429	
2026		0.000	-0.149	11.663	17.348	2.901	6.944	38.706	
2027		0.000	-0.149	12.054	17.931	2.999	7.106	39.941	
2028		0.000	-0.149	12.496	18.538	3.103	7.272	41.260	
2029		0.000	-0.149	13.051	19.169	3.222	7.441	42.734	
2030		0.000	-0.149	13.818	19.823	3.364	7.614	44.470	
2031		0.000	-0.149	14.524	20.498	3.502	7.791	46.166	
2032		6.413	-0.039	15.282	21.193	3.648	7.971	54.467	
2033		-12.701	-0.149	10.742	21.812	3.255	8.155	31.114	
2034		0.000	-0.149	14.775	22.850	3.763	8.343	49.581	
2035		-6.413	-0.151	15.215	23.696	3.891	8.535	44.774	
2036		0.000	-0.149	17.021	25.656	4.268	8.730	55.525	
2037		0.000	-0.149	18.886	28.215	4.710	8.930	60.593	
2038		0.000	-0.149	21.724	31.856	5.358	9.134	67.922	
2039	154.341	0.000	-0.149	24.262	34.873	5.914	9.342	228.583	
NPV =	(308.36)	(13.05)	(2.90)	151.01	226.80	37.78	89.19	26.30	
25			benefits %	29.9%	44.9%	7.5%	17.7%		

Table 3-A-7 Median traffic growth scenario – Smokovac-Matesevo

			Disc rate =	5.0%	generated =	20%	RV =	33%
Smokovac - Matesevo (central motorway)				**Costs & Benefits in Eur millions**				
		Median growth forecast					B / C ratio	1.05
Econ cost	-512.600			Length (km)	43.50		NPV =	€ 20.9
switch =	100%	-512.6					EIRR =	5.28%
	Road Agency Costs (RAC)			**Road User Benefits (RUE)**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-128.150							-128.150
2012	-128.150							-128.150
2013	-128.150							-128.150
2014	-128.150							-128.150
2015		0.000	-0.088	5.378	7.424	1.280	3.219	17.213
2016		-0.714	-0.088	5.748	8.031	1.378	3.420	17.775
2017		0.000	-0.088	6.406	8.700	1.511	3.631	20.159
2018		0.000	-0.088	6.876	9.417	1.629	3.853	21.687
2019		0.000	-0.088	7.351	10.194	1.755	4.088	23.299
2020		0.000	-0.088	7.910	11.034	1.894	4.334	25.084
2021		0.000	-0.792	8.559	11.943	2.050	4.594	26.355
2022		-7.300	-0.088	9.359	12.937	2.230	4.868	22.006
2023		0.000	-0.047	11.980	14.209	2.619	5.156	33.916
2024		0.000	-0.088	10.498	15.359	2.586	5.458	33.813
2025		0.000	-0.088	11.228	16.715	2.794	5.777	36.425
2026		0.000	-0.088	12.019	18.216	3.023	6.112	39.281
2027		-0.714	-0.088	12.391	18.984	3.137	6.260	39.969
2028		0.000	-0.088	13.590	20.317	3.391	6.411	43.620
2029		0.000	-0.088	14.876	22.331	3.721	6.565	47.405
2030		0.000	-0.088	16.681	25.057	4.174	6.723	52.547
2031		0.000	-0.088	19.126	28.523	4.765	6.884	59.210
2032		0.000	-0.088	19.816	29.369	4.918	7.049	61.063
2033		-7.300	-0.088	20.538	30.192	5.073	7.217	55.632
2034		4.508	0.012	23.755	31.305	5.506	7.389	72.476
2035		-4.508	-0.091	20.602	32.115	5.272	7.564	60.954
2036		0.000	-0.088	21.648	33.139	5.479	7.744	67.920
2037		0.000	-0.088	22.183	34.182	5.637	7.927	69.841
2038		-0.714	-0.088	22.682	35.177	5.786	8.114	70.957
2039	169.158	0.000	-0.088	23.787	36.188	5.998	8.306	243.348
NPV =	(337.97)	(9.00)	(1.68)	171.00	248.11	41.91	76.21	20.87
25			benefits %	31.8%	46.2%	7.8%	14.2%	

Table 3-A-8 Djurmani – Boljare – all sections

			Disc rate =	5.0%	generated =		RV =	33%
Djurmani - Boljare - all sections				**Costs & Benefits in Eur millions**				
							B / C ratio	1.23
Econ cost	-1442.11			Length (km)	169.150		NPV =	€ 317.7
switch =	100%	-1442.1					EIRR =	6.46%
	Road Agency Costs			**Road User Benefits**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-300.325							-300.325
2012	-300.325							-300.325
2013	-300.325							-300.325
2014	-331.228							-331.228
2015	-30.903	0.000	-0.262	13.075	21.213	3.429	10.854	17.405
2016	-80.270	-0.714	-0.275	13.394	22.890	3.628	11.572	(29.776)
2017	-49.367	0.000	-0.465	14.482	26.173	3.936	14.133	8.893
2018	-49.367	0.000	-0.465	15.400	28.325	4.238	15.092	13.224
2019	0.000	0.000	-0.462	17.207	33.275	4.910	17.373	72.303
2020		-1.966	-0.272	18.244	36.060	5.289	18.582	75.936
2021		0.000	-2.820	20.263	39.143	5.711	19.875	82.171
2022		-20.008	-0.230	22.304	42.488	6.215	21.260	72.029
2023		-3.540	-0.231	27.845	46.811	7.156	22.743	100.784
2024		0.000	-0.272	27.942	51.466	7.517	24.331	110.983
2025		0.000	-0.272	33.305	60.068	8.597	26.032	127.729
2026		2.786	-0.195	37.106	66.330	9.525	27.853	143.405
2027		-2.517	-0.273	35.753	68.908	9.739	28.731	140.341
2028		0.000	-0.462	38.101	72.368	10.319	29.636	149.962
2029		0.000	-0.272	40.519	76.759	10.995	30.571	158.571
2030		-1.966	-0.272	43.698	82.132	11.855	31.535	166.982
2031		0.000	-0.272	48.760	88.635	12.883	32.529	182.535
2032		6.413	-0.162	50.868	91.937	13.391	33.556	196.003
2033		-26.421	-0.272	46.461	95.167	13.235	34.615	162.784
2034		7.381	-0.172	59.344	100.196	14.892	35.707	217.349
2035		-10.921	-0.276	58.190	106.882	15.163	36.834	205.872
2036		0.000	-0.168	66.831	117.914	16.663	37.997	239.238
2037		2.786	-0.172	77.977	133.846	18.603	39.197	272.238
2038		-0.714	-0.272	84.247	148.652	20.815	40.436	293.164
2039	475.896	-1.803	-0.465	89.631	156.172	22.088	41.713	783.232
NPV =	(998.35)	(27.40)	(6.02)	464.20	844.66	122.36	340.25	317.68
			benefits %	26.2%	47.7%	6.9%	19.2%	

Table 3-A-9 All sections - Median Traffic growth assumption

			Disc rate =	5.0%	generated =		RV =		33%
Djurmani - Boljare - all sections				Costs & Benefits in Eur millions					
		Median Traffic growth					B / C ratio		1.01
Econ cost	-1442.11			Length (km)	169.150		NPV =	€	43.3
switch =	100%	-1442.1					EIRR =		5.21%
	Road Agency Costs			Road User Benefits				Net Benefits	
Year	Constr.	Capital2	Recurrent	Vehicle Operation	Travel Time	Generated Traffic	Accident Savings		
2010									
2011	-300.325							-300.325	
2012	-300.325							-300.325	
2013	-300.325							-300.325	
2014	-331.228							-331.228	
2015	-30.903	0.000	-0.262	11.690	18.965	3.065	9.703	12.258	
2016	-80.270	-0.714	-0.275	11.900	20.337	3.224	10.281	(35.517)	
2017	-49.367	0.000	-0.465	12.787	23.110	3.476	12.479	2.020	
2018	-49.367	0.000	-0.465	13.513	24.853	3.719	13.242	5.495	
2019	0.000	0.000	-0.462	15.003	29.012	4.281	15.147	62.982	
2020		-1.966	-0.272	15.806	31.241	4.583	16.098	65.490	
2021		0.000	-2.820	17.443	33.696	4.916	17.109	70.344	
2022		-20.008	-0.230	19.077	36.341	5.316	18.184	58.679	
2023		-3.540	-0.231	23.662	39.779	6.081	19.327	85.077	
2024		0.000	-0.272	23.590	43.450	6.346	20.542	93.655	
2025		0.000	-0.272	27.934	50.380	7.210	21.833	107.085	
2026		2.786	-0.195	30.917	55.265	7.936	23.207	119.916	
2027		-2.517	-0.273	29.591	57.033	8.061	23.779	115.674	
2028		0.000	-0.462	31.324	59.496	8.483	24.365	123.206	
2029		0.000	-0.272	33.087	62.681	8.979	24.964	129.439	
2030		-1.966	-0.272	35.442	66.615	9.615	25.577	135.011	
2031		0.000	-0.272	39.278	71.399	10.378	26.204	146.986	
2032		6.413	-0.162	40.695	73.550	10.713	26.845	158.054	
2033		-26.421	-0.272	36.913	75.608	10.515	27.501	123.843	
2034		7.381	-0.172	46.819	79.050	11.749	28.171	172.999	
2035		-10.921	-0.276	45.587	83.734	11.879	28.857	158.859	
2036		0.000	-0.168	51.987	91.725	12.962	29.558	186.064	
2037		2.786	-0.172	60.226	103.377	14.368	30.275	210.861	
2038		-0.714	-0.272	64.603	113.991	15.962	31.007	224.577	
2039	475.896	-1.803	-0.465	68.236	118.894	16.816	31.756	709.330	
NPV =	(998.35)	(27.40)	(6.02)	380.12	691.97	100.36	281.39	43.28	
			benefits %	26.1%	47.6%	6.9%	19.4%		

APPENDIX 3 - B

Development benefits & treatment of generated traffic

1 Introduction

1.1 Definition of traffic flows

Normal traffic is defined as: traffic flows in the corridor without any new investment. Generated, induced, and diverted traffic may then be defined as follows:

- **Generated traffic**: Traffic associated with existing users of the corridor driving more frequently or driving longer distances than before. Traffic movement which would not have arisen without the improvement to the corridor.
- **Induced traffic**: Traffic attracted to the project road from other roads, changing its origin or destination due to increased economic activity (which may be brought about or induced by the project) in the road zone of influence.
- **Diverted traffic**: Traffic that diverts to the project road from an alternative road with the same origin and destination as the project road or sections thereof.

1.2 Economic effects of a major transport improvement

The general concept is that improvements in transport reduce the time and cost of travel, as will be unquestionably the case for the Durmani-Boljare motorway. Reductions in travel time and cost may alter travel patterns and thus affect traffic volumes, patterns of land use, the operation of labour markets, and both the location and organisation of businesses. Major transport changes certainly do affect the economy at both national and regional levels, but hard evidence (i.e., ex post) is very scarce. The evidence that is available does not show that new transport investment has a major impact on economic growth in a country with an already well-developed infrastructure; but such is clearly not the case in Montenegro, which for many years has suffered from under-investment in both the road and railway transport network. Commentary in this section is largely drawn from reports prepared by NERA (National Economic Research Associates) for the UK Department of the Environment, Transport and the Regions *A Framework for Assessing Studies of the Impact of Transport Infrastructure on Economic Activity.* (*J. Dodgson, NERA, Nov. 1999*).

In some circumstances a major transport investment may have impacts which are additional to those measured by the conventional cost benefit analysis. However, these could be either positive or negative. A new road may bring added economic benefits to an area needing regeneration, but in some circumstances the opposite might occur. Better communications will enlarge the markets for goods, services and labour, but a given area as a whole may gain or lose from this, depending on the structure and competitiveness of the local economy. The persistent (often merely implicit) assumption that the benefit of improved accessibility will always accrue to the target area may sometimes be misplaced.

The consensus of studies in Britain and elsewhere in Europe is that there is no simple unambiguous link between transport provision and local regeneration.

The potential impacts on development in a particular region can be classified in a number of ways, but the following is an outline:

- Population and housing
- Effects on existing firms via product markets

- Effects on location decisions
- Formation of new businesses
- Effects on the labour market

2 Population and Housing

The new motorway has clearly a potential for influencing the spatial distribution of population and hence housing development. People deciding to live further from their workplace may want to trade off the higher cost (longer distance) of traveling to work against lower house prices. In turn, housing development will generate demands for local labour, and perhaps stimulate local firms in supplying materials, etc. The increasing local populations (e.g., of settlements further away from Podgorica) will also increase local trade in other goods and services, such as restaurants and shopping centres. It should however be noted that any increase in house and land prices is only a pecuniary (money) benefit to the individual owners concerned, not an economic benefit to be counted for the motorway project.

3 Effects on Existing Firms via Product Markets

3.1 Substitution and Scale effects

The demand for transport is always a derived demand, for the final product. For products, reductions in cost of any input (i.e., in this case, transport cost) have two effects:

i) a substitution effect, when the firm minimizes the cost of producing a given level of output by substituting the (now cheaper) transport input for other inputs; and

ii) a scale effect, where the overall reduction in costs result in the firm being more competitive and being able to expand its market, either by lowering prices or by entering markets from which it was formerly excluded on cost grounds

3.2 The effects of enhanced competition

However, conversely, like any reduction in barriers to inter-regional trade, the improved transport link will expose firms in the region to greater competition from firms based elsewhere. Thus, gains in output and employment derived from increased potential to penetrate markets outside the region may be offset by the erosion of local markets. The overall effect may be beneficial in welfare terms, but there is no guarantee that the net effect on employment will be positive within a given region.

3.3 Effects in the transport and distribution sector

The general framework for firms as given above also applies to transport and distribution businesses. However, the effects on competitiveness and the scale effects, noted above (3.1 ii) are likely to be greater for transport firms, since a high proportion of overall cost consists directly of transport cost.

4 Effects on Tourism

The above section refers to situations where transport cost is borne by the suppliers.

However, tourism is a special case, because the cost of transport is being paid by the consumers. The improved transport links will reduce the generalized travel cost of those visiting the region, and using the normal assumptions, this will tend to increase visitor numbers. In fact, this is believed to be evidentially the case in the northern mountain region. A recent analysis of tourist visits showed that in 2006, while a total of 581,000 foreign visitors went to the coast, only some 19,000 went to the eleven municipalities in the north; a pitifully small number, about 3 percent.

In considering the tourism potential of the north region, there is skiing and snowboarding in the winter, but the summertime can attract sport fishermen, rock climbers and mountain walkers, para-gliding, and white-water rafting, inter alia. Apart from those engaged in extreme sports, many others (e.g., people with small children) might be interested in more simple pleasures such as walking and enjoying nature. Expansion of such tourism products will not simply spring to life overnight, but will require that specialist firms invest in their development[13]. However, a large proportion of eventual benefit will accrue, not to specialist firms (perhaps branches of firms already established in the coastal region) but to hotel and restaurant businesses and their locally employed staff. Although the other effects, as outlined in section 3 above, cannot be dismissed, in view of the gross imbalance in tourist destinations at present, it is considered very probable that the tourist industry will have the most to gain from the effect of improved access to the north.

Some useful observations about the effect of the north-south motorway were made by a local journalist (Vojin Golubovic) recently, as follows: *Transport is very important from the aspect of more balanced regional development. Underdevelopment of transport and local road networks in rural areas (especially of northern region) directly influences the poor utilisation agriculture potential in the mountain region and the possibility of transportation to city centres. The undeveloped road network also seems the limiting factor for tourism development, both in areas which are already traditional tourist destinations, and in areas which are gradually being included in the new tourist offer. The effects would be visible for regional development too. The development strategy will create preconditions for economic realisation of potentials in undeveloped areas of Montenegro, firstly through proceeding with construction of motorway Podgorica-Mateševo, then further towards border with Serbia, and then the road Risan-Grahovo-*

Zabljak. Source: V. Golubovic "Transport Development" Biznis Montenegro Feb. 2008 pp 32-33 (unofficial LBG translation).

Recently, the leader of the Vienna Economic Forum (in conference near Budva 15th April 2008)[14] stated the view that new foreign investments should be more balanced, and specifically, that more new investment should be made in the winter tourist industry in the North.

5. Employment Effects

There is a mixture of economic entities in the country, some entirely owned by the state and

[13] In a round table meeting held 08 February 2008, Minister Lompar noted that "the new motorway will not solve all the problems in the North".

[14] Montenegro Times 18April 2008, page 7.

some entirely owned by private individuals or companies. Based on the Labour Force Survey (LFS) a household sample survey of November 2005, Monstat estimated that total employment could be divided as shown in the table below.

Table 3B.1 Employment by ownership type

Total employment	178,815	100%
State ownership	70,068	39.2%
Private ownership	77,913	43.6%
Public /social	21,950	12.3%
Other types	8,884	5.0%

Thus in late 2005 the state-owned enterprises had a very significant share of the employment market, at 39 percent of the total workforce, although it is likely that by now (April 2008) this share is lower, as result of on-going government initiatives toward privatization or partial privatization of major employers. The total employment in 2005, by sector, is shown in the table below.

Table 3B.2 Employment by sector

Sector	Total	percent
Agriculture, forestry & water	15,432	8.6%
Manufacturing	21,893	12.2%
Construction, mining, etc	12,500	7.0%
Wholesale & retail trade	29,903	16.7%
Hotels & restaurants	11,005	6.2%
Transport & storage etc	14,617	8.2%
Public administration etc.	22,797	12.7%
Education	13,463	7.5%
Health & social work	12,243	6.8%
Financial, real estate	6,718	3.8%
Other service activities	18,244	10.2%
Total	178,815	100%

What seems surprising above is that given the importance of tourism in the economy (about 15% of value added GDP) hotels and restaurants accounted for only 6.2% of total employment, about 11,000 employees. It appears that the LFS must have counted only permanent[15] or year-round employees, not the many extra staff employed temporarily in summer months.

The structure of employment for the Coast region, Central region, Podgorica, and the North region is shown in the table below. As shown, there are some distinct regional differences, especially for the North region compared to the others.

[15] Since LFS was a household survey this is logical.

Table 3B.3 Employment by type and region, 2005

All employment	Total	Coastal	Podgorica	Central	Northern
	178,815	47,978	49,644	29,911	51,282
		27%	*28%*	*17%*	*29%*
Agriculture, forestry & water	15,432	1,611 *10%*	611 *4%*	1,888 *12%*	11,322 *73%*
Manufacturing	21,893	3,137 *14%*	9,160 *42%*	5,198 *24%*	4,398 *20%*
Construction, mining, etc	12,500	1,483 *12%*	3,471 *28%*	1,805 *14%*	5,741 *46%*
Wholesale & retail trade	29,903	9,759 *33%*	9,092 *30%*	4,462 *15%*	6,590 *22%*
Hotels & restaurants	11,005	5,425 *49%*	1,735 *16%*	1,003 *9%*	2,842 *26%*
Transport & storage etc	14,617	6,990 *48%*	3,717 *25%*	1,192 *8%*	2,718 *19%*
Public administration etc.	22,797	6,496 *28%*	6,546 *29%*	4,021 *18%*	5,734 *25%*
Education	13,463	1,976 *15%*	3,145 *23%*	3,705 *28%*	4,637 *34%*
Health & social work	12,243	5,250 *43%*	3,584 *29%*	1,198 *10%*	2,211 *18%*
Financial, real estate	6,718	2,678 *40%*	2,677 *40%*	403 *6%*	960 *14%*
Other service activities	18,244	3,170 *17%*	5,913 *32%*	5,035 *28%*	4,126 *23%*
Population in 2007 (est)	**632,860**	**151,460**	**175,300**	**110,140**	**195,960**
employed as percent	28.3%	31.7%	28.3%	27.2%	26.2%
unemployed total (2006)	74,820	13,400	22,340	15,532	23,548
unemployed as percent	11.8%	8.8%	12.7%	14.1%	12.0%

Source: Monstat LFS, Nov 2005 (Table 7) and Statistical Yearbook 2007

The North consists of (in descending order of population) the eleven municipalities of Bijelo Polje, Berane, Pljevlja, Rozaje, Plav, Kolasin, Mojkovac, Andrijevica, Zabljak, Pluzine, and Savnik. The first three have a combined total of about 120,000 people, and the last three municipalities (Zabljak, Pluzine, and Savnik) have only some 11,000 people.

Central region consists of Cetinje, Danilovgrad, and Niksic; and for the purposes of analysis above, these three municipalities have been separated from the adjacent 'region' of Podgorica. Niksic is dominant in Central region with a population of more than 75,000. The Coastal region consists (in order from south to north) of the 6 municipalities: Ulcinj, Bar, Budva, Tivat, Kotor, and Herceg Novi. All are along the Adriatic Sea and they have a combined population only slightly less than that of Podgorica.

Some conclusions from the above data are as follows:

- The clear importance of the North in terms of agriculture, forestry and water supply. More than 70 percent of workers in this sector are in the north;

- The North is also dominant in the construction and mining sector, largely from the coal mines at Pljevlja;
- In the North there is a very small representation for transport and storage workers (19%) while on the coast there are 48% of the total employees in this category. This is likely to be mainly a function of the poor level of accessibility in the North, and in turn, the shortage of locally based transport companies may well inhibit the efficiency of agriculture and forestry industries in bringing their products to markets. Thus, the scale effect (see 3.1 ii above) may apply;
- Although nominally the north has its 'fair share' of employees in hotels and restaurants the coastal region has nearly 50 percent of all employees in the category, although this is probably an under-estimate, i.e., does not include temporary staff.

6 An estimate of regional GDP for the North

Data on wage earnings were published by Monstat (March 2008 bulletin) giving average monthly wages by municipality. These are shown in the table below. In general, the highest annual growth rates of average disposable wage were recorded in low wage municipalities. The fastest growth rate (year on year) of 30%, was recorded in Zabljak, followed by Ulcinj (26%) Bijelo Polje (25%) and Rozaje (25%). Strong growth rates of wages in Zabljak and Ulcinj could be attributed to successful tourist seasons; while in the remaining municipalities the increase is probably due to a general increase in economic activity. The average wage in the municipality of Pljevlja is among the highest in the country (and annual growth rate also high) probably caused by the increase in mining sector wages, as the major economic activity in Pljevlja is the coal mine.

Table 3B.4 Average disposable wages in 2007 by municipality

Municipality	Growth rate % p.a.	Average disposable wage /month
Andrijevica	-4.8%	€ 176.23
Bar	20.2%	€ 197.55
Berane	10.7%	€ 182.40
Bijelo Polje	25.6%	€ 171.64
Budva	12.7%	€ 256.15
Cetinje	14.1%	€ 165.15
Danilovgrad	7.2%	€ 200.60
Herceg Novi	4.0%	€ 212.14
Kolašin	22.7%	€ 200.33
Kotor	9.4%	€ 248.96
Mojkovac	10.4%	€ 170.88
Nikšić	18.8%	€ 279.55
Plav	9.0%	€ 146.00
Pljevlja	22.5%	€ 261.14
Plužine	20.3%	€ 228.54
Podgorica	14.3%	€ 293.92
Rožaje	24.4%	€ 141.92
Šavnik	18.2%	€ 222.97
Tivat	13.2%	€ 239.85
Ulcinj	26.4%	€ 177.01
Žabljak	30.1%	€ 169.39
weighted mean		€ 235.22

Source: Monstat, March 2008 bulletin

Using the average wage data, approximate estimates of total GDP in 2007 were made for seven of the northern municipalities, that is: those directly in the zone of influence of the motorway. This is shown below.

Table 3B.5 GDP estimates for northern municipalities 2007

Municipality	GDP 000s	Popln 2007	per capita
Andrijevica	€ 12,933	5,700	€ 2,269
Berane	€ 81,017	34,500	€ 2,348
Kolasin	€ 25,276	9,800	€ 2,579
Mojkovac	€ 22,000	10,000	€ 2,200
Pljevlja	€ 134,147	39,900	€ 3,362
Rozaje	€ 41,477	22,700	€ 1,827
Zabljak	€ 8,941	4,100	€ 2,181
GDP n7 (000s)	€ 325,791	126,700	€ 2,571

Thus the 2007 GDP total for these seven municipalities is approximately 325 million euros, or about 15 to 17 percent of the national total.

7 Estimates of trip making propensity

A final factor in the estimation of generated traffic for the central and northern sections of the motorway is taken from examination of the O-D survey data (discussed elsewhere). Acomparison of trips by zone showed that in the northern zones, car trip rates per unit of population are much lower than for the rest of the country. This is particularly evident for the larger municipalities of Bijelo Polje, Berane, Pljevlja, and Rozaje, as shown in the table below. In fact with the apparent exception of Pluzine (where sample size is very small) all the northern municipalities have a lower propensity to travel than the national average (163 trips per thousand) and a far lower travel rate than the coastal region.

Table 3B.6 Estimates of car journey rates based on the O-D survey data

Municipality (zone)	Population 2007 (est)	as origin	as destination	Total O&D	O&D/ 000s population
Budva	16,780	5,147	4,305	9,452	563.3
Danilovgrad	16,790	2,519	3,082	5,601	333.6
Tivat	14,210	2,134	2,281	4,415	310.7
Kotor	22,050	3,493	3,109	6,602	299.4
Cetinje	18,010	2,611	2,532	5,143	285.6
Ulcinj	21,770	2,359	2,474	4,833	222.0
Plužine	3,900	419	431	850	217.9
Herceg Novi	34,010	3,671	3,363	7,034	206.8
Bar	42,640	3,732	4,236	7,968	186.9
Podgorica	175,300	12,758	11,871	24,629	140.5
Nikšić	75,340	3,852	4,916	8,768	116.4
Andrijevica	5,530	436	441	877	158.6
Kolašin	9,920	794	614	1,408	141.9
Bijelo Polje	50,820	2,787	2,913	5,700	112.2
Berane	35,340	1,804	1,857	3,661	103.6
Rožaje	23,890	1,157	1,199	2,356	98.6
Mojkovac	9,310	418	404	822	88.3
Šavnik	2,820	123	90	213	75.5
Pljevlja	35,130	1,179	1,246	2,425	69.0
Žabljak	4,360	126	70	196	45.0
Plav	14,940	168	230	398	26.6
Country	632,860	51,687	51,664	103,351	**163.3**

It is believed that, over and above the differences in mean incomes and car ownership rates, this situation is mainly due to lack of adequate accessibility, and hence if better access (including improvements to adjoining links) becomes a reality, there will be a considerable effect in terms of generated traffic on the motorway. For example, from the above data it was estimated that about 10 percent additional trips across the network would arise if propensity to travel in the 10 northern municipalities (in the shaded part of the table) above was brought to the average national value of 160 per thousand population.

8 Development benefits and generated traffic

The question sometimes arises: should secondary benefits, often known as development benefits - be counted separately from road traffic benefits? It turns out that in most cases, they are one and the same thing. That is, having estimated generated traffic, all the secondary effects (or 'knock on' effects) in increased trade, etc., for given areas are then counted. This is because virtually all road transport is a derived demand, an intermediate good.

John Dodgson[16] shows that the conventional consumers' surplus (CS) area under the demand curve for an intermediate good (in this case transport) will give a true measure of the total benefits, both to firms and consumers, i.e.,

CS = 0.5 (c1-c2) (T1+T2) and CS is equal to 0.5 (p1-p2) (Q1+Q2)
where:
c1, c2 are travel costs, and T1, T2 are traffic volumes
p1, p2 are market prices and Q1, Q2 are quantities sold.

Dodgson concludes that the market for the intermediate good is able to value the CS correctly in a nearly perfect competitive model. However, if the firms (producers) concerned are monopolists, or for some other reason operate in an effectively non-competitive market, then transport benefits may either underestimate or overestimate the benefits. Thus the critical element for the prediction of transport benefits is the extent to which the producer sector can re-organize in a way to take maximum advantage of the transport improvement, i.e., this is the factor primarily affecting generation of traffic. Except that, in the 1973 paper, the case of tourism (see 4 above) was not considered, as the paper referred specifically to manufacturing industry effects.

Following this, the effect on real GDP in the North can be examined by comparing the generated traffic benefits (from the HDM-4 analyses) with the estimated GDP for the north as derived in section 6 above. Considering only the Smokovac-Matesevo motorway section and the northern motorway sections, of Matesevo-Berane & Berane-Boljare, the generated traffic annual benefits in the period 2023 to 2029 are compared with estimated regional GDP, in the table below.

Table 3B.7 Comparing generated traffic benefits with northern region GDP
(Euro millions per year)

Year	GDP estimate for northern region	Generated traffic benefit	Generated traffic % of GDP
2023	€ 587.1	€ 5.037	0.86%
2025	€ 622.8	€ 5.753	0.92%
2027	€ 660.8	€ 6.336	0.96%
2029	€ 701.0	€ 6.870	0.98%

It is concluded that the generated traffic estimates, of 20 percent in the case of a full motorway, and 10 percent extra traffic on a half motorway, are conservatively estimated, having an effect of typically about 7 percent on the quantum of motorway traffic benefits, and an effect assuming ideal conditions (see sections 3 and 4 above) of increasing the regional GDP by about 1.0 percent, up to a possible maximum of about 1.5 percent.

16 J.S. Dodgson: *External effects and secondary benefits in road investment appraisal* (Journal of Transport Economics & Policy, May 1973 pp 169-185)

9. Benefits to freight traffic through Port of Bar

Completion of Bar-Boljare motorway is effectively an imperative for further development of the Port of Bar. In this analysis the level of benefit to freight is a small proportion of total benefits. The HDM-4 model outputs show that benefits to long-distance freight traffic are about 6 percent of total benefits. Even so, the motorway will be a crucial factor in development of the Port, which is currently handling just over 2 million tonnes per year, but has a capacity of 4.5 million tonnes per year without further major additions to equipment and infrastructure. The Serbian authorities have indicated that their principal seaborne commerce would be transferred from Thessaloniki to Bar, once the complete motorway link from Belgrade to Bar is ready[17]. In 2006 and 2007 total tonnage was approximately equal at 2.2 million tonnes, and in 2007 there were 1,494 ship calls. At present only about 25% of the traffic is containerized, the majority consists of roll on-roll off (ro-ro) trucks from Bari in Italy. About 50 trucks per day are bound for Serbia. The railway (ZCG) also carries some goods from the port to Serbia, but this is a small element, total railway traffic from the port, including that to Podgorica, being no more than 200,000 tonnes in 2007.

At Bar, the port managers are sure that completion of the motorway will have a very positive effect in enhanced trade, and thus a major impact on increasing the pace of modernisation and investment there. However although it is possible that nearly all Serbian seaborne commerce would transfer to Bar, the managers are realistically expecting about 20 percent of Serbian traffic to move to Bar at the outset, and then in the long term this percentage would increase as safe business connections are firmly established. This development has not been explicitly considered in the motorway analysis, and thus benefits accruing to freight traffic may turn out to be underestimated.

[17] Serbian Infrastructure Minister Velemir Ilic, announcement 19th March 2008.

4 ROAD SAFETY INSPECTION (RSI) (SAFETY CONDITIONS ON THE EXISTING M-2 ROAD, BAR TO BARSKI MOST)

4.1 Introduction

A Road Safety Inspection (RSI) was carried out along the existing road Bar to Barski Most, near the Serbian border. The objective was to produce recommendations for short term measures that are the means to reduce the current level of risk on the road.

This road effectively integrates hundreds of settlements, and links to natural and economic resources within a wide hinterland, since the national road network, especially in this part of the country, has few alternative road links. Most of the route is of hilly-mountainous character, and various sections between Podgorica and Bijelo Polje are currently being re-constructed, and thus operated under difficult traffic management conditions. There are many structures: bridges, tunnels and galleries, and in terms of safety they represent some serious driving “tasks” for drivers.

A noticeable feature of commercial traffic on the route is the domination of articulated trucks (5 or 6 axles) compared to medium/heavy trucks (2 or 3 axles) since long-distance traffic is characteristic along the route. Articulated trucks are mostly present in the flow structure in central sections of the route (sections 4, 5 and 6) among other things because the total traffic frequency on them is relatively lower than on neighboring ones, so presumably nearly constant number of auto-trains in it represents most part of it. Sections with the highest participation of trucks in the flow are at the same time sections with the most difficult condition on the route, of hilly character and with numerous road structures.

Database on traffic safety along the route (traffic accidents records) which was available at the time of preparing the RSI survey was provided by Traffic police. Available were data for 2006 and first eleven months of 2007. Traffic accidents recorded in this period over the whole territory of Montenegro are spatially classified by road sections under authority of certain police department units.

4.2 Generalized results of the RSI

The field inspection included drive-through inspection of the whole route, as well as monitoring of road character, immediate road surroundings, traffic and user behavior. In regards to the agreed survey character and adopted work methodology, the longest part of the route was surveyed from the slow moving vehicle. More detailed survey was conducted on all road structures (bridges and tunnels).

As a general conclusion of the safety inspection, the risk factors characterizing the road can be noted as follows:

- Most part of the route is located close to the river flows, within the narrow rocky mountainous environment, and therefore the predominant cross section type of the immediate road surrounding is very steep and there is often high embankment or vertical cliff of the river bed on one side of the road and vertical rocky part (cut) on the other side.
- There are numerous road structures along the road stretching north of Podgorica, including bridges and tunnels which could be easily classified in relatively uniformed scopes in regards to traffic risks. Unfortunately, common attributes for majority of such structures are numerous and sometimes even dramatic limitations.
- Apart from two new tunnels, one in the locality of Sozina and one newly reconstructed and located north of Podgorica (the closest one), all other tunnels do not have entrance portals physically safe since they are massive structures in the close vicinity of the road and therefore they represent factors of a high risk.
- Numerous bridges along the sections situated within the mountainous environment are fenced only with relatively light pedestrian fences; most of these fences are in a very bad condition, they are deformed due to vehicle bumps, and foundation of their retaining pillars is unstable and deteriorated.
- Traffic signing and marking aimed for speed regulation is incoherent and inconsistent; Speed limits of 70, 60, 50, 40 km/h are constantly changing along the route, there are no end signs of speed limit after the reason for that limitation is over, or pre-warning signs near new access road or access points to the road.
- Long road sections near Skadar Lake are stretching parallel with and very close to the railway line; they are separated by continuous concrete wall which is 0,5 m high and could be considered in terms of risk level as hardly acceptable solution.
- Guard safety rail which can be seen along the route is typically in bad condition, to a greater or lesser effect deformed, damaged, or removed; or simply deteriorated by time and erosion, and therefore it does not posses the original functionality.
- There are roadside bollards appearing from time to time on some sections of the route which were in old times used as guide signs; there are also massive elongated concrete forms which in combination with pillars or elements of guard rail just seemingly to protect vehicles from slipping off the road; but these are extremely hazardous factors of road surroundings which must be removed and changed with new and modern elements of safety equipment.

There are, as a rule, restaurant areas and rest areas along the whole route, which are connected to the road by unregulated wide zones, with no signings and markings and access control at all, and with no appropriate pavement surfacing on the points of access. On some parts of the route there are construction work zones on or close by the road. These sections are relatively well equipped with signalization accompanying construction works and current traffic regime, but such signalization is not appropriately and correctly located and properly mounted into purpose-designed mobile foundations. Improvised solutions are used, and it is expected from users to be patient so as additional engagement of construction workers in order to overcome the problems with traffic operation successfully and safely. Zones of possible running of vehicles into the work space, massive openings and channels beside operational part of the carriageway are not properly protected with safety equipment which would prevent such occurrences etc.

4.3 Inspection results for individual sections

The following remarks are the part of documentation resulting from the immediate inspection, survey, assessment of risk factors, roadside surrounding and traffic along each methodologically defined section. Detailed descriptions and observations of risk factors are followed by recommendations for short term solution measures aimed to eliminate or reduce noticed faults and make them acceptable.

For the purpose of the field inspection the whole route was divided into 14 sections as shown below.

1	Bar – turn to Sozina,
2	Turn to Sozina – turn to Virpazar
3	Turn from Sozina – Virpazar,
4	Virpazar – Vranjina,
5	Vranjina – Golubovci,
6	Urban Golubovci,
7	Golubovci – Podgorica,
8	Urban Podgorica,
9	Podgorica – Manastir Morača
10	Manastir Morača – Mioska,
11	Mioska – Kolašin,
12	Kolašin – Mojkovac,
13	Mojkovac – Ribarevina,
14	Ribarevina – Bijelo Polje - Serbian border

Some sections include sub-sections which are in terms of functionality consistent and connected by important common attributes. Thus, Podgorica – Manastir Moraca section consists of two parts with different characters, i.e., canyon, where road conditions are harsher and therefore the risk is increased; and two sections of more relaxed terrain conditions where the risk protection is of different character or intensity of equipment used.

Lengths of such sub-sections were measured during the inspection from the RSI car odometer, so assessment of measures and equipment needed for risk to be reduced, was done on the basis of such data. Some proposed measures have been quantified by assessment of frequency of usage along certain sections resulting from combination of measured lengths and a heuristic assessment of frequency and spatial distribution of risk. Such a procedure is in line with the methodology adopted for typical RSI.

01 Bar – turn to Sozina

- This section is 8 km long, it starches from the three-branch junction with one branch leading toward the bypass and road to Ulcinj to the three-branch junction in Sutomore with one branch going toward the Sozina tunnel.
- It is consisted of two urban sections, through the city of Bar in the length of approximately 1,3 km and through Sutomore in the length of around 4,7 km.
- Speed limit in urban sections is 50km/h, there are numerous local individual links, people are parking their vehicles by the carriageway. Sidewalk is partly protected along the Bar section, only on one-side, but it is discontinuous and with different surface quality.
- Sidewalks in Sutomore are partly protected, but rather with deformed shoulders. Pedestrians are walking by and over the carriageway, away from cross walks because there are beaches and park areas right across.
- Traffic signing is rather correct, but on section where construction works are ongoing in Sutomore, site marking is very poor and there is hardly any physical protection from vehicles running off the road and falling into ditches (installed ones) along the carriageway zone.
- During the summer season, there are also pedestrians walking by and within the road zone along the non resident part of this section, so as vehicles parked along the roadside.
- Road widening with rest area near the Ratac cape is located in the outside zone of the curve, and there is a very hazardous and unmarked longitudinal pit by the edge between the carriageway and parking area (in the shape and size of physical island which should logically be protected at such place).

Recommendations for the reduction of risk

- Physical protection of the carriageway along the urban sections with curbs and also protection of continuous sidewalks along one side and parts of the sidewalks along the other side of the road in such areas where pedestrian activity is evident.
- Marking with high-quality horizontal traffic signalization especially on three key lateral links on the road to Sutomore and sidewalks at all locations where necessary (especially in summer season). Setting up “rumble strips” elements for the purpose of traffic calming (in the length of 10 m) before crosswalks.
- Designing and control of interchange with traffic lights near Bus terminal in Sutomore in line with principles of risk minimizing. Road access control from the Bus terminal plateau.
- Proper and rational lighting of the whole section (urban ones and 2 km of rural one), in order to improve traffic conditions in situation of reduced visibility. More intensive lighting in the zones of crosswalks.
- Appropriate construction and marking of rest areas and out of the road parking areas near the Ratac cape.

02 Detour/turn to Sozina – turn to Virpazar

- Newly-constructed road section approximately 11.8 km long between three-branch intersection in Sutomore, where the third branch of intersection leads to Petrovac, and three-branch intersection with detour to Virpazar and Podgorica, where the branch leads to Petrovac. There are two tunnels – Sozina 4.2 km in length, and the other one 0.7 km.

- The tunnels, as well as the road itself are of modern construction, designed and equipped in conformity with the current principles on minimizing transport process risk. Modern management and communication signing has been applied/implemented and the equipment for management, surveillance and of incident occurrences. On the access roads to the tunnels/tunnel approaches VMS signalization/signing has been applied.
- The tunnels are lighted in accordance with current European recommendations, however a suggestion can be put to the selection of the technology of signing inside the tunnel Sozina. Namely, the combination of signs with high level of illumination derived from LED technology with standard signs with internal illumination based on neon makes the latter visually inferior and often not sufficiently intelligible. This is not only a matter of aesthetics but also traffic risk, since any diversion of attention or distraction of the driver from an active/ongoing traffic situation, especially in a tunnel, does not contribute to its safety.
- The point of entry to the tunnel Sozina has been secured with elastic protective fence in a minimum-risk appropriate manner, and it can serve as a role model. However, several dozens yards prior to the tunnel entry from the pay toll booth there are several elements/components of the protective fence properly placed but still not secured with screws to the ground. As such they pose a greater risk than if they had not been there in the first place, since if a vehicle were to bump into it, the component hit would move sideways, while the following one in the sequence would frontally encounter the vehicle.
- Entries into the shorter tunnel are not adequately secured: the left hand side is totally unsecured, while the right hand side one is secured with a concrete barrier of New Jersey type, but its first part is not secured and presents a dangerous massive obstacle. In from of this tunnel there is no slow down of the vehicles (there is no pay toll this side) and therefore they can be approached at high speeds and the risk is obvious.
- Out of the tunnel parts/partitions of the road along this section present a role model with regard to the use of guard rail. However there is a downside which should be noted, viz. at places where gutter ends with a drainage element for the drainage of water away from the right-of-way, massive parts of this element protrude several dozen centimetres out of the elastic barrier and potentially present a risk spot if a vehicle were to bump into it.
- At the road sections approaching the tunnel with relatively high (although not in particular) longitudinal gradient, three lanes have been provided which are used in a 2+1 scheme. At one part of this section it has been noted that a double/solid division line was used between opposite directions which allows overtaking from the independent lane. On the basis of sight distance of the road in normal visibility conditions this may appear justified and reasonable, however in the conditions of reduced sight distance such as fog, such a solution poses a great risk. Generally speaking, Road Safety inspection best practices do not recommend overtaking from the independent lane.
- Horizontal signaling in front of the pay toll booths of Sozina tunnel has almost disappeared from the carriageway, so that a massive asphalt surface approaching the pay toll booths could confuse the drivers and provoke risky behaviour.

Recommendations for the reduction of risk

- To furnish the points of entry into the shorter tunnel with guard rail in the manner it is used with Sozina tunnel, while the concrete barrier components should be removed.
- To appropriately fasten the elements of the guard rail to the access road to the tunnel Sozina from the pay toll booths side.

- To mark with intensive horizontal signing access plateau to the pay toll booths in front of the tunnel Sozina.
- To provide double solid division line between the opposite directions along the entire/complete road sections with 2+1 lanes.
- To correct/amend/rectify drainage elements exceeding the size of the guard rail or to cover them with barrier deviation.

03 detour to Virpazar - Virpazar

- The section is about 1.5 km long and is placed between three-branch intersection where there is a diversion to Sozina tunnel and three-branch intersection in Virpazar where the road leads to Rijeka Crnojevića.
- The intersection with the branch leading to the tunnel Sozina Raskrsnica has been designed and delivered according to the standard principles of risk minimization at such components of the road network, and therefore can be considered acceptable.
- Along the section there are two relatively sharp curves, along a few hundreds of metres of the road edge, there is a retaining wall made of stone. The road section running along the rail tracks has been separated from it by a concrete wall, approximately 0.5m in height.
- Along the opposite edge of the carriageway/pavement steep embankment is safeguarded by a number of stone pillars which represent a long outdated solution for marking and protection of the road edge and they pose a massive impediment/obstacle to the secure/protective carriageway zone.

Recommendations for risk reduction

- Massive stone pillars to be removed and replaced by a continuous guard rail. The same barrier should be used to prevent vehicles' rubbing against the stone retentive wall, and along sharp curves to restore components of the existing barrier and extend it as far as chainage of safe right-of-way.
- Under RSI principles, also the concrete wall separating the road from the rail tracks presents a potential risk, however since it is close vicinity to the carriageway and that its surface is relatively smooth it can be considered as an accepted level of risk. It should be furnished/equipped with the elements of optical driver navigation (light-reflecting markers).

04 Virpazar - Vranjina

- The section is about 6.1 km long and leads to the three-branch intersection with a detour from i Rijeka Crnojevića road to a picturesque Place of Vranjina. The road in the length of 1.3 km is located by the rail tracks on the narrow embankment leading to Lake Scutari, while in the length of 0.3 km it has a similar position between the railroad and the small port part of the settlement of Vranjina.
- Three-branch intersection with a detour to Rijeka Crnojevića is located on a relatively straight line route and has a good sight distance. The intersection has not been construction engineered nor canalized, but it covers a wide/spacious plateau along the road of undefined edges or purposes.

- Land section of the road almost continually runs along the rail tracks and it is separated from it by a continuous concrete wall 0.5 m high. Opposite from the railroad alternately appear rough vertical rock massifs (walls) and embankments circled with rows of massive stone pillars, which present serious risk factors.
- Along the road section located on the crossing/bridge/passage over lake Scutari the road is separated from the railroad by a curb 20 cm in height and metal fence of the pedestrian type , but more massive in construction. Such protection cannot be considered adequate or safe in case of trucks slip-off. At approximately 100m length of the section before the rail tunnel the separation of the road from the railroad is conveyed by a number of massive stone/rocky pillars, which represent a highly inappropriate solution.
- Carriageway edge opposite to the railroad along the crossing is divided from a steep and high embankment with the lake at its base/foot by a range of massive stone pillars, in part where bridge construction curb and pedestrian fence are insufficiently long or robust, and there is also a section along which the road is not physically separated from the embankment as the shoulder is somewhat wider and grows into a rest area. (panoramic view).
- Road section along the banks of the small port is also from the lake embankment - dangerously protected by a number of massive stone pillars, and from the railroad on the opposite side of the carriageway with a concrete wall 0.5 m high.

Recommendations for risk reduction

- Three-branch intersection with a detour to Rijeka Crnojevića needs to be designed and realized in the form of a compact canalized intersection with high quality signaling and physically defined limits/boundaries.
- All carriageway edges protected with massive stone pillars need to be protected by an guard rail, and the pillars should be removed. The same type of barrier should be mounted between the road and the railroad along the crossing, parallel with pedestrian fence on the bridge on the crossing and along the crossing section where physical protection of the couple of metres distant lake embankment has not been provided.
- The guard rail needs to be mounted on the edge of the road opposite to the small port/harbour in Vranjina and along the sections where there is a coarse massive rocky/stone wall.
- Continuous concrete wall 0.5 m high between the road and the railroad could be retained as a facility with acceptable risk, but it needs to be equipped with the optical navigation/ guidance elements for example light-reflecting markers.

05 Vranjina - Golubovci

- The section is 7.9 long. All length long it runs parallel to the railroad and in its close vicinity.
- The section approximately 2 km in length has a constant transverse road profile which towards to railroad makes a continuous little concrete wall around 0.5m high, while along the opposite edge of the carriageway alternate ranges of massive stone pillars and fragments of elastic barrier which is often is not in the best condition.

- There is a bridge over the river Moraca at the section and the road is on one side protected by a curb around 15 cm high and pedestrian fence. On the side towards the railroad as a risky solution a fence has been observed /spotted/noted on both accesses to the bridge about 75 m long, of the light pedestrian type, and at that section the level of the road is below the level/ling of the railroad.
- The remaining 5.5 km approximate length of the road is separated from the railroad with lower embankments, low concrete walls (or curb) around 25 cm high or in certain places it is almost level with the railroad without physical protection. Opposite edge of the carriageway is almost permanently "protected" by massive stone pillars or fragments of the elastic barrier of non-uniform quality or condition.
- Along the section there are only few short subsections/partitions with housing estates along the road, so there are no pedestrian activities or movements, and there are only a small number of local links.

Recommendations for risk reduction

- The section between Vranjina and the bridge over the Moraca should be fully equipped with guard rail along one edge of the carriageway, and continuous low concrete wall 0.5 m high erected along the other edge of the carriageway to be equipped with light reflecting elements of optical navigation for the drivers (markers).

- Access roads to the bridge over the Moraca and the bridge itself should be fully equipped with guard rail on both sides.

- Section stretching from the bridge over the Moracato the outskirts of Golubovci should be equipped with guard rail on both sides along approximately 70 % of the route, in places where the embankment towards the railroad is less than a metre, and on the opposite side all the stone pillars should be replaced and non-functional fence, and fence should be added facilities and unprotected steep embankment.

06 Golubovci (urban section)

- Urban section of the road about 6.1 km long is of non-uniform density and content features.
- The central intersection is regulated by traffic lights however the signals are not operational. A major disturbance to the traffic flow along the road with regard to this intersection at the section of approximately 400 m. Parking, commercial activities and pedestrians pose a major problem and create risks.
- Along the whole section, the speed is limited to 50 km/h, and the signs are not consistently placed.
- Pedestrian communications along the road have not been developed, parked vehicles obstruct the movement of pedestrians, who on occasions walk on the carriageway edge marking.
- Along two sections, with influence section of the central intersection in between, the speeds exceed the limitation and the absence of access control from individual housing and commercial facilities makes the traffic situation a high risk one.

- Three-branch intersection with a detour to the airport has good sight distance however in combination with the surrounding complex commercial facilities it presents a complicated traffic scenery of potentially risky driver behaviour. Asphalt surfaces of the commercial compound by the side of the carriageway have unusual horizontal marking, and thus may be confusing, and also their width only encourages speed.

Recommendations for risk reduction

- At the section from the direction of Virpazar in certain places in the length of 3 km guard rail should separate the road from private yards and patches of land which are below the road level.
- Speed control should be improved by consistent application of vertical signaling „rumble strips" elements, whose sets of 10 m should be repeated to the access to the central intersection three times at 100m distance between the elements.
- Pedestrian crossings should be properly marked in the central zone of Golubovci (4 crossings) in accordance with the positions/locations where there is a highest volume of pedestrian movements across the carriageway.
- Footpaths should be secured in the central part of the settlement/ town on both sides (section about 1 km long) while along access sections they should be secured on one side, approximately 1 km in length in either direction.
- The locations of two bus stops in the central intersection zone should be arranged in such a way that there is minimum obstruction to the flows along the road and the creation/occurrence of risky traffic situations is prevented upon combining the buses in the bus stop and movement of pedestrians in its vicinity.
- Three-branch intersection with a detour to the airport should be properly equipped with vertical and horizontal signaling and synchronize its solutions with the neighboring scattered commercial compound. The facilities/complex plateau should be re-designed and made intelligible to the users and drivers moving along the road.. Horizontal signing needs to be supported by physical channeling with a view to better access control.

07 Golubovci - Podgorica

- The section is 6.7 km long and stretches from the signpost for the city of Podgorica (which does not comply with the standards and is placed about 0.5 km away from the EKO petrol station towards Golubovci) to three-branch intersection in Golubovci, with a detour to the airport.
- Suburban section of two-lane road predominantly of straight-line route. Scarce commercial facilities are in most cases located away from the road, outside the direct impact zone, barring some exceptions along the last kilometre in front of Golubovci. Local links to these facilities are unmarked and without proper construction licenses and direct accesses to the road are both those with and without hard surfacing.
- The carriageway/road pavement is of a high quality, the profile is spacious, sight distance good, speed limits are not consistently indicated (generally 80, at a few places 60 km/h), so that the real speeds are often about 100m/h. Horizontal signing is worn out, while the vertical is relatively in good condition though incomplete.
- Referential/reference land take is mostly leveled with the carriageway, there are no curbs, barriers or any other physical restrictions, so that from the shoulder and behind it the road can be approached virtually at any point.

- The section contains two construction-engineered, very indented and unsafe three-branch intersections (Dajbabe, and the aluminium plant Kombinat Aluminijuma). They have been designed according to acceptable principles (traffic lanes for left detour have been provided, taper and slow-down/deceleration lane for turning right/right detour), however all other elements of the intersection are out of proportion (detour radii, width of side access) STOP signs and stopping lanes are improperly placed. Visibility is good at both intersections.
- About 2 metres away from the road there is a cemetery enclosed with a massive stone fence, with much evidence of vehicle bumping, which is not surprising since this is an exceptionally risky road scenery.
- Along a couple of lengthy road sections and at two controlled three-branch intersections lighting has been provided but the lamp posts are placed about 1m away from the road and present massive structures which pose risk upon/at vehicles' slip off the road.
- The section contains an overpass and a bridge over the river Cijevna. The overpass is secured on both edges with guard rail, while the bridge is secured only by curb and pedestrian fence, which cannot be deemed safe enough.
- In the close vicinity to the bridge over the river Cijevna there is a wide plateau by the roadside, unmarked, with side accesses, an off-road bus stop and parking and several commercial facilities.

Recommendations for risk reduction

- Re-designing of two intersections with rational channeling and appropriate accompanying signing.
- Removal of the light posts and other massive impediments from the protective road area (4m for the speed of 60 km/h and 6m for the speed of 80 km/h) or the use of guard rail.
- Provision of guard rail for the vehicles along the bridge over the river Cijevna, across from the cemetery and along several sections with steep sides of the embankment.
- The plateau by the road in part approaching the bridge over the river Cijevna should be re-designed and given regulatory framework by application of ground construction elements and quality signing.

08 Podgorica urban section

- Urban road section approximately 7.5 km long. It comprises about 2 km of the route through a typical downtown street network and from approaching sections to the town, characteristic/specific for lower density of facilities along the road but also for lower level of construction and access control from the surrounding surfaces.
- The intersections at town street network to which urban section leads are controlled by traffic signals or priority signs, where the route mostly has a priority treatment. Direction signing is appropriate and facilitates finding one's way, allowing them to focus on other driving elements relevant for safety.
- At the territory of the city of Podgorica currently the speed limit is 50 km/h, so that with appropriate control and management system with relatively high volume of traffic flow no specific risks have been observed at the section running through typically city ambience. Roadworks /men-at-work which are being performed along the route have been secured

and marked more or less adequately, with some inconsistencies in the selection and location of signing and safety equipment which do not affect considerably the increase in traffic risk.

- Access sections between rural sections and central urban section stretch/extend in a straight-line route, have good visibility and regardless of the current speed limit of 50 km/h higher speeds of individual vehicles have also been observed.
- Along the approaches to the downtown there are a number of smaller economic, commercial and housing facilities. Driveway to the road with such has not been construction engineered and regulated, but rather this is performed/achieved/ along a wide front , often from the surface which doesn't have hard surfacing and they are a factor for non-maintenance of the road.
- At access sections it has been observed that tractors, motorized-cultivators and bicycles appear and move along the road. Trucks and buses often use surrounding surfaces as a parking alternative to rough land and it is an alternative tolled parking within purpose-designed city parking areas.
- Since pedestrian movements across access roads in the outskirts are dispersed pedestrian crossings are rarely secured, so that at all times and at every point it can be expected that pedestrians appear on the road, which is risky especially in the evening and dawning periods. On the northern access road the pedestrian footbridge provided over the road even in its close vicinity fails to attract considerable numbers of pedestrian crossings, so that a number of pedestrians still cross the road under of near the footbridge.
- Street lighting is discontinuous, and certain sections with close facilities, pedestrian movements and parking and maneuvering of vehicles by the road side are not lit or there are individual lamp posts mounted locally.

Recommendations for risk reduction

- Along the road section running through the core urban area no need for additional intervention has been spotted, as the risk level in realistic conditions of the traffic stream has been estimated as acceptable.
- Speed control of the vehicles along the road sections approaching the central urban area should be supported by „traffic calming“ measures, most appropriately with occasional installation of „rumble strips“ elements, disturbing the road continuity with properly signposted, marked and lit pedestrian crossings, visual edging or construction of the road, with occasional taper and related measures.
- Access roads should be continuously and evenly lit with street lights, and horizontal and vertical signing should be intensified and with high quality visual features.
- Access control from the road of the surrounding surfaces should be conveyed by the carriageway with curbs and curbed islands, and by vaulting of access fronts to profiled and surfaced links, signposted/marked with appropriate traffic signing.

09 Podgorica – Moraca Monastery

- The road section is approximately 39.1 km long in the mountainous area. An extremely difficult and safety-critical section can be singled out in the approximate length of 19.2 km which stretches along the actual canyon of the river Moraca, in a narrow rocky ambience, of attractive looks of the road and surroundings, but also high traffic risks. The preceding as well as the following sections are also connected to the river valley, in this case a wider valley basin. Road profiles along these sections are less extreme and only occasionally there are rocky walls or vertical slopes (embankments).

- Due to complex driving conditions, uncomfortable profile and evident road risks, there are often speed limits along the road ranging from 70, 60 to 40 km/h, but these are applied inconsistently, there is no recall of previously indicated speed limits, nor apparent or reasonable logic that drivers would understand and follow. It is obvious that at any point in time vehicles actually move at considerably higher speeds than the indicated speed limits, and this represents a major safety issue of this road.
- The section disposes of a number of bridge structures (some 15) varied in length (mostly between 50 and 100 metres long) as a rule high above the water courses of rocky river beds. None of the bridges is sideways/on the side properly secured. Different types of pedestrian fences has been used, often surprisingly light in structure, but the prevailing and extremely dangerous situation is the fact that at almost all bridges the fences or barriers are damaged by vehicles collisions, and the stability of pillars is disturbed, the concrete which is supposed to wrap them neatly has been crushed and reinforcement stripped off. At one of the bridges it was noted that five successive pillars in the barrier which are not hard in the surface and it has been estimated that a pedestrian would be able to send a long part of the barrier into the abyss were he to kick it strongly.
- All the bridges have on both sides narrow revision pavements (about 75 wide), while the height of the curb ranges from about 10 to 20 cm. Small heights are risky as the vehicles can easily pass over them and find themselves on the sidewalk, while higher heights pose a potential lifting factor (bouncing) of the vehicle and turbulent movement at high speed movements and at higher angle. Along the road a number of tunnels are noted (16) they are varied in length, construction techniques and equipment. Half of them are approximately 100m+ long, while the others are shorter. Only one of the tunnels is furnished with interior lighting, with neatly finished walls, with properly painted and delineated sides.
- The mentioned tunnel, as well as the others, could be objected the absence of proper signing/marking and protection of the points of entry from, and therefore its vertical sides pose dangerous massive obstacles in close vicinity to the road/carriageway. Speed limit signs (of 40 km/h) before some of the tunnels cannot be an excuse for the total absence of signing, which is especially risky in situations of reduced visibility, and note that fog is a recurrent ambience factor along this section.
- The majority of tunnels have coarse walls - very uneven and rough - and only in a few of them has partial flattening of surfaces been conducted with cement stabilization. Tunnel walls are not properly painted white (in conformity with European recommendations) nor are they marked with delineators intended for optical guidance/navigation. It has been noted that along several of them markers have been mounted on the ground, which is ineffective, and only after a few days of utilization even the markers become totally non-functional through mud-spray.
- Along two sections of the road (approximately 500 m long each) road profile has been reconstructed by extending the carriageway and providing a free zone between the edge of the driving lane and a newly erected massive concrete barrier. Built-in massive barrier appears by far more reliable than all other barriers applied, its surface is smooth and visually good, marked with markers and a colored line.

- Along the whole road section occasionally appear road barrier elements against the steep sides towards the river bed massive stone and concrete elements inherited from past times, though mounted fairly recently. A variety of combinations of these massive elements have been found as well as their combing with the fragments of guard rail. It cannot be precisely defined which of these combinations poses the highest level of risk, but undoubtedly they are all very risky. The problem lies in the fact that they constitute a discontinuous barrier, where a vehicle is very likely to frontally collide with one of the individual massive elements and be decelerated with considerable damage and probable passenger injuries.
- On a number of locations it was observed that broken and damaged elastic barriers have not been repaired, so that the next vehicle which loses control and hits those parts of the road edge, will most certainly end up in the river bed.
- Opposite to the river bed, a rocky vertical wall is often very close to the road edge, which poses a high risk element.

Recommendations for risk reduction

- All the bridges need to be to a higher of lower extent reconstructed, damages repaired fix of the pedestrian fence and it is mandatory that in the curb level, guard rail be mounted for the vehicles. This barrier should start before the bridge structure itself, so that it prevents the vehicles from slipping off the road into the river bed, prior to approaching the bridge.
- All the tunnels exceeding 100 m (and those 75 to 100 m long, if in a curve)should be lit to such a degree that they are no longer „black points" and have psychologically adverse effects on the drivers (6 tunnels). Tunnel walls should be painted white in accordance with European recommendations in that area, equipped with delineators with larger light-reflecting surfaces mounted above the zone of intensive filthiness staining /dirt (at least 0.75 m above the carriageway).
- Rocky sides of the cut, the sides of the tunnel entries and all other fixed massive structures in the zone up to 6m from the road edge should be protected with guard rails from direct vehicle running across.
- The road edge facing the river bed should be continuously furnished with guard rail, well-mounted /grounded and regularly maintained and repaired if damaged.
- Steep embankments overgrown in greenery look harmless enough in comparison to the surrounding rocky landscape, but still need to be protected with guard rail, as they pose high risk elements.
- Horizontal signing should be high quality and particularly noticeable in road ambiences with many sharp curves, tunnels and rocky cuts. Vertical signing should also be complete and high quality, and in particular a clear and logical system of speed control should be established, which would build trust and thus, be observed to a large degree by the drivers.
- The only intersection at the detour to Matesevo should be reconstructed in accordance with the principles of safe designing and traffic control of three-branch road junctions.
- Wide plateaus in the zones of several restaurants along the road opposite the Moraca Monastery should be physically rimmed with traffic islands, access to the road should be reduced to normal dimensions and located at a position with good visibility.

10 Moraca Monastery – Mioska

- Road section 7.2 km long still runs along the river bed gulch, with slightly simpler alignment elements and less in the composition of immediate surroundings.
- This section contains almost all risk elements observed at the previous section, although these are less frequent which does not mean they are less risky as well.
- There are 7 bridges at the section, fenced with pedestrian fences in a very poor state, physically damaged and corroded, with curbs varied in height.
- There are 5 tunnels along the section, 4 of which have concrete walls but no lighting, no visual marking of the point of entry, no protection from running into its vertical sides, which are fixed massive impediments in the immediate carriageway zone.
- Guard rail elements are worn off, damaged and need to be replaced and mounted at certain sections where they are missing.
- Occasionally, only bollards feature as safeguards to the steep and deep river beds, which present a barrier of limited capacity in prevention the high risk of vehicles slipping off the road.

Recommendations for risk reduction

- All the bridges should be should be to a higher or lesser degree reconstructed, damaged areas repaired and disturbed pedestrian fence foundations, and as mandatory in the curb level, to mount guard rail for the vehicles. The rail should start before the bridge structure itself in a length which fully prevents vehicles slipping off the road into the river bed prior to approaching the bridge.
- The four tunnels more than 100 m long should be lit, their walls painted white in keeping with European recommendations, and equipped with delineators of large light-reflecting surfaces mounted above the intensive staining zone (i.e., at least 0.75 m above the carriageway).
- Rocky sides of the cuts, sides of the tunnel entries and all other fixed massive structures in the zone up to 6m away from the road edge should be protected from direct vehicle bumping into guard rails.
- Road edge facing the river bed should be continuously equipped with guard rail, properly fastened to the ground, and regularly maintained and repaired after being damaged.
- Horizontal and vertical signing should be of high quality. Especially a clear and completely logical system of speed control should be established.
- A wide plateau at the location Mioska (Medjurecje) with several facilities and undefined exit points to the road should be reshaped and physically separated from the road, while the direct access to the road should be engineered and marked, and located at a place with good visibility.

11 Mioska – Kolasin

- The section is about 17.1 km long. The first 8.2 km from Mioska to curvature Crkvine is located in longitudinal ascending gradient, only to descend slightly on approach to Kolasin.

- At Mioska–Crkvine section intensive roadworks are ongoing on a reconstruction of the road and road structures. The roadworks concurrently cover almost the whole length of this section, several bridges and tunnels are being repaired.
- The elements of the future alignment and road profile are still not complete and therefore the appropriateness of their realization cannot be assessed with regard to the traffic risks, but the organization of roadworks zone can be evaluated.
- In the organization of the roadworks zone a procedure is applied based on a daily occasional complete closure of the section concerned in a couple of intervals. Local drivers and those who occasionally use this section are notified about the schedule of closures via the media and can plan their travel arrangements accordingly. Construction workers should therefore closely observe the prescribed schedule of closures and not exceed the timelines.
- Due to a considerable narrowing of the road at two roadwork sites, sections where alternate passing of traffic flows has been arranged. The control of such movements of vehicles is performed by traffic signals. The system functions properly and efficiently, lanterns are placed at conspicuous places, they are of the right size and the envisaged traffic regime is clear and makes sense. The problems are caused by impatient and non-disciplined drivers who waiting in front of the red light can form two or even three queues. When the vehicles from the opposite direction approach there is a small congestion in maneuvering so that they can pass, to be followed by rearranging of vehicles so that they form one line. In terms of traffic safety this does not pose an additional risk and is only a matter of efficient moving and users' comfort.
- At a construction site there is occasionally a need for the vehicles to pass alternately in short intervals at locations where, currently, there are no mobile signals installed. In such instances, the traffic is regulated by the construction workers equipped with a red flag (flagman). Some of the traffic regulators are equipped with appropriate flags, while others improvise with red cloth or torn flags. They sometimes do not use appropriate signs when regulating the traffic, however, considering the low speeds of the traffic stream, normally everything runs smoothly.
- The construction zone is sufficiently equipped with traffic signs which indicate men-at-work, regime changes and local dangers about which drivers should be warned. The signs are not always appropriately and neatly placed, but with appropriate improvisations and tolerance it appears successfully managed.
- When passing through the roadworks zone in the tunnels, vehicles are protected from dust and material falling from the gallows by appropriate foils and structures made of construction planks by the Contactor, so it appears that the contractor does have some concern about the safety and comfort of road users moving along the roadworks zone.
- Descending from Crkvine towards Kolasin runs through relatively mild surroundings. Only occasionally relatively short sections are fenced from steep slopes facing the river/towards the river, and for this purpose there are massive concrete blocks, as an extremely risky solution.
- There are 6 bridges on this section and outside the section one bridge about 200m long is under construction, with sharp curbs and edges protected only by pedestrian fence. There are 12 tunnels and only one is outside the section is under construction, unlit, but the only one whose entry points sides marked with red-white cross-hatching.

- Near Kolasin there is a three-branch intersection whose third leg leads into the town. The intersection has good sight distance, it is compact, but covered with dirt and currently undergoing some works.

Recommendations for risk reduction

- In the roadworks zone no specific risks have been observed considering the small running speed. However, safety equipment should be more carefully distributed (vertical impediments) along the edges of the occupied part of the carriageway, and signing should be placed on stabile purpose-designed mobile stands. Flagmen should be more appropriately clad and equipped as officials authorized persons (phosphorescent vests and more quality flags) in order to be more noticeable and authoritative.
- At newly constructed (reconstructed) section which is still under construction the use of 2+1 lanes has been noted with overtaking allowed from the. Such an arrangement should be changed fro safety reasons and overtaking should not be allowed. .
- It is assumed that the tunnels at the section under ongoing construction would be progressed into a proper and safe state, and on the tunnel outside this zone the entry portal sides should be protected from direct vehicles bumping by use of guard rail.
- At road section outside roadworks zone all the elements of concrete safety barriers should be removed and replaced by guard rails of appropriate lengths.
- Horizontal and vertical signing should be more frequent and high quality, and carriageway cleared from material partly originating from the construction site along the road.

12 Kolasin - Mojkovac

- The section is approximately 20.2 km long and runs through a relatively mild surroundings with occasional individual buildings and shorter sections which are protected with barriers.
- There are two tunnels, one dating from recent times, the other constructed earlier, both unlit, and with smoothly surfaced walls. The entry portals represent an unmarked and unprotected massive object in the road zone and they pose a great risk.
- There are two bridges fenced with pedestrian rail that is too light a structure.
- A couple of massive structures (the concrete pillars of the viaduct) are protected with equally massive concrete walls, which pose even higher risk since they are in close vicinity to the section.
- Long ago obliterated elements of the safety barrier were noticed, which have never been repaired or replaced.
- At a location by the road (at 3.5 km before Mojkovac) on two successive days, garbage was set on fire and the smoke stretched as far as the road causing reduced visibility. It was assumed that this was a dump or landfill.

Recommendations for risk reduction

- Massive structures by the roadside and steep sides of the embankment need to be protected by guard rail, and all the massive concrete elements should be removed.
- Then provide a consistent sign system for speed controlling, while the other elements of vertical and horizontal signing should be properly completed.

- To prevent setting litter on fire at the dump close to the road.
- Bridge fence should be reconstructed and guard rail should be added along the edge of the sidewalk.
- Entry points/portals to the tunnels should be colored and protected by guard rail but since both are in a curve and longer than 75m, they need to be equipped with interior lighting.

13 Mojkovac - Ribarevina

- The section is 23 km long. The runs to the location Slijepac most through surroundings where it is necessary that its edges be physically protected in front of high and steep embankments and occasionally vertical rocky cuts and continues towards Ribarevina in slight hilly undulating alignment.
- The interchange in front of Mojkovac where a road leads to Zabljak has poor visibility, horizontal and vertical signing is scarce, and engineering solution is too relaxed.
- The road section running through Mojkovac is of high profile, unmarked, only partially curbed.
- Before leaving town there are two bridges about 100m long, with no guard rail for the vehicles.
- After exiting Mojkovac the road goes uphill and 2+1 lanes are provided. In front of the bridge it merges into two lanes only to return to 2+1.
- Guard rail along a fair portion of the road is appropriate and in good condition.
- There are six bridges at the rural section of the road with pedestrian fences in bad condition and there is a need for guard rail to be mounted for the vehicles.
- Often are seen destroyed fences which have not been repaired.
- The space along the road at Slijepac Most is amorphous, the road can be accessed in a wide front, and visibility is good.
- The intersection Ribarevina is a three-leg one with good visibility. Speeds of vehicles through it are safe, since it houses a police booth occupied at all times and control of traffic is almost continual.

Recommendations for risk reduction

- All bridges need to be equipped with guard rail and existing sidewalk to be renewed.
- To improve the interchange at the entrance of Mojkovac and also to equip it with proper signalization.
- To improve the area around Slijepac Most and secure the channeled road access in terms of construction.
- Not to allow overtaking from the third traffic lane along the 2+1 road section above Mojkovac.
- Ribarevina interchange to be improved in terms of horizontal, vertical and signpost signalization.

14 Ribarevina - Serbian border

- This section is approximately 18.6 km long and is mostly stretching through the urban zone of Bijelo Polje (around 11 km) with different density and types of facilities, ending at the border crossing toward Serbia. Speed limit is 50km/h.
- From Ribarevina, about 4 km of road is passing through suburban surrounding with not much individual housing facilities. There are sporadic discontinuous sidewalks which then change into continuous, and carriageway is bordered with curbs.
- When approaching urban zone of Bijelo Polje, pedestrian activity on sidewalks and roadside is getting more frequent, there are also bicyclists appearing on the road, while local vehicles within the traffic flow constantly grow.
- The road is passing through the city centre and on the central interchange it turns left. There is great activity of pedestrians near and on the road, and disruption of traffic is evident.
- From the central interchange the road is a 3 km long section, stretching rectilinearly through an industrial zone. Profiles are rather extensive, insufficiently marked with horizontal signalization. There are many pedestrians and vehicles communicating with surrounding areas and facilities.
- After the city exit, an approximately 5 km long road passes through a suburban area with individual housing, and a sidewalk. Then the rural section has a slight hilly surrounding, almost up to the border post.

Recommendations for risk reduction

- Suburban part of the section needs to be controlled with rumble strip elements.
- It is necessary to provide continuous sidewalk along complete section leading through urban and suburban surrounding. This mainly exists, but in those parts where the sidewalk is discontinued, it needs to be protected in order to move pedestrians off the roadway.
- Central city interchange to be designed in such manner to provide more direct passing through it and to find appropriate solution for pedestrians for keeping them on sidewalks and thus reduce disruption of traffic.

4.4 Cost assessment for recommended measures

On the basis of RSI observations by sections and their characteristic sub-sections, then on the basis of lengths of certain sections needing risk reduction measures or on the basis of number of factors needing intervention, the assessment of necessary works and equipment was made, so as assessment of their costs i.e. costs of realization and implementation.

The Bills of Quantity were formulated within an Excel table which is not practical for overall printing. This table is divided into four parts which are more convenient for publishing. Fifteen different measures are included, and numbers in the last row show total cost of each measure by its implementation along the whole road. In the fourth table (4/4), the last column shows total costs of risk reduction with all recommended measures for each section or sub-section, while the field in the last row of the same column shows estimated total costs of implementation of all recommended measures along the whole route.

Recommended Bill of Quantity 1/4

br.	deonica	km	sekcija	km	elastična ograda [km]	EUR	hor./vert. sig. duž puta [km]	EUR	hor./vert. sig. u krivini [kom.]	EUR	hor./vert. sig. raskrsnice [kom./ 5 lok.]	EUR
jedinični troškovi predložene mere (EUR)					29400	EUR	2500	EUR	1300	EUR	900	EUR
01	Bar - za Sozine	8.0	urban Bar	1.3	0.2	5880	1.3	3250		0		0
			rural	2.0	0.2	5880	2	5000		0		0
			urban Sut.	4.7	0.5	14700	4.7	11750		0	3	2700
02	za Sozine - za Virpazar	11.8		11.8		0	1	2500		0	2	1800
03	za Virpazar - Virpazar	1.5		1.5	1.5	44100	1.5	3750	2	2600		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3	2.6	76440	1.3	3250		0	2	1800
			uz lučicu	0.3	0.3	8820	0.3	750		0		0
			rural	4.5	2.5	73500	4.5	11250		0		0
05	Vranjina - Golubovci	7.9		7.9	10	294000	7.9	19750		0		0
06	urban Golubovci	6.1		6.1	1	29400	6.1	15250	1	1300	1	900
07	Golubovci - PG	6.7		6.7	2.6	76440	6.7	16750	2	2600		0
08	urban PG	7.5		7.5		0	5.5	13750		0	1	900
09	PG - man. Morača	39.1	blaža trasa	19.9	5	147000	19.9	49750	5	6500		0
			kanjon Morače	19.2	23	676200	19.2	48000	10	13000		0
10	man. Morača - Mioska	7.2		7.2	5	147000	7.2	18000	5	6500		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9	2.5	73500	8.9	22250	3	3900	2	1800
12	Kolašin - Mojkovac	20.2		20.2	5	147000	20.2	50500		0	2	1800
13	Mojkovac - Ribarevina	23.0		23.0	2	58800	23	57500	4	5200	2	1800
14	Ribarevina - granica RS	18.6		18.6	1.5	44100	18.6	46500	2	2600	4	3600
	kompletan put	180.8		180.8		1922760		399500		44200		17100

Recommended Bill of Quantity 2/4

br.	deonica	km	sekcija	km	*rumble strips* komplet [kom.]	EUR	obezbeđenje tunel. ulaza [kom.]	EUR	osvetljenje tunela [kom.]	EUR	rekonstr. 4kr. raskrsnice [kom.]	EUR
jedinični troškovi predložene mere (EUR)					600	EUR	5900	EUR	100000	EUR	200000	EUR
01	Bar - za Sozine	8.0	urban Bar	1.3	3	1800		0		0		0
			rural	2.0		0		0		0		0
			urban Sut.	4.7	10	6000		0		0		0
02	za Sozine - za Virpazar	11.8		11.8		0	2	11800		0		0
03	za Virpazar - Virpazar	1.5		1.5		0		0		0		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3		0		0		0		0
			uz lučicu	0.3		0		0		0		0
			rural	4.5		0		0		0		0
05	Vranjina - Golubovci	7.9		7.9		0		0		0		0
06	urban Golubovci	6.1		6.1	6	3600		0		0	1	200000
07	Golubovci - PG	6.7		6.7		0		0		0		0
08	urban PG	7.5		7.5	5	3000		0		0		0
09	PG - man. Morača	39.1	blaža trasa	19.9		0	30	177000		0		0
			kanjon Morače	19.2		0		0	5	500000		0
10	man. Morača - Mioska	7.2		7.2		0	10	59000	4	400000		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9		0		0		0		0
12	Kolašin - Mojkovac	20.2		20.2		0		0	2	200000		0
13	Mojkovac - Ribarevina	23.0		23.0		0		0		0		0
14	Ribarevina - granica RS	18.6		18.6	6	3600		0		0		0
	kompletan put	180.8		180.8		18000		247800		1100000		200000

Recommended Bill of Quantity 3/4

jedinični troškovi predložene mere (EUR)					150000	EUR	100000	EUR	10000	EUR	25000	EUR
					rekonstr. 3kr. raskrsnice		zaštita od odrona		poboljšanje peš. staze		izgradnja peš. staze	
br.	deonica	km	sekcija	km	[kom.]		km		km		km	
01	Bar - za Sozine	8.0	urban Bar	1.3		0		0	1.3	13000		0
			rural	2.0		0		0		0	2	50000
			urban Sut.	4.7	1	150000		0	4.7	47000		0
02	za Sozine - za Virpazar	11.8		11.8		0	0.2	20000		0		0
03	za Virpazar - Virpazar	1.5		1.5	3	450000		0		0		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3	1	150000		0		0		0
			uz lučicu	0.3		0		0		0		0
			rural	4.5		0		0		0		0
05	Vranjina - Golubovci	7.9		7.9		0		0		0		0
06	urban Golubovci	6.1		6.1	1	150000		0		0	4	100000
07	Golubovci - PG	6.7		6.7	3	450000		0		0		0
08	urban PG	7.5		7.5		0		0		0		0
09	PG - man. Morača	39.1	blaža trasa	19.9	5	750000	0.5	50000		0		0
			kanjon Morače	19.2		0		0		0		0
10	man. Morača - Mioska	7.2		7.2	1	150000	0.2	20000		0		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9		0		0		0		0
12	Kolašin - Mojkovac	20.2		20.2		0	0.2	20000		0		0
13	Mojkovac - Ribarevina	23.0		23.0	2	300000		0	1	10000		0
14	Ribarevina - granica RS	18.6		18.6	1	150000		0	6	60000		0
	kompletan put	180.8		180.8		2700000		110000		130000		150000

Recommended Bill of Quantity 4/4

jedinični troškovi predložene mere (EUR)					5900	EUR	80000	EUR	12000	EUR	UKUPNO EUR
					prilaz mostu		semafor		BUS stop		
br.	deonica	km	sekcija	km	[kom.]		[kom.]		[kom.]		
01	Bar - za Sozine	8.0	urban Bar	1.3		0		0		0	**23930**
			rural	2.0		0		0	1	12000	**72880**
			urban Sut.	4.7		0	1	80000		0	**312150**
02	za Sozine - za Virpazar	11.8		11.8		0		0		0	**36100**
03	za Virpazar - Virpazar	1.5		1.5		0		0		0	**500450**
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3		0		0		0	**231490**
			uz lučicu	0.3		0		0		0	**9570**
			rural	4.5		0		0		0	**84750**
05	Vranjina - Golubovci	7.9		7.9	2	11800		0		0	**325550**
06	urban Golubovci	6.1		6.1		0		0	2	24000	**524450**
07	Golubovci - PG	6.7		6.7	2	11800		0	2	24000	**581590**
08	urban PG	7.5		7.5		0		0		0	**17650**
09	PG - man. Morača	39.1	blaža trasa	19.9	16	94400		0		0	**1274650**
			kanjon Morače	19.2		0		0		0	**1237200**
10	man. Morača - Mioska	7.2		7.2	16	94400		0	2	24000	**918900**
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0	**0**
			Crkvine-Kolašin	8.9	2	11800		0		0	**113250**
12	Kolašin - Mojkovac	20.2		20.2	4	23600		0		0	**442900**
13	Mojkovac - Ribarevina	23.0		23.0	8	47200		0	2	24000	**504500**
14	Ribarevina - granica RS	18.6		18.6		0		0	2	24000	**334400**
	kompletan put	180.8		180.8		295000		80000		132000	**7546360**

Total costs of implementation of all recommended improvement measures along the route are the result of cost sum in the last row of each of four sub-tables. The total amount would thus be approximately €7.55 million.

It is interesting to take a look at the cost structure. Reconstruction of three-branch interchanges requires the highest investments. These include complete change of geometry and harmonization with the principles of safe interchange. There are 18 three-branch interchanges along the road which are recommended to be reconstructed and improved geometrically. Not only interchanges, but also intervention and reconstruction of several wide plateaus in front of recreational and catering facilities which are located by the roadside are recommended. Of course, not each intervention individually would require unit cost of 150 thousand €, but for the purpose of this kind of rough estimation not every reconstruction can be evaluated independently and in detail.

Guard rail is on the second place by the volume of investment. It needs to be taken into consideration that this is a short-term measure (fast and simple implementation) of physical protection of road which is highly functional and has proportionally reasonable unit cost. Installation of 65.4 km of guard rail is recommended along the 180 km of road. This means that such guard rail length is applied for 360 km of the road edge, i.e. that the new rail has to cover and protect 18% of immediate road surrounding from vehicles slipping off the road and crashing against solid objects.

Considerable item in the table is tunnel lighting. It needs to be taken into consideration that estimation was done for the unit cost of 100 thousand € regardless the tunnel size, and the lighting criterion was the tunnel length (more than 100 m or between 75 and 100 m, if the tunnel is in the curve). The unit cost for the tunnel lighting is quite relative amount. Some European documents calculate with the amount of €500 thousand, but it was estimated that this amount is quite high. After consultations with local experts dealing with related issues, an amount of € 100 thousand was adopted as more realistic option.

It is also worth noting that it is necessary to remove big quantities of massive stone and concrete parts of the fence along the road, as well as non-functional and deformed guard rails and pedestrian fences at bridges. These costs are not included in the BOQ.

4.5 Economic analysis

For economic analysis of the suggested improvements the accident rates given below were utilized in HDM-4. The unimproved (no action) situation is the rates for fatalities and injury-accidents analyzed from Police data for 2006-2007 and an estimate for damage-only (DO) accidents, which are estimated to cost Eur 2,000 per accident. For the ‘with improvements’ (Improved) case, it is assumed that fatal and injury-accidents can be reduced by 20 percent and that damage-only crashes will be reduced by 15 percent.

Table 4.1 Accident rates with and without safety improvements
(per 100 million vehicle –km)

Type	No action	Improved	difference
Fatal	4.80	3.84	-20%
Injury	144.0	115	-20%
Damage only	300.0	255	-15%

Source: T.M. no 12 (Table 8) and consultant estimates

The following table shows the cost and benefit streams (millions euro) starting from year 2009 for a 15 year period. After 2017 benefits are reduced, because it is assumed that 90 percent of the traffic flows in the corridor will divert to the new motorways. The total cost of works is assumed to be €8 million, and for NPV calculation purposes this is assumed to be spent in year 1.

Table 4.2 Bar-Barski Most existing road (M-2)
Accident reduction costs and benefits (million Euros)

Year	Accidents no measures	Accidents new measures	Accidents benefits	benefits - minus cost
2008	17.564	13.388	4.176	-8.000
2009	18.969	14.459	4.511	4.511
2010	20.487	15.615	4.871	4.871
2011	22.126	16.865	5.261	5.261
2012	23.675	18.045	5.629	5.629
2013	25.332	19.308	6.023	6.023
2014	27.105	20.660	6.445	6.445
2015	29.002	22.106	6.896	6.896
2016	31.033	23.654	7.379	7.379
2017	32.895	25.073	7.822	7.822
2018	34.868	26.577	8.291	1.244
2019	36.960	28.172	8.789	1.318
2020	39.178	29.862	9.316	1.397
2021	41.529	31.654	9.875	1.481
2022	44.020	33.553	10.467	1.570

Note: After 2017 all except 10% of normal traffic transfers to the motorway
Source: HDM-4 analysis based on consultant estimates.

The main economic indicators (NPV in €millions) are shown below.

NPV (millions)	$31.40
EIRR	63%
B/C ratio =	4.92

Even if the difference in accident rates is assumed to be much lower, i.e., fatal and injury-accidents reduced by 10 percent and damage crashes also reduced by only 10 percent, the B/C ratio is still substantial, as shown below.

NPV (millions)	$8.75
EIRR	26%
B/C ratio =	2.09

The conclusion is that road safety improvement projects with the probability of high benefit/cost ratios should be given top priority within available budgets, either capital and current. This especially the case for the existing Bar-Barski Most magistralni road because, as noted above, it is the most important road link in Montenegro, and because traffic volumes will continue to grow very quickly until the motorway is completed.

5 OPTIONS FOR TOLLING STRATEGIES

5.1 Introduction

This chapter describes the background behind the establishment of a possible strategy for tolling in Montenegro. The project currently under study looks at two new routes (namely, Bar to Boljare and The Adriatic-Ionian Highway) and the final objective should be to integrate both future toll roads with a view to complete a Toll Road network covering the two main axes in the Country. When completed, the high speed Motorway[18] network will link the major towns and activity centres and will complete major Corridors, which pass through from North to South and from East to West linking with neighbouring Countries.

At this time, the strategy covers only the Bar to Boljare Motorway, since this is viewed as the top priority project. As the Adriatic-Ionian Motorway is added later, the tolling strategy will be expanded.

The paper discusses the following main aspects:-

a) Definition of terms used in the paper;

b) A description of the existing toll road system, which is operating at the present time;
c) A description of the preferred future system when fully complete; and

d) A description of the gradual expansion of the network on the basis of a possible phased implementation programme.

The concepts provided here form inputs to the on-going financial assessments and thus provide a basis for deciding on the likely viability of the toll road network or parts thereof.

5.2 Systems Definitions

5.2.1 Introduction

This section provides a series of definitions of the terms used in the specification and designs of toll systems. It covers the subjects of the Tolling Strategy and the methods of Toll Collection.

5.2.2 Tolling Strategies

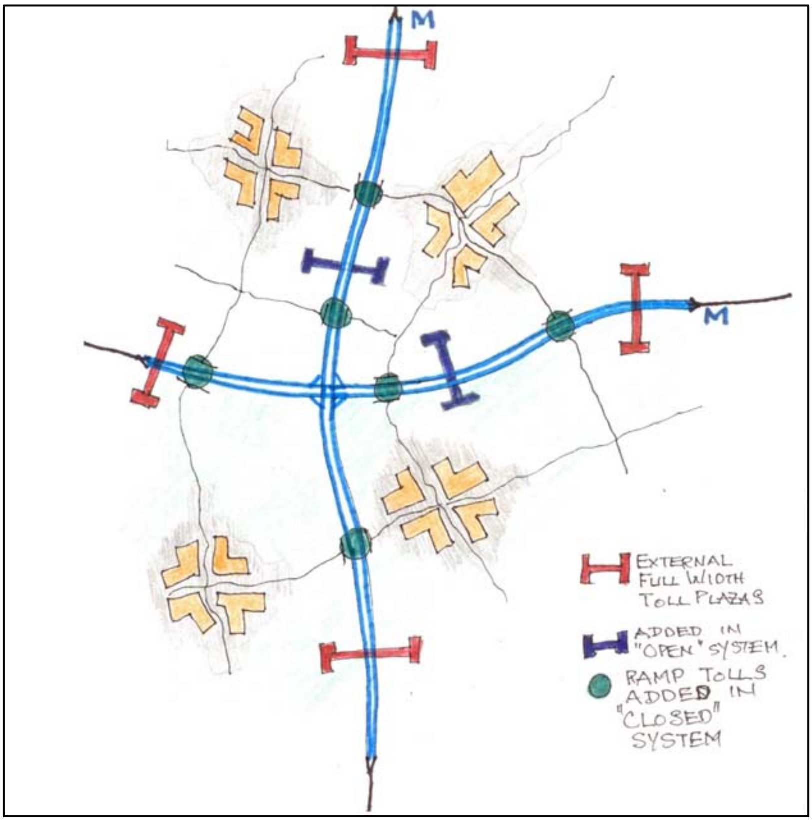
The design of the tolling system takes into account items such as continuity of the network, the number of interchanges, the spacing of interchanges, the traffic volumes and the trip patterns. Where there is a simple network of Toll Roads in place, the toll strategy can also be simple. As the network becomes more and more extensive and as traffic

[18] The term “Motorway” is used to designate a fully access-controlled highway with a minimum of two lanes in each direction designed and built to TEM standards or similar, and intended for operation as a Toll Road. The term is defined in Article #3 of the Law on Public Roads, 1996

volumes increase, the tolling strategy should reflect and respond to this more complicated network. Although there are variations within either of the two main methods, the tolling strategy can be divided into the so-called "Open" system and "Closed" system.

a) The Open System

The essential difference between this and a closed system is that there is the possibility for some journeys to take place without the payment of a toll. Usually in most cases, the numbers of such "free" journeys is a relatively small percentage of the total journeys taking place. In a pure closed system, all intermediate entry and exit ramps between the ends of each section should also be controlled with toll collection/distribution booths; in practice it is often the case that small local roads are not controlled and this leaves the system "open" for non-payment of tolls for some journeys.



Comparison of Open and Closed Systems showing multiple Toll Plazas for the Open System and full tolling on all entry and exit ramps for the Closed system.

A second important feature of open systems is the number of times when a driver is required to stop to pay a toll or collect a ticket. Unlike closed systems, longer distance journeys often require multiple stops which create time wasting and frustration on the part of drivers.

b) The Closed System

The essential difference between this and the open system is that all journeys are intercepted and all journeys therefore pay a toll. In a typical closed system the driver of any vehicle would only need to stop twice[19] – the first time to collect a ticket and the second time to pay his toll fee. In a normal approach to a closed system, there would be an external cordon at which all vehicles entering and leaving the network would be intercepted. These main external Toll Plazas would define the network and all entry and exit ramps would also be controlled. Other existing toll plazas would become superfluous and vehicles would pass through without stopping. This closed system therefore, requires that every entry and exit ramp must be controlled.

c) Directional Tolling

Directional tolling can be cost-effective in certain layouts. It is most suitable for a single link or series of links in which any alternative route is such a long diversion that the return trip is virtually captive traffic. A typical example is a Bridge. The diagram shows the two newest crossings (1966 and 1996) of the Severn river in England. (The alternative is a 100km trip via the previous lowest crossing, a stone bridge built by Telford in 1829). In this circumstance, tolls may be placed in one direction of travel and the fee levied would be typically twice the normally expected fee.

A layout for a river crossing in South-West England where tolls are collected in one direction only. If the driver were to try to avoid the non-tolled return, there would need to be a very long diversion.

Clearly this removes the need for half the toll booths and reduces land acquisition and personnel considerably.

5.3 Toll Collection Systems

One of the most important aspects to be decided at the outset is the likely volume of traffic passing through any and all of the toll plazas or ramps. This will have a major effect on the decision about the type of toll collection method. Low traffic volumes can be easily handled with manual methods; high volumes require more advanced technology if long delays are to be avoided.

[19] This relates to semi-automatic systems which are very common. In a fully automatic system, drivers do not stop at all and fees are collected automatically.

The following three terms (a, b, and c below) are used constantly, to describe the main options available[20] but it should be appreciated that there are many variations within each of the definitions.

a) Manual Collection Systems

As the name suggests these collection methods are done by hand. Conventionally, the toll fees are posted at the toll gate or, better still, a kilometre or so in advance of the toll collection booth. The motorist stops at the booth window and pays the prescribed fee to the booth operator. The driver receives a receipt as proof of payment. This approach is the common practice in Montenegro at the Sozina Tunnel.

b) Semi-Automatic Collections Systems

As traffic levels increase, the need to speed up the toll collection methods becomes more urgent. The move away from manual systems of collection can achieve some reduction in delays. Semi-automatic means reducing the intervention by personnel in some of the transactions. It is not a complete removal (this would be a fully automatic system). Semi-automatic systems can have wide variations in their approach all of which speed up the process and reduce the reliance on human intervention including the following:-

- Issuance of a ticket from a machine on entrance to the Toll Road, thereby lifting a barrier;
- Use of credit/debit cards or loyalty cards for toll fee payment; and
- Use of pre-paid tokens or tickets.

This last method also allows marketing options for frequent users to be introduced.

c) Fully Automatic Collection Systems

The ultimate, high technology collection systems virtually eliminate the need for human intervention on the Toll Road itself. There is always a need for administrative staff but these are housed remotely from the Toll Road itself. In these fully automated systems, vehicles are usually pre-registered and/or drivers establish bank accounts from which the toll fees may be debited. Other systems use transponders which carry a sum of money embedded in the chip in the transponder and which the toll collection system debits as vehicle pass across a beacon. A pre-requisite of such systems is that there is a data base of drivers, vehicles and addresses in existence which can be used reliably to identify and prosecute violators.

Below are two illustrations from a modern fully automated system in use in Ontario in Canada. The system is established on Highway 407 north of Toronto. The left picture

[20] As an example the system currently in use in Austria uses a "Vignette" which is a permit bought and displayed on a vehicle and is valid for a pre-determined period. There are thus no toll barriers and all the fee collection is completed at a roadside booth on entrance to the Toll Road network. However, the use of Vignettes goes against the current trend in setting tolling systems which pursue the idea of User Pays

shows a transponder used on Highway 407, which identifies the vehicle and applies the necessary charges to the account. The right picture shows a typical ramp to the highway with overhead gantries[21] bearing cameras and detection equipment. All vehicles passing the gantries are recorded and their entry and exit points used to calculate the toll. For further information see the website - [www.407etr.com].

An example of a Transponder

An example of a fully automated system showing the access ramp and overhead gantry with detector beacons.

5.4 Toll Rates

The Toll Rate is conventionally considered to be calculated using a cost per kilometre. This is then translated into a price at each toll collection point to act as a proxy for the distance travelled on the particular journey. In open systems, an approximate average value for distance travelled is estimated and the rate applied giving a price at the toll booths. The selected rate will be set in consideration of various parameters as noted below:-

- Payback Levels. Often the rate is fixed to reflect the capital cost of construction. In this system, the rate will become a function of the cost and traffic volumes coupled with the time perceived over which the costs should be paid back;
- Harmonization. The standardization of rates for the payment of tolls has merit in that motorists feel that they have been treated equitably as they travel around long distances. In the case of the Trans European Network for example, these Trans European Motorways occur in many European countries and a reasonably constant toll rate is aimed at. For Montenegro therefore, there will be pressure to create a similar rate to that which exists in the surrounding countries;
- Ability to Pay. The rate which is payable needs to be set at a level at which the local people can afford (sometimes referred to as “social rates”). As economies vary, the ability of drivers to pay a toll will also vary. Hence there are usually surveys undertaken which will be planned to identify that rate which is acceptable to a

[21] It should be clear from this that there is no need for Toll Plazas and hence, no need for additional land acquisition other than that for the Motorway itself.

reasonably large number of people. In this study, the Consultants undertook a Stated Preference survey which was (in part) designed to establish the acceptable level for toll rates;

- Free Market Rates. This approach to tolling allows the operator to vary the toll charges to suit traffic levels and hence balance traffic volumes by time of day or day of the week. The objective is to maximise the revenues by optimising the rate and traffic flows. As the rate increases, the diversion away will increase and the revenue might drop; conversely, as the rate drops more traffic will divert to the Motorway thereby increasing revenue. Although it is possible to activate the system using manual methods, the use of electronic tolling systems will enable the operator to vary the rate much more easily.

As an illustration of the variability of rates, the Toll Roads in Croatia use a rate of approximately 5 eurocents per kilometre; rates in Macedonia are lower at 4 eurocents per kilometre; the recently opened M6 Motorway in United Kingdom has a single charge, equivalent to approximately 13 eurocents per kilometre; finally, values of 6 eurocents per kilometre are frequently encountered in the south eastern Europe region.

5.5 Existing Tolling System

The only system of tolling currently in operation in Montenegro can be observed at the Sozina Tunnel.

There is a single set of booths located at the northern end of the tunnel serving traffic in both directions. This is a full width barrier toll plaza with 4 booths although at most times only two (one in each direction) booths are in operation.

The system of toll collection is manual with the operator making a visual identification of the vehicle classification. The operator records this vehicle by pressing a key on the till and a visual display shows the fee to be paid.

The fee transaction is completed by a cash payment which is deposited in the operator's till by the operator.

Other payment methods such as Credit Cards for example could be better used since these are in common usage in Montenegro. Although the possibility exists to use such cards and could speed up the toll collection process and also remove the build-up of cash at the booths and tolling plaza, there is no evidence that they are in use.

Although prepaid accounts are available for payments, we are not aware of any efforts in place to use marketing techniques to increase sales of toll tickets. Examples of these could be discounts for frequent travellers realised via their accounts or by sale of multiple tokens at a discount or special rates for off peak travel and weekend usage. Use of such techniques could increase revenue by relevant amounts.

5.6 Proposed System Based on a Fully Closed Toll Road Network

5.6.1 Introduction

The proposed tolling method for the Toll Roads system in Montenegro is based on a "Closed System". Initially, the fee collection is recommended to be by semi-automatic methods but this should be gradually developed until full automation is achieved. This section describes the initial system, and the gradual development through time leading up to the final system.

5.6.2 Assumptions on Project Phasing

A study was undertaken partly by the team's Engineers and partly by our Economists. The purpose was to investigate the likely construction sequences which would be most appropriate for the implementation of the project highways. Both disciplines had a major influence on the phasing:-

- From an economic point of view, the sequencing was chosen in order to maximise the rates of return. The economic assessment investigated the effects on the EIRR of the variations in timing investment in sections or variations in lateral and longitudinal phasing[22]; and
- From an engineering viewpoint, the investigation looked into items such as costs, ease of construction, difficult structural elements and need for accessibility.

[22] In this context, Longitudinal phasing means starting at one end and progressively building and opening sections until the complete Motorway is constructed. Lateral Phasing means building a half Motorway to begin with and then adding the second two lanes at a later date

Following these investigations, there was a consensus view on a logical implementation sequence.

Phase	Section	Opening year Half Motorway	Opening year Full Motorway
①	Smokovac to Matesevo	N/A*	
②	Virpazar to Bar	N/A	
③	Virpazar to Smokovac	N/A	
④	Matesevo to Berane & Boljare	N/A	
⑤	Smokovac to Matesevo		2015
⑥	Matesevo to Berane & Boljare		2015
⑦	Virpazar to Bar[23]		2017
⑧	Virpazar to Smokovac		2019

* N/A = not applicable

The table shows the assumptions which have been derived from the considerations of engineering and economics. These assumptions have been made in order to structure a phased sequence for construction and also to develop an evolving toll system.

5.6.3 Phasing of Toll Collection

Figures A and B below show how the tolling system should evolve through time. The following points of explanation should be noted:-

a) In Phase ① [Smokovac to Matesevo] toll booths would be built on the access and exit ramps at each end of the section. The section will be open to traffic in mid-2012. It has been assumed that there will be no intermediate interchanges due to minimal local access requirements. If, however, an intermediate access were to be provided, this would need to have toll booths placed on the ramps;

[23] At the time of writing, it is uncertain whether this section will be a full motorway or an Expressway. If the later is decided upon, then the phasing will be slightly altered to make Phase 5 from Virpazar to Sozina Tunnel as a Motorway and the extension of the Sozina access road to Bar as the wider four lane section.

b) In Phase ② [Bar to Virpazar] it is anticipated that the section to Bar from the Sozina Tunnel access road would be constructed first and a full width barrier would be erected somewhere suitable on the section between Bar and the Sozina Tunnel. There would also be a need to construct booths on access roads at E851 at Susanj and Durmanj. However, footnote 7 above shows that it is possible that the section Bar to Sozina Tunnel Access road may not be a full Motorway. In this event, the first full width barrier toll area could remain as it is presently, at the north end of the Sozina Tunnel. Following this section, the Motorway would be extended from the Sozina Tunnel to Virpazar and toll booths would be built on the access and exit ramps at Virpazar. The section will be open to traffic in 2014. Once these toll areas have been opened, and if the Bar to Sozina section is tolled, the toll collection facilities at Sozina tunnel would be removed, salvaged and used elsewhere. If however, the Bar to Sozina section is not tolled, the toll collection facilities at Sozina will remain and will be upgraded;

c) In Phase ③ [Virpazar to Smokovac] the new access ramps at Virpazar and Smokovac would be tolled and there would be a need to construct booths on access roads at the Bistrica, with Cetinje Road near Farmaci and with the Niksic road near Gorica. At this point, there will be a complete half-Motorway operational between Bar and Matesevo operating as a closed system open to traffic in mid-2016.

d) In Phase ④ [Matesevo to Berane and Boljare] a full width barrier would be constructed to the south of Boljare. There would be a need to construct booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca. At this point, there will be a complete half-Motorway operational between Bar and Boljare operating as a closed system open to traffic in mid-2016;

e) In Phase ⑤ [Bar to Virpazar] the second two lanes would be built (or the widening to four lanes from bar to Sozina Tunnel Access road) and the ramps at E851 at Susanj and Durmanj would be modified. There would also be modifications to the ramps at Virpazar. The full Motorway would be open to traffic in 2020;

f) In Phase ⑥ [Virpazar to Smokovac] the second two lanes would be built on the By-pass and the booths on access roads at the Bistrica Road, with Cetinje Road near Farmaci and with the Niksic Road near Gorica would be modified. The full Motorway would be open to traffic in 2020;

g) In Phase ⑦ [Smokovac to Matesevo] the second two lanes would be built and the booths on the access roads at Smokovac and Matesevo would be modified. The full Motorway would be open to traffic in mid-2021; and

h) In Phase⑧ [Matesevo to Berane and Boljare] the second two lanes would be built and booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca would be modified. The full Motorway would be open to traffic in 2023.

5.6.4 Re-organisation of Interchanges

In proposing this closed system of tolling, it will be of advantage to make some adjustments to the interchanges as designed. These interchanges have configurations which are wasteful of land and could be re-organised to require less land acquisition while at the same time be more conducive to tolling designs. The sketches in Annex A show recommendations for the general locations of toll booths.

Figure 5-1 Motorway Phasing

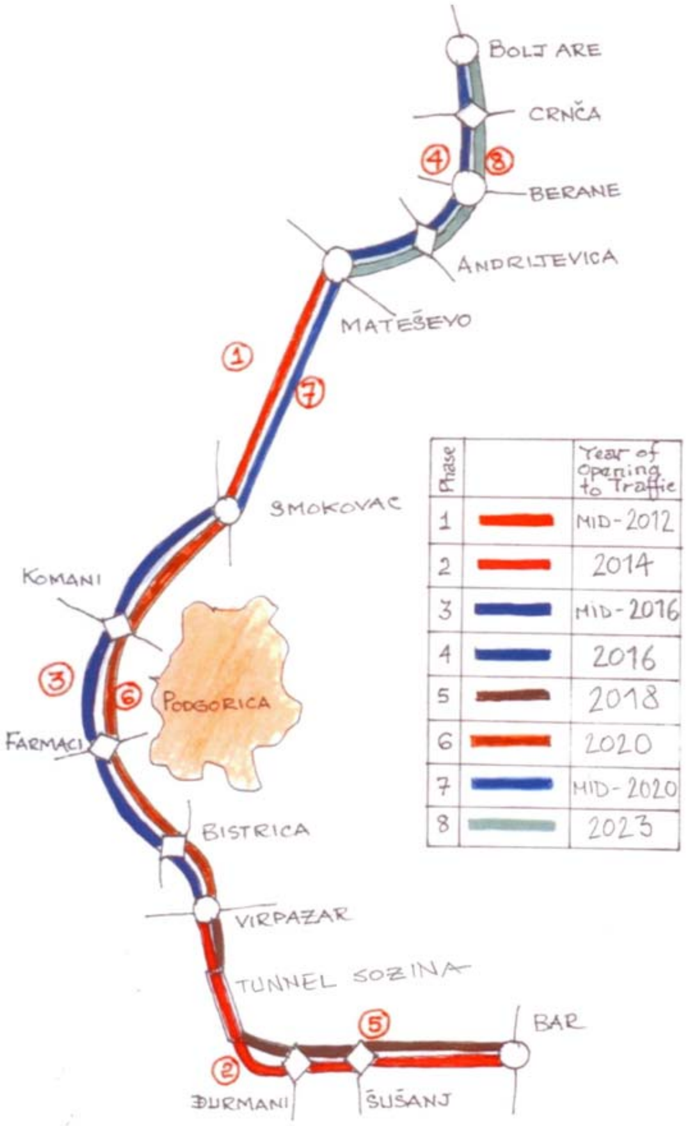
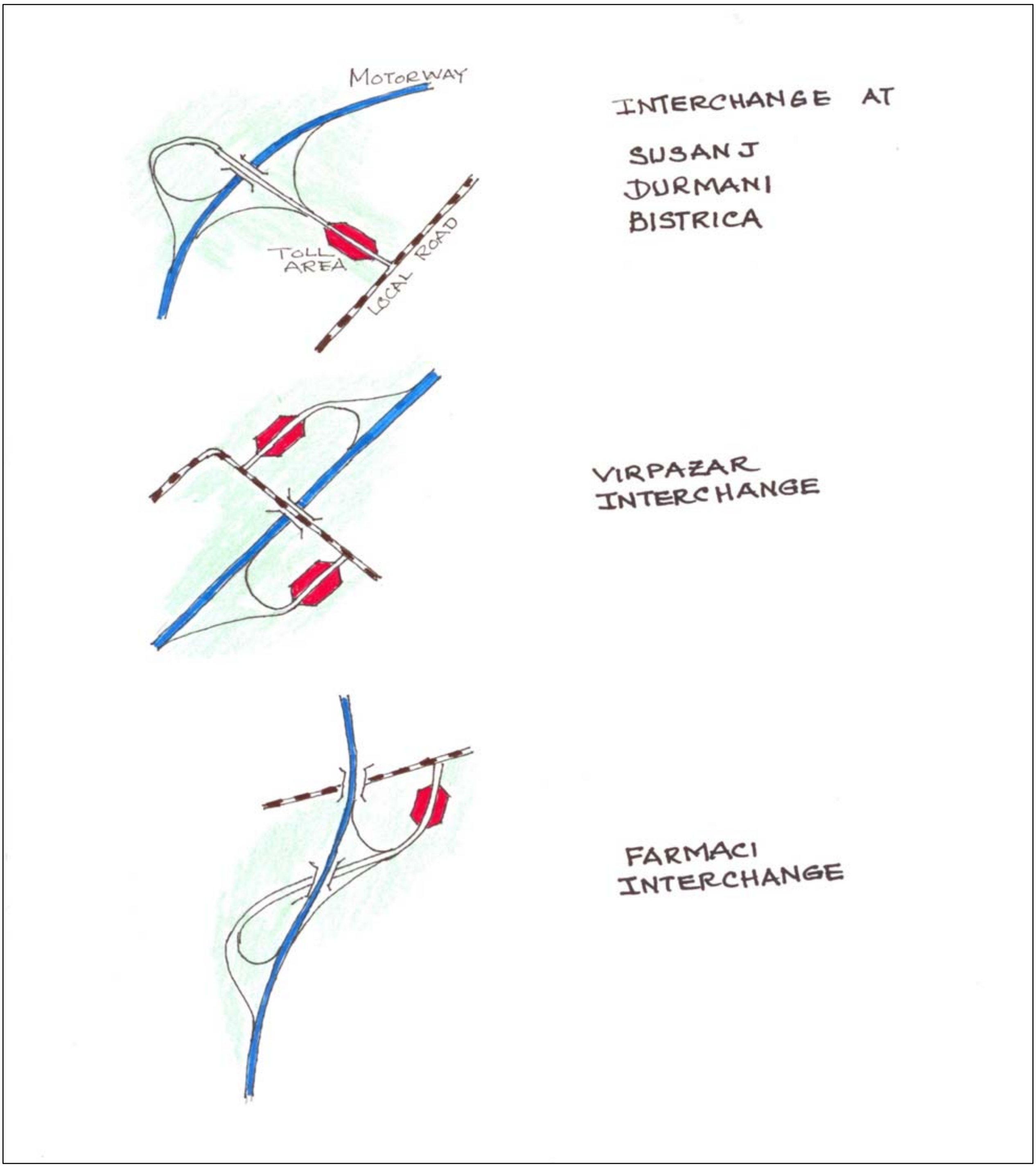
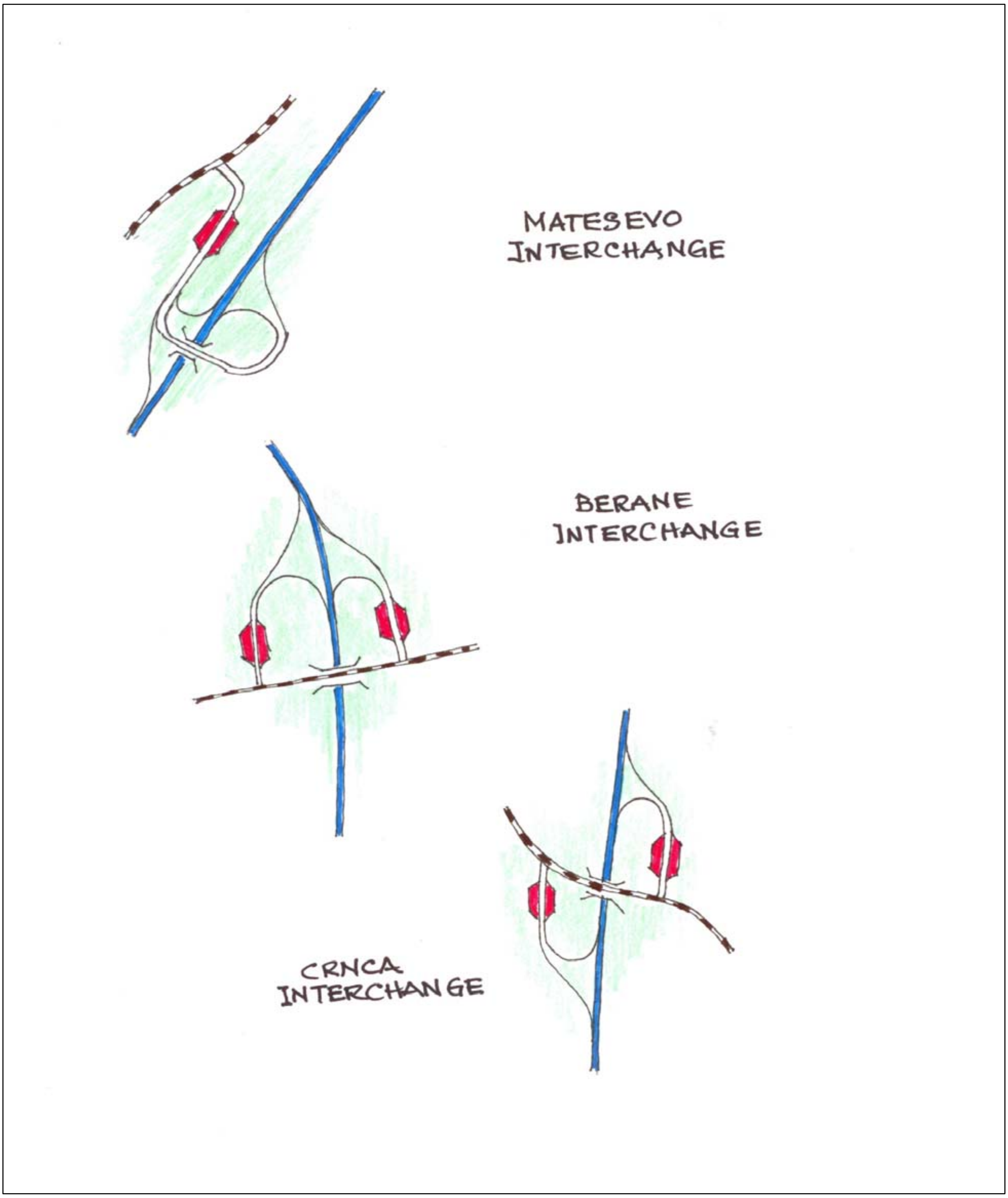


Figure 5-2 Staging of Construction and Tolling Implementation

Description	Half-Motorway				Full-Motorway			
	2012½ Open Smokovac to Matesevo	2014 Open Virpazar to Bar	2016 Open Virpazar to Smokovac	2016 Open Matesevo to Boljare	2020 Open Virpazar to Bar	2020 Open Virpazar to Smokovac	2021 Open Smokovac to Matesevo	2023 Open Matesevo to Boljare
Existing Toll System includes Full Barrier Width Toll Gate at North end of Sozina Tunnel	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps south of Smokovac	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps north of Matesevo	☑	☑	☑	☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Bar		☑	☑	☑	Remove	Remove	Remove	Remove
Construct Toll Booths on Access Ramps with E851 at Durmanj		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E851 at Susanji		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Smokovac			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Virpazar			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Niksic Rd at Komani			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Farmaci			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Bistrica			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo				☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Road at Andrijevica				☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Boljare				☑	☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E851 at Durmanj					☑	☑	☑	☑
Exoand Toll Booths on Access Ramps with E851 at Susanji					☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Smokovac						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Virpazar						☑	☑	☑
Expand Toll Booths on Access Ramps with Niksic Rd at Komani						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Farmaci						☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Bistrica						☑	☑	☑
Expand Toll Booths on Access Ramps south of Smokovac							☑	☑
Expand Toll Booths on Access Ramps north of Matesevo							☑	☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo								☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Andrijevica								☑

APPENDIX 5 - A - Interchange Toll Areas




MATESEVO
INTERCHANGE
BERANE
INTERCHANGE
CRNCA
INTERCHANGE

REPUBLIC OF MONTENEGRO

MINISTRY OF TRANSPORT, MARITIME AFFAIRS AND TELECOMMUNICATIONS

RIMSKI TRG 46 "VEKTRA BUILDING"

81000, PODGORICA, MONTENEGRO

FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

FINAL REPORT

VOLUME I

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE

PODGORICA, AUGUST, 2008

EXECUTIVE SUMMARY

This is the final report of the project entitled "Feasibility Study for Two Highways in Montenegro". It is the conclusion of 8 months technical work by the Consultants Louis Berger SAS of Paris. It contains important technical revisions to the Draft Final report that was issued on 22nd April 2008. The Consultants were retained in September 2007 under contract to the Ministry of Transport, Maritime Affairs and Telecommunications. From the beginning of the project, the Consultants kept a close liaison with the Client and were guided by the Client (in particular by the MTMAT technical committee) as to the concentration of effort and the expected priorities for work tasks.

The team has been formed as a blend of international experts and local specialists. The balance of foreign skills and experience coupled with the in-depth local knowledge has proven to be of great benefit. The study results and the team's ability to keep pace with the planned schedule reflect this close working relationship.

The Consultants provided a number of reports to the Client. The key reports were a requirement of the Terms of Reference, and others, more than 30 Technical Memoranda, (39 total including revisions) were provided in order to fully describe all the technical issues encountered.

At the beginning of the work, the Consultants undertook a detailed review of available information and concluded that further design work was required in order to prepare the relevant project designs. This work was sub-contracted to a local design house under the supervision of the Consultants.

The most important aspects of the project are the two feasibility studies – for economic and financial feasibility. The analysis has been presented below in two parts; one for the Bar-Boljare Motorway and one for the Ionian-Adriatic Motorway.

BAR – BOLJARE MOTORWAY

Economic Feasibility Study

The preliminary economic analysis presented in the Draft Final report was completely revised following the conclusion of a panel of experienced construction engineers that, principally for engineering logistical reasons in the severe mountainous terrain, the full motorway should be built in one stage only. (This is documented in Technical Memorandum no. 30). The main finding of the economic analysis (see Chapter 4) is that, using a test discount rate of 5 percent, the net present value (NPV) of the project would be €318 million and the economic internal rate of return (EIRR) 6.5 percent. Principal components of social benefit would be travel time savings (about 48%) and vehicle operation and accident reduction benefits (about 22% each). Generated traffic represents a comparatively minor element of benefit and excluding this the project NPV would still be some €212 million with EIRR 6.0 percent. A sensitivity test showed that should construction costs increase by 20 percent NPV would still be positive at €56.7 million. Another test showed that for the median traffic growth scenario, there would be a lower but still positive benefit, of about €61 million in net present value.

In this analysis the benefit to long-distance freight traffic is a quite small proportion of benefits, at about 6 percent of total benefits. However, completion of the motorway is effectively an imperative for further development of the Port of Bar.

The motorway will be a crucial factor in development of the Port, which is currently handling just over 2 million tonnes per year, but has a capacity of 4.5 million tonnes. The Serbian authorities have indicated that their seaborne commerce would be transferred from Thessaloniki to Bar, once the complete motorway link from Belgrade to Bar is ready. This development has not been explicitly included, and thus benefits accruing to generated traffic, at about 7 percent of traffic benefits in the current economic analysis, may turn out to be underestimated.

Improvements to the existing road

There is an argument that, instead of a new North-South motorway, the solution (at least in the medium term) may be to upgrade the existing road. Improvements are ongoing, and will continue to be made, for example in the vehicle safety area, but the terrain difficulties in this corridor mean it is not possible to provide a major increase in capacity along this alignment. Therefore this idea as a medium term solution has been discarded, although recommending considerable investment in safety improvements which are estimated to cost about €8 million (see Chapter 3).

Financial Feasibility Study

Based on the above results, the revised financial analysis examined the one-stage construction option and forecast traffic revenues over a 30 year period. This is reported in Chapter 6. The conclusions from the financial analysis are as follows:
There are certain conditions under which the Bar-Boljare Motorway would be attractive to private companies for concession. Assuming a toll for cars of 6 eurocents per kilometre, rising in real terms at 2 percent per year, the overall NPV (net present value) would be negative over a 30 year period, for all three traffic growth rate scenarios (standard, median and low). However, using a Government subsidy would be beneficial and could make the project attractive to potential concessionaires. The level of annual subsidy required will depend mainly on the outturn for traffic growth, but would be approximately €35 million per year for the standard traffic growth forecast, €57million for the median growth forecast, and €77 million in the low traffic scenario. (Chapter 6).

ADRIATIC–IONIAN MOTORWAY

For the Adriatic–Ionian motorway, the economic analysis was carried out for the sector Bosnia & Herzegovina border (at Nudo) to the Podgorica bypass (at Komani), since for these sections the potential travel distance saving, compared with the existing route through Niksic, is large.

The result shows that the motorway on the proposed alignment in its present form is not feasible in economic terms, assuming an opening year in 2027. At a discount rate of 5 percent the NPV is strongly negative at minus €126 million, and EIRR 1.9 percent. By deduction a similar conclusion would apply in financial terms. It is considered most unlikely that revenues earned would be sufficient to justify a public-private concession arrangement. (Chapter 5).

Safety aspects of the existing road from Bar to the Serbian border

On the existing road from Bar to Serbia (M-2 Bar-Barski Most) road safety conditions at present are clearly unsatisfactory. A road safety inspection was carried out (in February 2008) and based on these results it is strongly recommended that Government should spend about an estimated €7.6 million on various types of safety improvements. This will yield about €8 to €30 million of social-economic benefit in present value terms (discounted net benefits) over a fifteen year period. In addition, this is one of the most heavily trafficked main roads in the country, and high benefit-cost ratios indicate that a high priority should be given to the project (Chapter 3).

PPP Aspects

The remaining chapters of this report discuss: public-private partnerships and the potential contributions of each sector during implementation, and the financing options. The risks involved are presented in general form in Chapter 7. The following chapter reviews and comments on the present Law on Concessions, and includes recommendations for amendments, although currently further work is now being done, to review the latest draft Law (see Chapter 8).

Finally, the options for tolling strategies are examined in detail in Chapter 9.

Acknowledgement

The Consultant wishes to thank Ms Angelina Zivkovic who coordinated all aspects of the study's technical work, together with the MTMAT appointed technical committee, and in particular for her constant interest and encouragement.

TABLE OF CONTENTS

ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
B/C ratio	Benefit / Cost ratio (project ranking mechanism)
BiH	Bosnia & Herzegovina
BOQ	Bills of Quantities for engineering cost
BOT	Build-Operate-Transfer
CGP	Crnagoraput - Montenegro road maintenance company
EIA	Environmental Impact Assessment
EIRR	Internal Rate of Return (for economic analysis)
FYRR	First year rate of return (for economic analysis)
FYRR	First year rate of return
HDM-4	Highway Design and Maintenance Management Model
LED	Light emitting diode (for road signs)
MTMAT	Ministry of Transport, Maritime Affairs and Telecommunications
NPV	Net Present Value (for economic analysis)
New Jersey barrier	Separates lanes of traffic to minimize vehicle crossover accidents
O-D	Origin-to-Destination
OYRR	Opening year rate of return
PPM	Physical (or Spatial) Plan of Montenegro (official document)
PPP (orP3)	Public-Private Partnership
R-P	Revealed Preference Surveys
RSA	Road Safety Audit (generally for planned new roads)
RSI	Road Safety Inspection for existing roads
SEA	Strategic Environmental Assessment
SEETO	Southeast Europe Transport Observatory
S-P	Stated Preference (Surveys)
TD	Traffic Directorate (of MTMAT)
TEM	TransEuropean Motorway
VISUM	Traffic Assignment Model
VMS	Electronic variable message sign
VOC	Vehicle operating costs
VOTT	Value of travel time
WOP	Without project (case for economic analysis)
WP	With project (case for economic analysis)
WTP	Willingness to pay (of road users)

1 INTRODUCTION

This is the Final Report from the Consultants appointed to advise the Government of the Republic of Montenegro regarding the **Feasibility Study for two Highways in Montenegro**. For the sake of brevity, the project name as defined will be referred to later as the "**Feasibility Study**". For the purposes of clarity the contract for consultancy services is entered into by the two parties referred to as **"The Consultant"** [namely Louis Berger SAS] and the Government [represented by the Ministry of Transport, Maritime Affairs and Telecommunications] which is hereafter referred to as **"The Client"**.

The report encompasses technical, economic, financial and environmental solutions for the total highways' length and for the prioritised highways sections.

1.1 Subject of the Study

Two specific links have been studied under the Feasibility Study:

a) **Bar – Boljare** (border with Republic of Serbia), in the length of about 183 km. The link will combine some existing highway sections, length 10 km, (Sozina Tunnel) with the construction of a completely new highway;

b) **Adriatic – Ionian highway**, in the length of about 110 km. The link starts with Border of Bosnia and Herzegovina, over the city of Podgorica and ends at the Border with Republic of Albania. This link will consist of a completely new highway to be built in the future.

These two links have a common route (link) in the area of Podgorica (Mareza–Smokovac), in the length of around 10 km.

According to government policy the development of the link Bar-Boljare has priority over the development of Adriatic–Ionian highway.

1.2 Issues and problems under the present traffic conditions

Montenegro's road infrastructure extends for 6,848 km, out of which 964km are regional roads and 884 km are highways. The total network also contains 312 bridges, 136 tunnels, and about 5000 km of local roads. The physical characteristics of most of the regional roads (steep slopes, absence of shoulders, tight curves, low radii, relatively high pavement degradation) results in average speeds of less than 50 kilometres per hour, and in higher costs for road users, reducing Montenegro's competitive advantage against other transit corridors, and inhibits economic development.

In Montenegro there is difficult mountain terrain throughout virtually the whole country and so road construction and maintenance costs are very costly. The transport infrastructure has suffered from lack of investment for at least the past 15 years and in general the technical and geometrical standards of the existing network are out-dated, especially given the fact that international tourism is an important and fast-growing component of the national economy.

1.2.1 Bar – Boljare Corridor

The existing route Bar – Podgorica – Kolasin – Barski Most represents an essential national traffic corridor for Montenegro. Stretching from one end of its territory to another, this road functionally and spatially integrates gravitational entities (settlements, natural and economic resources) within its wider hinterland, since the national road network in this part of the territory has not much alternative road links.

Total length of the existing road is around 180 km. Most of the route (around 75%) is of hilly-mountainous character, and sections north of Podgorica are being constructed and operated under very complex ambiance conditions. These include many structures (bridges, tunnels, galleries) and in the terms of safety they represent relatively serious traffic “task” for drivers.

The map on the next page (Figure 1-1) shows position and configuration of analyzed route along with the key toponyms.

Figure 1-1:
Map of the road Bar – Barski most (Serbian border)

This highway was constructed 50 years ago, according to the former Yugoslavian Standards. The design speed varies from one section to other from 30 km/h[1] (in the difficult mountainous part) to 70 km/h on other part.

The highway passes through mountainous massifs. The first is between Petrovac and Podgorica and the difference in level is over 650m (from 30m to 700m).

From Tanki Rt to Smokovac via Podgorica the highway passes through the flat area over about 30 km.

The second massif is between Smokovac practically to Barski most on the Serbian border. On this section the difference in level is over 1000m (from 22m to 1045m).

The pavement of the road was designed for the Axle load equal to 10T which today is insufficient for the heavy trucks.

Unfortunately, in most of places the slopes of cut and embankments are not protected and are deteriorating by erosion.

All intersections were designed according to the former Yugoslavian Standards from 1950s or 1960s which today are very dangerous with high traffic flows of the speediest cars.

In 2002 a rehabilitation works started on this highway. Most of the “black spots” were improved. On the section from Bar to Tanki Rt the tolled tunnel Sozina of over than 4km length was constructed and open for traffic in 2005.

At the present on the section of M-2 road from Mioska to Kolasin there are some rehabilitation works on the pavement, retaining walls and inside tunnels. On the M-2.4 road in Kufin there is curvature construction and the third lane in Sutomore.

For the purpose of reducing traffic jams in the cities, construction of bypasses of Bar, Podgorica, Kolasin and Bijelo Pole will be performed in the following two years.

Today the highway is in good technical condition, with the pavement of 7m width and hard shoulders from 0.5m to 0.75m within different sections. Only a section from Ribarevina to Barski most on the Serbian border has 6m of pavement with 0.70 to 1.0m of shoulders. This information the Consultant found in the Road Database prepared by BCEOM in 2002.

Nevertheless, the difference of cross section width between the former Yugoslavian Standards and the situation on terrain is explained by the fact that the road was improved before 2003.

The road is equipped with safety barriers, while some sections have climbing lanes (Ulici, Jankovici, Seoce 1, Seoce 2, Crkvine, Krstac) . The avalanche protection galleries were constructed on some of the sections.

[1] The Administrative speed limitation is 40 km/h but on the hairpin bends it is difficult and risky to maintain the speed over 30 km/h.

The following pictures show the existing road.

Figure 1-2:
Section Kolasin – Smokovac

Figure 1-3:
Section Mojkovac - Kolašin

Figure 1-4:
Sozina Tunnel entrance

The accident rate on the existing highway is reportedly very high. The reasons for this are multiple. Generally this kind of road is still difficult for drivers for some reasons like the limited distance of visibility linked to the curvature of the road. It is also very important that some drivers have not experience of driving on the mountainous road and others are too sure of their capacity as drivers. Note that the psychological aspect for some drivers, to have a modern, speedy and "safe" car - also should not be neglected.

Generally, the main safety problems are as follows:

- Difficulty linked to the typical mountainous road;
    - Inadequate curve radius;
    - Steep gradients with lack of climbing lanes;
    - Too few overtaking opportunities;
    - Inadequate crash barriers;
    - Inadequate bus stopping facilities, and
    - Dangerous cliffs.
- Weather conditions often bad or difficult for driving;
    - Inadequate lighting.
- Mixed traffic flows of speedy modern cars and old slower cars;
- High rate of truck in the traffic flows during the day and night and,
    - Congestion during peak hours;
    - Long journey times;
    - Many private accesses with slowing and turning movements;
    - Many at-grade junctions – i.e., junction density too high;
    - High speeds in built-up areas;
    - Lack of safety zones along road, and
    - Conflicts between vehicles and pedestrians.

The completion of this project will be considered as a major engineering achievement in any country. There are planned to be more than 38 km of tunnels and nearly 16 km of bridges and viaducts, as shown in the table below. Well over 150 structures, measuring just over 54 km in total length, will be built in mostly difficult mountainous terrain.

Section	Overall Length (m)	Bridges		Tunnels		Bridges & Tunnels (%)
		nos.	L (m)	nos.	L (m)	
Bar - Virpazar	24,951	24	2,430	12	10,060	50%
Virpazar -Smokovac	38,231	22	4,242	9	5,510	26%
Smokovac-Matesevo	43,500	na	4,640	na	13,392	41%
Matesevo-Berane	34,352	22	2,900	8	5,735	25%
Berane-Boljari	41,300	24	1,460	7	3,690	12%
Total	**182,334**	**92**	**15,672**	**36**	**38,387**	**30%**

1.2.2 Adriatic – Ionian Corridor

The length of the analyzed highway from the Bosnian border (Klobuk) to the Albanian border (Bozaj) is approximately 115km. It is composed of roads M6 from the Bosnian border (Klobuk) to Niksic and M18 from Niksic to the Albanian border (Bozaj), via Podgorica. This is main road from Podgorica do Božaj. The construction of the M6 highway started in the 1976 and finished in 1981. The construction of the M18 highway started in the 1974 and finished in 1980. In 1973 was constructed M18 section from Podgornica to Bozaj. Today it is effectively an international road, linking Bosnia & Herzegovina with Albania through Montenegro.

The map on the next page (Figure 1-5) shows position and configuration of analyzed route along with the key toponyms.

Figure 1-5:
Map of the road Klobuk (BiH border) – Bozaj (Albanian border)

This highway is divided into four different sections.

The first is from the Bosnian border (Klobuk) to Niksic. The highway passes through hilly areas with the difference in level of over 400m (from 1000m to 600m).

The second is from Niksic to Podgorica where the highway passes on slope of hills and the difference in level is over 500m (from 600m to 22m).

The third is from Podgorica to Vuksan Lekici. On this section the highway is practically on the flat area.

The last section is from Vuksan Lekici to the Albanian border (Bozaj). The highway passes on slope of hills and the difference in level is over 180m (from 200m to 22m).

The M6 and M18 highways were constructed 30 years ago according to the former Yugoslavian Standards. The design speed is 70km/h from Vilusi to Tuzi and less than 40km/h[2] from Tuzi to the Albanian border (Bozaj).

The pavement of the road was designed for the Axle Load equal to 10T which today is insufficient for the heavy trucks.

Unfortunately, in most places the slopes of cut and embankment are not protected and are deteriorating by erosion. There is a high risk of damage to vehicles by fallen stones from unprotected cut slopes, especially on the section from the Bosnian border (Klobuk) to Niksic.

All intersections were designed according to the former Yugoslavian Standards from 1950s or 1960s which today are very dangerous with high traffic flows of the speediest cars.

Today the road from the Bosnian border (Klobuk) to Podgorica is in good technical condition with a pavement of 7m width and hard shoulders from 0.5m to 0.75m within different sections. The road is equipped with safety barriers. Pavement on the Podgorica – Tuzi section is 6 to 7 m wide or without hard shoulders on some parts.

The last section from Tuzi to the Albanian border (Bozaj) is below standards (4 - 6m width), without shoulders and no safety barriers.

The pictures on the next page show the existing road.

[2] The Administrative speed limitation is 40 km/h but on the hairpin bends it is difficult and risky to maintain the speed over 30 km/h.

Figure 1-6:
Section Podgorica-Nikšić

Figure 1-7:
Section Nikšić - Vilusi

Figure 1-8:
Section Podgorica – Tuzi

Figure 1-9:
Section Tuzi - Božaj

1.3 Project objectives

The primary objective of the Feasibility Study has been identified as the following:

- To identify the optimal solution in various respects: technically, environmentally, economically, financially; based on a robust analysis of all possible alternatives (alternatives in alignments, in selection of standards etc.) and comparison of possible alternatives.

The following represents the secondary objectives for the assignment:

- to prepare traffic forecasts for a number of different scenarios (optimistic, normal, pessimistic) for a defined appraisal period;
- to provide reliable cost estimates of the proposed solution, estimating quantities and determining unit prices from recently completed projects in similar conditions. The cost estimates shall include tentative expropriation costs;
- to determine the optimal phases in realization of the projects;
- to determine the economic and financial viability of the proposed investments, reporting the economic criteria;
- to undertake risk and sensitivity analysis of the proposed investments;
- to undertake an environmental scoping study for the corridors;
- to provide an indication as to the potential contribution of the private and public sectors in the implementation stage;
- to review and comment on the PPP legislation currently in force.

The overall objective of building the highways is to make a significant contribution in support of the ongoing economic development of Montenegro, through the provision of two key strategic links in the national transportation network. The *specific objectives* of the project can be summarized as follows:

- To gather together all available traffic information held in various Ministries and departments and to supplement this where necessary in order to provide a comprehensive database suitable for the design of the project highways;
- To gather together all available information on engineering cost rates based on work undertaken previously from design estimates and from as-built projects so that a robust set of cost rate data can be assembled for this project but also for future projects in the Country;
- To identify a number of options for the alignments of both of the project highways following suitable site visits and investigations of topographic mapping (including the possible provision of new mapping where required) and to select the best alignment from the possible options based on economic, social, financial, environmental and engineering aspects;
- To undertake an economic feasibility study of the project highways taking account of environmental factors and their associated mitigation measures, the economic benefits and the implementation costs, all of which should be input to the evaluation process; and

- To provide a financial analysis of the project highways on the basis that they may be constructed as toll motorways and a possible investor may be sought to act with the Government as a concessionaire or via some other form of Public Private Partnership.

1.4 Tasks of the Study

Consultant services included analyses and revisions of existing planning and project documentation, as well as finishing necessary project documentation.

1.4.1 Bar – Boljare

Corridor Bar – Boljare Highway (border with Serbia) is planned as two separate carriageways with two traffic lanes each and appropriate stop lanes. Tentative project speed should be 100 km/h. The task of the Consultant was to analyze possible advantages of a phased construction or realization of another kind of savings, subject to approval by the Client. In analysing the design options of the highway route, the European standards have been applied. Client will give its final consent for the route layout proposed by the Consultant.

The Consultant was expected to analyse the offered alternatives and to use a multi-criteria method of optimisation evaluating at least three possible alternatives of the highway route including already constructed section of the semi-highway:

- construction of two separate roads with two-lane each and appropriate stop lanes;
- construction of the highway in phases (2+1 traffic lanes); and
- construction of a new roadway and reconstruction of the existing (2+1 traffic lanes).

Results of the environmental scoping of the highway and necessary protection measures were supposed to be separately included in analysis.

Designs and construction of the highway Bar-Boljare need to be in compliance with all European standards and recommendations related to these kind of infrastructure facilities including resting places, service locations, area for recreation, hotels and etc. Consultants can suggest grouping of activities in the best way possible. For example, main groups of activities are (i) elaboration of engineering geology and geo-technical conditions, hydrological and hydrographical conditions, and associated studies and elaborations on area topography, land use and creation of a technical study of the highway in a the best possible scale; (ii) preparation of spatial-traffic studies, selection of the optimal route using the appropriate multi-criteria analysis.

1.4.1.1 Documentation to be prepared by the Consultant

The responsibility of the Consultant was to prepare the relevant missing parts of the project documentation and to upgrade the existing project documentation to the level necessary to obtain accurate cost estimates that would allow preparing the feasibility study. In particular for the missing sections in this link the project documentation was supposed to be prepared in line with the requirements of the national legislation.

The Design shall respect the limitations deriving from cultural heritage, use of water potentials, preservation of national parks, as well as respecting planned construction zones.

Apart from these limitations, Consultant took into consideration geological, hydro graphic and hydrologic conditions of the terrain, climate characteristics of the area, existing and planned infrastructure structures, etc. in defining the highway route layout.

1.4.1.2 Traffic Analysis and Transport Study

The Consultant was responsible to make maximum use of available data, road condition surveys, technical studies, documents and traffic counts available from Traffic Directorate and pertinent Ministries as well as data from any other studies conducted recently by European, regional, or other agencies.

The task of the Consultant was to review available information and supplement as considered appropriate to ensure that the data employed in the study are robust to indicate the baseline conditions for road condition, traffic volume, traffic composition and axle loads along the road's direction.

After completion of collecting data, the Consultant was supposed to propose activities for additional traffic counting, if he finds it necessary. In the Inception report, Consultant explained full justification for additional counting or examination of traffic users. The method of counting and number of locations was set in cooperation with the authorized representatives of the Client.

After the collection of the relevant data, the Consultant prepared realistic traffic forecasts, considering different development scenarios over the defined appraisal period of 20 years. These forecasts should reflect, within the different scenarios, the current state of trade between countries within the region, and the future development of flows across the relevant borders. The resulting forecasts were supposed to be compared with earlier forecasts prepared by European Union funded studies and other International Financial Institutions supported studies for the Balkans.

1.4.1.3 Environmental Scoping

The environmental scoping was to be done in line with the contents of the Law on Environmental Impact Assessment, as well as in line with the contents of the EU directives related to environment.

The environmental scoping within the Feasibility study shall include the following: analysis on the environmental impact of the investment, measures on environment protection and its tentative cost.

1.4.2 Adriatic – Ionian Corridor

Corridor of Adriatic – Ionian Highway is planned as two separate carriageways with two traffic lanes each and appropriate stop lanes. Tentative project speed is 100 km/h. The task of the Consultant was to analyse possible advantages of a phased construction or realization of another kind of savings, subject to approval by the Client. In analysing the design options of the highway route, the European standards have been applied. Client will give its final consent for the route layout proposed by the Consultant.

The Consultant was expected to analyse the offered alternatives and to use a multi-criteria method of optimisation evaluating at least two possible alternatives of the highway:

- construction of two separate roads with two-lane each and appropriate stop lanes; and
- construction of the highway in phases (2+1 traffic lanes).

Results of the environmental scoping of the highway and necessary protection measures were supposed to be separately included in analysis.

Designs and construction of the Adriatic – Ionian motorway need to be in compliance with all European standards and recommendations related to these kind of infrastructure facilities including resting places, service locations, area for recreation, hotels and etc. Consultants can suggest grouping of activities in the best way possible. For example, main groups of activities are (i) elaboration of engineering geology and geo-technical conditions, hydrological and hydrographical conditions, and associated studies and elaborations on area topography, land use and creation of a technical study of the highway in a the best possible scale; (ii) preparation of spatial-traffic studies, selection of the optimal route using the appropriate multi-criteria analysis.

1.4.2.1 Documentation to be prepared by the Consultant

The responsibility of the Consultant was to prepare the relevant missing parts of the project documentation and to upgrade the existing project documentation to the level necessary to obtain accurate cost estimates that would allow preparing the feasibility study. In particular for the missing sections in this link the project documentation was supposed to be prepared in line with the requirements of the national legislation.

The Design shall respect the limitations deriving from cultural heritage, use of water potentials, preservation of national parks, as well as respecting planned construction zones.

Apart from these limitations, Consultant took into consideration geological, hydro graphic and hydrologic conditions of the terrain, climate characteristics of the area, existing and planned infrastructure structures, etc. in defining the highway route layout.

1.4.2.2 Traffic Analysis and Transport Study

The Consultant was responsible to make maximum use of available data, road condition surveys, technical studies, documents and traffic counts available from Traffic Directorate and pertinent Ministries as well as data from any other studies conducted recently by European, regional, or other agencies.

The task of the Consultant was to review available information and supplement as considered appropriate to ensure that the data employed in the study are robust to indicate the baseline conditions for road condition, traffic volume, traffic composition and axle loads along the road's direction.

After completion of collecting data, the Consultant was supposed to propose activities for additional traffic counting, if he finds it necessary. In the Inception report, Consultant explained full justification for additional counting or examination of traffic users. The method of counting and number of locations was set in cooperation with the authorized representatives of the Client.

After the collection of the relevant data, the Consultant prepared realistic traffic forecasts, considering different development scenarios over the defined appraisal period of 20 years. These forecasts should reflect, within the different scenarios, the current state of trade between countries within the region, and the future development of flows across the relevant borders. The resulting forecasts were supposed to be compared with earlier forecasts prepared by European Union funded studies and other International Financial Institutions supported studies for the Balkans.

1.4.2.3 Environmental Scoping

The environmental scoping was to be done in line with the contents of the Law on Environmental Impact Assessment, as well as in line with the contents of the EU directives related to environment.

The environmental scoping within the Feasibility study shall include the following: analysis on the environmental impact of the investment, measures on environment protection and its tentative cost.

1.5 Initial planning period of project implementation and operation

The Contract no. 01-3814/1 for consultancy services and preparation of the Feasibility Study for two Highways in Montenegro was signed on 10 August 2007 between two parties - the Consultant [namely Louis Berger SAS] and the Client [represented by the Ministry of Transport, Maritime Affairs and Telecommunications].

A number of documents and compact discs provided by MoTMAT were examined and reviewed during the first month. Based on a review of the documents provided by the TD annual traffic counting results for the period 2001-2006, the Consultants have made arrangements to contract out the new traffic surveys and Origin-Destination and Stated Preference surveys to a local firm CEED to carry out these activities.

All surveys, at 16 locations, including classified traffic counting for 7 days, roadside origin-destination (O-D) interviews, and a stated-preference (S-P) survey, were executed in a satisfactory manner.

The project Inception Report was prepared and sent to MoTMAT on 19th October. Then, a considerable quantity of additional documentation has been obtained with the assistance of MoTMAT, the Traffic Directorate, and the Police Traffic department. After this initial phase, a numerous useful meetings have been held with the Traffic Directorate personnel.

The contract for engineering surveys and outline design work was agreed with the sub-contractor, local company SIMM engineering consultancy.

In the initial project phase numerous drive-trough inspections of the existing routes have been conducted. The purpose of these visits was to inspect and get familiar with the existing terrain conditions. In addition, the basic HDM model was created with a complete set of input data; economic and ecological analysis have been undertaken; All this is explained and presented in detail within various Technical Memoranda which were submitted to the Client in soft and hard copies by the Consultant, as scheduled in the detailed plan. Below is the list of all Technical Memoranda prepared by the Consultant and dates submitted to the Ministry of Transport, Maritime Affairs and Telecommunications.

LIST OF TECHNICAL MEMORANDA & dates submitted:

1.	MOTORWAY BAR – TANKI RT – PODGORICA: ANALYSIS OF THE DESIGN PARAMETERS	02.11.2007
1B.	MOTORWAY BAR – BOLJARE: ANALYSIS OF THE DESIGN PARAMETERS	08.11.2007.
1C.	MOTORWAY BAR – BOLJARE: ANALYSIS OF THE DESIGN PARAMETERS	29.11.2007.
2.	POPULATION FORECASTS BY MUNICIPALITY	02.11.2007.
3.	TRAFFIC ANALYSIS AND FORECASTS	02.11.2007.
4.	MACRO-ECONOMIC FORECASTS & VEHICLE FLEET GROWTH	30.11.2007.
5.	METHODOLOGY FOR MULTI-CRITERIA ANALISYS	27.12.2007.
6.	STATED PREFERENCE SURVEY ANALYSIS & RESULTS	27.12.2007.
7.	MOTORWAY BAR – BOLJARE: ANALYSIS CONDITIONS OF THE EXISTING HIGHWAY	30.11.2007.
7A.	MOTORWAY BAR – BOLJARE: ANALYSIS CONDITIONS OF THE EXISTING HIGHWAY, ANNEX TO TM7, ROAD CAPACITIES	20.12.2007.
7B.	ANALYSIS LENGTHS OF THE EXISTING HIGHWAY, MOTORWAY BAR – BOLJARE	20.03.2008.
8.	HDM-4 INPUT PARAMETERS	20.12.2007.
8A.	HDM-4 INPUT PARAMETERS – REVISION	22.02.2008
9.	STRATEGIC ENVIRONMENTAL ASSESSMENT – OVERVIEW & GENERAL ISSUES	22.02.2008.
10A.	SEA – BAR-BOLJARE HIGHWAY (APPENDICES)	22.02.2008.

10B.	SEA – ADRIATIC-IONIAN HIGHWAY (APPENDICES)	22.02.2008.
11.	ADRIATIC-IONIAN MOTORWAY PROJECT: ANALYSIS CONDITIONS OF THE EXISTING HIGHWAY	20.12.2007.
11A.	ADRIATIC-IONIAN MOTORWAY PROJECT: ANALYSIS CONDITIONS OF THE EXISTING HIGHWAY, ANNEX TO TM11, ROAD CAPACITIES	20.12.2007.
12.	ROAD ACCIDENT REDUCTION BENEFITS	20.12.2007.
13.	GENERAL TRAFFIC FORECAST	20.12.2007.
13A.	GENERAL TRAFFIC FORECAST – REVISION	22.02.2008.
14.	DRAFT REPORT TRAFFIC SURVEYS	20.12.2007.
15.	MOTORWAY BAR – BOLJARE: ANALYSIS OF THE SERBIAN DESIGN STANDARDS FOR THE BEOGRAD-SOUTH ADRIATIC MOTORWAY	20.12.2007.
16.	INFORMATION FOR THE FURTHER INPUT TO HDM-4 ANALYSIS	20.12.2007.
17.	MOTORWAY BAR – BOLJARE SECTION SMOKOVAC – UVAC, ANALYSIS OF THE DESIGN PREPARED BY THE FACULTY OF CIVIL ENGINEERING OF PODGORICA	22.02.2008.
18.	ROAD SAFETY INSPECTION (RSI): BAR-BARSKI MOST	22.02.2008.
19.	REVIEW AND COMMENT ON THE DRAFT LAW ON CONCESSION	03.03.2008.
20.	PREPARATION FOR SESSION VII OF COUNCIL FOR CONSTRUCTION OF MOTORWAYS IN MONTENEGRO	20.03.2008.
21.	ASSESSMENT OF TRAFFIC, SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF THE PROPOSED ALIGNMENT FOR THE ADRIATIC-IONIAN MOTORWAY	08.05.2008.
22.	MOTORWAY BAR – BOLJARE, ANALYSIS: OPENING OF THE SECOND TUBE OF THE SOZINA TUNNEL	08.04.2008.
23.	OPTIMAL SOLUTION PROPOSAL FOR SELECTION OF THE ALIGNMENT ON NEWLY DESIGNED SECTIONS	02.04.2008.
24.	REVIEW AND COMMENT ON THE LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES	02.04.2008.

25.	OPTIONS FOR TOLLING STRATEGIES	08.04.2008.
26.	FINANCIAL ANALYSIS, BAR – BOLJARE MOTORWAY	08.04.2008.
26A.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – REVISION	/
26B.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – REVISION	18.04.2008.
26C.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – 3RD REVISION	12.05.2008.
27.	CHANGING CONSTRUCTION SCHEDULES AND THEIR MAIN EFFECTS	18.04.2008.
28.	REVIEW AND COMMENT ON THE SECOND DRAFT LAW ON CONCESSION	08.05.2008.
29.	PUBLIC-PRIVATE PARTNERSHIPS: POTENTIAL CONTRIBUTIONS OF THE PRIVATE AND PUBLIC SECTORS IN THE IMPLEMENTATION STAGE	19.04.2008.
30.	DIFFICULTIES OF STAGE CONSTRUCTION (TWO PHASES) FOR THE SMOKOVAC – MATESEVO - BOLJARE MOTORWAY	29.04.2008.
31.	ECONOMIC ANALYSIS, BAR (ĐURMANI) – BOLAJRE MOTORWAY (REVISION)	23.05.2008.

1.6 Documentary base for Study preparation

1.6.1 Bar – Boljare Corridor

Prior to the Project commencement, the Ministry and relevent institutions have already been developed the highways project and project documentation to the certain level which Consultant used as the base for its further development, in particular for the Bar – Boljare corridor.

In planning documentation, this highway corridor was defined:

- Bar – Djurmani – Sozina tunnel – Virpazar – Tanki Rt – Farmaci (Podgorica) – Mareza (Podgorica) – Smokoca (Podgorica) – Bratonozici – Verusa – Matesevo – Andrijevica – Berane – Boljare.

In corridor Bar-Boljare highway, section Djurmani – Sozina tunnel – Virpazar, approximately of 10 km of semi-highway has been constructed, within 4,2 km of Sozina tunnel, as well as temporary linkages with existing roads in Sutomore and Virpazar.

The following project documentation for Bar-Boljare route has been prepared:

General Design in R = 25 : 000 for section Bar – Tanki Rt;

1. Preliminary Design for highway sections Djurmani Tanki Rt;
2. Detailed and as-built Design for section tunnel 'Sozina' – Virpazar;

   Detailed and as-built Design for section – temporary connection Sutomore;

   Detailed and as-built Design for section – temporary connection Virpazar;

   Detailed and as-built Design for section for Tunel 'Ras';

   Detailed and as-built Design for section for aqueduct 'Bistrica';

   Detailed and as-built Design for section for Tunel 'Sozina';

   Detailed and as-built Design for section for Tunnel 'Sozina' with access roads.
3. General Design in R = 1: 5000 for the section Tanki Rt – interception with road Podgorica – Cetinje;
4. General Design in R = 1: 5000 for the section Smokovac – interception with road Podgorica – Cetinje;
5. Preliminary Design for Smokovac – interception with road Podgorica – Cetinje;
6. Section Smokovac – Verusa, analyses of the corridor from Smokovac to Verusa;
7. General Design for the highway section Podgorica – Verusa (4 alternative alignment solutions);

   General Design for the highway section Verusa – Matesevo;

   Pre-feasibility Study for construction of highway section Podgorica-Matesevo;

   General Design for the highway section Andrijevica – Berane – Boljare.
8. Preliminary Design –objects on highway alignment Verusa – Matesevo;
9. Detailed Design Verusa-Matesvo- design did not pass revision;
10. Preliminary Design Matesevo – Andrijevica (as a part of conceptual solution of highway Matesevo – Andrijevica – Cakor – Bjeluha (border with Republic Serbia)); and
11. Conceptual solution for Titograd (Podgorica) – Matesevo.

As per Client 's proposal, the Bar – Boljare highway is treated and divided into the following sections and priorities:

- Section I: Virpazar – Tanki Rt – Farmaci – Mareza – Smokovac (obilaznica Podgorica);
- Section II: Smokovac – Veruša – Mateševo;
- Section III: Mateševo – Andrijevica – Berane;
- Section IV: Bar – Đurmani –tunel Sozina – Virpazar; and
- Section V: Berane – Boljare (border with Serbia).

After revision of existing documentation, the Consultant prepared the relevant missing part of the project documentation in line with the requirements of the national legislation.

The Design was prepared respecting the limitations deriving from cultural heritage, use of water potentials, preservation of national parks, as well as respecting planned construction zones.

Apart from these limitations, Consultant took into consideration geological, hydro graphic and hydrologic conditions of the terrain, climate characteristics of the area, existing and planned infrastructure structures, etc. in defining the highway route layout and also prepared studies in regards to this aspect of designing.

As per Client' s request and as agreed with the Ministry of Transport, Maritime Affairs and Telecommunications, TEM standards and recommended practice, respecting *Directive 2004/54/ec of European Parliament of the Council of 29 April 2004 on minimum requirements for tunnels in the trans-European road network SIA 197:2004 i SIA 197/2:2004* and adopted geometrical parameters for designing motorways in Montenegro were used as the base for designing and in preparing missing project documentation for the Bar - Boljere corridor.

Also, for the purpose of unifying the complete alignment from Bar to Boljare, harmonization with existing project documentation and for the purpose of easier comparison of designed variants, the Consultant also used former Yugoslavian standards in designing missing sections, from the *Pravilnik o osnovnim uslovima koje javni putevi izvan naselja i njihovi elementi moraju da ispunjavaju sa stanovišta bezbjednosti saobraćaja, 1981. godina.*

1.6.2 Adriatic – Ionian corridor

Prior to the Project commencement, in planning documentation the Adraitic – Ionian highway corridor was defined:

- Nudo (border with BiH) – Grahovo – Cevo – Podgorica (Mareza) – Smokovac (Podgorica) – Dinosa – Border with Republic of Albania.

Section Mareza – Smokovac (area of Podgorica), represents a joint section with Bar – Boljari highway.

The following documentation for Adriatic-Ionian highway has been prepared:

- Adriatic-Ionian highway - digital maps in scale 1:25000 in the area of corridor;
- Analysis of corridor Adriatic-Ionian highway – Albanian border – Komani; and
- Analysis of corridor Adriatic-Ionian highway – Podgorica – Nudo.

The Consultant analysed the above mentioned documentation and prepared the necessary documentation with associated studies for proper realization of Feasibility Study.

As per Client' s request, the Adriatic – Ionian highway is treated and divided into the following sections and priorities:

- Setion I: Mareza (Podgorica) – Smokovac – Dinosa – border with Republic of Albania; and
- Section II: Mareza (Podgorica) – Cevo – Grahovo – Nudo (border with BiH).

As agreed with the Ministry of Transport, Maritime Affairs and Telecommunications, TEM standards and recommended practice, respecting *Directive 2004/54/ec of European Parliament of the Council of 29 April 2004 on minimum requirements for tunnels in the trans-European road network SIA 197:2004 i SIA 197/2:2004* and adopted geometrical parameters for designing motorways in Montenegro were used as the base for designing and in preparing missing project documentation for the Adriatic - Ionian corridor.

The list of all received documents is given in the **Appendix 1-A**.

APPENDIX 1 – A - Master List – Project Documents Received Register

Brief Title	Source	Remarks
General Design of the highway: Bar – Tanki Rt		
Volume 1. Alignment and general documentation	TD/FoCE	HC
Volume 2. Studies (Traffic and Economic, Climate Parameters, Hydrological and hydrographical parameters, Environmental Impact Analysis)	TD/FoCE	HC
Volume 3. Engineering – Geological and Geotechnical conditions	TD/FoCE	HC
Volume 4.Techno – economical indicators and evaluations	TD/FoCE	HC
Volume 5. Presentation	TD/FoCE	HC
Volume 6. Presentation (Eng)	FoCE	HC
Revision Commission Final Report	FoCE	HC
General Design of the highway: Tanki Rt – crossing with the Podgodica-Cetinje road, scale 1:5000		
Volume 1. Alignment and general documentation	TD/FoCE	HC
Volume 2. Conditions of responsible Republic and Municipal Bodies and Organizations	TD/FoCE	HC
Volume 3. Engineering – Geological and Geotechnical conditions	TD/FoCE	HC
Volume 4. Climate, Hydrological and Hydrographical parameters	TD/FoCE	HC
Volume 5. Environmental Impact Analysis Report	TD/FoCE	HC
Volume 6. Report on seismic parameters	TD/FoCE	HC
Volume 7. Techno – economical parameters and evaluations	TD	HC
Volume 8. Presentation	TD/FoCE	HC
General Design of the highway: Tanki Rt – crossing with the Podgorica – Cetinje road		
Volume 1. Alignment - textual part	FoCE	HC
Volume 2. Alignment and Graphical Documentation	TD/FoCE	HC
Volume 3. Previous Environmental Impact Analysis	FoCE	HC
Volume 4. Geotechnical Conditions Study	FoCE	HC
Volume 5. Conditions of Responsible Bodies	FoCE	HC
Volume 6. Presentation	FoCE	HC
Revision Commission Final Report	FoCE	HC

General Design of the Highway: Andrijevica - Berane - Boljare		
Volume 1. Traffic Analysis and Projections	FoCE	HC
Volume 2. Climate, Hydrological and Hydrographical parameters	FoCE	HC
Volume 3. Environmental Impact Analysis	FoCE	HC
Volume 4. Alignment (Graphical documentation)	TD/FoCE	HC
Volume 5 (Techno – economical indicators and evaluations)	FoCE	HC
Volume 6. Engineering – Geological and Geotechnical conditions	FoCE	HC
Volume 7. Presentation	FoCE	HC
Volume 7. Presentation (English)	FoCE	HC
Volume 7. Presentation II	FoCE	HC
Revision Commission Final Report	FoCE	HC
General Design of the highway: Verusa - Matesevo	TD	HC
OTHER DOCUMENTATION		
Review of technical and other highway documentation in Montenegro by 1997	FoCE	HC
Analysis and inspection of existing technical and other documentation reconciliation	FoCE	HC
General Design of highway: Bar – Tanki Rt section, presentation	TD	CD
Preliminary Design of highway: Djurmani – Tanki Rt section	TD	CD
General Design of highway: Andrijevica – Berane – Boljare section	TD	CD
Spatial Plan of the Republic of Montenegro (draft)		CD
Smokovac – Verusa		CD
General Design Verusa – Matesevo section		CD
Highway: Djurmani – Tanki Rt		CD

Section: Sozina Tunnel – Virpazar		
General Design of highway: Smokovac – crossing with the Podgorica – Cetinje road, presentation		CD
Tanki Rt – layout		CD
Bypass Podgorica presentation		CD
Topographic maps in scale 1:25000 /analog maps/	TD	CD
Adriatic-Ionian highway corridor /digital form/	TD	CD
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro 2002.	TD	HC
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro in 2001.	TD	HC
"PILOT" TRAFFIC COUNTING 2006., along main and regional roads in the Republic of Montenegro	TD	HC
"PILOT" TRAFFIC COUNTING 2005., along main and regional roads in the Republic of Montenegro	TD	HC
TRAFFIC INTENSITY along main and regional roads in the Republic of Montenegro 2000.	TD	HC
EAR Feasibility Study for Belgrade - Montenegro Road, Serbia (Serbia and Montenegro), dated March 2006.	TD	HC
CD 13Traffic counting, 2007.	TD	CD
CD 14 Topographic maps	TD	CD
TRAFFIC INTENSITY along road network in the Republic of Montenegro 2000.	TD	HC
SMOKOVAC - VERUŠA, DIGITAL MAP	TD	CD
VERUŠA MATEŠEVO, MAIN DESIGN	TD	CD

ANDRIJEVICA - BERANE - BOLJARE, GENERAL DESIGN	TD	CD
SMOKOVAC - WITH ROAD PODGORICA-CETINJE, GENERAL DESIGN	TD	CD
BAR - TANKI RT, GENERAL DESIGN	TD	CD
DJURMANI - TANKI RT, TEMPORARY JUNCTION, MAIN DESIGN	TD	CD
PODGORICA - MATEŠEVO - KOLAŠIN	TD	CD
SOZINA TUNNEL, VIDEO PRESENTATION	TD	CD
ADRIATIC - IONIAN HIGHWAY, DIGITAL AND TOPOGRAPHIC MAPS	TD	CD
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL MAIN REPORT, JULY 2003.	Volume 0, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ROAD SURVEYS**, JULY 2003.	Volume 1, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ROAD DATA BASE**, JULY 2003.	Volume 2, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **TRAFFIC**, JULY 2003.	Volume 3, TD	HC

STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **TRAFFIC FORECASTS AND INPUTS INTO HDM**, JULY 2003.	Volume 4, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **CALIBRATION OF ROAD USER EFFECTS INPUTS TO HDM-4**, JULY 2003.	Volume 5, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **HDM-4 ANALYSES AND GIRR IMPLEMENTATION**, JULY 2003.	Volume 6, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **ENVIRONMENT**, JULY 03.	Volume 7, TD	HC
STRATEGIC PLAN FOR ROAD INFRASTRUCTURE MAINTENANCE AND DEVELOPMENT, Project EAR/02/MTG01/03/001 Preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, Montenegro (FRY), FINAL REPORT, **HIGHWAY PLANNING AND DESIGN CRITERIA GUIDELINE**, JULY 2003.	Volume 8, TD	HC
Road Design Standards	Put Inzenjering	HC

FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; CONCEPT DESIGN REPORT, SEPTEMBER 2004.	Volume 1, Podgorica Municipality	HC
FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; TRAFFIC SURVEY REPORT, SEPTEMBER 2004.	Volume 3, Podgorica Municipality	HC
FEASIBILITY STUDY FOR PODGORICA EASTERN BYPASS; ENVIRONMENTAL SCOPING REPORT, SEPTEMBER 2004.	Volume 4, Podgorica Municipality	HC
ADRIATIC-IONIAN CORRIDOR COMMITTEE REPORT	TD	HC
ToR FOR CONCEPTUAL DESIGN PODGORICA-VERUŠA	TD	E-MAIL
LEVEL OF DEVELOPMENT AND QUALITY OF TRANSPORT SYSTEM OPERATION IN THE ECONOMY OF MONTENEGRO, draft	SIMM Eng.	HC
ToR FOR PREPARATION OF DETAIL SPATIAL PLAN, BAR - BOLJARE MOTORWAY	Ministry for Economic Development	HC

2 ANALYSIS OF TRAFFIC FLOWS FOR THE BAR-BOLJARE CORRIDOR

2.1 Traffic surveys in October 2007

In the 16 point traffic surveys in October 2007, traffic was counted by vehicle type for 12 hours per day on seven consecutive days, including for one 24-hour continuous period. Generally the count station locations were the same, or quite close to, the regular CGP stations. The table below gives a summary of AADT estimated for the five links in the existing network that are directly related to the motorway corridor Bar-Boljare. For the Sozina tunnel, data were supplied by Monteput d.o.o., the tunnel operator. Note that for count station no. 14, traffic count data for the link Bijelo Polje to the border (near Barski Most) was adjusted to allow for 50 percent of the traffic counted being local short-distance urban traffic circulating around the town of Bijelo Polje. Examination of responses in the Origin-Destination (O-D) survey at this location showed that this estimate is correct, although since the O-D survey does not include the very high seasonal traffic peak in July and August, the overall AADT estimate is likely to be biased downwards.

Table 2.1
Summary of traffic counts in 2007
(Results in estimated AADT for 2007)

Vehicle type	Bar - Petrovac (RSI 4)	Sozina Tunnel (Monteput)	Podgorica - Bioče (RSI 9)	Mioska - Kolašin (RSI 10)	Bijelo Polje - Barski Most (RSI 14)
Private Car	6,373	5,016	4,131	4,930	4,563
Light Delivery & Microbus	501	362	367	490	198
Bus (>30 seats)	118	56	142	135	47
Small truck (2-axle)	319	157	147	148	64
Medium truck (2-axle)	390	145	273	236	173
Heavy truck (5-axle art.)	518	303	464	727	267
Total	8,219	6,039	5,524	6,666	5,312
Light vehicles & microbuses	83.6%	89.1%	81.4%	81.3%	89.6%
Trucks & buses	16.4%	10.9%	18.6%	18.7%	10.4%

Source: LB traffic counts 23-29 October 2007, and Monteput d.o.o.

The AADT was determined using weekly factors and seasonal factors based on 2002 and 2003 data from CGP and the BCEOM surveys[3] of 2003. The weekly factor was estimated as 0.99 and the October seasonal factor as 1.20. Daily (24/12 hour) adjustment factors were determined for each vehicle type using the Consultant survey data. For details, see Technical Memorandum No. 14.

2.2 Traffic counts in 2008

Over an eight-day period from 27th July to 3rd August, the Traffic Directorate of MTMAT carried out 24-hour counts at a location near the Manastir Moraca, on the M-2 about 26km south of Kolasin. The results are given in the table below.

[3] Strategic Plan for Road Infrastructure Development, Montenegro (BCEOM Final Report Volume 4, July 2003)

Table 2.2
Traffic counts on M-2, July 2008

Date		24h count
Sun	27-Jul	12,131
Mon	28-Jul	10,084
Tue	29-Jul	9,520
Wed	30-Jul	11,098
Thu	31-Jul	11,644
Fri	1-Aug	14,815
Sat	2-Aug	14,481
Sun	3-Aug	14,533
Average daily (July)		12,288

Source: Traffic Directorate MTMAT

Using a July/annual average factor of 1.96 (see below) the AADT for 2008 would equal 6,270, and then, assuming a general growth rate of 8 percent during the past year, the 2007 AADT at this location would be 5,805. This is reasonably consistent with the traffic estimates for Bioce-Podgorica (5,524) and Mioska-Kolasin (6,666) derived from the October 2007 traffic surveys (see Table 2.1).

2.3 Sozina Tunnel traffic 2005-2008

Average daily traffic for Sozina tunnel, average by month, since opening in August 2005, is shown in the table below.

Table 2.3
AADT by month at Sozina tunnel 2005-2008

	2005	2006	2007	2008
Jan		2,712	3,634	4,034
Feb		3,006	3,765	4,254
Mar		3,578	4,132	4,483
Apr		4,078	4,907	4,950
May		4,395	5,305	5,842
Jun		5,454	7,534	7,775
Jul		9,635	11,797	
Aug	8,383	9,855	11,702	
Sep	4,144	5,244	6,202	
Oct	2,976	4,013	4,616	
Nov	2,843	3,829	4,404	
Dec	3,014	3,899	4,485	

Source: Monteput d.o.o.

As shown above, there is a marked variation in monthly traffic total depending on season, as shown in the graph below. The high seasonal variation for Sozina tunnel is very consistent

with the seasonal variations elsewhere in the corridor reported by Crnagoraput. In July and August traffic totals are nearly double (about 96% higher) the overall year-round average; while January and February traffic is little more than half the average.

Comparing 2006 traffic for the last four months of the year with the same period in 2005, up by some 31% in 2006, and assuming that the underlying annual traffic growth rate (for 2007 compared with 2006) was about 10 percent, there appears to have been a generated traffic effect of about 20 percent. The year-on-year changes for each month are given in the table below.

Table 2.4
Year-on-year traffic changes at Sozina (by month)

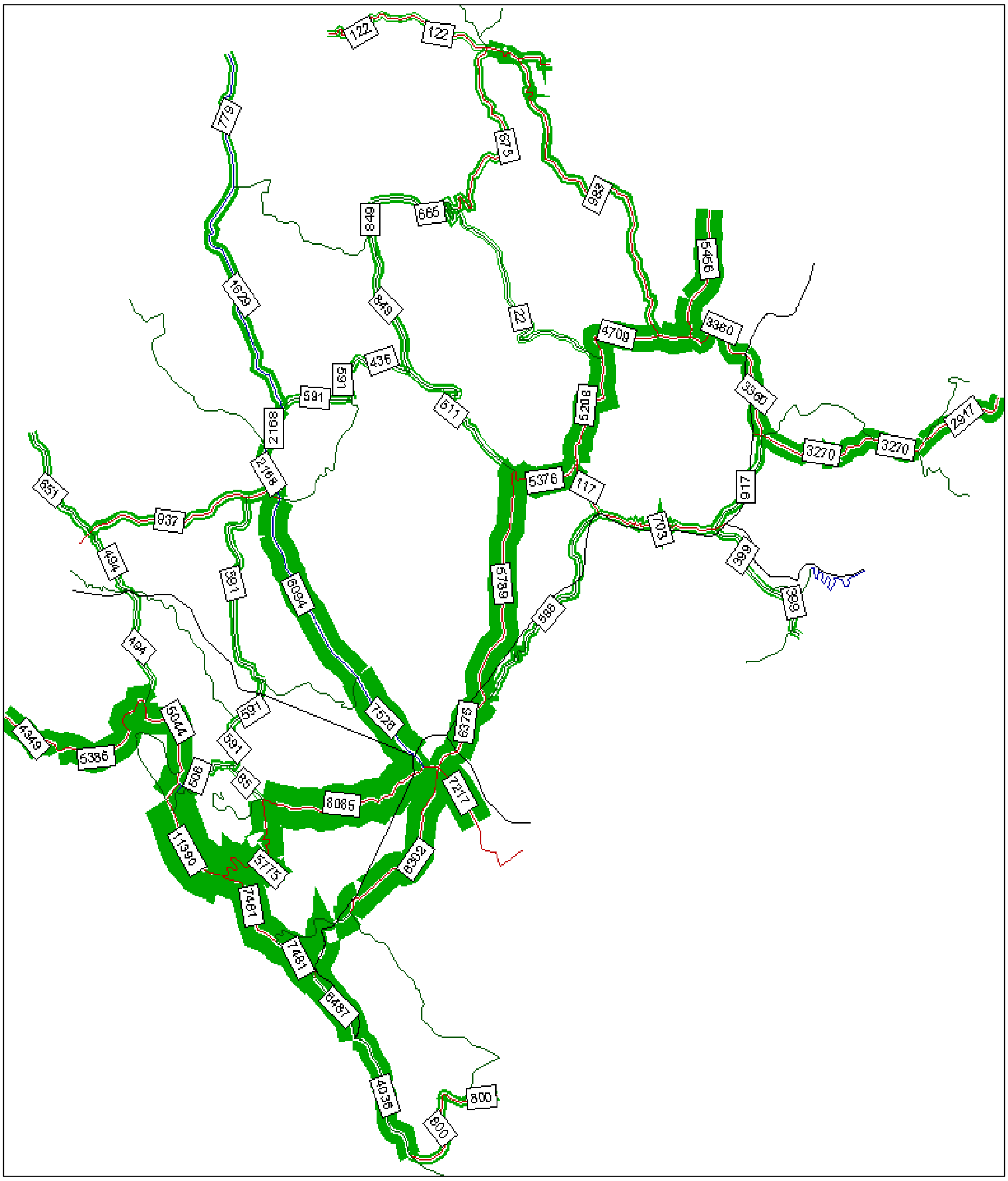
	2006/2005	2007/2006	2008 /2007
Jan		34.0%	11.0%
Feb		25.2%	13.0%
Mar		15.5%	8.5%
Apr		20.3%	0.9%
May		20.7%	10.1%
Jun		38.1%	
Jul		22.4%	
Aug		18.7%	
Sep	26.5%	18.3%	
Oct	34.8%	15.0%	
Nov	34.7%	15.0%	
Dec	29.4%	15.0%	

At Sozina the AADT adjustment factors for October (AADT /October daily average) were 1.240 in 2006 and 1.309 in 2007. These compare to the factor of 1.20 used for adjustment of AADT from the consultant’s traffic counts in the corridor (see section 2.1 above).

2.4 Estimation of base year and horizon year traffic volumes in the traffic model

The VISUM traffic assignment model was used to simulate the existing traffic network in 2007 and for the horizon year, 2027, the expected network characteristics at that date, including the planned improvements listed in the Physical Plan of Montenegro (PPM), and including the proposed motorway. Details of the assignment procedure used are given in Technical Memorandum no. 14. Comparing with the traffic count data for the base year (see tables above) the assignment model allocated approximately equal traffic volumes on the network. The figure below shows the traffic modeling results in map-diagram form for the base year, 2007.

Figure 2-1 Modeled base year traffic flows in 2007



The next phase of modelling procedure was the creation of matrices and future corridor options for an intermediate year (year 2012) and for the horizon year 2027. The results are shown in the following map-diagram figures.

Figure 2-2 Modeled traffic flows in 2012 – with 6c/km Toll (Generalized cost including Fuel consumption)

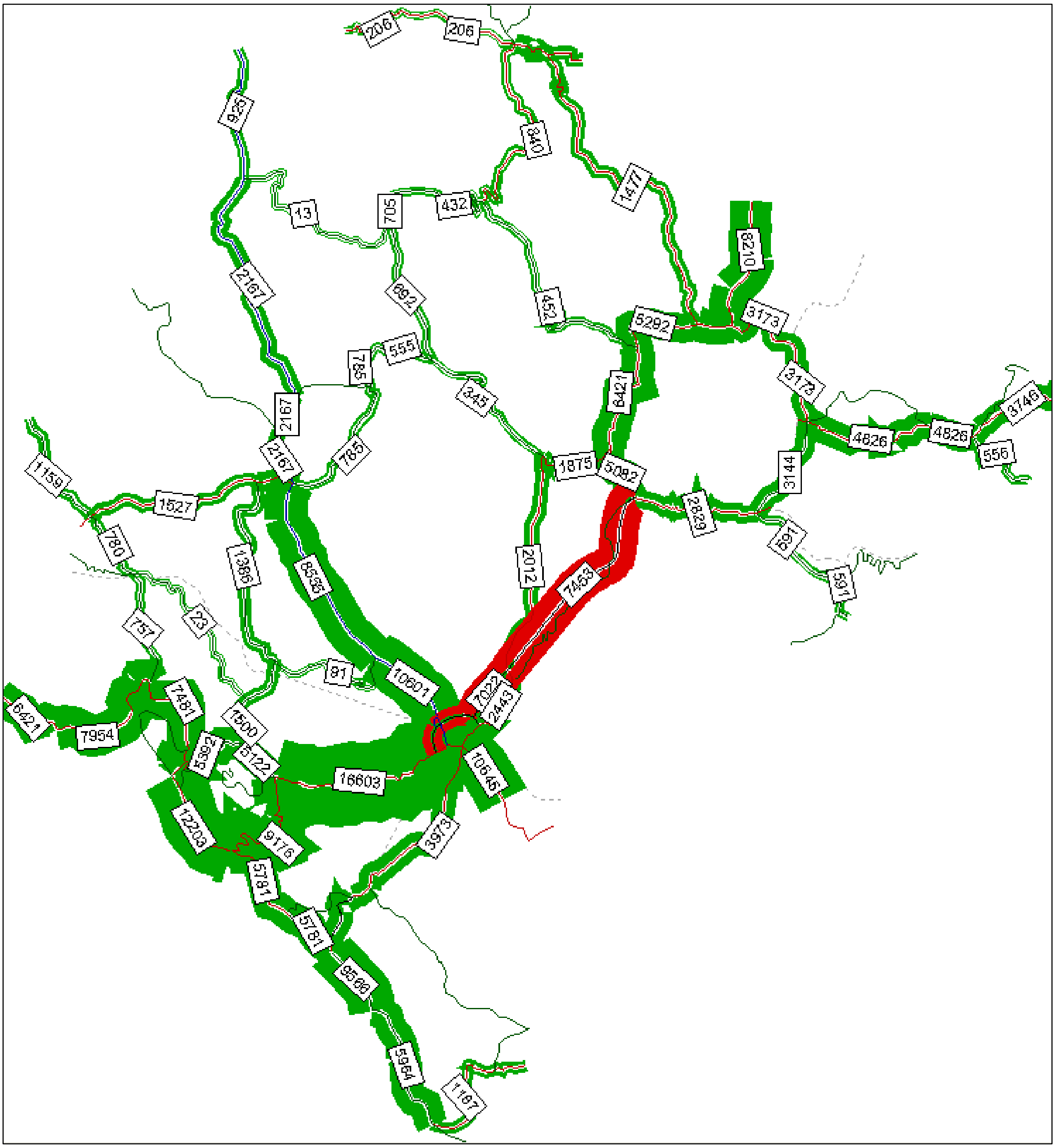


Figure 2-2 Modeled traffic flows in 2012 with 6c/km Toll (Generalized cost including Fuel consumption) Podgorica Bypass

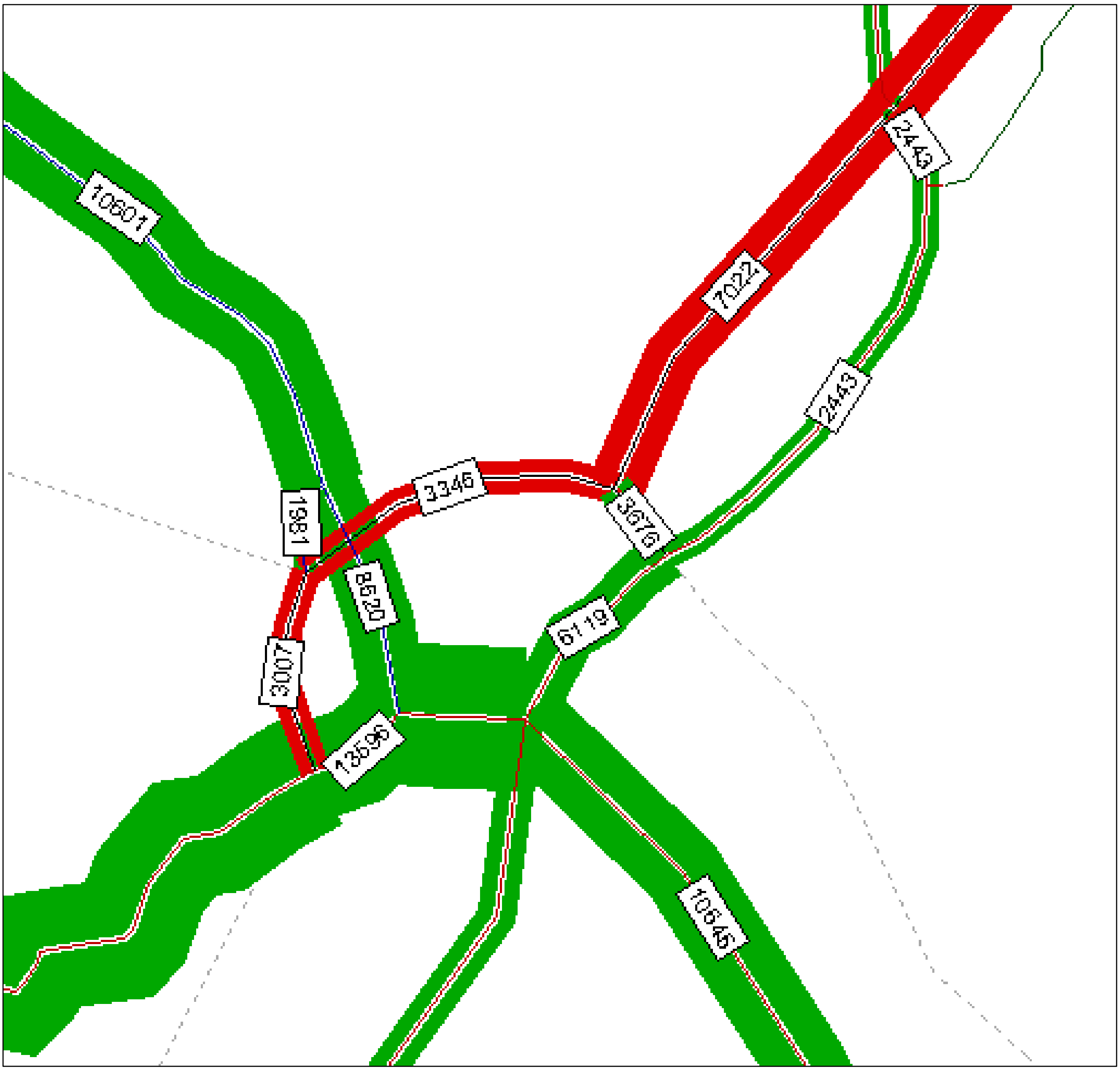


Figure 2-4 Modeled traffic flows in 2027 NO Toll (Generalized cost including Fuel consumption)

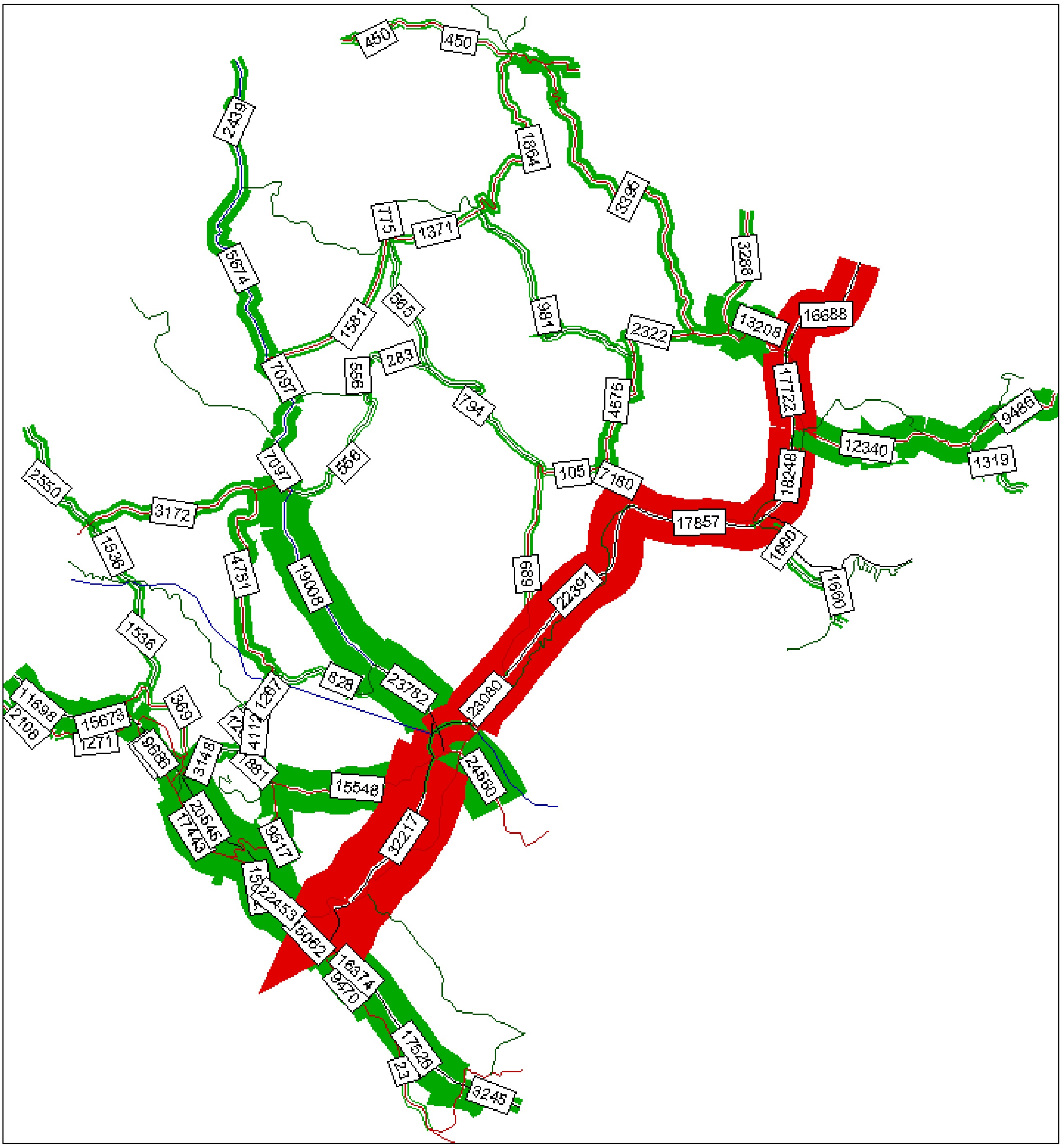


Figure 2-5 Modeled flows for Podgorica By-pass in 2027 - NO Toll (Generalized cost including Fuel consumption)

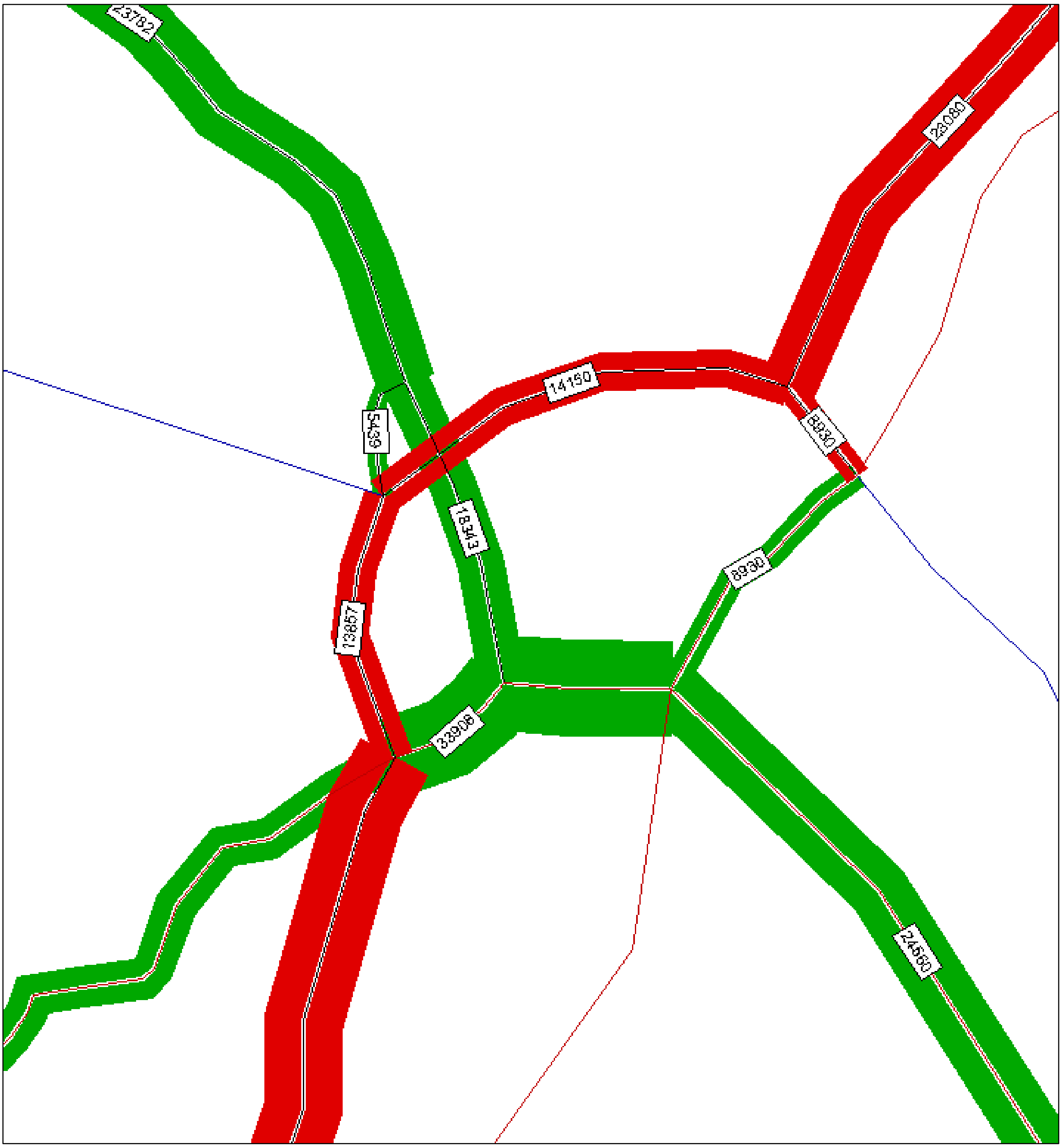


Figure 2-6 Modeled traffic for 2027 Toll = 6 Eurocent/km (Generalized cost with Fuel consumption)

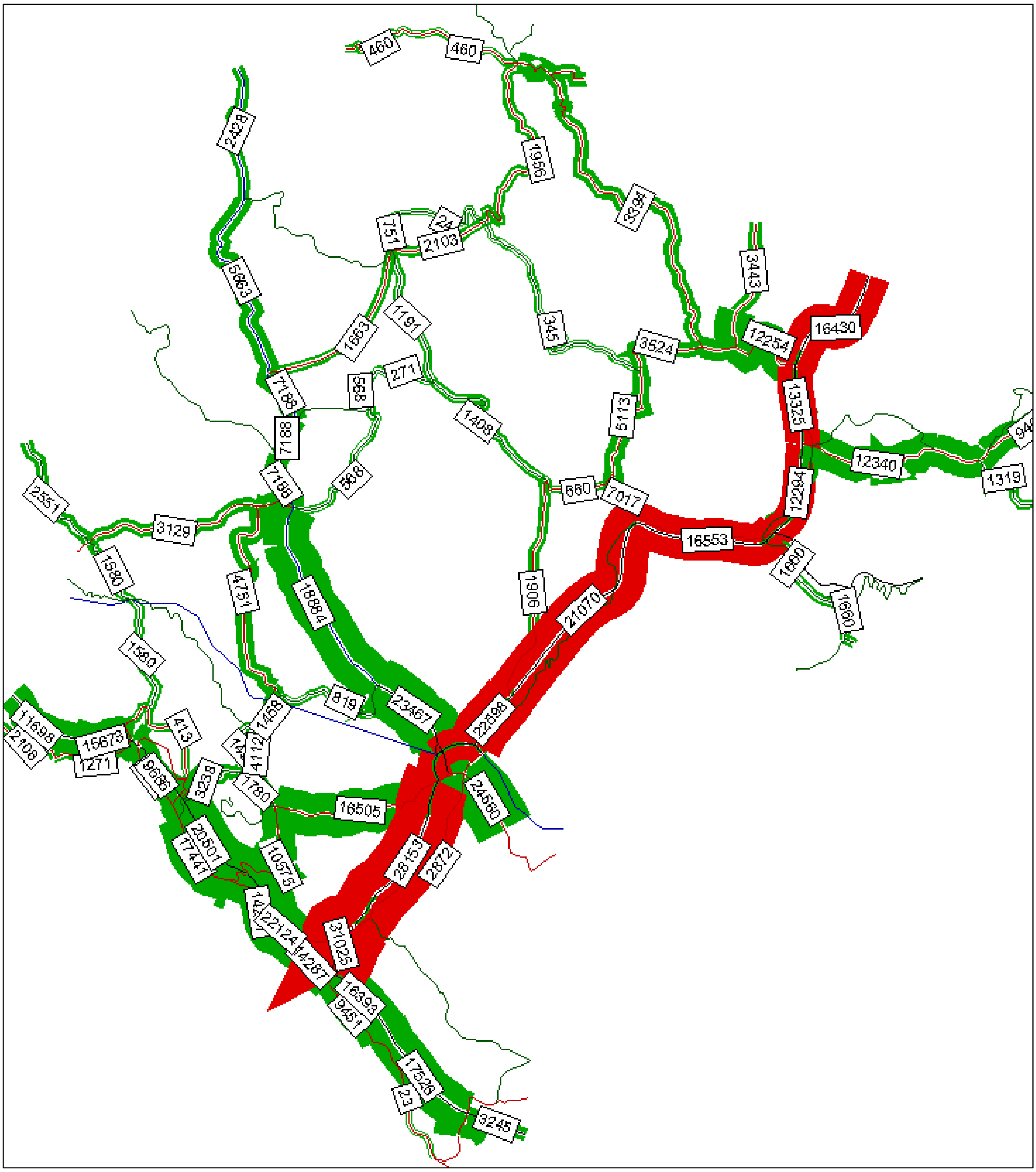


Figure 2-7 Modeled traffic for 2027 Toll = 6 Eurocent/km (Generalized cost with Fuel consumption) Podgorica By-pass

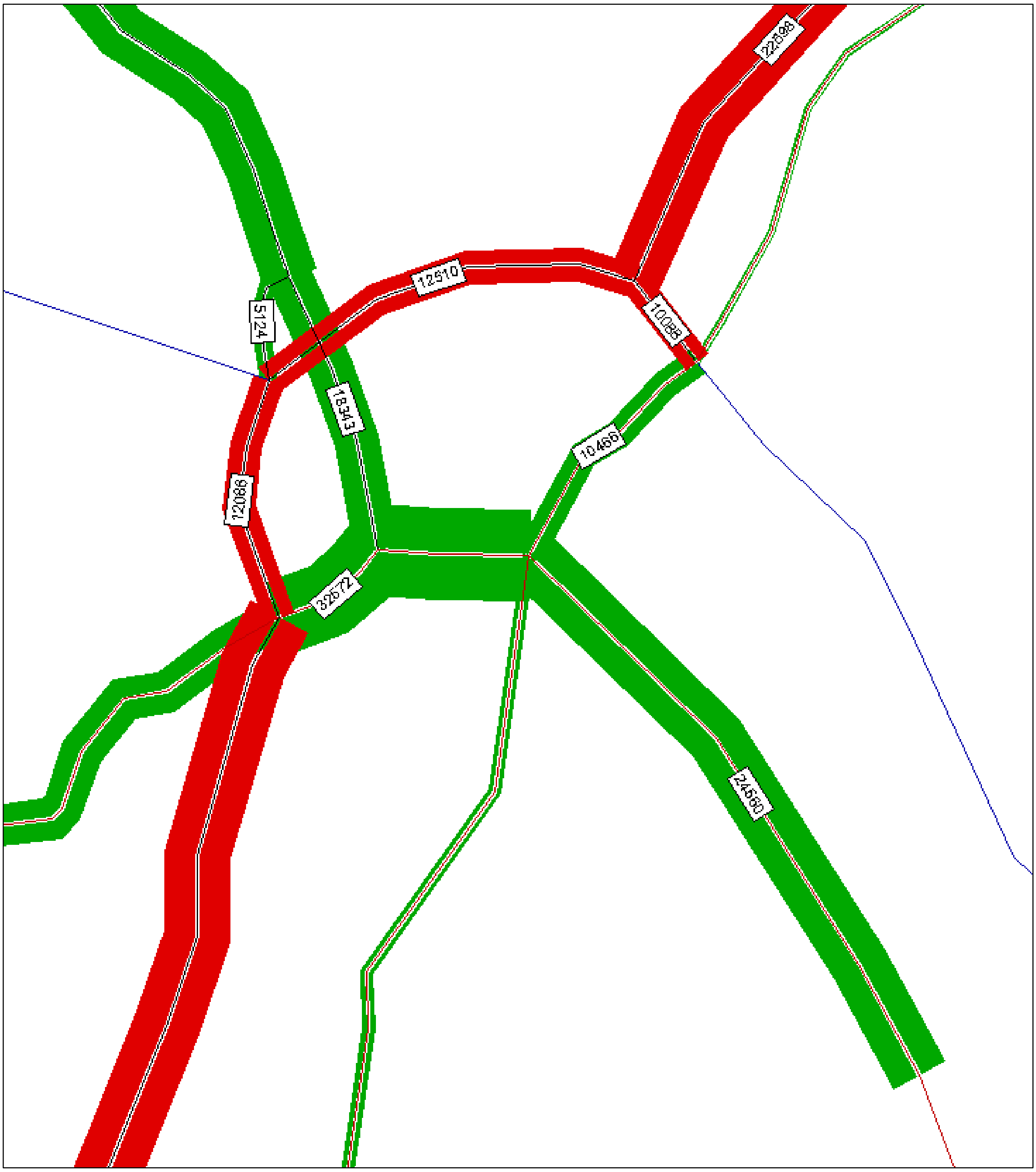


**Figure 2-8 Traffic flows in 2027 Toll = 8 Eurocent/km
(Generalized cost with Fuel consumption)**

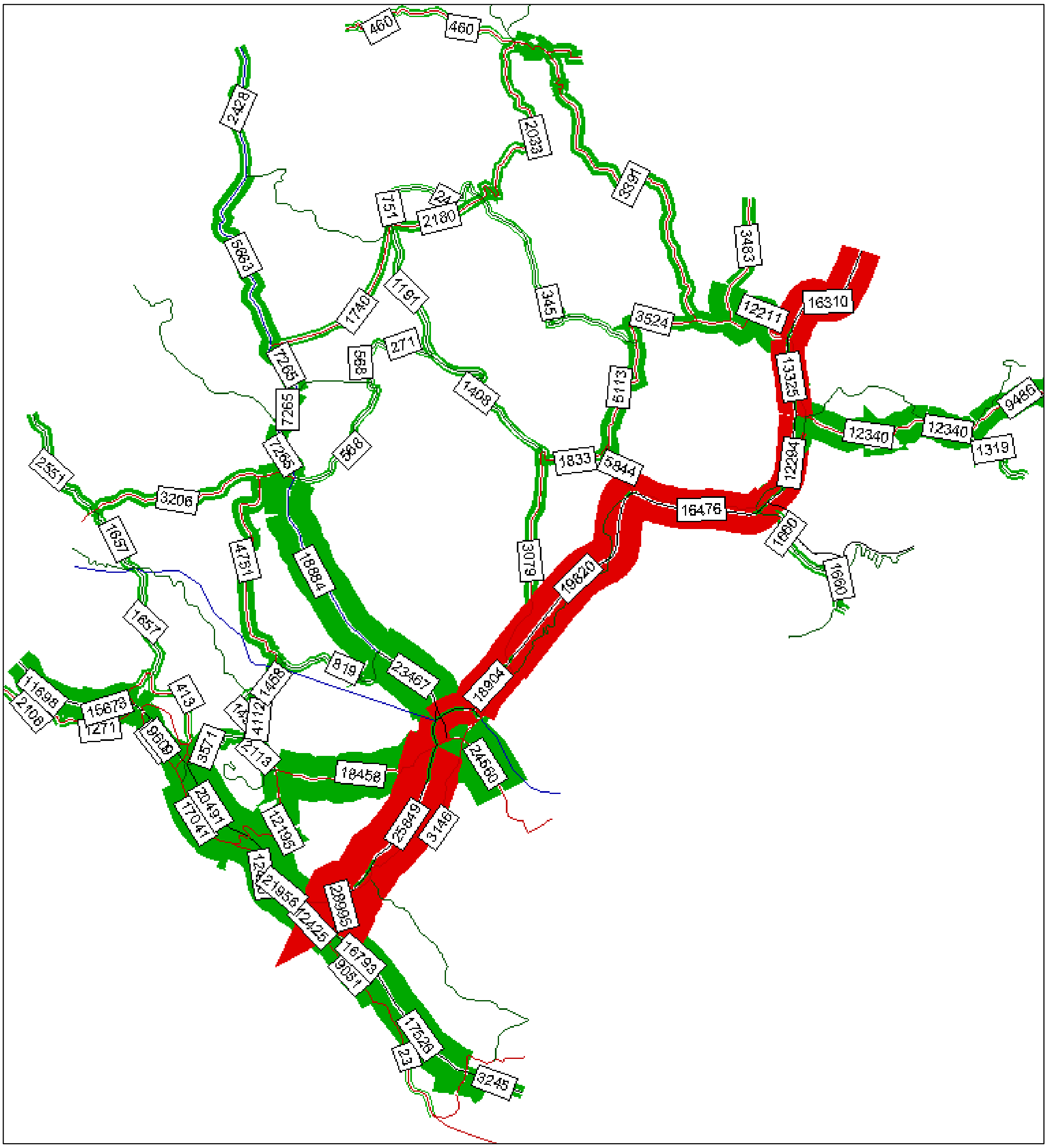


Figure 2-9 Traffic flows in 2027 Toll = 8 Eurocent/km (Generalized cost with Fuel consumption) Podgorica By-pass

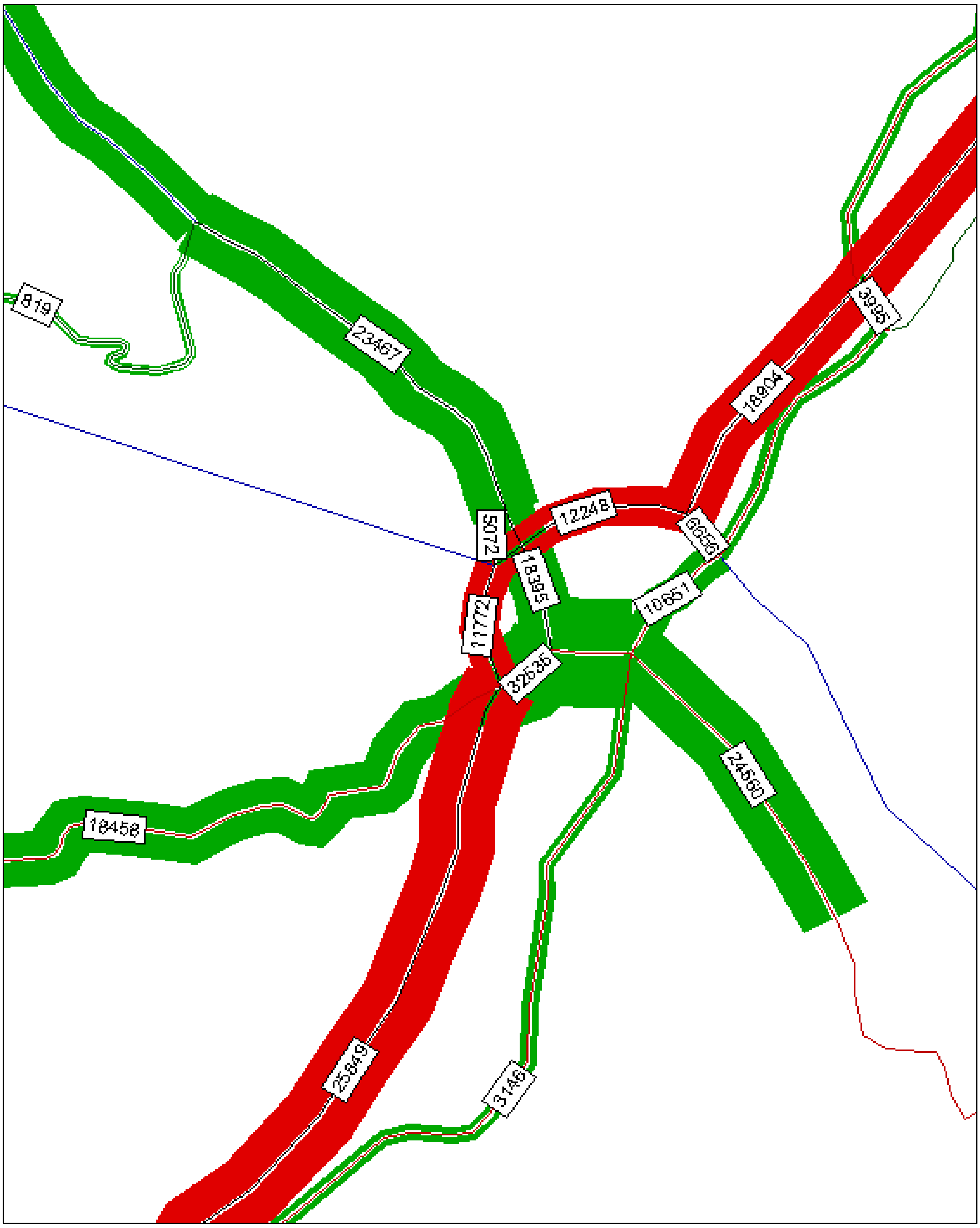


Figure 2-10 Traffic flows in 2027 Toll = 10 Eurocent/km (Generalized cost with Fuel consumption)

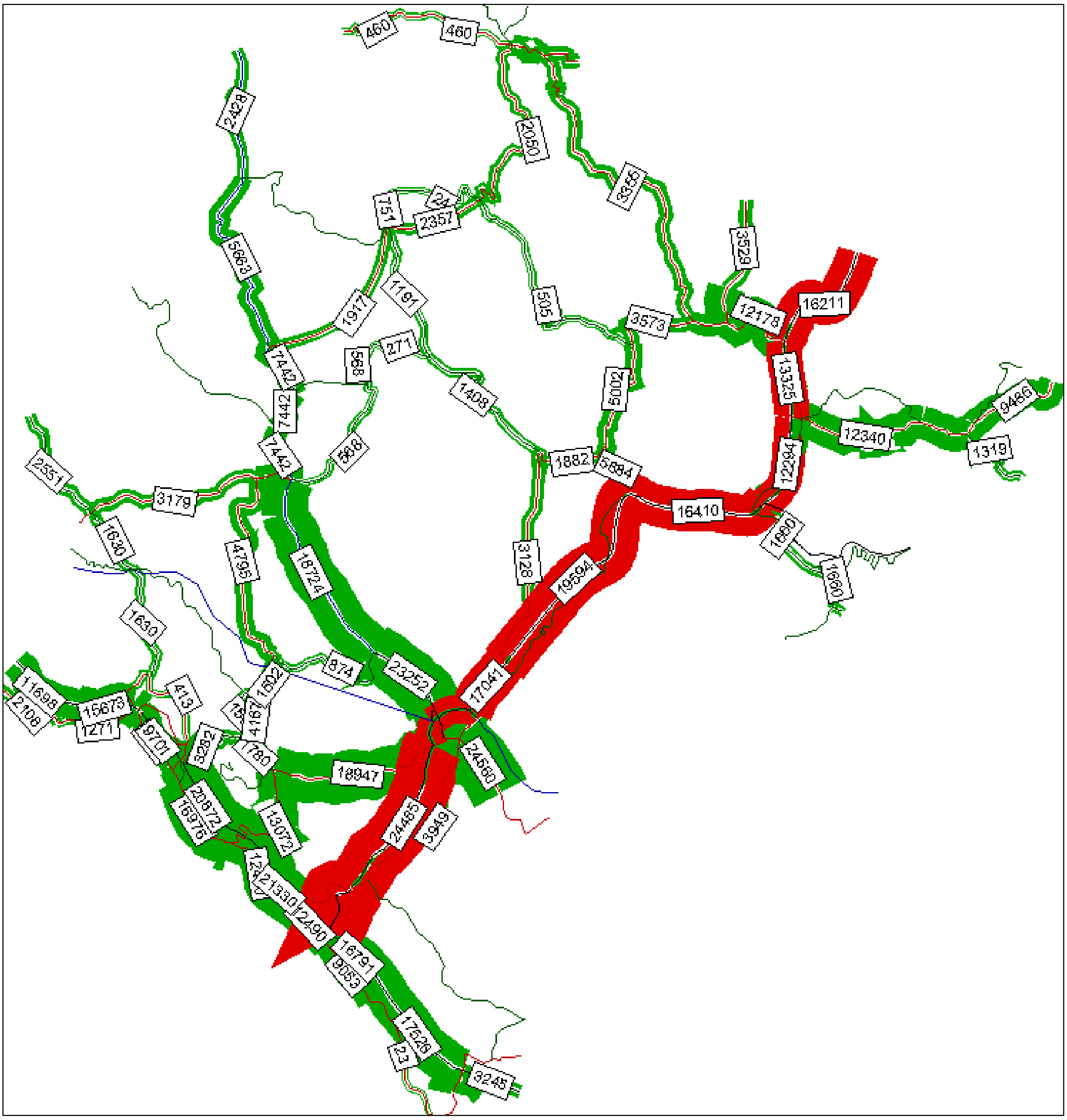
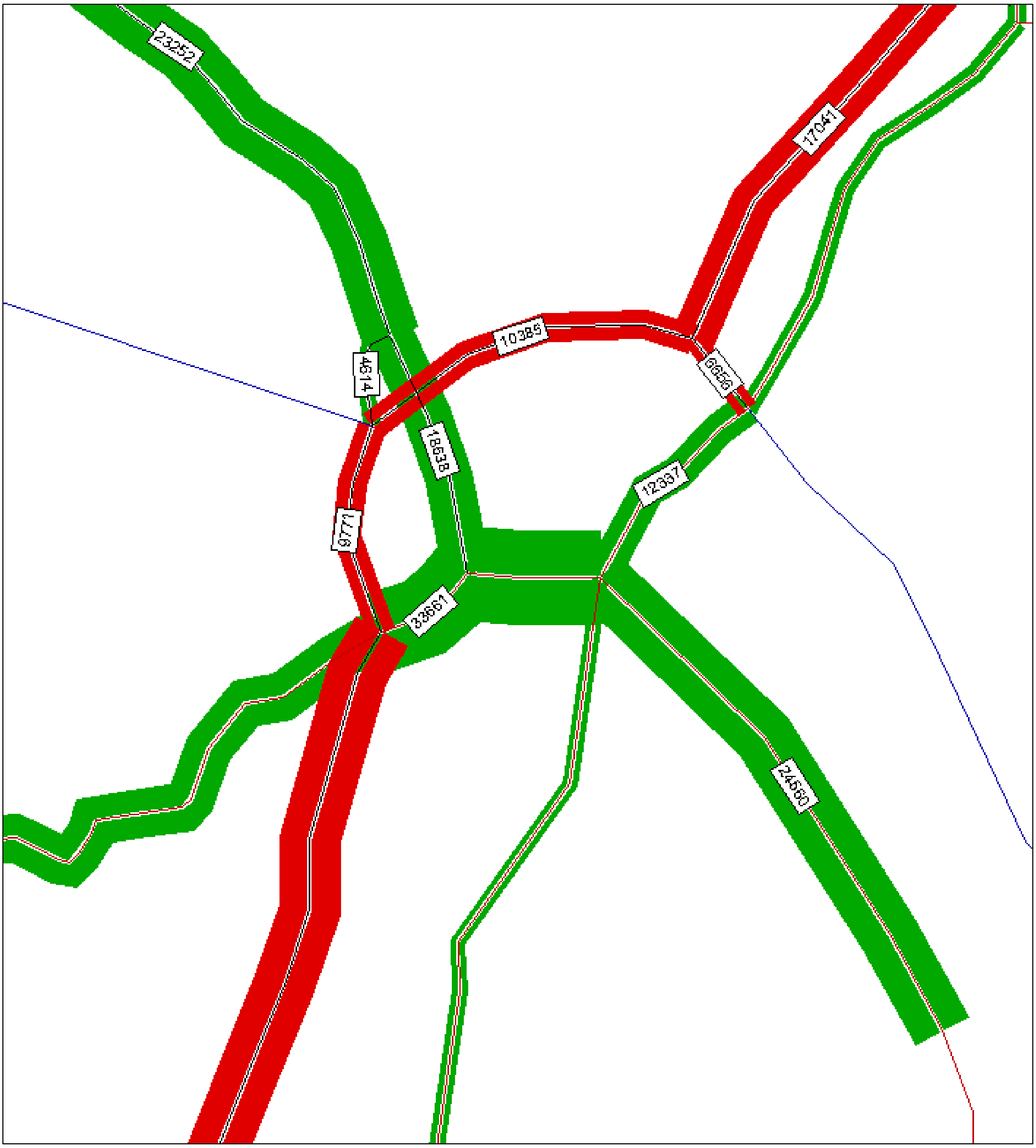


Figure 2-11 Traffic flows in 2027 Toll = 10 Eurocent/km
Podgorica By-pass



2.5 Tests for differing toll rates

Traffic assignment model tests were carried out to see the effects of changes in toll rates on traffic volumes on the different motorway sections for the 2027 scenario. Results in terms of motorway traffic volume (AADT) are shown in the table below.

Table 2.5
Modeled traffic volumes under various toll rates, 2027

Section	No toll	6 c/km	8 c/km	10 c/km
Durmani-Virpazar	32,217	31,025	28,955	28,434
Virpazar-Farmaci	32,217	28,153	25,849	24,485
Farmaci-Komenari	13,857	12,086	11,772	9,771
Komenari-Smokovac	14,150	12,510	12,248	10,385
Smokovac-Bioce	23,080	22,698	18,904	17,041
Bioce-Matesevo	22,391	21,070	19,820	19,594
Matesevo-Andrijevica	17,857	16,553	16,476	16,410
Andrijevica-Berane	16,246	12,294	12,294	12,294
Berane-Poda	17,722	13,325	13,325	13,325
Poda-Boljare	16,688	16,430	16,310	16,211

The following table gives the results in percent differences and the measured point[4] elasticity ratios for changes in toll rate from 6 eurocents/km to 10 eurocents/km.

Table 2.6
Toll rate changes and estimated point elasticity ratios, by section

Section	Change in traffic volume (%)			Elasticity
	No toll - 6c/km	6c - 8c/km	8c -10c/km	6c -10c/km
Durmani-Virpazar	-3.7%	-6.7%	-1.8%	-0.17
Virpazar-Farmaci	-12.6%	-8.2%	-5.3%	-0.27
Farmaci-Komani	-12.8%	-2.6%	-17.0%	-0.40
Komani-Smokovac	-11.6%	-2.1%	-15.2%	-0.35
Smokovac-Bioce	-1.7%	-16.7%	-9.9%	-0.57
Bioce-Matesevo	-5.9%	-5.9%	-1.1%	-0.15
Matesevo-Andrijevica	-7.3%	-0.5%	-0.4%	-0.02
Andrijevica-Berane	-24.3%	0.0%	0.0%	--
Berane-Poda	-24.8%	0.0%	0.0%	--
Poda-Boljare	-1.5%	-0.7%	-0.6%	-0.03

As shown (and as expected) the elasticities are highest for the sections around Podgorica, namely Farmaci-Komani, Komani-Smokovac and Smokovac-Bioce, which comprise the bypass. For the central motorway section from Bioce to Matesevo, and for Matesevo to the north, elasticities are low because the alternative route is of poor standard. It is not clear why the sections Andrijevica-Berane–Poda (Poda is the junction for access to Bijelo Polje) would lose about 25 percent of traffic going from ‘no toll’ to a 6c toll, but thereafter, traffic on these sections is apparently insensitive to increases in toll rate.

Reference: Technical Memorandums no. 3, 4, 7A, 7B and 14

[4] Elasticity calculated in regression equations, using the log (ln) of traffic volume.

3 ROAD SAFETY INSPECTION (RSI) SAFETY CONDITIONS ON THE EXISTING M-2 ROAD, BAR TO BARSKI MOST

3.1 Introduction

A Road Safety Inspection (RSI) was carried out along the existing road Bar to Barski Most, near the Serbian border. The objective was to produce recommendations for short term measures that are the means to reduce the current level of risk on the road.

This road effectively integrates hundreds of settlements, and links to natural and economic resources within a wide hinterland, since the national road network, especially in this part of the country, has few alternative road links. Most of the route is of hilly-mountainous character, and various sections between Podgorica and Bijelo Polje are currently being re-constructed, and thus operated under difficult traffic management conditions. There are many structures: bridges, tunnels and galleries, and in terms of safety they represent some serious driving “tasks” for drivers.

A noticeable feature of commercial traffic on the route is the domination of articulated trucks (5 or 6 axles) compared to medium/heavy trucks (2 or 3 axles) since long-distance traffic is characteristic along the route. Articulated trucks are mostly present in the flow structure in central sections of the route (sections 4, 5 and 6) among other things because the total traffic frequency on them is relatively lower than on neighboring ones, so presumably nearly constant number of auto-trains in it represents most part of it. Sections with the highest participation of trucks in the flow are at the same time sections with the most difficult condition on the route, of hilly character and with numerous road structures.

Database on traffic safety along the route (traffic accidents records) which was available at the time of preparing the RSI survey was provided by Traffic police. Available were data for 2006 and first eleven months of 2007. Traffic accidents recorded in this period over the whole territory of Montenegro are spatially classified by road sections under authority of certain police department units. The analysis is covered in Technical Memorandum No. 12 *Road accident reduction benefits.*

3.2 Generalized results of the RSI

The field inspection included drive-through inspection of the whole route, as well as monitoring of road character, immediate road surroundings, traffic and user behavior. In regards to the agreed survey character and adopted work methodology, the longest part of the route was surveyed from the slow moving vehicle. More detailed survey was conducted on all road structures (bridges and tunnels).

As a general conclusion of the safety inspection, the risk factors characterizing the road can be noted as follows:

- Most part of the route is located close to the river flows, within the narrow rocky mountainous environment, and therefore the predominant cross section type of the immediate road surrounding is very steep and there is often high embankment or vertical cliff of the river bed on one side of the road and vertical rocky part (cut) on the other side.

- There are numerous road structures along the road stretching north of Podgorica, including bridges and tunnels which could be easily classified in relatively uniformed scopes in regards to traffic risks. Unfortunately, common attributes for majority of such structures are numerous and sometimes even dramatic limitations.
- Apart from two new tunnels, one in the locality of Sozina and one newly reconstructed and located north of Podgorica (the closest one), all other tunnels do not have entrance portals physically safe since they are massive structures in the close vicinity of the road and therefore they represent factors of a high risk.
- Numerous bridges along the sections situated within the mountainous environment are fenced only with relatively light pedestrian fences; most of these fences are in a very bad condition, they are deformed due to vehicle bumps, and foundation of their retaining pillars is unstable and deteriorated.
- Traffic signing and marking aimed for speed regulation is incoherent and inconsistent; Speed limits of 70, 60, 50, 40 km/h are constantly changing along the route, there are no end signs of speed limit after the reason for that limitation is over, or pre-warning signs near new access road or access points to the road.
- Long road sections near Skadar Lake are stretching parallel with and very close to the railway line; they are separated by continuous concrete wall which is 0,5 m high and could be considered in terms of risk level as hardly acceptable solution.
- Guard safety rail which can be seen along the route is typically in bad condition, to a greater or lesser effect deformed, damaged, or removed; or simply deteriorated by time and erosion, and therefore it does not posses the original functionality.
- There are roadside bollards appearing from time to time on some sections of the route which were in old times used as guide signs; there are also massive elongated concrete forms which in combination with pillars or elements of guard rail just seemingly to protect vehicles from slipping off the road; but these are extremely hazardous factors of road surroundings which must be removed and changed with new and modern elements of safety equipment.

There are, as a rule, restaurant areas and rest areas along the whole route, which are connected to the road by unregulated wide zones, with no signings and markings and access control at all, and with no appropriate pavement surfacing on the points of access. On some parts of the route there are construction work zones on or close by the road. These sections are relatively well equipped with signalization accompanying construction works and current traffic regime, but such signalization is not appropriately and correctly located and properly mounted into purpose-designed mobile foundations. Improvised solutions are used, and it is expected from users to be patient so as additional engagement of construction workers in order to overcome the problems with traffic operation successfully and safely. Zones of possible running of vehicles into the work space, massive openings and channels beside operational part of the carriageway are not properly protected with safety equipment which would prevent such occurrences etc.

3.3 Inspection results for individual sections

The following remarks are the part of documentation resulting from the immediate inspection, survey, assessment of risk factors, roadside surrounding and traffic along each methodologically defined section. Detailed descriptions and observations of risk factors are followed by recommendations for short term solution measures aimed to eliminate or reduce noticed faults and make them acceptable.

For the purpose of the field inspection the whole route was divided into 14 sections as shown below.

1	Bar – turn to Sozina,
2	Turn to Sozina – turn to Virpazar
3	Turn from Sozina – Virpazar,
4	Virpazar – Vranjina,
5	Vranjina – Golubovci,
6	Urban Golubovci,
7	Golubovci – Podgorica,
8	Urban Podgorica,
9	Podgorica – Manastir Morača
10	Manastir Morača – Mioska,
11	Mioska – Kolašin,
12	Kolašin – Mojkovac,
13	Mojkovac – Ribarevina,
14	Ribarevina – Bijelo Polje - Serbian border

Some sections include sub-sections which are in terms of functionality consistent and connected by important common attributes. Thus, Podgorica – Manastir Moraca section consists of two parts with different characters, i.e., canyon, where road conditions are harsher and therefore the risk is increased; and two sections of more relaxed terrain conditions where the risk protection is of different character or intensity of equipment used.

Lengths of such sub-sections were measured during the inspection from the RSI car odometer, so assessment of measures and equipment needed for risk to be reduced, was done on the basis of such data. Some proposed measures have been quantified by assessment of frequency of usage along certain sections resulting from combination of measured lengths and a heuristic assessment of frequency and spatial distribution of risk. Such a procedure is in line with the methodology adopted for typical RSI.

01 Bar – turn to Sozina

- This section is 8 km long, it starches from the three-branch junction with one branch leading toward the bypass and road to Ulcinj to the three-branch junction in Sutomore with one branch going toward the Sozina tunnel.
- It is consisted of two urban sections, through the city of Bar in the length of approximately 1,3 km and through Sutomore in the length of around 4,7 km.
- Speed limit in urban sections is 50km/h, there are numerous local individual links, people are parking their vehicles by the carriageway. Sidewalk is partly protected along the Bar section, only on one-side, but it is discontinuous and with different surface quality.
- Sidewalks in Sutomore are partly protected, but rather with deformed shoulders. Pedestrians are walking by and over the carriageway, away from cross walks because there are beaches and park areas right across.
- Traffic signing is rather correct, but on section where construction works are ongoing in

Sutomore, site marking is very poor and there is hardly any physical protection from vehicles running off the road and falling into ditches (installed ones) along the carriageway zone.

- During the summer season, there are also pedestrians walking by and within the road zone along the non resident part of this section, so as vehicles parked along the roadside.
- Road widening with rest area near the Ratac cape is located in the outside zone of the curve, and there is a very hazardous and unmarked longitudinal pit by the edge between the carriageway and parking area (in the shape and size of physical island which should logically be protected at such place).

Recommendations for the reduction of risk

- Physical protection of the carriageway along the urban sections with curbs and also protection of continuous sidewalks along one side and parts of the sidewalks along the other side of the road in such areas where pedestrian activity is evident.
- Marking with high-quality horizontal traffic signalization especially on three key lateral links on the road to Sutomore and sidewalks at all locations where necessary (especially in summer season). Setting up “rumble strips” elements for the purpose of traffic calming (in the length of 10 m) before crosswalks.
- Designing and control of interchange with traffic lights near Bus terminal in Sutomore in line with principles of risk minimizing. Road access control from the Bus terminal plateau.
- Proper and rational lighting of the whole section (urban ones and 2 km of rural one), in order to improve traffic conditions in situation of reduced visibility. More intensive lighting in the zones of crosswalks.
- Appropriate construction and marking of rest areas and out of the road parking areas near the Ratac cape.

02 Detour/turn to Sozina – turn to Virpazar

- Newly-constructed road section approximately 11.8 km long between three-branch intersection in Sutomore, where the third branch of intersection leads to Petrovac, and three-branch intersection with detour to Virpazar and Podgorica, where the branch leadsto Petrovac. There are two tunnels – Sozina 4.2 km in length, and the other one 0.7 km.
- The tunnels, as well as the road itself are of modern construction, designed and equipped in conformity with the current principles on minimizing transport process risk. Modern management and communication signing has been applied/implemented and the equipment for management, surveillance and of incident occurrences. On the access roads to the tunnels/tunnel approaches VMS signalization/signing has been applied.
- The tunnels are lighted in accordance with current European recommendations, however a suggestion can be put to the selection of the technology of signing inside the tunnel Sozina. Namely, the combination of signs with high level of illumination derived from LED technology with standard signs with internal illumination based on neon makes the latter visually inferior and often not sufficiently intelligible. This is not only a matter of aesthetics but also traffic risk, since any diversion of attention or distraction of the driver from an active/ongoing traffic situation, especially in a tunnel, does not contribute to its safety.

- The point of entry to the tunnel Sozina has been secured with elastic protective fence in a minimum-risk appropriate manner, and it can serve as a role model. However, several dozens yards prior to the tunnel entry from the pay toll booth there are several elements/components of the protective fence properly placed but still not secured with screws to the ground. As such they pose a greater risk than if they had not been there in the first place, since if a vehicle were to bump into it, the component hit would move sideways, while the following one in the sequence would frontally encounter the vehicle.
- Entries into the shorter tunnel are not adequately secured: the left hand side is totally unsecured, while the right hand side one is secured with a concrete barrier of New Jersey type, but its first part is not secured and presents a dangerous massive obstacle. In from of this tunnel there is no slow down of the vehicles (there is no pay toll this side) and therefore they can be approached at high speeds and the risk is obvious.
- Out of the tunnel parts/partitions of the road along this section present a role model with regard to the use of guard rail. However there is a downside which should be noted, viz. at places where gutter ends with a drainage element for the drainage of water away from the right-of-way, massive parts of this element protrude several dozen centimetres out of the elastic barrier and potentially present a risk spot if a vehicle were to bump into it.
- At the road sections approaching the tunnel with relatively high (although not in particular) longitudinal gradient, three lanes have been provided which are used in a 2+1 scheme. At one part of this section it has been noted that a double/solid division line was used between opposite directions which allows overtaking from the independent lane. On the basis of sight distance of the road in normal visibility conditions this may appear justified and reasonable, however in the conditions of reduced sight distance such as fog, such a solution poses a great risk. Generally speaking, Road Safety inspection best practices do not recommend overtaking from the independent lane.
- Horizontal signaling in front of the pay toll booths of Sozina tunnel has almost disappeared from the carriageway, so that a massive asphalt surface approaching the pay toll booths could confuse the drivers and provoke risky behaviour.

Recommendations for the reduction of risk

- To furnish the points of entry into the shorter tunnel with guard rail in the manner it is used with Sozina tunnel, while the concrete barrier components should be removed.
- To appropriately fasten the elements of the guard rail to the access road to the tunnel Sozina from the pay toll booths side.
- To mark with intensive horizontal signing access plateau to the pay toll booths in front of the tunnel Sozina.
- To provide double solid division line between the opposite directions along the entire/complete road sections with 2+1 lanes.
- To correct/amend/rectify drainage elements exceeding the size of the guard rail or to cover them with barrier deviation.

03 detour to Virpazar - Virpazar

- The section is about 1.5 km long and is placed between three-branch intersection where there is a diversion to Sozina tunnel and three-branch intersection in Virpazar where the road leads to Rijeka Crnojevića.

- The intersection with the branch leading to the tunnel Sozina Raskrsnica has been designed and delivered according to the standard principles of risk minimization at such components of the road network, and therefore can be considered acceptable.
- Along the section there are two relatively sharp curves, along a few hundreds of metres of the road edge, there is a retaining wall made of stone. The road section running along the rail tracks has been separated from it by a concrete wall, approximately 0.5m in height.
- Along the opposite edge of the carriageway/pavement steep embankment is safeguarded by a number of stone pillars which represent a long outdated solution for marking and protection of the road edge and they pose a massive impediment/obstacle to the secure/protective carriageway zone.

Recommendations for risk reduction

- Massive stone pillars to be removed and replaced by a continuous guard rail. The same barrier should be used to prevent vehicles' rubbing against the stone retentive wall, and along sharp curves to restore components of the existing barrier and extend it as far as chainage of safe right-of-way.
- Under RSI principles, also the concrete wall separating the road from the rail tracks presents a potential risk, however since it is close vicinity to the carriageway and that its surface is relatively smooth it can be considered as an accepted level of risk. It should be furnished/equipped with the elements of optical driver navigation (light-reflecting markers).

04 Virpazar - Vranjina

- The section is about 6.1 km long and leads to the three-branch intersection with a detour from i Rijeka Crnojevića road to a picturesque Place of Vranjina. The road in the length of 1.3 km is located by the rail tracks on the narrow embankment leading to Lake Scutari, while in the length of 0.3 km it has a similar position between the railroad and the small port part of the settlement of Vranjina.
- Three-branch intersection with a detour to Rijeka Crnojevića is located on a relatively straight line route and has a good sight distance. The intersection has not been construction engineered nor canalized, but it covers a wide/spacious plateau along the road of undefined edges or purposes.
- Land section of the road almost continually runs along the rail tracks and it is separated from it by a continuous concrete wall 0.5 m high. Opposite from the railroad alternately appear rough vertical rock massifs (walls) and embankments circled with rows of massive stone pillars, which present serious risk factors.
- Along the road section located on the crossing/bridge/passage over lake Scutari the road is separated from the railroad by a curb 20 cm in height and metal fence of the pedestrian type , but more massive in construction. Such protection cannot be considered adequate or safe in case of trucks slip-off. At approximately 100m length of the section before the rail tunnel the separation of the road from the railroad is conveyed by a number of massive stone/rocky pillars, which represent a highly inappropriate solution.

- Carriageway edge opposite to the railroad along the crossing is divided from a steep and high embankment with the lake at its base/foot by a range of massive stone pillars, in part where bridge construction curb and pedestrian fence are insufficiently long or robust, and there is also a section along which the road is not physically separated from the embankment as the shoulder is somewhat wider and grows into a rest area. (panoramic view).
- Road section along the banks of the small port is also from the lake embankment - dangerously protected by a number of massive stone pillars, and from the railroad on the opposite side of the carriageway with a concrete wall 0.5 m high.

Recommendations for risk reduction

- Three-branch intersection with a detour to Rijeka Crnojevića needs to be designed and realized in the form of a compact canalized intersection with high quality signaling and physically defined limits/boundaries.
- All carriageway edges protected with massive stone pillars need to be protected by an guard rail, and the pillars should be removed. The same type of barrier should be mounted between the road and the railroad along the crossing, parallel with pedestrian fence on the bridge on the crossing and along the crossing section where physical protection of the couple of metres distant lake embankment has not been provided.
- The guard rail needs to be mounted on the edge of the road opposite to the small port/harbour in Vranjina and along the sections where there is a coarse massive rocky/stone wall.
- Continuous concrete wall 0.5 m high between the road and the railroad could be retained as a facility with acceptable risk, but it needs to be equipped with the optical navigation/ guidance elements for example light-reflecting markers.

05 Vranjina - Golubovci

- The section is 7.9 long. All length long it runs parallel to the railroad and in its close vicinity.
- The section approximately 2 km in length has a constant transverse road profile which towards to railroad makes a continuous little concrete wall around 0.5m high, while along the opposite edge of the carriageway alternate ranges of massive stone pillars and fragments of elastic barrier which is often is not in the best condition.
- There is a bridge over the river Moraca at the section and the road is on one side protected by a curb around 15 cm high and pedestrian fence. On the side towards the railroad as a risky solution a fence has been observed /spotted/noted on both accesses to the bridge about 75 m long, of the light pedestrian type, and at that section the level of the road is below the level/ling of the railroad.
- The remaining 5.5 km approximate length of the road is separated from the railroad with lower embankments, low concrete walls (or curb) around 25 cm high or in certain places it is almost level with the railroad without physical protection. Opposite edge of the carriageway is almost permanently “protected” by massive stone pillars or fragments of the elastic barrier of non-uniform quality or condition.
- Along the section there are only few short subsections/partitions with housing estates along the road, so there are no pedestrian activities or movements, and there are only a small number of local links.

Recommendations for risk reduction

- The section between Vranjina and the bridge over the Moraca should be fully equipped with guard rail along one edge of the carriageway, and continuous low concrete wall 0.5 m high erected along the other edge of the carriageway to be equipped with light reflecting elements of optical navigation for the drivers (markers).
- Access roads to the bridge over the Moraca and the bridge itself should be fully equipped with guard rail on both sides.
- Section stretching from the bridge over the Moracato the outskirts of Golubovci should be equipped with guard rail on both sides along approximately 70 % of the route, in places where the embankment towards the railroad is less than a metre, and on the opposite side all the stone pillars should be replaced and non-functional fence, and fence should be added facilities and unprotected steep embankment.

06 Golubovci (urban section)

- Urban section of the road about 6.1 km long is of non-uniform density and content features.
- The central intersection is regulated by traffic lights however the signals are not operational. A major disturbance to the traffic flow along the road with regard to this intersection at the section of approximately 400 m. Parking, commercial activities and pedestrians pose a major problem and create risks.
- Along the whole section, the speed is limited to 50 km/h, and the signs are not consistently placed.
- Pedestrian communications along the road have not been developed, parked vehicles obstruct the movement of pedestrians, who on occasions walk on the carriageway edge marking.
- Along two sections, with influence section of the central intersection in between, the speeds exceed the limitation and the absence of access control from individual housing and commercial facilities makes the traffic situation a high risk one.
- Three-branch intersection with a detour to the airport has good sight distance however in combination with the surrounding complex commercial facilities it presents a complicated traffic scenery of potentially risky driver behaviour. Asphalt surfaces of the commercial compound by the side of the carriageway have unusual horizontal marking, and thus may be confusing, and also their width only encourages speed.

Recommendations for risk reduction

- At the section from the direction of Virpazar in certain places in the length of 3 km guard rail should separate the road from private yards and patches of land which are below the road level.
- Speed control should be improved by consistent application of vertical signaling „rumble strips" elements, whose sets of 10 m should be repeated to the access to the central intersection three times at 100m distance between the elements.
- Pedestrian crossings should be properly marked in the central zone of Golubovci (4 crossings) in accordance with the positions/locations where there is a highest volume of pedestrian movements across the carriageway.

- Footpaths should be secured in the central part of the settlement/ town on both sides (section about 1 km long) while along access sections they should be secured on one side, approximately 1 km in length in either direction.
- The locations of two bus stops in the central intersection zone should be arranged in such a way that there is minimum obstruction to the flows along the road and the creation/occurrence of risky traffic situations is prevented upon combining the buses in the bus stop and movement of pedestrians in its vicinity.
- Three-branch intersection with a detour to the airport should be properly equipped with vertical and horizontal signaling and synchronize its solutions with the neighboring scattered commercial compound. The facilities/complex plateau should be re-designed and made intelligible to the users and drivers moving along the road.. Horizontal signing needs to be supported by physical channeling with a view to better access control.

07 Golubovci - Podgorica

- The section is 6.7 km long and stretches from the signpost for the city of Podgorica (which does not comply with the standards and is placed about 0.5 km away from the EKO petrol station towards Golubovci) to three-branch intersection in Golubovci, with a detour to the airport.
- Suburban section of two-lane road predominantly of straight-line route. Scarce commercial facilities are in most cases located away from the road, outside the direct impact zone, barring some exceptions along the last kilometre in front of Golubovci. Local links to these facilities are unmarked and without proper construction licenses and direct accesses to the road are both those with and without hard surfacing.
- The carriageway/road pavement is of a high quality, the profile is spacious, sight distance good, speed limits are not consistently indicated (generally 80, at a few places 60 km/h), so that the real speeds are often about 100m/h. Horizontal signing is worn out, while the vertical is relatively in good condition though incomplete.
- Referential/reference land take is mostly leveled with the carriageway, there are no curbs, barriers or any other physical restrictions, so that from the shoulder and behind it the road can be approached virtually at any point.
- The section contains two construction-engineered, very indented and unsafe three-branch intersections (Dajbabe, and the aluminium plant Kombinat Aluminijuma). They have been designed according to acceptable principles (traffic lanes for left detour have been provided, taper and slow-down/deceleration lane for turning right/right detour), however all other elements of the intersection are out of proportion (detour radii, width of side access) STOP signs and stopping lanes are improperly placed. Visibility is good at both intersections.
- About 2 metres away from the road there is a cemetery enclosed with a massive stone fence, with much evidence of vehicle bumping, which is not surprising since this is an exceptionally risky road scenery.
- Along a couple of lengthy road sections and at two controlled three-branch intersections lighting has been provided but the lamp posts are placed about 1m away from the road and present massive structures which pose risk upon/at vehicles' slip off the road.

- The section contains an overpass and a bridge over the river Cijevna. The overpass is secured on both edges with guard rail, while the bridge is secured only by curb and pedestrian fence, which cannot be deemed safe enough.
- In the close vicinity to the bridge over the river Cijevna there is a wide plateau by the roadside, unmarked, with side accesses, an off-road bus stop and parking and several commercial facilities.

Recommendations for risk reduction

- Re-designing of two intersections with rational channeling and appropriate accompanying signing.
- Removal of the light posts and other massive impediments from the protective road area (4m for the speed of 60 km/h and 6m for the speed of 80 km/h) or the use of guard rail.
- Provision of guard rail for the vehicles along the bridge over the river Cijevna, across from the cemetery and along several sections with steep sides of the embankment.
- The plateau by the road in part approaching the bridge over the river Cijevna should be re-designed and given regulatory framework by application of ground construction elements and quality signing.

08 Podgorica urban section

- Urban road section approximately 7.5 km long. It comprises about 2 km of the route through a typical downtown street network and from approaching sections to the town, characteristic/specific for lower density of facilities along the road but also for lower level of construction and access control from the surrounding surfaces.
- The intersections at town street network to which urban section leads are controlled by traffic signals or priority signs, where the route mostly has a priority treatment. Direction signing is appropriate and facilitates finding one’s way, allowing them to focus on other driving elements relevant for safety.
- At the territory of the city of Podgorica currently the speed limit is 50 km/h, so that with appropriate control and management system with relatively high volume of traffic flow no specific risks have been observed at the section running through typically city ambience. Roadworks /men-at-work which are being performed along the route have been secured and marked more or less adequately, with some inconsistencies in the selection and location of signing and safety equipment which do not affect considerably the increase in traffic risk.
- Access sections between rural sections and central urban section stretch/extend in a straight-line route, have good visibility and regardless of the current speed limit of 50 km/h higher speeds of individual vehicles have also been observed.
- Along the approaches to the downtown there are a number of smaller economic, commercial and housing facilities. Driveway to the road with such has not been construction engineered and regulated, but rather this is performed/achieved/ along a wide front , often from the surface which doesn’t have hard surfacing and they are a factor for non-maintenance of the road.
- At access sections it has been observed that tractors, motorized-cultivators and bicycles appear and move along the road. Trucks and buses often use surrounding surfaces as a parking alternative to rough land and it is an alternative tolled parking within purpose-designed city parking areas.

- Since pedestrian movements across access roads in the outskirts are dispersed pedestrian crossings are rarely secured, so that at all times and at every point it can be expected that pedestrians appear on the road, which is risky especially in the evening and dawning periods. On the northern access road the pedestrian footbridge provided over the road even in its close vicinity fails to attract considerable numbers of pedestrian crossings, so that a number of pedestrians still cross the road under of near the footbridge.
- Street lighting is discontinuous, and certain sections with close facilities, pedestrian movements and parking and maneuvering of vehicles by the road side are not lit or there are individual lamp posts mounted locally.

Recommendations for risk reduction

- Along the road section running through the core urban area no need for additional intervention has been spotted, as the risk level in realistic conditions of the traffic stream has been estimated as acceptable.
- Speed control of the vehicles along the road sections approaching the central urban area should be supported by „traffic calming“ measures, most appropriately with occasional installation of „rumble strips“ elements, disturbing the road continuity with properly signposted, marked and lit pedestrian crossings, visual edging or construction of the road, with occasional taper and related measures.
- Access roads should be continuously and evenly lit with street lights, and horizontal and vertical signing should be intensified and with high quality visual features.
- Access control from the road of the surrounding surfaces should be conveyed by the carriageway with curbs and curbed islands, and by vaulting of access fronts to profiled and surfaced links, signposted/marked with appropriate traffic signing.

09 Podgorica – Moraca Monastery

- The road section is approximately 39.1 km long in the mountainous area. An extremely difficult and safety-critical section can be singled out in the approximate length of 19.2 km which stretches along the actual canyon of the river Moraca, in a narrow rocky ambience, of attractive looks of the road and surroundings, but also high traffic risks. The preceding as well as the following sections are also connected to the river valley, in this case a wider valley basin. Road profiles along these sections are less extreme and only occasionally there are rocky walls or vertical slopes (embankments).
- Due to complex driving conditions, uncomfortable profile and evident road risks, there are often speed limits along the road ranging from 70, 60 to 40 km/h, but these are applied inconsistently, there is no recall of previously indicated speed limits, nor apparent or reasonable logic that drivers would understand and follow. It is obvious that at any point in time vehicles actually move at considerably higher speeds than the indicated speed limits, and this represents a major safety issue of this road.
- The section disposes of a number of bridge structures (some 15) varied in length (mostly between 50 and 100 metres long) as a rule high above the water courses of rocky river beds. None of the bridges is sideways/on the side properly secured. Different types of pedestrian fences has been used, often surprisingly light in structure, but the prevailing and extremely dangerous situation is the fact that at almost all bridges the fences or barriers are damaged by vehicles collisions, and the stability of pillars is disturbed, the

concrete which is supposed to wrap them neatly has been crushed and reinforcement stripped off. At one of the bridges it was noted that five successive pillars in the barrier which are not hard in the surface and it has been estimated that a pedestrian would be able to send a long part of the barrier into the abyss were he to kick it strongly.

- All the bridges have on both sides narrow revision pavements (about 75 wide), while the height of the curb ranges from about 10 to 20 cm. Small heights are risky as the vehicles can easily pass over them and find themselves on the sidewalk, while higher heights pose a potential lifting factor (bouncing) of the vehicle and turbulent movement at high speed movements and at higher angle. Along the road a number of tunnels are noted (16) they are varied in length, construction techniques and equipment. Half of them are approximately 100m+ long, while the others are shorter. Only one of the tunnels is furnished with interior lighting, with neatly finished walls, with properly painted and delineated sides.
- The mentioned tunnel, as well as the others, could be objected the absence of proper signing/marking and protection of the points of entry from, and therefore its vertical sides pose dangerous massive obstacles in close vicinity to the road/carriageway. Speed limit signs (of 40 km/h) before some of the tunnels cannot be an excuse for the total absence of signing, which is especially risky in situations of reduced visibility, and note that fog is a recurrent ambience factor along this section.
- The majority of tunnels have coarse walls - very uneven and rough - and only in a few of them has partial flattening of surfaces been conducted with cement stabilization. Tunnel walls are not properly painted white (in conformity with European recommendations) nor are they marked with delineators intended for optical guidance/navigation. It has been noted that along several of them markers have been mounted on the ground, which is ineffective, and only after a few days of utilization even the markers become totally non-functional through mud-spray.
- Along two sections of the road (approximately 500 m long each) road profile has been reconstructed by extending the carriageway and providing a free zone between the edge of the driving lane and a newly erected massive concrete barrier. Built-in massive barrier appears by far more reliable than all other barriers applied, its surface is smooth and visually good, marked with markers and a colored line.
- Along the whole road section occasionally appear road barrier elements against the steep sides towards the river bed massive stone and concrete elements inherited from past times, though mounted fairly recently. A variety of combinations of these massive elements have been found as well as their combing with the fragments of guard rail. It cannot be precisely defined which of these combinations poses the highest level of risk, but undoubtedly they are all very risky. The problem lies in the fact that they constitute a discontinuous barrier, where a vehicle is very likely to frontally collide with one of the individual massive elements and be decelerated with considerable damage and probable passenger injuries. On a number of locations it was observed that broken and damaged elastic barriers have not been repaired, so that the next vehicle which loses control and hits those parts of the road edge, will most certainly end up in the river bed.
- Opposite to the river bed, a rocky vertical wall is often very close to the road edge, which poses a high risk element.

Recommendations for risk reduction

- All the bridges need to be to a higher of lower extent reconstructed, damages repaired fix of the pedestrian fence and it is mandatory that in the curb level, guard rail be mounted for the vehicles. This barrier should start before the bridge structure itself, so that it prevents the vehicles from slipping off the road into the river bed, prior to approaching the bridge.
- All the tunnels exceeding 100 m (and those 75 to 100 m long, if in a curve)should be lit to such a degree that they are no longer „black points" and have psychologically adverse effects on the drivers (6 tunnels). Tunnel walls should be painted white in accordance with European recommendations in that area, equipped with delineators with larger light-reflecting surfaces mounted above the zone of intensive filthiness staining /dirt (at least 0.75 m above the carriageway).
- Rocky sides of the cut, the sides of the tunnel entries and all other fixed massive structures in the zone up to 6m from the road edge should be protected with guard rails from direct vehicle running across.
- The road edge facing the river bed should be continuously furnished with guard rail, well-mounted /grounded and regularly maintained and repaired if damaged.
- Steep embankments overgrown in greenery look harmless enough in comparison to the surrounding rocky landscape, but still need to be protected with guard rail, as they pose high risk elements.
- Horizontal signing should be high quality and particularly noticeable in road ambiences with many sharp curves, tunnels and rocky cuts. Vertical signing should also be complete and high quality, and in particular a clear and logical system of speed control should be established, which would build trust and thus, be observed to a large degree by the drivers.
- The only intersection at the detour to Matesevo should be reconstructed in accordance with the principles of safe designing and traffic control of three-branch road junctions.
- Wide plateaus in the zones of several restaurants along the road opposite the Moraca Monastery should be physically rimmed with traffic islands, access to the road should be reduced to normal dimensions and located at a position with good visibility.

10 Moraca Monastery – Mioska

- Road section 7.2 km long still runs along the river bed gulch, with slightly simpler alignment elements and less in the composition of immediate surroundings.
- This section contains almost all risk elements observed at the previous section, although these are less frequent which does not mean they are less risky as well.
- There are 7 bridges at the section, fenced with pedestrian fences in a very poor state, physically damaged and corroded, with curbs varied in height. There are 5 tunnels along the section, 4 of which have concrete walls but no lighting, no visual marking of the point of entry, no protection from running into its vertical sides, which are fixed massive impediments in the immediate carriageway zone.
- Guard rail elements are worn off, damaged and need to be replaced and mounted at certain sections where they are missing.

- Occasionally, only bollards feature as safeguards to the steep and deep river beds, which present a barrier of limited capacity in prevention the high risk of vehicles slipping off the road.

Recommendations for risk reduction

- All the bridges should be should be to a higher or lesser degree reconstructed, damaged areas repaired and disturbed pedestrian fence foundations, and as mandatory in the curb level, to mount guard rail for the vehicles. The rail should start before the bridge structure itself in a length which fully prevents vehicles slipping off the road into the river bed prior to approaching the bridge.
- The four tunnels more than 100 m long should be lit, their walls painted white in keeping with European recommendations, and equipped with delineators of large light-reflecting surfaces mounted above the intensive staining zone (i.e., at least 0.75 m above the carriageway).
- Rocky sides of the cuts, sides of the tunnel entries and all other fixed massive structures in the zone up to 6m away from the road edge should be protected from direct vehicle bumping into guard rails.
- Road edge facing the river bed should be continuously equipped with guard rail, properly fastened to the ground, and regularly maintained and repaired after being damaged.
- Horizontal and vertical signing should be of high quality. Especially a clear and completely logical system of speed control should be established.
- A wide plateau at the location Mioska (Medjurecje) with several facilities and undefined exit points to the road should be reshaped and physically separated from the road, while the direct access to the road should be engineered and marked, and located at a place with good visibility.

11 Mioska – Kolasin

- The section is about 17.1 km long. The first 8.2 km from Mioska to curvature Crkvine is located in longitudinal ascending gradient, only to descend slightly on approach to Kolasin.
- At Mioska–Crkvine section intensive roadworks are ongoing on a reconstruction of the road and road structures. The roadworks concurrently cover almost the whole length of this section, several bridges and tunnels are being repaired.
- The elements of the future alignment and road profile are still not complete and therefore the appropriateness of their realization cannot be assessed with regard to the traffic risks, but the organization of roadworks zone can be evaluated.
- In the organization of the roadworks zone a procedure is applied based on a daily occasional complete closure of the section concerned in a couple of intervals. Local drivers and those who occasionally use this section are notified about the schedule of closures via the media and can plan their travel arrangements accordingly. Construction workers should therefore closely observe the prescribed schedule of closures and not exceed the timelines.
- Due to a considerable narrowing of the road at two roadwork sites, sections where alternate passing of traffic flows has been arranged. The control of such movements of vehicles is performed by traffic signals. The system functions properly and efficiently,

lanterns are placed at conspicuous places, they are of the right size and the envisaged traffic regime is clear and makes sense. The problems are caused by impatient and non-disciplined drivers who waiting in front of the red light can form two or even three queues. When the vehicles from the opposite direction approach there is a small congestion in maneuvering so that they can pass, to be followed by rearranging of vehicles so that they form one line. In terms of traffic safety this does not pose an additional risk and is only a matter of efficient moving and users' comfort.

- At a construction site there is occasionally a need for the vehicles to pass alternately in short intervals at locations where, currently, there are no mobile signals installed. In such instances, the traffic is regulated by the construction workers equipped with a red flag (flagman). Some of the traffic regulators are equipped with appropriate flags, while others improvise with red cloth or torn flags. They sometimes do not use appropriate signs when regulating the traffic, however, considering the low speeds of the traffic stream, normally everything runs smoothly.
- The construction zone is sufficiently equipped with traffic signs which indicate men-at-work, regime changes and local dangers about which drivers should be warned. The signs are not always appropriately and neatly placed, but with appropriate improvisations and tolerance it appears successfully managed.
- When passing through the roadworks zone in the tunnels, vehicles are protected from dust and material falling from the gallows by appropriate foils and structures made of construction planks by the Contactor, so it appears that the contractor does have some concern about the safety and comfort of road users moving along the roadworks zone.
- Descending from Crkvine towards Kolasin runs through relatively mild surroundings. Only occasionally relatively short sections are fenced from steep slopes facing the river/towards the river, and for this purpose there are massive concrete blocks, as an extremely risky solution.
- There are 6 bridges on this section and outside the section one bridge about 200m long is under construction, with sharp curbs and edges protected only by pedestrian fence. There are 12 tunnels and only one is outside the section is under construction, unlit, but the only one whose entry points sides marked with red-white cross-hatching.
- Near Kolasin there is a three-branch intersection whose third leg leads into the town. The intersection has good sight distance, it is compact, but covered with dirt and currently undergoing some works.

Recommendations for risk reduction

- In the roadworks zone no specific risks have been observed considering the small running speed. However, safety equipment should be more carefully distributed (vertical impediments) along the edges of the occupied part of the carriageway, and signing should be placed on stabile purpose-designed mobile stands. Flagmen should be more appropriately clad and equipped as officials authorized persons (phosphorescent vests and more quality flags) in order to be more noticeable and authoritative.
- At newly constructed (reconstructed) section which is still under construction the use of 2+1 lanes has been noted with overtaking allowed from the. Such an arrangement should be changed fro safety reasons and overtaking should not be allowed. .
- It is assumed that the tunnels at the section under ongoing construction would be progressed into a proper and safe state, and on the tunnel outside this zone the entry portal sides should be protected from direct vehicles bumping by use of guard rail.

- At road section outside roadworks zone all the elements of concrete safety barriers should be removed and replaced by guard rails of appropriate lengths.
- Horizontal and vertical signing should be more frequent and high quality, and carriageway cleared from material partly originating from the construction site along the road.

12 Kolasin - Mojkovac

- The section is approximately 20.2 km long and runs through a relatively mild surroundings with occasional individual buildings and shorter sections which are protected with barriers.
- There are two tunnels, one dating from recent times, the other constructed earlier, both unlit, and with smoothly surfaced walls. The entry portals represent an unmarked and unprotected massive object in the road zone and they pose a great risk.
- There are two bridges fenced with pedestrian rail that is too light a structure.
- A couple of massive structures (the concrete pillars of the viaduct) are protected with equally massive concrete walls, which pose even higher risk since they are in close vicinity to the section.
- Long ago obliterated elements of the safety barrier were noticed, which have never been repaired or replaced.
- At a location by the road (at 3.5 km before Mojkovac) on two successive days, garbage was set on fire and the smoke stretched as far as the road causing reduced visibility. It was assumed that this was a dump or landfill.

Recommendations for risk reduction

- Massive structures by the roadside and steep sides of the embankment need to be protected by guard rail, and all the massive concrete elements should be removed.
- Then provide a consistent sign system for speed controlling, while the other elements of vertical and horizontal signing should be properly completed.
- To prevent setting litter on fire at the dump close to the road.
- Bridge fence should be reconstructed and guard rail should be added along the edge of the sidewalk.
- Entry points/portals to the tunnels should be colored and protected by guard rail but since both are in a curve and longer than 75m, they need to be equipped with interior lighting.

13 Mojkovac - Ribarevina

- The section is 23 km long. The runs to the location Slijepac most through surroundings where it is necessary that its edges be physically protected in front of high and steep embankments and occasionally vertical rocky cuts and continues towards Ribarevina in slight hilly undulating alignment.
- The interchange in front of Mojkovac where a road leads to Zabljak has poor visibility, horizontal and vertical signing is scarce, and engineering solution is too relaxed.
- The road section running through Mojkovac is of high profile, unmarked, only partially curbed.

- Before leaving town there are two bridges about 100m long, with no guard rail for the vehicles.
- After exiting Mojkovac the road goes uphill and 2+1 lanes are provided. In front of the bridge it merges into two lanes only to return to 2+1.
- Guard rail along a fair portion of the road is appropriate and in good condition.
- There are six bridges at the rural section of the road with pedestrian fences in bad condition and there is a need for guard rail to be mounted for the vehicles.
- Often are seen destroyed fences which have not been repaired.
- The space along the road at Slijepac Most is amorphous, the road can be accessed in a wide front, and visibility is good.
- The intersection Ribarevina is a three-leg one with good visibility. Speeds of vehicles through it are safe, since it houses a police booth occupied at all times and control of traffic is almost continual.

Recommendations for risk reduction

- All bridges need to be equipped with guard rail and existing sidewalk to be renewed.
- To improve the interchange at the entrance of Mojkovac and also to equip it with proper signalization.
- To improve the area around Slijepac Most and secure the channeled road access in terms of construction.
- Not to allow overtaking from the third traffic lane along the 2+1 road section above Mojkovac.
- Ribarevina interchange to be improved in terms of horizontal, vertical and signpost signalization.

14 Ribarevina - Serbian border

- This section is approximately 18.6 km long and is mostly stretching through the urban zone of Bijelo Polje (around 11 km) with different density and types of facilities, ending at the border crossing toward Serbia. Speed limit is 50km/h.
- From Ribarevina, about 4 km of road is passing through suburban surrounding with not much individual housing facilities. There are sporadic discontinuous sidewalks which then change into continuous, and carriageway is bordered with curbs.
- When approaching urban zone of Bijelo Polje, pedestrian activity on sidewalks and roadside is getting more frequent, there are also bicyclists appearing on the road, while local vehicles within the traffic flow constantly grow.
- The road is passing through the city centre and on the central interchange it turns left. There is great activity of pedestrians near and on the road, and disruption of traffic is evident.
- From the central interchange the road is a 3 km long section, stretching rectilinearly through an industrial zone. Profiles are rather extensive, insufficiently marked with horizontal signalization. There are many pedestrians and vehicles communicating with surrounding areas and facilities.

- After the city exit, an approximately 5 km long road passes through a suburban area with individual housing, and a sidewalk. Then the rural section has a slight hilly surrounding, almost up to the border post.

Recommendations for risk reduction

- Suburban part of the section needs to be controlled with rumble strip elements.
- It is necessary to provide continuous sidewalk along complete section leading through urban and suburban surrounding. This mainly exists, but in those parts where the sidewalk is discontinued, it needs to be protected in order to move pedestrians off the roadway.
- Central city interchange to be designed in such manner to provide more direct passing through it and to find appropriate solution for pedestrians for keeping them on sidewalks and thus reduce disruption of traffic.

3.4 Cost assessment for recommended measures

On the basis of RSI observations by sections and their characteristic sub-sections, then on the basis of lengths of certain sections needing risk reduction measures or on the basis of number of factors needing intervention, the assessment of necessary works and equipment was made, so as assessment of their costs i.e. costs of realization and implementation.

The Bills of Quantity were formulated within an Excel table which is not practical for overall printing. This table is divided into four parts which are more convenient for publishing. Fifteen different measures are included, and numbers in the last row show total cost of each measure by its implementation along the whole road. In the fourth table (4/4), the last column shows total costs of risk reduction with all recommended measures for each section or sub-section, while the field in the last row of the same column shows estimated total costs of implementation of all recommended measures along the whole route.

Recommended Bill of Quantity 1/4

br.	deonica	km	sekcija	km	elastična ograda [km]	EUR	hor./vert. sig. duž puta [km]	EUR	hor./vert. sig. u krivini [kom.]	EUR	hor./vert. sig. raskrsnice [kom./ 5 lok.]	EUR
jedinični troškovi predložene mere (EUR)					29400	EUR	2500	EUR	1300	EUR	900	EUR
01	Bar - za Sozine	8.0	urban Bar	1.3	0.2	5880	1.3	3250		0		0
			rural	2.0	0.2	5880	2	5000		0		0
			urban Sut.	4.7	0.5	14700	4.7	11750		0	3	2700
02	za Sozine - za Virpazar	11.8		11.8		0	1	2500		0	2	1800
03	za Virpazar - Virpazar	1.5		1.5	1.5	44100	1.5	3750	2	2600		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3	2.6	76440	1.3	3250		0	2	1800
			uz lučicu	0.3	0.3	8820	0.3	750		0		0
			rural	4.5	2.5	73500	4.5	11250		0		0
05	Vranjina - Golubovci	7.9		7.9	10	294000	7.9	19750		0		0
06	urban Golubovci	6.1		6.1	1	29400	6.1	15250	1	1300	1	900
07	Golubovci - PG	6.7		6.7	2.6	76440	6.7	16750	2	2600		0
08	urban PG	7.5		7.5		0	5.5	13750		0	1	900
09	PG - man. Morača	39.1	blaža trasa	19.9	5	147000	19.9	49750	5	6500		0
			kanjon Morače	19.2	23	676200	19.2	48000	10	13000		0
10	man. Morača - Mioska	7.2		7.2	5	147000	7.2	18000	5	6500		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9	2.5	73500	8.9	22250	3	3900	2	1800
12	Kolašin - Mojkovac	20.2		20.2	5	147000	20.2	50500		0	2	1800
13	Mojkovac - Ribarevina	23.0		23.0	2	58800	23	57500	4	5200	2	1800
14	Ribarevina - granica RS	18.6		18.6	1.5	44100	18.6	46500	2	2600	4	3600
	kompletan put	180.8		180.8		1922760		399500		44200		17100

Recommended Bill of Quantity 2/4

br.	deonica	km	sekcija	km	*rumble strips* komplet [kom.]	EUR	obezbeđenje tunel. ulaza [kom.]	EUR	osvetljenje tunela [kom.]	EUR	rekonstr. 4kr. raskrsnice [kom.]	EUR
jedinični troškovi predložene mere (EUR)					600	EUR	5900	EUR	100000	EUR	200000	EUR
01	Bar - za Sozine	8.0	urban Bar	1.3	3	1800		0		0		0
			rural	2.0		0		0		0		0
			urban Sut.	4.7	10	6000		0		0		0
02	za Sozine - za Virpazar	11.8		11.8		0	2	11800		0		0
03	za Virpazar - Virpazar	1.5		1.5		0		0		0		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3		0		0		0		0
			uz lučicu	0.3		0		0		0		0
			rural	4.5		0		0		0		0
05	Vranjina - Golubovci	7.9		7.9		0		0		0		0
06	urban Golubovci	6.1		6.1	6	3600		0		0	1	200000
07	Golubovci - PG	6.7		6.7		0		0		0		0
08	urban PG	7.5		7.5	5	3000		0		0		0
09	PG - man. Morača	39.1	blaža trasa	19.9		0	30	177000		0		0
			kanjon Morače	19.2		0		0	5	500000		0
10	man. Morača - Mioska	7.2		7.2		0	10	59000	4	400000		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9		0		0		0		0
12	Kolašin - Mojkovac	20.2		20.2		0		0	2	200000		0
13	Mojkovac - Ribarevina	23.0		23.0		0		0		0		0
14	Ribarevina - granica RS	18.6		18.6	6	3600		0		0		0
	kompletan put	180.8		180.8		18000		247800		1100000		200000

Recommended Bill of Quantity 3/4

jedinični troškovi predložene mere (EUR)					150000	EUR	100000	EUR	10000	EUR	25000	EUR
					rekonstr. 3kr. raskrsnice		zaštita od odrona		poboljšanje peš. staze		izgradnja peš. staze	
br.	deonica	km	sekcija	km	[kom.]		km		km		km	
01	Bar - za Sozine	8.0	urban Bar	1.3		0		0	1.3	13000		0
			rural	2.0		0		0		0	2	50000
			urban Sut.	4.7	1	150000		0	4.7	47000		0
02	za Sozine - za Virpazar	11.8		11.8		0	0.2	20000		0		0
03	za Virpazar - Virpazar	1.5		1.5	3	450000		0		0		0
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3	1	150000		0		0		0
			uz lučicu	0.3		0		0		0		0
			rural	4.5		0		0		0		0
05	Vranjina - Golubovci	7.9		7.9		0		0		0		0
06	urban Golubovci	6.1		6.1	1	150000		0		0	4	100000
07	Golubovci - PG	6.7		6.7	3	450000		0		0		0
08	urban PG	7.5		7.5		0		0		0		0
09	PG - man. Morača	39.1	blaža trasa	19.9	5	750000	0.5	50000		0		0
			kanjon Morače	19.2		0		0		0		0
10	man. Morača - Mioska	7.2		7.2	1	150000	0.2	20000		0		0
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0		0
			Crkvine-Kolašin	8.9		0		0		0		0
12	Kolašin - Mojkovac	20.2		20.2		0	0.2	20000		0		0
13	Mojkovac - Ribarevina	23.0		23.0	2	300000		0	1	10000		0
14	Ribarevina - granica RS	18.6		18.6	1	150000		0	6	60000		0
	kompletan put	180.8		180.8		2700000		110000		130000		150000

Recommended Bill of Quantity 4/4

jedinični troškovi predložene mere (EUR)					5900	EUR	80000	EUR	12000	EUR	UKUPNO EUR
					prilaz mostu		semafor		BUS stop		
br.	deonica	km	sekcija	km	[kom.]		[kom.]		[kom.]		
01	Bar - za Sozine	8.0	urban Bar	1.3		0		0		0	23930
			rural	2.0		0		0	1	12000	72880
			urban Sut.	4.7		0	1	80000		0	312150
02	za Sozine - za Virpazar	11.8		11.8		0		0		0	36100
03	za Virpazar - Virpazar	1.5		1.5		0		0		0	500450
04	Virpazar - Vranjina	6.1	uz S. jezero	1.3		0		0		0	231490
			uz lučicu	0.3		0		0		0	9570
			rural	4.5		0		0		0	84750
05	Vranjina - Golubovci	7.9		7.9	2	11800		0		0	325550
06	urban Golubovci	6.1		6.1		0		0	2	24000	524450
07	Golubovci - PG	6.7		6.7	2	11800		0	2	24000	581590
08	urban PG	7.5		7.5		0		0		0	17650
09	PG - man. Morača	39.1	blaža trasa	19.9	16	94400		0		0	1274650
			kanjon Morače	19.2		0		0		0	1237200
10	man. Morača - Mioska	7.2		7.2	16	94400		0	2	24000	918900
11	Mioska - Kolašin	17.1	Mioska-Crkvine	8.2		0		0		0	0
			Crkvine-Kolašin	8.9	2	11800		0		0	113250
12	Kolašin - Mojkovac	20.2		20.2	4	23600		0		0	442900
13	Mojkovac - Ribarevina	23.0		23.0	8	47200		0	2	24000	504500
14	Ribarevina - granica RS	18.6		18.6		0		0	2	24000	334400
	kompletan put	180.8		180.8		295000		80000		132000	7546360

Total costs of implementation of all recommended improvement measures along the route are the result of cost sum in the last row of each of four sub-tables. The total amount would thus be approximately €7.55 million.

It is interesting to take a look at the cost structure. Reconstruction of three-branch interchanges requires the highest investments. These include complete change of geometry and harmonization with the principles of safe interchange. There are 18 three-branch interchanges along the road which are recommended to be reconstructed and improved geometrically. Not only interchanges, but also intervention and reconstruction of several wide plateaus in front of recreational and catering facilities which are located by the roadside are recommended. Of course, not each intervention individually would require unit cost of 150 thousand €, but for the purpose of this kind of rough estimation not every reconstruction can be evaluated independently and in detail.

Guard rail is on the second place by the volume of investment. It needs to be taken into consideration that this is a short-term measure (fast and simple implementation) of physical protection of road which is highly functional and has proportionally reasonable unit cost. Installation of 65.4 km of guard rail is recommended along the 180 km of road. This means that such guard rail length is applied for 360 km of the road edge, i.e. that the new rail has to cover and protect 18% of immediate road surrounding from vehicles slipping off the road and crashing against solid objects.

Considerable item in the table is tunnel lighting. It needs to be taken into consideration that estimation was done for the unit cost of 100 thousand € regardless the tunnel size, and the lighting criterion was the tunnel length (more than 100 m or between 75 and 100 m, if the tunnel is in the curve). The unit cost for the tunnel lighting is quite relative amount. Some European documents calculate with the amount of €500 thousand, but it was estimated that this amount is quite high. After consultations with local experts dealing with related issues, an amount of € 100 thousand was adopted as more realistic option.

It is also worth noting that it is necessary to remove big quantities of massive stone and concrete parts of the fence along the road, as well as non-functional and deformed guard rails and pedestrian fences at bridges. These costs are not included in the BOQ.

3.5 Economic analysis

For economic analysis of the suggested improvements the accident rates given below were utilized in HDM-4. The unimproved (no action) situation is the rates for fatalities and injury-accidents analyzed from Police data for 2006-2007 (as described in Technical Memorandum no.12) and an estimate for damage-only (DO) accidents, which are estimated to cost Eur 2,000 per accident. For the 'with improvements' (Improved) case, it is assumed that fatal and injury-accidents can be reduced by 20 percent and that damage-only crashes will be reduced by 15 percent.

Table 3.1:
Accident rates with and without safety improvements
(per 100 million vehicle –km)

Type	No action	Improved	difference
Fatal	4.80	3.84	-20%
Injury	144.0	115	-20%
Damage only	300.0	255	-15%

Source: T.M. no 12 (Table 8) and consultant estimates

The following table shows the cost and benefit streams (millions euro) starting from year 2009 for a 15 year period. After 2017 benefits are reduced, because it is assumed that 90 percent of the traffic flows in the corridor will divert to the new motorways. The total cost of works is assumed to be €8 million, and for NPV calculation purposes this is assumed to be spent in year 1.

Table 3.2:
Bar-Barski Most existing road (M-2)
Accident reduction costs and benefits (million Euros)

Year	Accidents no measures	Accidents new measures	Accidents benefits	benefits - minus cost
2008	17.564	13.388	4.176	-8.000
2009	18.969	14.459	4.511	4.511
2010	20.487	15.615	4.871	4.871
2011	22.126	16.865	5.261	5.261
2012	23.675	18.045	5.629	5.629
2013	25.332	19.308	6.023	6.023
2014	27.105	20.660	6.445	6.445
2015	29.002	22.106	6.896	6.896
2016	31.033	23.654	7.379	7.379
2017	32.895	25.073	7.822	7.822
2018	34.868	26.577	8.291	1.244
2019	36.960	28.172	8.789	1.318
2020	39.178	29.862	9.316	1.397
2021	41.529	31.654	9.875	1.481
2022	44.020	33.553	10.467	1.570

Note: After 2017 all except 10% of normal traffic transfers to the motorway
Source: HDM-4 analysis based on consultant estimates.

The main economic indicators (NPV in €millions) are shown below.

NPV (millions)	$31.40
EIRR	63%
B/C ratio =	4.92

Even if the difference in accident rates is assumed to be much lower, i.e., fatal and injury-accidents reduced by 10 percent and damage crashes also reduced by only 10 percent, the B/C ratio is still substantial, as shown below.

NPV (millions)	$8.75
EIRR	26%
B/C ratio =	2.09

The conclusion is that road safety improvement projects with the probability of high benefit/cost ratios should be given top priority within available budgets, either capital and current. This especially the case for the existing Bar-Barski Most magistralni road because, as noted above, it is the most important road link in Montenegro, and because traffic volumes will continue to grow very quickly until the motorway is completed.

Reference: Technical Memorandum no .18, 12

4 ECONOMIC ANALYSIS – BAR (ĐURMANI)-BOLJARE

4.1 Introduction

The economic analysis as presented in the Final Report dated June 2008 has been substantially revised to take account of the following: i) a revision to the traffic model assignments for 2027 to include fuel consumption in the impedance (behavioural cost) function. This change has the effect of slightly reducing predicted traffic levels on the motorway in 2027 compared to the earlier analysis. And ii) in the HDM-4 model the economic cost of fuel has been substantially increased, based on the latest US Government long term forecasts.

Based on advice from a panel of experienced construction engineers, the full motorway should be built in one stage only. The analysis in the draft final report (April 2008) assumed it would be possible to construct in two stages: building a ‘half motorway’ with two lanes first, and later, adding a second carriageway with two more lanes. Such a strategy would be possible in many countries where there are no special terrain difficulties. However in Montenegro the mountainous terrain for most of the route Durmani-Boljare is particularly severe, such that well over half of construction cost will consist of building tunnels (38,000m) and bridges (17,000m) which together extend for more than one-third of the total length. Engineering logistics, traffic disruption in a second (upgrading) phase of construction, and safety considerations all mean it is better and less costly to build the full motorway in one stage. (see Technical Memo no. 30).

4.2 Construction Schedules

For economic analysis purposes the assumed construction schedules, and financial costs by section, are shown in the table below.

Table 4.1: Construction schedules and financial costs (Million Euros)

Section	km	2011	2012	2013	2014	2015	2016	2017	2018	Total
Matesevo - Boljare	75.7	146.2	146.2	146.2	146.2					584.6
Smokovac - Matesevo	43.5	160.2	160.2	160.2	160.2					640.8
Durmani-Virpazar	11.7				38.6	38.63	38.6			115.9
Virpazar-Farmaci	22.9	69.1	69.1	69.1	69.1					276.3
Farmaci-Smokovac	15.4						61.7	61.7	61.7	185.1
Totals	169.2	375.4	375.4	375.4	414.0	38.6	100.3	61.7	61.7	1802.6

Note: Totals may differ due to rounding

4.3 Works and Engineering costs

Details of engineering costs are given in the tables below. The costs were derived from a common set of unit costs and are for the Montenegrin geometric design standards as used in the 1:25000 scale outline designs that were recently prepared, together with bills of quantities (BOQ) by SIMM Engineering. Should the TEM (Trans-European Motorway Standards & Recommended Practice 3rd Edition Feb. 2002) standards eventually be employed, it has been estimated that works and engineering costs would be less than 2 percent different from those given below.

The two tables below give unit costs and details of the estimated engineering costs, including design and supervision (8%) and environmental mitigation provisions (5%). For economic analysis purposes the conversion factor used is 0.80.

Table 4.2 a) Unit costs of engineering works

No.	Construction works	Unit	Unite Price
1.	Preliminary works	km	€ 25,000.00
2.	Excavations		
	a) material class III & IV	m³	€ 4.50
	b) material class V & VI	m³	€ 7.50
3.	Embankment		
	a) material class III & IV	m³	€ 3.50
	b) material class V & VI	m³	€ 4.50
4.	Drainage	m'	€ 120.00
5.	Cut and side cut slope protection	m²	€ 11.00
6.	Drainage channels	m'	€ 22.50
7.	Shoulders	m²	€ 1.80
8.	Water source development	pcs	€ 2,700.00
9.	Mechanically stabilized bottom bearing course 40 cm.	m³	€ 12.00
10.	Carriageway		
	a) Pavement (2 x 8 cm);	m²	€ 22.00
	b) Wearing course (4 cm)	m²	€ 8.50
11.	Concrete curb dim. 18/24.		€ 16.00
12.	Concrete gutter width 75 cm.	m'	€ 20.00
13.	Edge marking line 0,35x0,20.	m'	€ 15.00
14.	Edge marking line 0,20x0,20.	m'	€ 12.00
15.	Concrete retaining walls MB 20 base excavation	m³	€ 200.00
16.	Culverts f 1-5 m	m'	€ 400.00
17.	Storm drainage	m'	€ 150.00
18.	Road equipment	km	€ 8,000.00
19.	Bridges and Viaducts		
	a) 10-30 m';	m'	€ 15,400.00
	b) 30-50 m';	m'	€ 18,700.00
	c) 50-100 m';	m'	€ 23,100.00
	d) over 100 m'.	m'	€ 26,400.00
20.	Tunnels:		
	a) to 200 m';	m'	€ 17,500.00
	b) 200 - 500 m';	m'	€ 18,700.00
	c) 500 - 1500 m';	m'	€ 19,500.00
	d) "Sozina" 4150 m' (1 tube)	m'	€ 12,500.00
21.	Illumination / open alignment and bridges	m'	€ 50.00
22.	Telecommunication / open alignment and bridges	m'	€ 60.00
23.	Toll booths	pcs	€ 375,000.00
24.	Gas stations	pcs	€ 187,500.00
25.	Grade separated interchanges	pcs	€ 2,750,000.00

Table 4.2 b) Full Motorway Construction Costs (Cost in Euros)

	MOTORWAY BAR-BOLJARE				
SECTION	Djurmani - Virpazar	Virpazar -Smokovac	Matesevo-Berane	Berane-Boljari	* TOTAL :
	km 13+241- km 24+951	km 24+951 - km 63 + 182			
	L=11.71 km	L= 38.231 km	L= 34.352 km	L=41,300 km	L=125.593 km
Alignment	12,012,772	149,276,451	89,282,246	119,941,092	370,512,560
Tunnels	71,102,500	105,829,000	103,668,800	71,219,000	351,819,300
Bridges	12,127,500	100,416,800	74,019,000	35,684,000	222,247,300
Junctions	5,500,000	11,000,000	5,500,000	5,500,000	27,500,000
Other activities (gas stations,maintanance bases ,toll booths...)	1,312,500	5,422,000	2,352,000	3,000,000	12,086,500
Illumination,telecomunication	494,934	3,599,310	3,096,060	4,137,100	11,327,404
Connection with A-I motorway		32,800,000			32,800,000
TOTAL: construction works	**102,550,206**	**408,343,561**	**277,918,106**	**239,481,192**	**1,028,293,064**
Design and supervision (8%)	8,204,016	32,667,485	22,233,448	19,158,495	82,263,445
Environmental protection (5%)	5,127,510	20,417,178	13,895,905	11,974,060	51,414,653
TOTAL: Other costs	**13,331,527**	**53,084,663**	**36,129,354**	**31,132,555**	**133,678,098**
TOTAL (EUR) :	**115,881,733**	**461,428,224**	**314,047,459**	**270,613,747**	**1,161,971,163**
Costs per km (Eur)	**9,895,964**	**12,069,478**	**9,142,043**	**6,552,391**	**9,251,878**

Note: This table excludes the Smokovac-Matesevo section, currently under detailed design by the University Engineering Faculty. This section has been provisionally costed at Euros 640.8 million.

At first sight the construction works may appear costly. However, for four sections totaling 127.9 km (namely Virpazar-Smokovac, Matesevo–Andrijevica, Berane-Boljare, and Durmani-Virpazar) there are 25 kilometres of tunnels and 10.8 km of bridges or viaducts. Thus, nearly one-third of the length of these sections consists of tunnels or bridges. Additionally, up to about half of the central section from Smokovac to Matesevo, where the terrain is even more difficult, will also consist of tunnels and bridges.

4.4 Economic growth and traffic forecasts

The GDP forecast by the Central Bank (CBCG) for the period 2006-2020 is given in the table below, together with estimates for GDP per capita growth rates. The CBCG 'most likely' scenario for this period is 6% per annum for total GDP, or 5.4% p.a. in per capita terms, assuming the population growth rates used in the Physical Plan of Montenegro (PPM).

Table 4.3
CBCG forecasts for GDP 2006-2020 (%/year)

Scenario	GDP	GDP/capita
Optimistic	7.0%	6.4%
Most likely	6.0%	5.4%
Pessimistic	4.0%	3.4%

Source: CBCG document, Table 7.1 & PPM Table 16

After 2020, there is no official forecast, and more conservative growth rates are anticipated. For the periods 2021-2027 and 2028-2037, lower rates of growth are used, to allow for the greater level of uncertainty that is inherent in long term forecasts. In the table below the 'most likely' and 'pessimistic' CBCG scenarios (to 2020) for income per capita are shown.

Table 4.4
Income per-capita growth forecasts to 2037 (% per year)

from/to	Most Likely	Pessimistic
2006-2020	5.40%	3.40%
2021-2027	3.60%	2.30%
2028-2037	2.40%	1.50%

Source: CBCG to 2020, and consultant estimates.

Based on the above, demand elasticity ratios (w.r.t personal income) for passenger travel have been estimated and utilized to produce the traffic growth forecasts shown in the table below. Between the 'standard' (CBCG most likely) and the low growth forecasts, a median forecast is included.

Table 4.5
Passenger traffic growth forecasts

Period from - to	Demand elasticity	Annual passenger traffic growth		
		Standard	Median	Low growth
2007-2012	1.40	7.5%	6.1%	4.7%
2012-2017	1.30	7.0%	5.7%	4.4%
2017-2020	1.20	6.5%	5.3%	4.1%
2021-2027	1.20	4.3%	3.5%	2.8%
2028-2032	1.20	2.9%	2.3%	1.8%
2032-2037	1.20	2.9%	2.3%	1.8%

For freight traffic, demand is assumed to increase in direct proportion to total GDP growth, thus truck traffic is forecast to grow at 6% per year until 2020, and at 3.5% per year thereafter in the standard forecast case, and by 4% until 2020 and 2.5% thereafter in the low growth case.

4.4.1 Other GDP forecasts

Other recent GDP forecasts for Montenegro are from SEETO (Southeast Europe Transport Observatory) and the World Bank. The SEETO forecasts of GDP and traffic growth for countries in the region are given in the table below.

Table 4.6
SEETO: Regional GDP & Traffic growth 2010-12

	GDP (a)	Traffic (b)	Elasticity (b/a)
Albania	6.5%	10.8%	1.66
Bosnia & Herzegovina	5.5%	8.9%	1.62
Croatia	3.7%	6.1%	1.65
Serbia	4.9%	8.0%	1.63
Montenegro	5.0%	8.1%	1.62

Source: SEETO, 2007

World Bank estimates of GDP growth, in the medium term from 2007 to 2014, are as follows: 7.5% in 2007 and 6.5% in 2008, then gradually slowing to 5% from 2012 onwards. (*Country Partnership Strategy for the Republic of Montenegro for FY07-FY10. May 15, 2007 Report No. 39800 –ME*). In the outturn, the annual GDP increase in Montenegro for 2007 has been provisionally measured as 7.2 percent. (Monstat, May 2008 provisional)

4.4.2 Traffic volumes by section

Projected traffic volumes (AADT) for each section are given in the table below. The volumes (rounded to 00s below) are for the standard economic growth case, but excluding the generated traffic (new traffic that will flow only as result of motorway completion) that is expected to arise.

Table 4.7
Forecast traffic volumes by section and by year

Year	Matesevo-Boljare	Smokovac-Matesevo	Durmani-Virpazar	Virpazar-Farmaci	Farmaci-Smokovac
2015	8,017	9,073	11,549	9,841	4,357
2020	10,378	12,566	16,946	14,715	6,766
2025	13,436	17,404	24,865	22,005	10,506
2030	15,937	20,987	30,334	26,946	13,421
2035	18,494	24,449	35,337	31,390	16,328
2040	21,461	28,480	41,164	36,567	19,866

Source: Consultants estimates (HDM-4 reports)

For economic analysis using the HDM-4 model, the sections from Matesevo to Berane and Berane-Boljare) were combined into one (named Motorway North) since firstly: traffic volumes in both base year (2007) and the horizon year 2027 were closely similar, and second: the rationale for extension of the motorway beyond Matesevo depends principally on the assumption that the motorway in Serbia, from Pozega to Boljare, will be open by the time of completion. Should the Serbian section be delayed, traffic benefits for the Matesevo-Berane-Boljare section would be severely reduced, and the NPV certainly negative. In this analysis it is assumed that border crossing delay at the new motorway border post will be the same as at Barski Most (Dobrakovo). However this may be a rather conservative assumption. In reality by 2015, it may be expected that on the motorway, border delays to vehicles will be kept to the very minimum, probably using new processing technologies, and will be certainly less than on the old road to Serbia from Bijelo Polje.

For the median economic growth case, and in the ‘low’ or pessimistic GDP scenario, aggregate traffic volumes during the period 2015–2027 would be lower by 18% and 29% respectively.

4.5 Discount rate

The EAR study of upgrading (to motorway standard) of two links between Belgrade and Montenegro (COWI-BCEOM, March 2006) adopted a discount rate of 7 percent. However, a discount rate of 5 percent could be used, based on an observation in the EC Guide that *“eventually, for regions lagging behind, a 5 percent return is compatible with the approach where a standard benchmark discount rate is used reflecting a required real growth objective”* (EC, op cit. p 105).

A test discount rate of 5 percent is therefore considered suitable for this analysis.

4.6 Economic analysis

The economic comparison is made by deducting the ‘with project’ (WP) costs of traffic on motorway and the existing road from the ‘without project’ (WOP) costs. In the with project case there are two traffic flows, being i) traffic that transfers to the motorway, and ii) traffic that elects to continue using the existing road. The latter traffic flow benefits to the extent that congestion will be considerably less after the motorway is in use.

Smokovac–Matesevo (Central motorway). The starting point for traffic flows is Smokovac, and the ending point is Kolasin. Thus, the link from the Matesevo junction of the motorway to

Kolasin is taken into account in the economic comparison. The sections for analysis are as follows:

- Existing road Smokovac–Kolasin 57.7km
- Motorway Smokovac–Matesevo junction 43.5 km
- Existing road Matesevo junction–Kolasin 8.5 km

For Matesevo to Boljare, the Northern motorway section, the comparison is based on drivers' decisions for two alternatives on arrival at Matesevo. **Alternative A**: Matesevo–Berane -Boljare–Serbian motorway. In this case there will be a motorway link direct to Pozega. **Alternative B**: Matesevo–Kolasin–Serbian border at Gostun–Serbian motorway. Choosing this alternative drivers will face an additional 15.9 km of travel in order to enter the Serbian motorway at Pozega. This 'penalty' link is therefore included in the HDM analysis for both the 'with project' and 'without project' case. In the case of the remaining sections, to Podgorica and the south, drivers' decision points, and lengths of the existing road and the motorway, are equal.

Principal details of the economic analysis are given in the table below, showing economic costs, lengths (in km) the start and end years of construction, the net present values (NPV) at the test discount rate of 5 percent, and the economic internal rate of return (EIRR).

Table 4.8:
Economic analysis indicators by section
Costs in million Euros (Meur)

sections	Djurmani Virpazar	Virpazar Farmaci	Farmaci Smokovac	Smokovac Matesevo	Matesevo Boljare	**All sections**
Economic cost	€ 92.7	€ 221.0	€ 148.1	€ 512.6	€ 467.7	€ 1,442.1
Length km	11.71	22.90	15.35	43.50	75.70	169.16
Cost /km	€ 7.92	€ 9.65	€ 9.65	€ 11.78	€ 6.18	€ 8.53
Start construction	2104	2011	2015	2011	2011	2011
End construction	2016	2014	2018	2014	2014	2018
NPV (Meur)	€ 62.9	€ 46.1	€ 14.7	€ 121.6	€ 118.2	€ 317.7
EIRR (%)	11.9%	6.2%	5.7%	6.5%	6.7%	6.5%
Components of benefit (%)						
Vehicle costs	16.5%	11.7%	20.0%	31.8%	29.9%	26.2%
Travel time savings	53.0%	54.2%	49.7%	46.3%	45.0%	47.4%
Generated traffic	0.0%	6.6%	7.0%	7.8%	7.5%	6.9%
Accident savings	30.5%	27.5%	23.4%	14.1%	17.6%	19.2%
memo item						
Financial cost	€ 115.9	€ 276.3	€ 185.1	€ 640.8	€ 584.6	€ 1,802.7
Financial cost/km	€ 9.90	€ 12.06	€ 12.06	€ 14.73	€ 7.72	€ 10.66

As noted earlier, this analysis used traffic forecasts based on the Central Bank 'most likely' or standard GDP growth scenario for the period until 2020. Using a median traffic growth forecast (i.e., mid-way between this 'standard' forecast and the Central Bank 'pessimistic' scenario) would result in about 17 percent less traffic volume on average, and would mean that to be socially profitable construction starts would need to be postponed until later years than those given in the table above. Cost-benefit analysis output tables from HDM-4 for each section are given in Appendix 3-A.

4.7 Sensitivity tests

For the tests shown in the table below, the NPV (€ million) is shown, the change (%) in NPV in the second column, and lastly the economic internal rate of return (EIRR).

Table 4.9:
Summary of sensitivity tests

Sensitivity tests	NPV (Meur)		EIRR (%)
Standard case (discount r =5%)	**€**	***317.70***	***6.46%***
All traffic benefits reduced by 20%	€	11.60	5.06%
Capital cost increase of 20%	€	56.70	5.23%
Value of travel time reduced by 33%	€	74.50	5.36%
Generated traffic = zero	€	212.00	5.99%
Discount rate = 10%	€	(453.70)	6.46%
Discount rate = 7%	€	(94.10)	6.46%

Switch value for construction costs	plus 22%
Switch value for value of travel time	minus 39%

The two primary fields of sensitivity are: capital costs, and the expected level of opening year traffic flows, as in any road analysis. As shown above, the value for costs that reduces (or ‘switches’) the net present value (NPV) to zero or slightly negative is 22% meaning, total financial cost rising to some Eur 2199 million from the estimated Eur 1802 million. Should capital costs increase by 20 percent, NPV would still be positive at about Eur 57 million.

The ‘switch’ value for traffic benefits is minus 22 percent in the standard growth case. For the median growth scenario, there would be a much lower but still positive benefit, at about Eur 43.3 million NPV. The low economic growth scenario is considered unlikely, as a decidedly ‘pessimistic’ outlook in the view of the Central Bank.

4.8 Summary of estimates of value of travel time

Values of travel time for cars & private vehicles were derived from results of the Stated Preference (S-P) roadside surveys carried out in October 2007 and reported in Technical Memorandum No. 6. The value of travel time (VOTT) is of importance since the classified traffic counts showed that private cars represent 85-90 percent of total traffic flows on the north-south corridor. The VOTT derived from the surveys is used as a value representing the drivers’ ‘willingness to pay’, and since the 1980s S-P surveys have become part of the accepted methodology for economic analysis of road projects in general. Analysis of the survey data – consisting of 1494 valid responses from drivers - showed the overall perceived value of time to be €3.54 per driver-hour, averaged across all respondents from the 16 country-wide survey stations. In the S-P surveys, average car-occupancy was found to be

2.14 persons (including driver) per vehicle. However, for the car passengers, it cannot be assumed they would perceive the value of a travel time saving the same as the driver, and hence a workable hypothesis is needed. In the S-P surveys only drivers were interviewed[5], and so there is no direct evidence on the willingness-to-pay (WTP) value of passenger time saving.

For car passengers, the hypothesis is that some passengers will have a WTP value at least as high as the driver (€3.54/hour) while others will have a value of close to zero. Then, assuming a normally distributed range of choices, the mean value for passengers would be [3.54/2] or €1.77 per hour. The overall value of time for cars and private vehicles is therefore €5.56 per car-hour, of which, car passengers (average 1.14 per vehicle) contribute about 36 percent. In real terms time saving values will increase in line with the GDP per-capita forecast and thus the values above are adjusted by a factor of 1.296 to reflect the average annual growth of personal incomes in the analysis period (2.58% per year) and the discount rate of seven percent. (See TM No. 16 section 2). The HDM input value is thus €7.21 per car-hour, or € 3.37 per occupant-hour.

Bus Passengers - Bus passengers were not included in the S-P surveys, and so a standard wage-based approach to estimating VOTT was used. For users of buses and micro-buses, reference was made to data on average monthly earnings. The gross wage rate (including employer contributions) average for 2007 is estimated as €484 per month[6] thus giving a value of €2.77 per hour at an average 175 working hours per month. From World Bank[7] recommendations, the value of non-working time is taken as 30 per cent of the gross value of working time. This value is therefore estimated as €0.83 per person-hour. Based on the BCEOM 2003 studies[8] it is estimated that 25 percent of bus passengers travel for a work or business purpose, and there are an average 22 persons per bus trip. The overall value of travel time is therefore €28.90 per bus-hour, of which, the non-working time element contributes 47 percent. Adjusted for future increases in real per-capita incomes as for cars (see previous paragraph) the HDM input values become €3.58 per working hour and €1.08 per person-hour for non-working trips on buses.

4.9 Summary of accident prevention parameters and social values

The rates of accidents, fatalities, and injuries per 100 million vehicle-km (100mvkm) traveled on the roads concerned in the project evaluation were evaluated using Police reports for the period 2006-2007. For the Bar-Barski Most (Serbian border) existing main road, injury-accident rates in 2006, as assessed from Police data available so far, are shown below.

[5] For practical reasons it was not possible to interview all vehicle occupants.
[6] Source: Montenegro Business Outlook, Sept. 2007.
[7] Professor K. Gwilliam, Paper no. OT-5, Transport Department, World Bank.
[8] BCEOM/COWI, 2003, Final Report, Vol. 5 *Calibration of Road User Effects Input to HDM-4*.

Table 4.10:
Injury-Accident rates per 100 million vehicle-km (100mvkm) in 2006

Road	from -	to -	Accidents 2006	AADT in 2006	Length km	mvkm 2006	Accidents /100 mvkm
M2-1	Barski Most	Bijelo Polje	46	4,949	16.2	29.3	157
M2-1	Bijelo Polje	Ribarevina	36	4,949	6.2	11.2	321
M2	Kolasin	Mojkovac	41	4,338	20.2	32.0	128
M2	Mojkovac	Slijepac Most	9	3,314	17.3	20.9	43
M2	Bioce	Monastir Moraca	31	3,886	40.0	56.7	55
	Northern	***Totals***	*163*		*99.9*	*150.1*	***109***
M2-4	Bar	Petrovac	150	6,589	19.3	46.3	324
M2	Petrovac	Virpazar	41	4,900	24.8	44.4	92
M2	Virpazar	Podgorica	55	5,649	33.0	68.0	81
	Southern	***Totals***	*246*		*77.1*	*158.8*	***155***

Source: Police data and Consultants estimates

In general, the accident rates above tend to confirm anecdotal evidence: that the safety record on the existing main road from Bar to Barski Most is indeed substandard. The very high accident rates for two sections, namely Bijelo Polje-Ribarevina, and Bar-Petrovac, may be attributed to these sections being largely urban or sub-urban in character. Road accident rates for this study are given in the table below.

Table 4.11:
Accident rates by road type for this study
(Personal injuries per million vkm)

Road type / route	**Fatal**	**Non-fatal**
Motorway	2.0	40.0
Bar-Podgorica	6.8	148.2
Podgorica - border	4.8	104.2

A review of motorway fatal accident rates in nine countries in Western Europe is given in the table below.

Table 4.12
Fatal injury rates on motorways in selected European countries

Country	Motorway travel (mvkm) 1999	Fatalities / 100 mvkm
Denmark	9,164	0.098
Great Britain	93,400	0.216
Finland	3,693	0.244
Sweden	9,853	0.254
Holland	48,883	0.270
France	102,586	0.480
Belgium	30,083	0.708
Austria	16,207	0.901
Portugal	8,156	1.508
Total	322,025	**0.420**

The data above show a wide variance around the mean. Denmark, Finland and Great Britain are well below average, but Austria and Portugal are about 2 or 3 times above the average, Indicating that, even on motorway-standard roads much can be done (e.g., enforcing speed limits, seat belts, etc.) to reduce fatality rates. There is evidence that in some south-eastern European countries, motorway fatality rates can be considerably higher than those above. For example in Romania for 2003, the fatal injury rate was estimated[9] at 3.2 per 100mvkm. Low fatality rates in northern Europe may be the product of long experience and of efficient police enforcement procedures. Evidence from Hungary[10], where the motorway experience is fairly recent, indicates that motorway fatality rates are one-third of those for other main roads. This ratio is considered reasonable for all personal-injury accidents in this study and is therefore utilized. It is concluded that the fatality rate used in this study for the motorway, 2.0 per million vehicle-km (mvkm) is fairly conservative; for example, as shown above, Portugal has the highest fatality rate of the European motorways examined, has a fatality rate of 1.51 per mvkm.

Using the 'gross output' approach, the basic social values of road injury-accident prevention were estimated and are given in the table below. (see Technical Memo no. 12A).

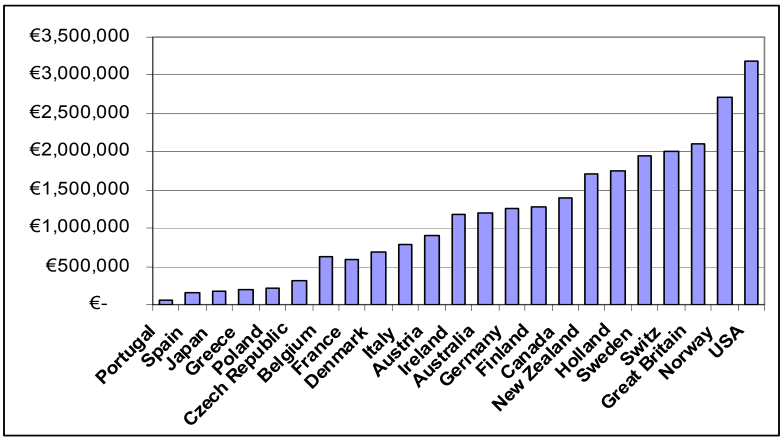
Table 4.13:
Social values of injury-accident prevention on roads

Social costs	Fatality	Severe injury	Minor injury
a) Lost output	€ 70,570	€ 16,820	€ 3,264
b) Human cost	€ 105,855	€ 33,640	€ -
Total	**€ 176,425**	**€ 50,460**	**€ 3,264**

4.9.1 Comparative data for value of preventing a fatality

The values of preventing a road fatality, in 2002 Euros, adjusted for purchasing power parity, for more than 20 advanced countries are shown in the chart below.

Figure 4-1:
Comparative national values of preventing a road fatality



Source: www.erso.eu/knowledge/content/08_measures/monetary_valuation_of_road_safety.htm

[9] Source: CESTRIN, Romania Highway Agency, August 2004.
[10] State Motorway Management Company Ltd. (SMMC Ltd. Hungary)

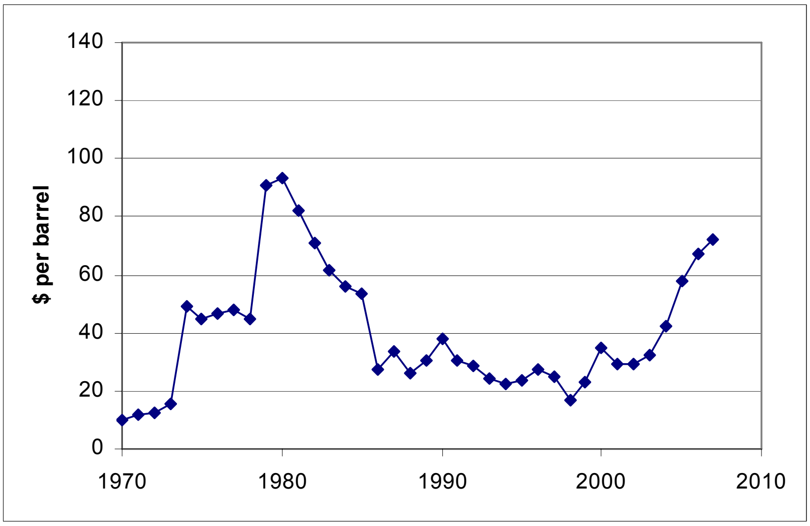
As shown, the valuations vary very substantially. An interesting pattern is that some of the countries that have a good safety record, such as Norway, Great Britain, Sweden and the Netherlands, assign a high monetary value to the prevention of a traffic fatality. Other countries, with a rather bad road safety record like Portugal, Spain and Greece, assign a low monetary value to the prevention of a fatality.

A study of 68 countries published in the Journal of Transport Economic and Policy "Variations between Countries in Values of Statistical Life" by Ted Miller (JTEP Vol 34 Part 2, May 2000, pp 169-188) found that values are typically about 120 times GDP per capita; this would indicate that the current value of preventing a road death in Montenegro should be of the order of Eur 360,000. It is thus considered that the values adopted in this study (see Table 4.10 above) are relatively conservative.

4.10 Fuel prices

There is considerable uncertainty in forecasting prices of many commodities over a long period, and this is certainly the case with crude oil. The graph below shows how average annual prices of crude (adjusted to 2007 dollars) have changed significantly over the last 30 years. The right-most point on the graph shows the average price during 2007, nearly $73, while so far during 2008 the average is about $120 per barrel, well exceeding the previous historic high point of 1980.

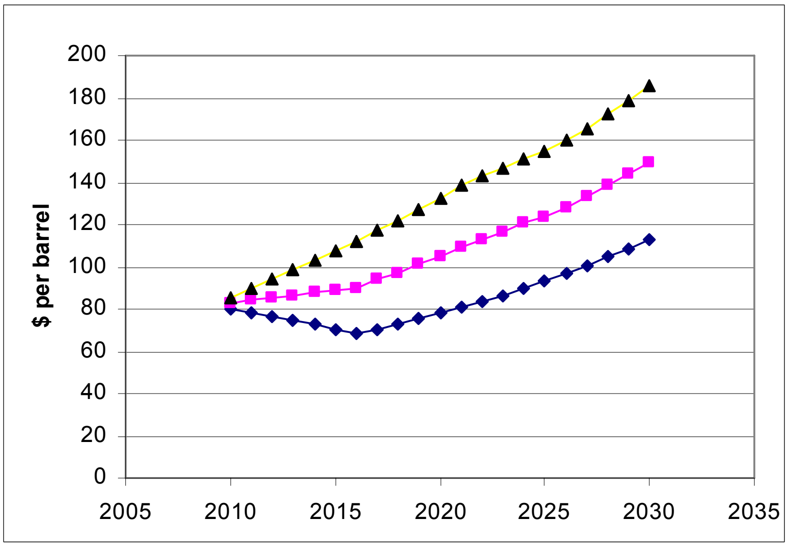
Figure 4-2
Average annual crude oil prices 1970-2007



Source: BP Review, 2008.

For a projection of crude oil prices in future, the U.S. Energy Information Agency (EIA) 'high' and 'reference' forecasts (triangles and diamonds) are shown in the graph below. The median of these projections is used.

Figure 4-3
EIA forecasts (July 2008) of crude oil prices, 2010-2030



Source: www.eia.doe.gov/oiaf/ieo/index.html.

The median of the EIA forecasts implies that crude prices will attain about $149 per barrel by year 2030, that is, rising at an average of about 2.7% per year from 2010. Based on this forecast, a calculation of fuel costs for HDM economic analysis is made, although recognizing that there is a large degree of uncertainty in the forecast. For analysis purposes the long term price of crude oil is assumed at US$120 per barrel. Based on information obtained from the Ministry of Economic Development, refinery manufacturing margins are estimated at €0.114 per litre for both diesel and gasoline, and sea transport costs at €23.30 per tonne or €.020 per litre. Inland distribution costs including retailing margins are added to give the economic cost of gasoline and diesel fuel, as shown in the table below. The traditional trading currency for oil is the US dollar and for this calculation the average long term exchange rate for dollars is assumed as $1.40 per Euro.

Table 4.14
Long term economic cost of fuel (Euro/litre)

Long term crude oil price	€	0.539
Manufacturing cost	€	0.114
Sea transport	€	0.020
Inland transport	€	0.025
Retailing margin	€	0.047
Total	**€**	**0.746**

Source: Consultant estimates (see text)

4.11 Other vehicle cost inputs for HDM analysis

The HDM-4 input data for the road user effects (RUE) model are given in the table below. Data on vehicles, tyres, unit costs for crew and workshop labour, were obtained from official agencies and dealers in new vehicles and tyres in Podgorica and Kotor. Other RUE elements, such as ESAL (equivalent standard axle load, or road damage factor) factors for trucks and buses, and annual working hours, are from the BCEOM 2003 *Study of Road* *investments in Montenegro*. Vehicle occupancy data are from the 16 point traffic and origin-destination surveys carried out in October 2007 by this study.

Table 4.15: Road User HDM-4 Input data summary

Model Input Parameter	Car	Light delivery vehicle	Microbus	Bus	Small truck	Medium truck	Articu-lated truck
Vehicle class	*Car*	*Utility*	*Bus*	*Bus*	*Truck*	*Truck*	*Truck*
PCSE	1.0	1.0	1.0	1.8	1.5	2.0	3.0
Number of axles	2	2	2	2	2	2	5
Number of wheels	4	4	4	6	6	6	12
Annual km	16,000	20,000	40,000	40,000	40,000	40,000	80,000
Annual work hours	500	600	1,200	1,200	1,200	1,200	2,000
Average life (years)	12	12	12	12	12	14	14
ESAL factor	0	0	0	0.92	0.02	0.60	3.23
Operating weight (tonnes)	1.10	2.60	2.50	11.84	4.13	7.50	28.85
number of passengers	2.1	-	4.5	22.0	-	-	-
New vehicle price	€11 200	€14 500	€18 800	€94 900	€30 000	€51 000	€106 000
Replacement tyre price	€ 78	€ 96	€ 96	€ 227	€ 96	€ 181	€ 341
Workshop labour / hour	€ 6.00	€ 6.00	€ 6.00	€ 9.00	€ 7.00	€ 9.00	€ 9.00
Crew cost per hour	-	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50
Overheads (annual)	€ 200	€ 220	€ 300	€ 700	€ 380	€ 770	€ 1,180
Passenger work time/ hour		-	€ 3.58	€ 3.58	-	-	-
Non-working time /hour	-	-	€ 1.08	€ 1.08	-	-	-

Notes: Articulated truck semi-trailer tyres (6) are super-singles.
Costs are expressed in economic terms, exclusive of VAT and all other taxes and duties.
PCSE = passenger car space equivalent. ESAL = equivalent standard axle load.

4.12 Daily Traffic histogram

Data from the 24-hour traffic counts at stations nos. 4, 9, 10, and 14 were examined to check the daily traffic profile (a 24 hour histogram) against default histograms provided in HDM-4. For the four stations on the N-S existing road in October 2007 the mean traffic flow profile in vehicles/hour throughout the day, is shown in the graph below. The HDM model default profiles consist of: free-flow, commuter, seasonal, and inter-urban. However these were found not to correspond sufficiently well with profiles observed at the count stations on the N-S existing road. A new daily histogram was therefore created for HDM modelling purposes.

The HDM input traffic profile is shown in the table below, consisting of three flow-periods of 2,190 hours each per year (denoted HRYR) one period of 1790 hours, and one period of 400 hours to account for seasonal traffic on this route when in July and August average traffic volumes are double the normal daily flow. Percentages of total traffic in the flow-period for the year are denoted PCNADT, and in the table average hourly flows in percent of total (denoted HV) are also shown, For reference purposes the annual average hourly traffic ratio (AAHT) for each flow-period are also given, expressing flows as a ratio of the 24 hour average, i.e., of 1/24 or 4.17 percent per hour.

Table 4.16
Daily traffic histogram for HDM-4 input

FLOW_NAME	HRYR	PCNADT	HV	AAHT
Period 1	400	11.0	10.4%	2.500
Period 2	1,790	32.0	6.7%	1.600
Period 3	2,190	30.0	5.4%	1.300
Period 4	2,190	21.0	3.3%	0.800
Period 5	2,190	6.0	1.0%	0.250

4.13 Vehicle emissions effects of the motorway

In conventional cost-benefit analysis, exhaust emissions and pollution from road vehicles is treated as an externality, along with other external effects from road transport, particularly in urban areas, such as noise and vibration, etc. They are called external effects or dis-benefits[11], because the people involved, as road users, are not directly concerned; they are passing on the loss of utility to the community in general. That is, unless government action is taken to make road users pay, in some form of tax or charge for the social cost of emissions, noise, etc. In fact, the government regulates the retail price of road fuels and includes a small charge per litre in the price for environmental effects. The government plans to increase environmental charges for vehicles in the near future, imposing an annual charge, of € 10 for cars, and up to €130 for heavy trucks. This is expected to raise revenues of about € 20 million per year. It should also be noted that Montenegro has already adopted the EURO-3 standard, an EU regulation which puts a limit on passenger car emissions[12].

From this study the evidence available so far is insufficient to enable the social costs of increased vehicle emissions, in particular carbon-dioxide (CO2) to be included as part of the cost-benefit analysis. An analysis carried out using the HDM-4 version 2.04 (reportedly with much improved vehicle emissions models compared to HDM-4 versions 1.xx) indicates that CO2 emissions on the motorway may increase by about 400 tonnes per 100,000 vehicle-km (due to faster speeds[13] and consequently increased fuel consumption) but although this increase seems alarming, it is only slightly – about 4 percent - above the estimated level of CO2 emissions output for the existing road. Turning to indicative social costs (i.e., which might be used in a CBA) the carbon offsets market has been extremely volatile in recent times. Carbon prices are difficult to predict because of the large number of factors that influence emissions and emission reductions. The pace of economic growth, changes in fuel prices, availability and cost of abatement options, and access to carbon offsets are just a few of the factors that determine the dynamics of supply and demand in carbon markets. For example, in Phase I of the European Union Emissions Trading Scheme (EU ETS) the cost of CO2 rose to more than €30 per tonne in October 2005, but then fell to less than €11 per tonne in April 2006. Current predictions for 2008 vary considerably, making the price between €6 to €18 per tonne. The conclusion therefore at this stage is that it would not be meaningful to include emissions effects directly into the economic analysis.

[11] Occasionally an external benefit may arise, but this is not often in road transport.
[12] Effectively means that cars more than 10 years old can no longer be sold by dealers in Montenegro.
[13] In 2017, average traffic speeds are expected to be 60 km/hour on the old road and 86 km/hour on the motorway.

4.14 Complementary road improvements in the North

In order to maximize use of the motorway, it is recommended that a number of adjacent road links in the north be improved in the near future, if possible before completing motorway construction. The proposed link improvements and approximate lengths (km) are given below. As noted in the table, some of the links, totaling about 142 km, are already included for upgrading in the Physical Plan of Montenegro (PPM).

Table 4.17:
Proposed complementary improvements

Link from /to	km (approx)
Kolasin – Mojkovac	20
Mojkovac – Zabljak	46
Zabljak – Savnik (1)	37
Mojkovac - Bijelo Polje	24
Rasova – Plevlja (1)	39
Berane - Rozaje	30
Andrijevica – Plav (1)	37
Berane - Bijelo Polje (1)	29
Total approx length (km)	262

For the remainder, the proposed improvements would consist of:-

- Re-surfacing and resealing, shape corrections and pothole filling, etc.
- Safety related measures, as those proposed for the existing M-2 road from Bar to Bijelo Polje; and including,
- Other small scale works such as widening on sharp bends and for bus stops.
- Junction layout improvements (as required) for minor roads.

An approximate cost estimate for the improvements is given in the table below.

Table 4.18:
Approximate cost of proposed improvements

Type of works	km	Cost/km (000s)	Total (000s)
Re-surfacing, resealing etc	130	€ 30	€ 3,900
Additional safety measures	262	€ 45	€ 11,790
Other works - junctions etc.	30	€ 70	€ 2,100
Total approximate cost			€ 17,790

Thus, about €18 million could be set aside for such complementary projects. If funds are not available to complete improvements for all these eight links within the motorway building period, the projects could be given priority rankings using a simple ratio such as: [annual traffic in vehicle-km / capital cost] which is comparable to the benefit/cost ratio B/C. Improving these links as the motorway construction proceeds would clearly demonstrate commitment to economic development of the northern municipalities and would help (perhaps considerably) to maximize toll revenues on the motorway, and to make the motorway more attractive to investors, since it would create an effectively enlarged catchment area of potential motorway users.

APPENDIX 4 – A HDM-4 Cost-Benefit Tables

Analysis by Sections

Matesevo-Berane-Boljare (Motorway North)

Smokovac – Matesevo (Motorway Central)

Farmaci – Smokovac (Podgorica Bypass)

Virpazar – Farmaci

Durmani – Virpazar

Matesevo-Berane-Boljare (MGS)

Smokovac – Matesevo (MGS)

Combined Analysis (Đurmani – Boljare)

Combined Analysis (Đurmani – Boljare- MGS)

Table 4-A-1

			Disc rate =	5.0%	generated =	20%	RV =	33%
Matesevo - Boljare				Costs & Benefits in Eur millions				
							B / C ratio	1.31
Econ cost	-467.700			Length (km)	75.70		NPV =	€ 118.2
switch =	100%	-467.7					EIRR =	6.66%
	Road Agency Costs			Road User Benefits				Net
				Vehicle	Travel	Generated	Accident	Benefits
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2010								
2011	-116.925							-116.925
2012	-116.925							-116.925
2013	-116.925							-116.925
2014	-116.925							-116.925
2015		0.000	-0.149	6.670	9.985	1.665	4.665	22.836
2016		0.000	-0.149	7.107	10.639	1.775	4.918	24.289
2017		0.000	-0.149	7.565	11.339	1.890	5.185	25.830
2018		0.000	-0.149	8.027	12.090	2.012	5.466	27.445
2019		0.000	-0.149	8.444	12.893	2.134	5.762	29.083
2020		0.000	-0.149	9.008	13.749	2.276	6.074	30.957
2021		0.000	-1.374	9.666	14.655	2.432	6.403	31.783
2022		-6.288	-0.107	10.608	15.628	2.624	6.750	29.214
2023		-6.413	-0.150	11.036	16.914	2.795	7.115	31.297
2024		0.000	-0.149	12.173	18.115	3.029	7.500	40.669
2025		0.000	-0.149	13.046	19.414	3.246	7.906	43.463
2026		0.000	-0.149	13.998	20.821	3.482	8.334	46.485
2027		0.000	-0.149	14.564	21.665	3.623	8.586	48.289
2028		0.000	-0.149	15.199	22.549	3.775	8.845	50.219
2029		0.000	-0.149	15.982	23.474	3.946	9.113	52.365
2030		0.000	-0.149	17.037	24.440	4.148	9.388	54.864
2031		0.000	-0.149	18.030	25.447	4.348	9.671	57.347
2032		6.413	-0.039	19.103	26.491	4.559	9.964	66.490
2033		-12.701	-0.149	13.520	27.455	4.097	10.265	42.487
2034		0.000	-0.149	18.728	28.963	4.769	10.575	62.885
2035		-6.413	-0.151	19.422	30.247	4.967	10.894	58.966
2036		0.000	-0.149	21.881	32.981	5.486	11.223	71.422
2037		0.000	-0.149	24.453	36.531	6.098	11.562	78.495
2038		0.000	-0.149	28.329	41.542	6.987	11.912	88.620
2039	154.341	0.000	-0.149	31.869	45.808	7.768	12.271	251.907
NPV =	(308.36)	(13.05)	(2.90)	183.05	274.91	45.80	107.44	118.22
25			benefits %	29.9%	45.0%	7.5%	17.6%	

Table 4-A-2

			Disc rate =	5.0%	generated =	20%	RV =	33%
Smokovac - Matesevo				**Costs & Benefits in Eur millions**				
							B / C ratio	1.28
Econ cost	-512.600			Length (km)	43.50		NPV =	€ 121.6
switch =	100%	-512.6					EIRR =	6.49%
	Road Agency Costs (RAC)			**Road User Benefits (RUE)**				**Net**
				Vehicle	**Travel**	**Generated**	**Accident**	**Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2010								
2011	-128.150							-128.150
2012	-128.150							-128.150
2013	-128.150							-128.150
2014	-128.150							-128.150
2015		0.000	-0.088	6.016	8.304	1.432	3.601	19.264
2016		-0.714	-0.088	6.470	9.039	1.551	3.849	20.107
2017		0.000	-0.088	7.256	9.853	1.711	4.112	22.843
2018		0.000	-0.088	7.836	10.732	1.857	4.392	24.729
2019		0.000	-0.088	8.431	11.692	2.012	4.688	26.735
2020		0.000	-0.088	9.130	12.736	2.187	5.003	28.967
2021		0.000	-0.792	9.943	13.874	2.382	5.337	30.743
2022		-7.300	-0.088	10.942	15.126	2.607	5.691	26.978
2023		0.000	-0.047	14.098	16.720	3.082	6.067	39.920
2024		0.000	-0.088	12.435	18.193	3.063	6.465	40.067
2025		0.000	-0.088	13.387	19.929	3.332	6.888	43.447
2026		0.000	-0.088	14.425	21.862	3.629	7.336	47.164
2027		-0.714	-0.088	14.971	22.937	3.791	7.563	48.459
2028		0.000	-0.088	16.530	24.712	4.124	7.798	53.076
2029		0.000	-0.088	18.217	27.347	4.556	8.040	58.071
2030		0.000	-0.088	20.567	30.894	5.146	8.289	64.808
2031		0.000	-0.088	23.743	35.409	5.915	8.546	73.524
2032		0.000	-0.088	24.769	36.711	6.148	8.811	76.350
2033		-7.300	-0.088	25.850	38.003	6.385	9.084	71.934
2034		4.508	0.012	30.110	39.679	6.979	9.365	90.654
2035		-4.508	-0.091	26.298	40.993	6.729	9.656	79.077
2036		0.000	-0.088	27.829	42.601	7.043	9.955	87.339
2037		0.000	-0.088	28.721	44.256	7.298	10.264	90.451
2038		-0.714	-0.088	29.579	45.873	7.545	10.582	92.777
2039	169.158	0.000	-0.088	31.245	47.535	7.878	10.910	266.637
NPV =	(337.97)	(9.00)	(1.68)	208.19	302.58	51.08	91.97	121.58
25			benefits %	31.8%	46.3%	7.8%	14.1%	

Table 4-A-3

			Disc rate =	5.0%	generated =	20%	RV =	33%
Farmaci - Smokovac				Costs & Benefits in Eur millions				
							B / C ratio	1.07
Econ cost	-148.100			Length (km)	15.35		NPV =	€ 14.7
switch =	100%	-148.1					EIRR =	5.67%
	Road Agency Costs			Road User Benefits				Net
				Vehicle	Travel	Generated	Accident	Benefits
Year	Constr.	Capital2	Recurrent	Operation	Time	Traffic	Savings	
2010								
2011								
2012								
2013								
2014								
2015								-
2016	-49.367							(49.367)
2017	-49.367							(49.367)
2018	-49.367	0.000						(49.367)
2019		0.000	0.003	1.009	2.607	0.362	1.258	5.238
2020		0.000	0.003	1.091	2.845	0.394	1.373	5.706
2021		0.000	-0.246	1.194	3.103	0.430	1.500	5.980
2022		-2.579	0.003	1.332	3.386	0.472	1.637	4.251
2023		2.873	0.003	1.883	3.734	0.562	1.788	10.842
2024		0.000	0.003	1.612	4.084	0.570	1.953	8.221
2025		0.000	0.003	1.766	4.471	0.624	2.132	8.996
2026		0.000	0.003	1.937	4.898	0.683	2.328	9.850
2027		0.000	0.003	2.017	5.101	0.712	2.422	10.254
2028		0.000	0.003	2.099	5.312	0.741	2.518	10.674
2029		0.000	0.003	2.181	5.532	0.771	2.619	11.106
2030		0.000	0.003	2.257	5.760	0.802	2.724	11.546
2031		0.000	0.003	2.340	5.997	0.834	2.833	12.006
2032		0.000	0.003	2.459	6.241	0.870	2.946	12.519
2033		-2.579	0.003	2.591	6.493	0.908	3.064	10.481
2034		2.873	0.003	3.444	6.822	1.027	3.187	17.355
2035		0.000	0.003	2.835	7.109	0.994	3.314	14.255
2036		0.000	0.003	2.957	7.413	1.037	3.447	14.857
2037		0.000	0.003	3.086	7.730	1.082	3.585	15.485
2038		0.000	0.003	3.220	8.061	1.128	3.728	16.140
2039		0.000	0.003	3.357	8.407	1.176	3.877	16.821
2040		0.000	0.003	3.495	8.768	1.226	4.032	17.524
2041		0.000	0.003	3.625	9.144	1.277	4.193	18.242
2042		0.000	0.003	3.737	9.428	1.316	4.323	18.808
2043		0.000	0.003	3.853	9.720	1.357	4.457	19.391
2044	48.873	0.000	0.003	3.973	10.021	1.399	4.596	68.865
NPV =	(98.94)	0.20	(0.17)	31.64	78.45	11.01	36.90	14.65
			benefits %	20.0%	49.7%	7.0%	23.4%	

Table 4-A-4

		Disc rate =	5.0%	generated =	20%	RV =	33%	
Virpazar - Farmaci			**Costs & Benefits in Eur millions**					
						B / C ratio	1.24	
Econ cost	-221.000			Length (km)	22.90	NPV =	€ 46.1	
switch =	100%	-221.0				EIRR =	6.22%	
	Road Agency Costs			**Road User Benefits**				**Net**
				Vehicle	**Travel**	**Generated**	**Accident**	**Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2010								
2011	-55.250							-55.250
2012	-55.250							-55.250
2013	-55.250							-55.250
2014	-55.250							-55.250
2015		0.000	-0.025	0.390	2.924	0.331	2.588	6.209
2016		0.000	-0.037	-0.183	3.212	0.303	2.805	6.099
2017		0.000	-0.037	-0.192	3.543	0.335	3.040	6.688
2018		0.000	-0.037	-0.218	3.913	0.369	3.294	7.321
2019		0.000	-0.037	-0.300	4.326	0.403	3.570	7.962
2020		0.000	-0.037	-0.452	4.788	0.434	3.869	8.602
2021		0.000	-0.408	-0.629	5.301	0.467	4.194	8.925
2022		-3.842	-0.037	-0.748	5.878	0.513	4.545	6.309
2023		0.000	-0.037	0.501	6.675	0.718	4.926	12.782
2024		0.000	-0.037	0.946	7.608	0.855	5.339	14.712
2025		0.000	-0.037	2.995	10.962	1.396	5.786	21.101
2026		1.803	0.040	4.288	13.020	1.731	6.271	27.153
2027		-1.803	-0.038	2.781	13.359	1.614	6.466	22.378
2028		0.000	-0.037	3.012	13.772	1.678	6.666	25.092
2029		0.000	-0.037	3.019	14.202	1.722	6.873	25.778
2030		0.000	-0.037	2.938	14.652	1.759	7.086	26.398
2031		0.000	-0.037	2.743	15.119	1.786	7.305	26.917
2032		0.000	-0.037	2.537	15.603	1.814	7.532	27.448
2033		-3.842	-0.037	2.355	16.083	1.844	7.765	24.168
2034		0.000	-0.037	4.372	16.806	2.118	8.006	31.264
2035		0.000	-0.037	5.747	18.975	2.472	8.254	35.412
2036		0.000	-0.037	8.247	22.726	3.097	8.510	42.542
2037		1.803	0.064	12.489	28.761	4.125	8.774	56.015
2038		0.000	-0.037	15.296	36.251	5.155	9.046	65.710
2039	72.930	-1.803	-0.040	15.514	37.144	5.266	9.326	138.337
NPV =	(145.71)	(4.02)	(0.70)	32.27	148.83	18.11	75.46	46.09
25			benefits %	11.7%	54.2%	6.6%	27.5%	

Table 4-A-5

			Disc rate =	5.0%	generated =	0%	RV =	40%
Durmani - Virpazar (& 2nd tunnel)				Costs & Benefits in Eur millions				
							B / C ratio	1.71
Econ cost	-92.710			Length (km)	11.70		NPV =	€ 62.9
switch =	100%	-92.71					EIRR =	11.89%
	Road Agency Costs (RAC)			Road User Benefits (RUE)				Net
				Vehicle	Travel	Generated	Accident	Benefits
Year	Constr.	Capital2	Recurrent	Operation	Time	Traffic	Savings	
2010								
2011								
2012								
2013								
2014	-30.903							(30.903)
2015	-30.903							(30.903)
2016	-30.903							(30.903)
2017		0.000	-0.190	-0.146	1.438	-	1.797	2.899
2018		0.000	-0.190	-0.244	1.589	-	1.940	3.095
2019		0.000	-0.190	-0.378	1.757	-	2.095	3.285
2020		-1.966	0.000	-0.533	1.942	-	2.262	1.705
2021		0.000	0.000	0.088	2.211	-	2.442	4.741
2022		0.000	0.000	0.170	2.471	-	2.637	5.277
2023		0.000	0.000	0.326	2.769	-	2.847	5.942
2024		0.000	0.000	0.775	3.466	-	3.074	7.314
2025		0.000	0.000	2.111	5.293	-	3.319	10.723
2026		0.983	0.000	2.459	5.729	-	3.583	12.754
2027		0.000	0.000	1.421	5.846	-	3.694	10.961
2028		0.000	-0.190	1.260	6.022	-	3.809	10.901
2029		0.000	0.000	1.121	6.203	-	3.927	11.251
2030		-1.966	0.000	0.899	6.385	-	4.049	9.367
2031		0.000	0.000	1.904	6.663	-	4.174	12.741
2032		0.000	0.000	2.001	6.891	-	4.303	13.195
2033		0.000	0.000	2.145	7.133	-	4.437	13.715
2034		0.000	0.000	2.690	7.926	-	4.574	15.191
2035		0.000	0.000	3.889	9.557	-	4.716	18.162
2036		0.000	0.105	5.918	12.194	-	4.862	23.079
2037		0.983	0.000	9.228	16.567	-	5.013	31.791
2038		0.000	0.000	7.824	16.925	-	5.169	29.917
2039		0.000	-0.190	7.646	17.278	-	5.329	30.063
2040		0.000	0.000	7.517	17.641	-	5.494	30.652
2041	37.084	0.000	-0.190	7.970	19.723	-	6.208	70.795
NPV =	(56.33)	(1.65)	(0.70)	26.09	83.83	-	48.23	62.88
			benefits %	16.5%	53.0%	0.0%	30.5%	

Table 4-A-6
Median traffic growth scenario – Matesevo-Boljare

			Disc rate =	5.0%	generated =	20%	RV =	33%
Matesevo - Boljare				**Costs & Benefits in Eur millions**				
		Median growth forecast					B / C ratio	1.08
Econ cost	-467.700			Length (km)	75.70		NPV =	€ 26.3
switch =	100%	-467.7					EIRR =	5.40%
	Road Agency Costs			**Road User Benefits**				**Net**
				Vehicle	**Travel**	**Generated**	**Accident**	**Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2010								
2011	-116.925							-116.925
2012	-116.925							-116.925
2013	-116.925							-116.925
2014	-116.925							-116.925
2015		0.000	-0.149	5.963	8.926	1.489	4.171	20.400
2016		0.000	-0.149	6.315	9.452	1.577	4.370	21.564
2017		0.000	-0.149	6.679	10.012	1.669	4.578	22.789
2018		0.000	-0.149	7.043	10.608	1.765	4.796	24.063
2019		0.000	-0.149	7.362	11.241	1.860	5.024	25.338
2020		0.000	-0.149	7.804	11.911	1.972	5.262	26.800
2021		0.000	-1.374	8.321	12.616	2.094	5.512	27.168
2022		-6.288	-0.107	9.073	13.367	2.244	5.773	24.061
2023		-6.413	-0.150	9.378	14.373	2.375	6.046	25.610
2024		0.000	-0.149	10.277	15.294	2.557	6.332	34.311
2025		0.000	-0.149	10.942	16.282	2.722	6.631	36.429
2026		0.000	-0.149	11.663	17.348	2.901	6.944	38.706
2027		0.000	-0.149	12.054	17.931	2.999	7.106	39.941
2028		0.000	-0.149	12.496	18.538	3.103	7.272	41.260
2029		0.000	-0.149	13.051	19.169	3.222	7.441	42.734
2030		0.000	-0.149	13.818	19.823	3.364	7.614	44.470
2031		0.000	-0.149	14.524	20.498	3.502	7.791	46.166
2032		6.413	-0.039	15.282	21.193	3.648	7.971	54.467
2033		-12.701	-0.149	10.742	21.812	3.255	8.155	31.114
2034		0.000	-0.149	14.775	22.850	3.763	8.343	49.581
2035		-6.413	-0.151	15.215	23.696	3.891	8.535	44.774
2036		0.000	-0.149	17.021	25.656	4.268	8.730	55.525
2037		0.000	-0.149	18.886	28.215	4.710	8.930	60.593
2038		0.000	-0.149	21.724	31.856	5.358	9.134	67.922
2039	154.341	0.000	-0.149	24.262	34.873	5.914	9.342	228.583
NPV =	(308.36)	(13.05)	(2.90)	151.01	226.80	37.78	89.19	26.30
25			benefits %	29.9%	44.9%	7.5%	17.7%	

Table 4-A-7

Median traffic growth scenario – Smokovac-Matesevo

			Disc rate =	5.0%	generated =	20%	RV =	33%
Smokovac - Matesevo (central motorway)				**Costs & Benefits in Eur millions**				
		Median growth forecast					B / C ratio	1.05
Econ cost	-512.600			Length (km)	43.50		NPV =	€ 20.9
switch =	100%	-512.6					EIRR =	5.28%
	Road Agency Costs (RAC)			**Road User Benefits (RUE)**				**Net Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Vehicle Operation**	**Travel Time**	**Generated Traffic**	**Accident Savings**	
2010								
2011	-128.150							-128.150
2012	-128.150							-128.150
2013	-128.150							-128.150
2014	-128.150							-128.150
2015		0.000	-0.088	5.378	7.424	1.280	3.219	17.213
2016		-0.714	-0.088	5.748	8.031	1.378	3.420	17.775
2017		0.000	-0.088	6.406	8.700	1.511	3.631	20.159
2018		0.000	-0.088	6.876	9.417	1.629	3.853	21.687
2019		0.000	-0.088	7.351	10.194	1.755	4.088	23.299
2020		0.000	-0.088	7.910	11.034	1.894	4.334	25.084
2021		0.000	-0.792	8.559	11.943	2.050	4.594	26.355
2022		-7.300	-0.088	9.359	12.937	2.230	4.868	22.006
2023		0.000	-0.047	11.980	14.209	2.619	5.156	33.916
2024		0.000	-0.088	10.498	15.359	2.586	5.458	33.813
2025		0.000	-0.088	11.228	16.715	2.794	5.777	36.425
2026		0.000	-0.088	12.019	18.216	3.023	6.112	39.281
2027		-0.714	-0.088	12.391	18.984	3.137	6.260	39.969
2028		0.000	-0.088	13.590	20.317	3.391	6.411	43.620
2029		0.000	-0.088	14.876	22.331	3.721	6.565	47.405
2030		0.000	-0.088	16.681	25.057	4.174	6.723	52.547
2031		0.000	-0.088	19.126	28.523	4.765	6.884	59.210
2032		0.000	-0.088	19.816	29.369	4.918	7.049	61.063
2033		-7.300	-0.088	20.538	30.192	5.073	7.217	55.632
2034		4.508	0.012	23.755	31.305	5.506	7.389	72.476
2035		-4.508	-0.091	20.602	32.115	5.272	7.564	60.954
2036		0.000	-0.088	21.648	33.139	5.479	7.744	67.920
2037		0.000	-0.088	22.183	34.182	5.637	7.927	69.841
2038		-0.714	-0.088	22.682	35.177	5.786	8.114	70.957
2039	169.158	0.000	-0.088	23.787	36.188	5.998	8.306	243.348
NPV =	(337.97)	(9.00)	(1.68)	171.00	248.11	41.91	76.21	20.87
25			benefits %	31.8%	46.2%	7.8%	14.2%	

Table 4-A-8
Djurmani – Boljare – all sections

			Disc rate =	5.0%	generated =		RV =	33%
Djurmani - Boljare - all sections				**Costs & Benefits in Eur millions**				
							B / C ratio	1.23
Econ cost	-1442.11			Length (km)	169.150		NPV =	€ 317.7
switch =	100%	-1442.1					EIRR =	6.46%
	Road Agency Costs			**Road User Benefits**				**Net**
				Vehicle	**Travel**	**Generated**	**Accident**	**Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2010								
2011	-300.325							-300.325
2012	-300.325							-300.325
2013	-300.325							-300.325
2014	-331.228							-331.228
2015	-30.903	0.000	-0.262	13.075	21.213	3.429	10.854	17.405
2016	-80.270	-0.714	-0.275	13.394	22.890	3.628	11.572	(29.776)
2017	-49.367	0.000	-0.465	14.482	26.173	3.936	14.133	8.893
2018	-49.367	0.000	-0.465	15.400	28.325	4.238	15.092	13.224
2019	0.000	0.000	-0.462	17.207	33.275	4.910	17.373	72.303
2020		-1.966	-0.272	18.244	36.060	5.289	18.582	75.936
2021		0.000	-2.820	20.263	39.143	5.711	19.875	82.171
2022		-20.008	-0.230	22.304	42.488	6.215	21.260	72.029
2023		-3.540	-0.231	27.845	46.811	7.156	22.743	100.784
2024		0.000	-0.272	27.942	51.466	7.517	24.331	110.983
2025		0.000	-0.272	33.305	60.068	8.597	26.032	127.729
2026		2.786	-0.195	37.106	66.330	9.525	27.853	143.405
2027		-2.517	-0.273	35.753	68.908	9.739	28.731	140.341
2028		0.000	-0.462	38.101	72.368	10.319	29.636	149.962
2029		0.000	-0.272	40.519	76.759	10.995	30.571	158.571
2030		-1.966	-0.272	43.698	82.132	11.855	31.535	166.982
2031		0.000	-0.272	48.760	88.635	12.883	32.529	182.535
2032		6.413	-0.162	50.868	91.937	13.391	33.556	196.003
2033		-26.421	-0.272	46.461	95.167	13.235	34.615	162.784
2034		7.381	-0.172	59.344	100.196	14.892	35.707	217.349
2035		-10.921	-0.276	58.190	106.882	15.163	36.834	205.872
2036		0.000	-0.168	66.831	117.914	16.663	37.997	239.238
2037		2.786	-0.172	77.977	133.846	18.603	39.197	272.238
2038		-0.714	-0.272	84.247	148.652	20.815	40.436	293.164
2039	475.896	-1.803	-0.465	89.631	156.172	22.088	41.713	783.232
NPV =	(998.35)	(27.40)	(6.02)	464.20	844.66	122.36	340.25	317.68
			benefits %	26.2%	47.7%	6.9%	19.2%	

Table 4-A-9
All sections - Median Traffic growth assumption

			Disc rate =	5.0%	generated =		RV =	33%
Djurmani - Boljare - all sections				Costs & Benefits in Eur millions				
		Median Traffic growth					B / C ratio	1.01
Econ cost	-1442.11			Length (km)	169.150		NPV =	€ 43.3
switch =	100%	-1442.1					EIRR =	5.21%
	Road Agency Costs			Road User Benefits				Net
				Vehicle	Travel	Generated	Accident	Benefits
Year	Constr.	Capital2	Recurrent	Operation	Time	Traffic	Savings	
2010								
2011	-300.325							-300.325
2012	-300.325							-300.325
2013	-300.325							-300.325
2014	-331.228							-331.228
2015	-30.903	0.000	-0.262	11.690	18.965	3.065	9.703	12.258
2016	-80.270	-0.714	-0.275	11.900	20.337	3.224	10.281	(35.517)
2017	-49.367	0.000	-0.465	12.787	23.110	3.476	12.479	2.020
2018	-49.367	0.000	-0.465	13.513	24.853	3.719	13.242	5.495
2019	0.000	0.000	-0.462	15.003	29.012	4.281	15.147	62.982
2020		-1.966	-0.272	15.806	31.241	4.583	16.098	65.490
2021		0.000	-2.820	17.443	33.696	4.916	17.109	70.344
2022		-20.008	-0.230	19.077	36.341	5.316	18.184	58.679
2023		-3.540	-0.231	23.662	39.779	6.081	19.327	85.077
2024		0.000	-0.272	23.590	43.450	6.346	20.542	93.655
2025		0.000	-0.272	27.934	50.380	7.210	21.833	107.085
2026		2.786	-0.195	30.917	55.265	7.936	23.207	119.916
2027		-2.517	-0.273	29.591	57.033	8.061	23.779	115.674
2028		0.000	-0.462	31.324	59.496	8.483	24.365	123.206
2029		0.000	-0.272	33.087	62.681	8.979	24.964	129.439
2030		-1.966	-0.272	35.442	66.615	9.615	25.577	135.011
2031		0.000	-0.272	39.278	71.399	10.378	26.204	146.986
2032		6.413	-0.162	40.695	73.550	10.713	26.845	158.054
2033		-26.421	-0.272	36.913	75.608	10.515	27.501	123.843
2034		7.381	-0.172	46.819	79.050	11.749	28.171	172.999
2035		-10.921	-0.276	45.587	83.734	11.879	28.857	158.859
2036		0.000	-0.168	51.987	91.725	12.962	29.558	186.064
2037		2.786	-0.172	60.226	103.377	14.368	30.275	210.861
2038		-0.714	-0.272	64.603	113.991	15.962	31.007	224.577
2039	475.896	-1.803	-0.465	68.236	118.894	16.816	31.756	709.330
NPV =	(998.35)	(27.40)	(6.02)	380.12	691.97	100.36	281.39	43.28
			benefits %	26.1%	47.6%	6.9%	19.4%	

APPENDIX 4 – B Development benefits & treatment of generated traffic

1 Introduction

1.1 Definition of traffic flows

Normal traffic is defined as: traffic flows in the corridor without any new investment. Generated, induced, and diverted traffic may then be defined as follows:

- **Generated traffic**: Traffic associated with existing users of the corridor driving more frequently or driving longer distances than before. Traffic movement which would not have arisen without the improvement to the corridor.
- **Induced traffic**: Traffic attracted to the project road from other roads, changing its origin or destination due to increased economic activity (which may be brought about or induced by the project) in the road zone of influence.
- **Diverted traffic**: Traffic that diverts to the project road from an alternative road with the same origin and destination as the project road or sections thereof.

1.2 Economic effects of a major transport improvement

The general concept is that improvements in transport reduce the time and cost of travel, as will be unquestionably the case for the Durmani-Boljare motorway. Reductions in travel time and cost may alter travel patterns and thus affect traffic volumes, patterns of land use, the operation of labour markets, and both the location and organisation of businesses. Major transport changes certainly do affect the economy at both national and regional levels, but hard evidence (i.e., ex post) is very scarce. The evidence that is available does not show that new transport investment has a major impact on economic growth in a country with an already well-developed infrastructure; but such is clearly not the case in Montenegro, which for many years has suffered from under-investment in both the road and railway transport network. Commentary in this section is largely drawn from reports prepared by NERA (National Economic Research Associates) for the UK Department of the Environment, Transport and the Regions *A Framework for Assessing Studies of the Impact of Transport Infrastructure on Economic Activity.* (*J. Dodgson, NERA, Nov. 1999*).

In some circumstances a major transport investment may have impacts which are additional to those measured by the conventional cost benefit analysis. However, these could be either positive or negative. A new road may bring added economic benefits to an area needing regeneration, but in some circumstances the opposite might occur. Better communications will enlarge the markets for goods, services and labour, but a given area as a whole may gain or lose from this, depending on the structure and competitiveness of the local economy. The persistent (often merely implicit) assumption that the benefit of improved accessibility will always accrue to the target area may sometimes be misplaced.

The consensus of studies in Britain and elsewhere in Europe is that there is no simple unambiguous link between transport provision and local regeneration.

The potential impacts on development in a particular region can be classified in a number of ways, but the following is an outline:

- Population and housing
- Effects on existing firms via product markets
- Effects on location decisions
- Formation of new businesses
- Effects on the labour market

2 Population and Housing

The new motorway has clearly a potential for influencing the spatial distribution of population and hence housing development. People deciding to live further from their workplace may want to trade off the higher cost (longer distance) of traveling to work against lower house prices. In turn, housing development will generate demands for local labour, and perhaps stimulate local firms in supplying materials, etc. The increasing local populations (e.g., of settlements further away from Podgorica) will also increase local trade in other goods and services, such as restaurants and shopping centres. It should however be noted that any increase in house and land prices is only a pecuniary (money) benefit to the individual owners concerned, not an economic benefit to be counted for the motorway project.

3 Effects on Existing Firms via Product Markets

3.1 Substitution and Scale effects

The demand for transport is always a derived demand, for the final product. For products, reductions in cost of any input (i.e., in this case, transport cost) have two effects:

i) a substitution effect, when the firm minimizes the cost of producing a given level of output by substituting the (now cheaper) transport input for other inputs; and

ii) a scale effect, where the overall reduction in costs result in the firm being more competitive and being able to expand its market, either by lowering prices or by entering markets from which it was formerly excluded on cost grounds

3.2 The effects of enhanced competition

However, conversely, like any reduction in barriers to inter-regional trade, the improved transport link will expose firms in the region to greater competition from firms based elsewhere. Thus, gains in output and employment derived from increased potential to penetrate markets outside the region may be offset
by the erosion of local markets. The overall effect may be beneficial in welfare terms, but there is no guarantee that the net effect on employment will be positive within a given region.

3.3 Effects in the transport and distribution sector

The general framework for firms as given above also applies to transport and distribution businesses. However, the effects on competitiveness and the scale effects, noted above (3.1 ii) are likely to be greater for transport firms, since a high proportion of overall cost consists directly of transport cost.

4 Effects on Tourism

The above section refers to situations where transport cost is borne by the suppliers. However, tourism is a special case, because the cost of transport is being paid by the consumers. The improved transport links will reduce the generalized travel cost of those visiting the region, and using the normal assumptions, this will tend to increase visitor numbers. In fact, this is believed to be evidentially the case in the northern mountain region. A recent analysis of tourist visits showed that in 2006, while a total of 581,000 foreign visitors went to the coast, only some 19,000 went to the eleven municipalities in the north; a pitifully small number, about 3 percent.

In considering the tourism potential of the north region, there is skiing and snowboarding in the winter, but the summertime can attract sport fishermen, rock climbers and mountain walkers, para-gliding, and white-water rafting, inter alia. Apart from those engaged in extreme sports, many others (e.g., people with small children) might be interested in more simple pleasures such as walking and enjoying nature. Expansion of such tourism products will not simply spring to life overnight, but will require that specialist firms invest in their development[14]. However, a large proportion of eventual benefit will accrue, not to specialist firms (perhaps branches of firms already established in the coastal region) but to hotel and restaurant businesses and their locally employed staff. Although the other effects, as outlined in section 3 above, cannot be dismissed, in view of the gross imbalance in tourist destinations at present, it is considered very probable that the tourist industry will have the most to gain from the effect of improved access to the north.

Some useful observations about the effect of the north-south motorway were made by a local journalist (Vojin Golubovic) recently, as follows*: Transport is very important from the aspect of more balanced regional development. Underdevelopment of transport and local road networks in rural areas (especially of northern region) directly influences the poor utilisation agriculture potential in the mountain region and the possibility of transportation to city centres. The undeveloped road network also seems the limiting factor for tourism development, both in areas which are already traditional tourist destinations, and in areas which are gradually being included in the new tourist offer. The effects would be visible for regional development too. The development strategy will create preconditions for economic realisation of potentials in undeveloped areas of Montenegro, firstly through proceeding with construction of motorway Podgorica-Mateševo, then further towards border with Serbia, and then the road Risan-Grahovo*- Zabljak. Source: V. Golubovic "Transport Development" Biznis Montenegro Feb. 2008 pp 32-33 (unofficial LBG translation).

Recently, the leader of the Vienna Economic Forum (in conference near Budva 15th April 2008)[15] stated the view that new foreign investments should be more balanced, and specifically, that more new investment should be made in the winter tourist industry in the North.

[14] In a round table meeting held 08 February 2008, Minister Lompar noted that "the new motorway will not solve all the problems in the North".
[15] Montenegro Times 18April 2008, page 7.

5. Employment Effects

There is a mixture of economic entities in the country, some entirely owned by the state and some entirely owned by private individuals or companies. Based on the Labour Force Survey (LFS) a household sample survey of November 2005, Monstat estimated that total employment could be divided as shown in the table below.

Table 4B.1
Employment by ownership type

Total employment	178,815	100%
State ownership	70,068	39.2%
Private ownership	77,913	43.6%
Public /social	21,950	12.3%
Other types	8,884	5.0%

Thus in late 2005 the state-owned enterprises had a very significant share of the employment market, at 39 percent of the total workforce, although it is likely that by now (April 2008) this share is lower, as result of on-going government initiatives toward privatization or partial privatization of major employers. The total employment in 2005, by sector, is shown in the table below.

Table 4B.2
Employment by sector

Sector	Total	percent
Agriculture, forestry & water	15,432	8.6%
Manufacturing	21,893	12.2%
Construction, mining, etc	12,500	7.0%
Wholesale & retail trade	29,903	16.7%
Hotels & restaurants	11,005	6.2%
Transport & storage etc	14,617	8.2%
Public administration etc.	22,797	12.7%
Education	13,463	7.5%
Health & social work	12,243	6.8%
Financial, real estate	6,718	3.8%
Other service activities	18,244	10.2%
Total	178,815	100%

What seems surprising above is that given the importance of tourism in the economy (about 15% of value added GDP) hotels and restaurants accounted for only 6.2% of total employment, about 11,000 employees. It appears that the LFS must have counted only permanent[16] or year-round employees, not the many extra staff employed temporarily in summer months.

The structure of employment for the Coast region, Central region, Podgorica, and the North region is shown in the table below. As shown, there are some distinct regional differences, especially for the North region compared to the others.

[16] Since LFS was a household survey this is logical.

Table 4B.3
Employment by type and region, 2005

All employment	Total	Coastal	Podgorica	Central	Northern
	178,815	47,978	49,644	29,911	51,282
		27%	*28%*	*17%*	*29%*
Agriculture, forestry & water	15,432	1,611	611	1,888	11,322
		10%	*4%*	*12%*	*73%*
Manufacturing	21,893	3,137	9,160	5,198	4,398
		14%	*42%*	*24%*	*20%*
Construction, mining, etc	12,500	1,483	3,471	1,805	5,741
		12%	*28%*	*14%*	*46%*
Wholesale & retail trade	29,903	9,759	9,092	4,462	6,590
		33%	*30%*	*15%*	*22%*
Hotels & restaurants	11,005	5,425	1,735	1,003	2,842
		49%	*16%*	*9%*	*26%*
Transport & storage etc	14,617	6,990	3,717	1,192	2,718
		48%	*25%*	*8%*	*19%*
Public administration etc.	22,797	6,496	6,546	4,021	5,734
		28%	*29%*	*18%*	*25%*
Education	13,463	1,976	3,145	3,705	4,637
		15%	*23%*	*28%*	*34%*
Health & social work	12,243	5,250	3,584	1,198	2,211
		43%	*29%*	*10%*	*18%*
Financial, real estate	6,718	2,678	2,677	403	960
		40%	*40%*	*6%*	*14%*
Other service activities	18,244	3,170	5,913	5,035	4,126
		17%	*32%*	*28%*	*23%*
Population in 2007 (est)	**632,860**	**151,460**	**175,300**	**110,140**	**195,960**
employed as percent	28.3%	31.7%	28.3%	27.2%	26.2%
unemployed total (2006)	74,820	13,400	22,340	15,532	23,548
unemployed as percent	11.8%	8.8%	12.7%	14.1%	12.0%

Source: Monstat LFS, Nov 2005 (Table 7) and Statistical Yearbook 2007

The North consists of (in descending order of population) the eleven municipalities of Bijelo Polje, Berane, Pljevlja, Rozaje, Plav, Kolasin, Mojkovac, Andrijevica, Zabljak, Pluzine, and Savnik. The first three have a combined total of about 120,000 people, and the last three municipalities (Zabljak, Pluzine, and Savnik) have only some 11,000 people.

Central region consists of Cetinje, Danilovgrad, and Niksic; and for the purposes of analysis above, these three municipalities have been separated from the adjacent ‘region’ of Podgorica. Niksic is dominant in Central region with a population of more than 75,000. The Coastal region consists (in order from south to north) of the 6 municipalities: Ulcinj, Bar, Budva, Tivat, Kotor, and Herceg Novi. All are along the Adriatic Sea and they have a combined population only slightly less than that of Podgorica.

Some conclusions from the above data are as follows:

- The clear importance of the North in terms of agriculture, forestry and water supply. More than 70 percent of all workers in this sector are in the north;
- The North is also dominant in the construction and mining sector, largely from the coal mines at Pljevlja;
- In the North there is a very small representation for transport and storage workers, 19% of the total, while on the coast there are 48% of total employees in this category. This is likely to be mainly a function of the poor level of accessibility in the North, and in turn, the shortage of locally based transport companies may well inhibit the efficiency of agriculture and forestry industries in bringing their products to markets. Thus, the scale effect (see 3.1 ii above) may apply;
- Although nominally the north has its ‘fair share’ of employees in hotels and restaurants the coastal region has nearly 50 percent of all employees in the category, although this is certainly an under-estimate, i.e., does not include temporary staff working in summer.

6 An estimate of regional GDP for the North

Data on wage earnings were published by Monstat (March 2008 bulletin) giving average monthly wages by municipality. These are shown in the table below. In general, the highest annual growth rates of average disposable wage were recorded in low wage municipalities. The fastest growth rate (year on year) of 30%, was recorded in Zabljak, followed by Ulcinj (26%) Bijelo Polje (25%) and Rozaje (25%). Strong growth rates of wages in Zabljak and Ulcinj could be attributed to successful tourist seasons; while in the remaining municipalities the increase is probably due to a general increase in economic activity. The average wage in the municipality of Pljevlja is among the highest in the country (and annual growth rate also high) probably caused by the increase in mining sector wages, as the major economic activity in Pljevlja is the coal mine.

Table 4B.4
Average disposable wages in 2007 by municipality

Municipality	Growth rate % p.a.	Average disposable wage /month
Andrijevica	-4.8%	€ 176.23
Bar	20.2%	€ 197.55
Berane	10.7%	€ 182.40
Bijelo Polje	25.6%	€ 171.64
Budva	12.7%	€ 256.15
Cetinje	14.1%	€ 165.15
Danilovgrad	7.2%	€ 200.60
Herceg Novi	4.0%	€ 212.14
Kolašin	22.7%	€ 200.33
Kotor	9.4%	€ 248.96
Mojkovac	10.4%	€ 170.88
Nikšić	18.8%	€ 279.55
Plav	9.0%	€ 146.00
Pljevlja	22.5%	€ 261.14
Plužine	20.3%	€ 228.54
Podgorica	14.3%	€ 293.92
Rožaje	24.4%	€ 141.92
Šavnik	18.2%	€ 222.97
Tivat	13.2%	€ 239.85
Ulcinj	26.4%	€ 177.01
Žabljak	30.1%	€ 169.39
weighted mean		€ 235.22

Source: Monstat, March 2008 bulletin

Using the average wage data, approximate estimates of total GDP in 2007 were made for seven of the northern municipalities, that is: those directly in the zone of influence of the motorway. This is shown below.

Table 4B.5
GDP estimates for 7 northern municipalities (2007)

Municipality	GDP 000s	Popln 2007	per capita
Andrijevica	€ 12,933	5,700	€ 2,269
Berane	€ 81,017	34,500	€ 2,348
Kolasin	€ 25,276	9,800	€ 2,579
Mojkovac	€ 22,000	10,000	€ 2,200
Pljevlja	€ 134,147	39,900	€ 3,362
Rozaje	€ 41,477	22,700	€ 1,827
Zabljak	€ 8,941	4,100	€ 2,181
GDP n7 (000s)	€ 325,791	126,700	€ 2,571

Source: Consultant estimates

Thus the GDP total for these seven municipalities is approximately 325 million euros in 2007, or about 15 to 17 percent of the national total.

7 Estimates of trip making propensity

A final factor in the estimation of generated traffic for the central and northern sections of the motorway is taken from examination of the O-D survey data (discussed elsewhere). A comparison of trips by zone showed that in the northern zones, car trip rates per unit of population are much lower than for the rest of the country. This is particularly evident for the larger municipalities of Bijelo Polje, Berane, Pljevlja, and Rozaje, as shown in the table below. In fact with the apparent exception of Pluzine (where sample size is very small) all the northern municipalities have a lower propensity to travel than the national average (163 trips per thousand) and a far lower travel rate than the coastal region.

Table 4B.6
Estimates of car journey rates based on the O-D survey data

Municipality (zone)	Population 2007 (est)	as origin	as destination	Total O&D	O&D/ 000s population
Budva	16,780	5,147	4,305	9,452	563.3
Danilovgrad	16,790	2,519	3,082	5,601	333.6
Tivat	14,210	2,134	2,281	4,415	310.7
Kotor	22,050	3,493	3,109	6,602	299.4
Cetinje	18,010	2,611	2,532	5,143	285.6
Ulcinj	21,770	2,359	2,474	4,833	222.0
Plužine	3,900	419	431	850	217.9
Herceg Novi	34,010	3,671	3,363	7,034	206.8
Bar	42,640	3,732	4,236	7,968	186.9
Podgorica	175,300	12,758	11,871	24,629	140.5
Nikšić	75,340	3,852	4,916	8,768	116.4
Andrijevica	5,530	436	441	877	158.6
Kolašin	9,920	794	614	1,408	141.9
Bijelo Polje	50,820	2,787	2,913	5,700	112.2
Berane	35,340	1,804	1,857	3,661	103.6
Rožaje	23,890	1,157	1,199	2,356	98.6
Mojkovac	9,310	418	404	822	88.3
Šavnik	2,820	123	90	213	75.5
Pljevlja	35,130	1,179	1,246	2,425	69.0
Žabljak	4,360	126	70	196	45.0
Plav	14,940	168	230	398	26.6
Country	632,860	51,687	51,664	103,351	**163.3**

It is believed that, over and above the differences in mean incomes and car ownership rates, this situation is mainly due to lack of adequate accessibility, and hence if better access (including improvements to adjoining links) becomes a reality, there will be a considerable effect in terms of generated traffic on the motorway. For example, from the above data it was estimated that about 10 percent additional trips across the network would arise if propensity to travel in the 10 northern municipalities (in the shaded part of the table) above was brought to the average national value of 160 per thousand populations.

8 Development benefits and generated traffic

The question sometimes arises: should secondary benefits, often known as development benefits - be counted separately from road traffic benefits? It turns out that in most cases, they are one and the same thing. That is, having estimated generated traffic, all the secondary effects (or 'knock on' effects) in increased trade, etc., for given areas are then counted. This is because virtually all road transport is a derived demand, an intermediate good.

John Dodgson[17] shows that the conventional consumers' surplus (CS) area under the demand curve for an intermediate good (in this case transport) will give a true measure of the total benefits, both to firms and consumers, i.e.,

CS = 0.5 (c1-c2) (T1+T2) and CS is equal to 0.5 (p1-p2) (Q1+Q2)

where:

c1, c2 are travel costs, and T1, T2 are traffic volumes

p1, p2 are market prices and Q1, Q2 are quantities sold.

Dodgson concludes that the market for the intermediate good is able to value the CS correctly in a nearly perfect competitive model. However, if the firms (producers) concerned are monopolists, or for some other reason operate in an effectively non-competitive market, then transport benefits may either underestimate or overestimate the benefits. Thus the critical element for the prediction of transport benefits is the extent to which the producer sector can re-organize in a way to take maximum advantage of the transport improvement, i.e., this is the factor primarily affecting generation of traffic. Except that, in the 1973 paper, the case of tourism (see 4 above) was not considered, as the paper referred specifically to manufacturing industry effects.

Following this, the effect on real GDP in the North can be examined by comparing the generated traffic benefits (from the HDM-4 analyses) with the estimated GDP for the north as derived in section 6 above. Considering only the Smokovac-Matesevo motorway section and the northern motorway sections, of Matesevo-Berane & Berane-Boljare, the generated traffic annual benefits in the period 2023 to 2029 are compared with estimated regional GDP, in the table below.

Table 4B.7
Comparing generated traffic benefits with northern region GDP
(Euro millions per year)

Year	GDP estimate for northern region	Generated traffic benefit	Generated traffic % of GDP
2023	€ 587.1	€ 5.037	0.86%
2025	€ 622.8	€ 5.753	0.92%
2027	€ 660.8	€ 6.336	0.96%
2029	€ 701.0	€ 6.870	0.98%

[17] J.S. Dodgson: *External effects and secondary benefits in road investment appraisal* (Journal of Transport Economics & Policy, May 1973 pp 169-185)

It is concluded that the generated traffic projections, of 20 percent in the case of a full motorway, are conservatively estimated, having an effect of adding about 7 percent on the motorway traffic benefits, and thus an effect, assuming ideal conditions (see sections 3 and 4 above) of increasing regional GDP in the North by about 1.0 percent or to a possible maximum of about 1.5 percent.

9 Benefits to freight traffic through Port of Bar

Completion of Bar-Boljare motorway is effectively an imperative for further development of the Port of Bar. In this analysis the level of benefit to freight is a small proportion of total benefits. The HDM-4 model outputs show that benefits to long-distance freight traffic are about 6 percent of total benefits. Even so, the motorway will be a crucial factor in development of the Port, which is currently handling just over 2 million tonnes per year, but has a capacity of 4.5 million tonnes per year without further major additions to equipment and infrastructure. The Serbian authorities have indicated that their principal seaborne commerce would be transferred from Thessaloniki to Bar, once the complete motorway link from Belgrade to Bar is ready[18]. In 2006 and 2007 total tonnage was approximately equal at 2.2 million tonnes, and in 2007 there were 1,494 ship calls. At present only about 25% of the traffic is containerized, the majority consists of roll on-roll off (ro-ro) trucks from Bari in Italy. About 50 trucks per day are bound for Serbia. The railway (ZCG) also carries some goods from the port to Serbia, but this is a small element, total railway traffic from the port, including that to Podgorica, being no more than 200,000 tonnes in 2007.

At Bar, the port managers are sure that completion of the motorway will have a very positive effect in enhanced trade, and thus a major impact on increasing the pace of modernisation and investment there. However although it is possible that nearly all Serbian seaborne commerce would transfer to Bar, the managers are realistically expecting about 20 percent of Serbian traffic to move to Bar at the outset, and then in the longer term this percentage would increase as safe business connections are firmly established. This development has not been explicitly considered in the motorway analysis, and therefore benefits accruing to generated freight traffic may turn out to be underestimated.

References: Technical Memoranda no. 6, 8A, 12, 13A, 16 and 22

[18] Serbian Infrastructure Minister Velemir Ilic, announcement 19th March 2008.

5 ECONOMIC ANALYSIS – ADRIATIC-IONIAN MOTORWAY

5.1 Traffic data

The first table summarizes traffic forecasts[19] in year 2027 for the Adriatic-Ionian motorway, under three demand scenarios: A) and B) assuming the full roads program under the Physical Plan of Montenegro (PPM) has been implemented; then A) is the motorway with no tolls; and B) with tolls at the equivalent of 6 eurocents per vehicle-km. In both these cases the proposed coastal expressway is assumed as completed. For ***scenario C*** tolls are included on the motorway (as in B), but the coastal expressway is absent. Traffic volume is expressed as average annual daily traffic (AADT). For traffic characteristic purposes, the motorway route consists of three main sections: i) from BiH border (near Nudo) to Cevo; ii) from Cevo to the Podgorica bypass; and iii) from Podgorica to the Albanian border. In the summary below, local traffic from Podgorica to Tuzi (expected to be about 18,000 AADT in 2027) is excluded.

Table 5.1:
Year 2027 Traffic (AADT) on Adriatic-Ionian Highway under 3 scenarios

A: full PPM, no tolls	Nudo >	1,989	<Cevo>	11,219	<Podgorica>	6,442	< Border
B: full PPM, with tolls	Nudo >	1,530	<Cevo>	3,079	<Podgorica>	6,183	< Border
C: no coastal expressway, with tolls	Nudo >	4,240	<Cevo>	10,413	<Podgorica>	6,219	< Border

The above shows that under ***scenario A*** - assuming no tolls, traffic in the Cevo-Podgorica sector would attain about 11,200 vehicles per day, and for the Nudo (BiH border) to Cevo sector, about 2,000 per day. However under ***scenario B***, with tolls, traffic volume in 2027 on this route would be very low, at the maximum about 3,100 vehicles per day. Under ***scenario C***, assuming no coastal expressway, traffic in the Cevo-Podgorica sector would attain about 10,400 vehicles per day, and for the BiH border (Nudo) to Cevo sector, about 4,240 per day. In assessing the traffic effects of this alignment, it is equally important to look at volumes on nearby and adjacent links. The table below gives forecast 2027 volumes for the adjacent links, under the same three scenarios as above. Figures 5-1 to 5-3 on the following pages show the 2027 assigned traffic volumes on all the relevant links in the area.

[19] At the 'standard growth' estimate, see previous chapter.

Table 5.2:
Year 2027 Traffic on adjacent links

	Adjacent links:	A Full PPM, no tolls	B Full PPM with tolls	C No coastal expressway, with tolls
i	Tivat - Budva	36,182	36,880	28,517
ii	Cetinje -Podgorica	7,287	15,311	18,099
iii	Niksic -Danilovgrad	18,276	18,322	18,357
iv	Danilovgrad-Podgorica	23,252	23,100	23,135
v	Niksic - border BiH	2,327	2,454	3,138
vi	Niksic - Motorway jct.	4,645	4,643	4,046
vii	Motorway jct. - Cetinje	12,107	5,833	6,738

From the above table, it will be noted (row vii) that in the 'no tolls' case (A) a good proportion of the Cetinje traffic to and from Podgorica would use the motorway, but in the 'with tolls' case (B) this traffic would revert to the existing Podgorica-Cetinje road (ii). Thus, from Table 5.1 above, the modelled traffic volume in the Cevo-Podgorica sector is 11,219 per day without tolls, but only 3,079 with tolls.

Traffic on the coastal routes would be almost unaffected by the Adriatic-Ionian motorway; only that, as shown in Table 5.2, without the coastal expressway there would be quite severe suppression of traffic because of high levels of congestion, especially in the summer season.

The North-South motorway will serve the majority of the Montenegro population, directly serving about 140,000 people, not including Podgorica. In the northern municipalities there is clearly some considerable socio-economic benefit from the N-S motorway. On the other hand the Adriatic-Ionian motorway will serve only (excluding Podgorica) some 35,000 people directly, at maximum.

In 2027 total traffic volume (in vehicle-km) on the Adriatic-Ionian motorway is estimated at only about 15 percent of the 2027 volume on the Bar-Boljare motorway. Thus, given comparatively low traffic levels, it is clearly not feasible in economic terms. If operated commercially as a toll road, the overall financial return would certainly be strongly negative.

It is also clear that the present proposed alignment will not help to remove or alleviate traffic congestion from the coastal areas, i.e., Herceg Novi, Kotor, Tivat, Budva, Sveti Stefan, etc. Thus, the only real gainers would be those travellers from outside the country, to and from Bosnia and Albania, those travellers who do not wish to go to the coast; and these are comparatively few, even assuming a major element of generated traffic.

Possibly, the project concept could be transformed, into a high-standard non-tolled road from Herceg Novi and the Kotor Bay area to Podgorica. This might (for example) involve completion of the new road from Risan to Grahovo that is currently under construction, together with appropriate improvements for the Vilusi-Niksic-Podgorica corridor. Drive-through surveys by the study team have noted that dualizing (a four-lane road with median) the existing roads in this corridor is feasible in engineering terms.

Figure 5-1:
Modeled traffic in 2027 with NO TOLL and full PPM road plans implemented, plus coastal expressway

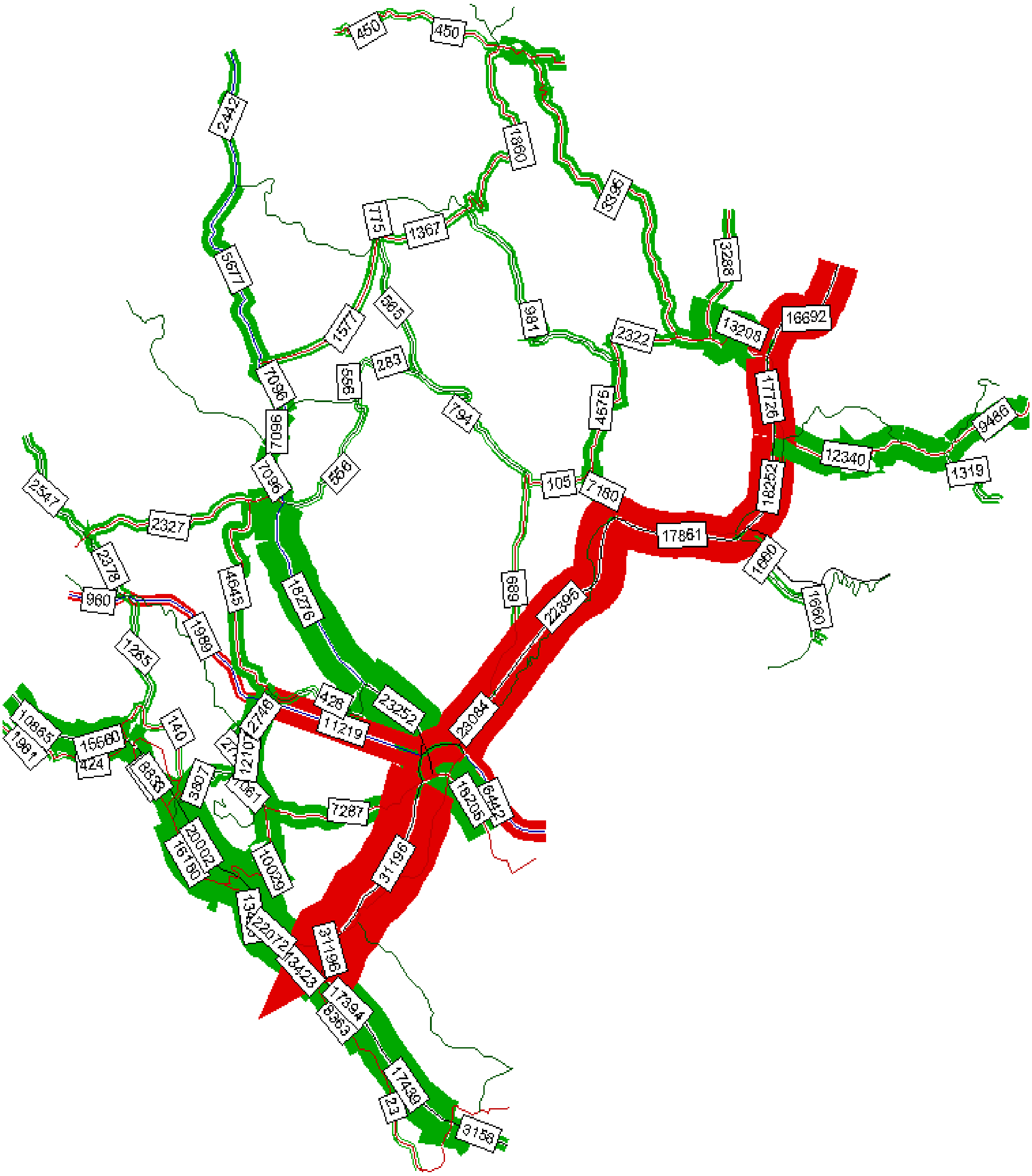


Figure 5-2:
Modeled traffic in 2027 WITH TOLL (6c/km) and full PPM road plans implemented, plus coastal expressway

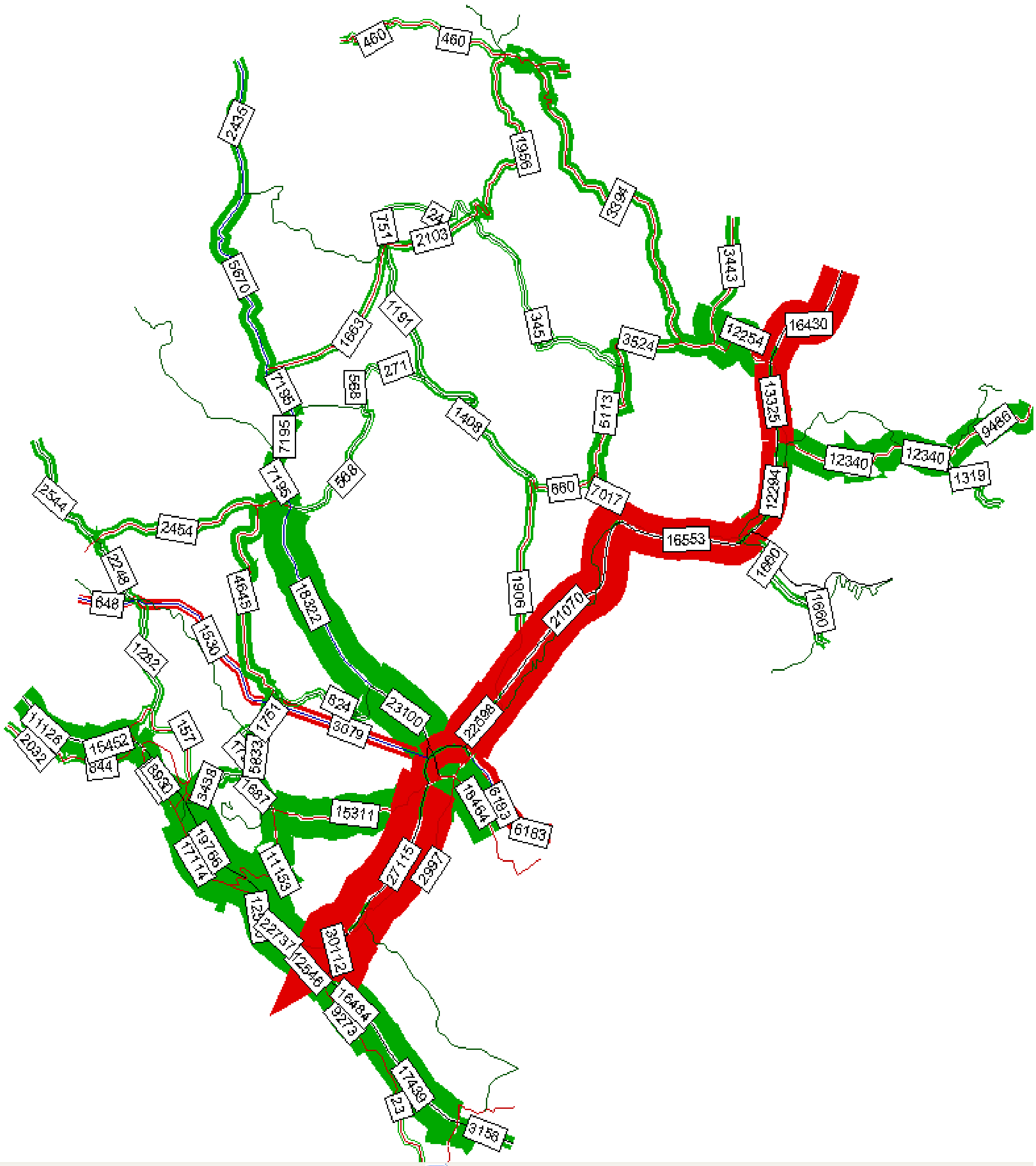
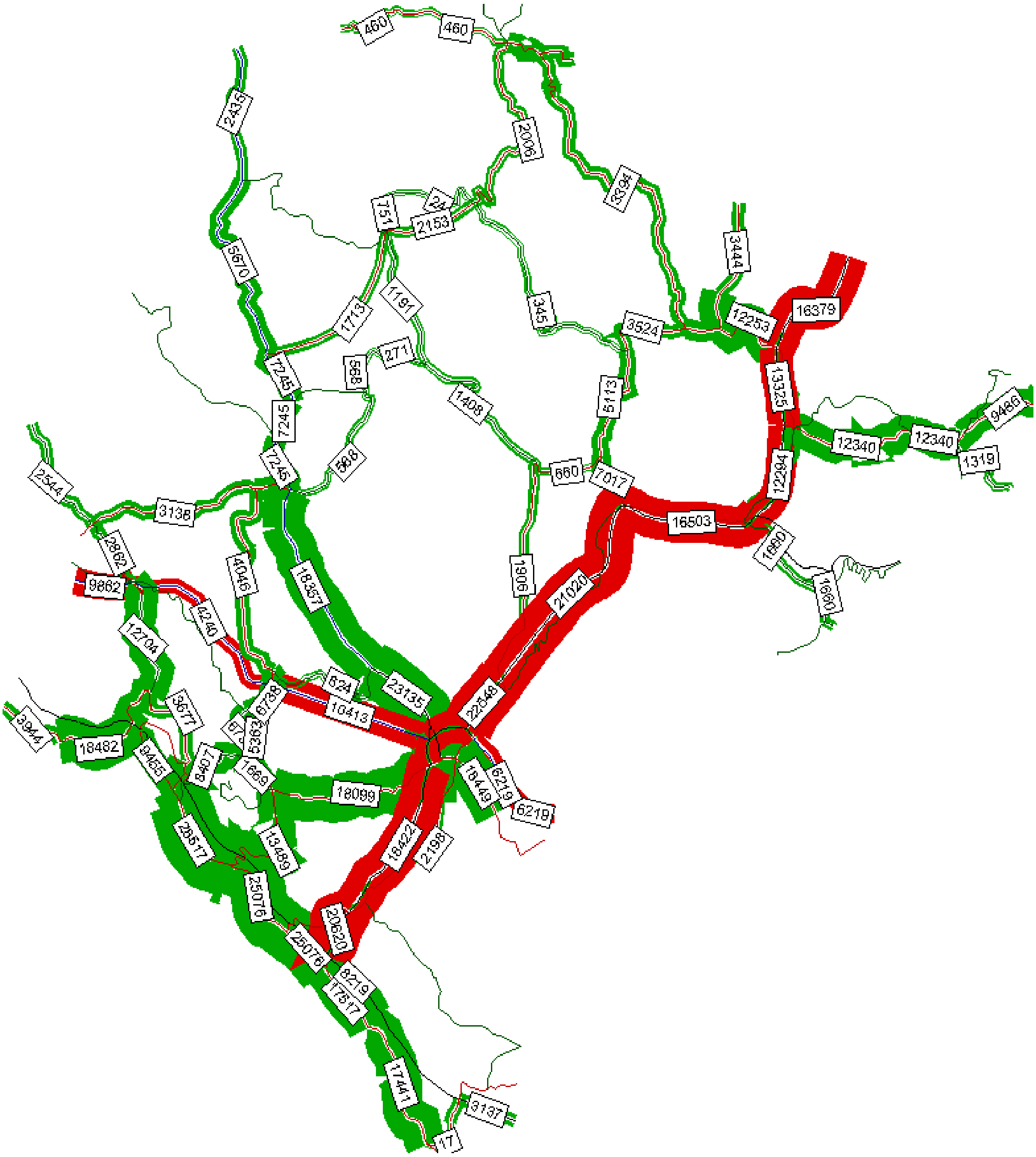


Figure 5-3:
Modeled traffic in 2027 with toll (6c/km) and NO coastal expressway



Finally, there is a potentially serious environmental difficulty with the present concept; this is that the quiet and picturesque valleys of Grahovo and Cevo would be considerably disturbed, both in the construction phase and afterwards. Although comparatively few people live in these valleys, they are relatively close to Podgorica, and the amenity value of the area for tourism and leisure purposes would be greatly diminished.

5.2 Economic analysis

The financial costs of the motorway section BiH border-Nudo-Cevo-Zelenika (Podgorica bypass) were estimated from the outline designs produced by SIMM Engineering and are given below. The entire length is 83.5km excluding the common section (of the Podgorica bypass) with the Bar-Boljare motorway.

Adriatic - Ionian motorway	€ millions
Works cost	458.0
Design & supervision (8%)	36.6
Additional interchange Cevo	35.0
Environmental mitigation (5%)	22.9
Total Financial cost	552.5

The length of the sections analyzed is 65.5 km (Nudo-Cevo 40.0km and Cevo-Podgorica 25.5km) and thus the financial cost is estimated as €433.43 million, or €346.7 million in economic terms.

An analysis using the HDM-4 model was carried out and results are given in the table below. The HDM comparison was made by comparing: all costs on the existing road from BiH border, namely Vilusi–Niksic–Danilovgrad to Podgorica, a total of 90.5 km; with all costs on the motorway from BiH border through Nudo to Cevo (40.0 km) and Cevo to Zelenika (Podgorica bypass) 25.5 km. Thus in this comparison there is a major distance saving, of 25 km, on the motorway. Genrated traffic of 25% of normal traffic is assumed, on the basis that the user cost (distance cost) saving is of the order of 40 percent. The remaining motorway section, from Podgorica via Tuzi to the Albanian border near Bozaj, was not analyzed mainly because there would be no distance savings and hence, much less benefit for road users than in the section described above.

This analysis shows that: considering a construction period from 2025 to 2027, and economic construction costs (for a full motorway to Podgorica 65.5km long) of Eur 346 million, at a discount rate of 5.0 percent the net present value (NPV) would be negative at minus Eur 126 million, and the economic internal rate of return (EIRR) would be 1.85 percent. The switch value for costs (i.e., that value of construction cost which (if achieved) would turn the NPV positive) is 55 percent. This indicates that the 65.5km project must cost no more than Eur 191 million in economic terms, or about Eur 238 million in financial terms, to produce a positive NPV.

Table 5.3
Cost Benefit analysis: Section from BiH border to Podgorica bypass

		Discount rate =		5.00%	generated =	25%	RV =	33%
Nudo-Podgorica motorway				**Costs & Benefits in Eur millions**				
	Adriatic-Ionian highway (part)						B / C ratio	0.55
Econ cost	-346.740			Length (km)	65.50		NPV =	€ (125.91)
switch =	100%	-346.74					EIRR =	1.85%
	Road Agency Costs			**Road User Benefits**				**Net**
				Vehicle	**Travel**	**Generated**	**Accident**	**Benefits**
Year	**Constr.**	**Capital2**	**Recurrent**	**Operation**	**Time**	**Traffic**	**Savings**	
2024	-115.580							(115.580)
2025	-115.580							(115.580)
2026	-115.580							(115.580)
2027		0.000	0.042	4.262	2.365	0.828	2.526	10.023
2028		0.000	0.042	4.482	2.439	0.865	2.604	10.432
2029		0.000	0.042	4.736	2.516	0.906	2.685	10.885
2030		0.000	0.056	5.014	2.596	0.951	2.768	11.386
2031		7.602	0.042	5.312	2.681	0.999	2.854	19.490
2032		0.000	0.042	4.790	2.746	0.942	2.942	11.462
2033		0.000	0.042	4.915	2.830	0.968	3.033	11.788
2034		0.000	0.042	5.013	2.917	0.991	3.127	12.090
2035		0.000	0.042	5.078	3.004	1.010	3.224	12.358
2036		0.000	0.042	5.138	3.092	1.029	3.324	12.625
2037		-10.920	0.042	5.197	3.180	1.047	3.427	1.973
2038		0.000	0.042	5.947	3.317	1.158	3.534	13.997
2039		0.000	0.042	6.228	3.422	1.206	3.643	14.541
2040		0.000	0.042	6.581	3.531	1.264	3.756	15.174
2041		0.000	0.042	6.963	3.645	1.326	3.873	15.848
2042		7.602	0.042	7.377	3.764	1.393	3.993	24.170
2043		0.000	0.042	6.703	3.858	1.320	4.116	16.040
2044		0.000	0.042	6.880	3.977	1.357	4.244	16.500
2045		0.000	0.042	7.024	4.100	1.391	4.376	16.932
2046		0.000	0.042	7.119	4.228	1.418	4.511	17.318
2047		0.000	0.042	7.207	4.358	1.446	4.651	17.703
2048		-10.920	0.042	7.294	4.487	1.473	4.795	7.171
2049		0.000	0.042	8.315	4.682	1.625	4.944	19.607
2050		0.000	0.042	8.698	4.836	1.692	5.097	20.365
2051	114.424	0.000	0.042	9.183	4.997	1.772	5.255	135.673
NPV =	(231.65)	(0.68)	0.60	81.54	45.68	15.90	48.72	(125.91)
			benefits %	42.5%	23.8%	8.3%	25.4%	

5.3 Conclusion

The results show that the most heavily trafficked part of this motorway would be in the Cevo junction to Podgorica section, which would, if there were no tolls, carry about 11,200 vehicles per day in 2027, but with tolls would attract only about 3,100 vehicles per day. The sensitivity of traffic volume to overall journey cost (including tolls) in this area is clearly apparent. In this southern area the road network is much denser than that to the north of Podgorica, and, assuming that the most important of the road proposals in the PPM will be implemented by 2027, there will be various good alternative routes.

The analysis concludes that in its present form the proposed alignment is not feasible in economic terms to open by year 2027. By deduction a similar conclusion would apply in financial terms. Revenues earned would be clearly insufficient to justify a concession arrangement.

References: Technical Memoranda no. 6, 8A, 11, 12, 16 and 21

6 FINANCIAL ANALYSIS – BAR-BOLJARE MOTORWAY

6.1 Introduction

Note: This revised Chapter presents an entirely new financial analysis based on the revision of phasing and scheduling for construction works that was carried out recently. In the original financial analysis, it was assumed that construction would take place under a two-phase programme starting in 2009 and ending in 2022, with 2-lane motorways being completed in the first phase or stage (2009-2015) and later upgraded to 4-lane motorways in a second phase (2016-2022). This chapter has also been revised (August 2008) in view of new results for traffic growth based on revised traffic assignments in the horizon year 2027.

In this analysis, capital investments are scheduled according to a one-phase only construction programme that runs from 2011 (or 2009) for 4-lane motorways. The reasons for this change are given in Technical Memorandum No. 30 which explains the engineering complexities of two-phase construction and concludes with recommending one-phase only. A second important difference from the previous analysis is that the section from Bar to Durmani (13.30km long) is now excluded from financial analysis since, although traffic capacity will be expanded, this section will not be designated as a toll road.

This chapter presents details of the financial model used and analysis undertaken for the Feasibility Study for the Highway Bar-Boljare Project. The objective of this analysis is to evaluate the financial feasibility of the investment program for the motorway.

The financial projections developed as part of this analysis are based on the traffic forecasts prepared by the LB project team. Since at present there is no toll road in the country, no information is available on existing or historical toll rate structures, toll revenues, or road operating expenditures.

The analysis involved the use of a financial model to simulate the cash flow of the motorways for a 30-year period between 2007 through 2037, with the objective of identifying the financial impact of the program under different investment scenarios.

The primary results of this analysis are presented in terms of the following indicators:

- Net Present Value (NPV) of the annual net cash flows;
- Internal Rate of Return (IRR).

Although much important data was obtained from the HDM-4 economic analyses and used as input to the model, this analysis was conducted without audited financial statements. In conducting the analysis, wherever data was lacking, it was necessary to include a series of assumptions based on the Consultant's experience in other similar road projects.

6.1.1 Financial Analysis Methodology

The methodology involved in conducting this financial feasibility analysis included:

- Estimating revenues of the highway over the various development phases, based on traffic projections and the price of tolls for different categories of vehicles as well as the source of other revenues;

- Project annual Operating Costs (OPEX) for the highway, including labour, operations and maintenance;
- Prepare preliminary cost estimates (CAPEX) for investment requirements for the various sections of highway and facilities;
- Prepare annual cash flows for the established planning horizon (30 years); and
- Determine the financial viability of the highway, in terms of its Net Present Value and Internal Rate of Return (IRR) - For this purpose, an appropriate discount rate was calculated that takes into account the risk-free rate, the commercial profit margin, the investment risk, the sovereign risk[20], exchange rate risks, etc.

The Consultant identified the potential tolls per km and different services that will take place at the highway. Based on this, the potential revenues were estimated, taking into consideration future tariff structures:

- Revenues from tolls - fees paid by vehicles for use of the highway. They are the main source of revenue;
- Revenues from rents and concessions - fees paid by concessionaires to operate shops (gift shops, restaurant, cafeterias, banks automated machines, etc.) and facilities in rest areas, and gas stations.
- Other miscellaneous revenues including among the others, advertising fees for billboards along the highway, or possible use of the highway to build hotels or install cell phone towers or other equipment.
- In line with other highway analyses, the revenues other than tolls are estimated to be in the range of 3% to 5% of toll revenues.

The Project's cost estimates for the financial analysis include capital investments, operations and maintenance costs. The investment costs include engineering, infrastructure construction, procurement, documentation, and supervision costs. Operating costs include, among other items, personnel, power, road maintenance, equipment operation, insurance, administrative services, and other costs such as security. Maintenance costs include the daily expenses for maintaining equipment as well as costs for repair of the runway and other facilities.

To undertake the analysis, models based on several assumptions have been developed. The impact of depreciation, interest payments and tax payments has not been considered in this analysis. It should be noted that the analysis conducted is not an "investment grade" analysis and the results of this analysis should not be used for making investment decisions.

[20] Risk that a foreign-owned company would take by investing in Montenegro

Figure 6-1:

Main Income and Cost Items for Financial Evaluation (Illustrative)

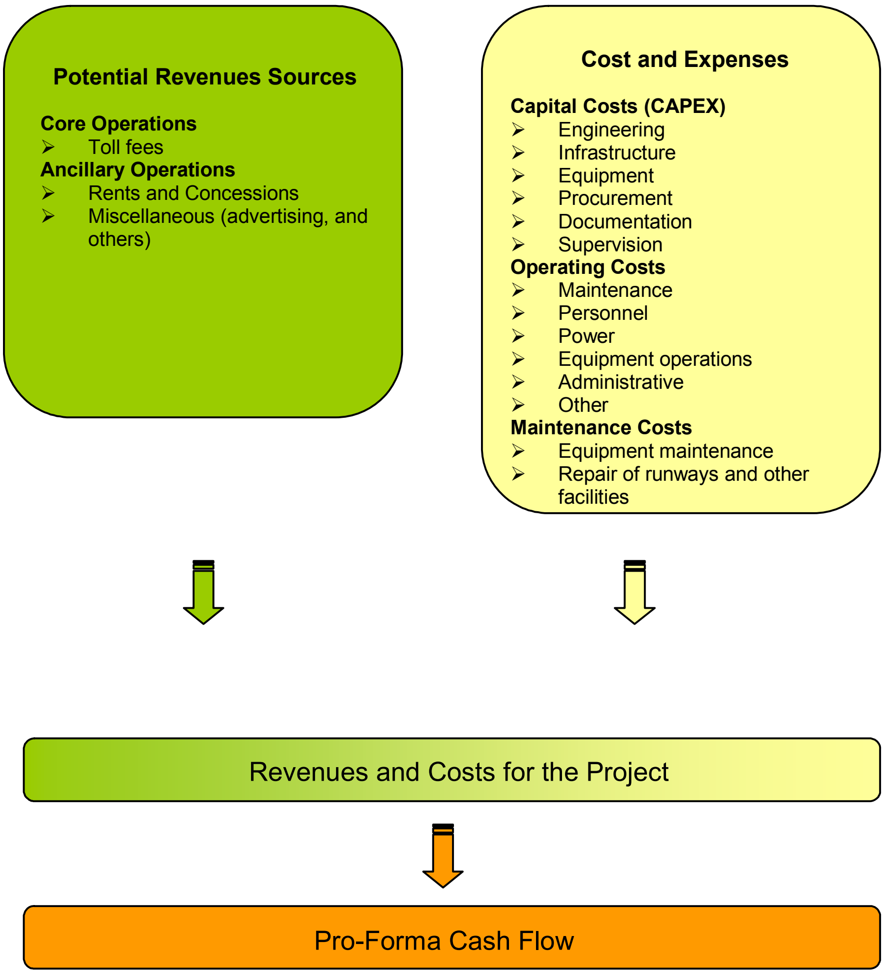
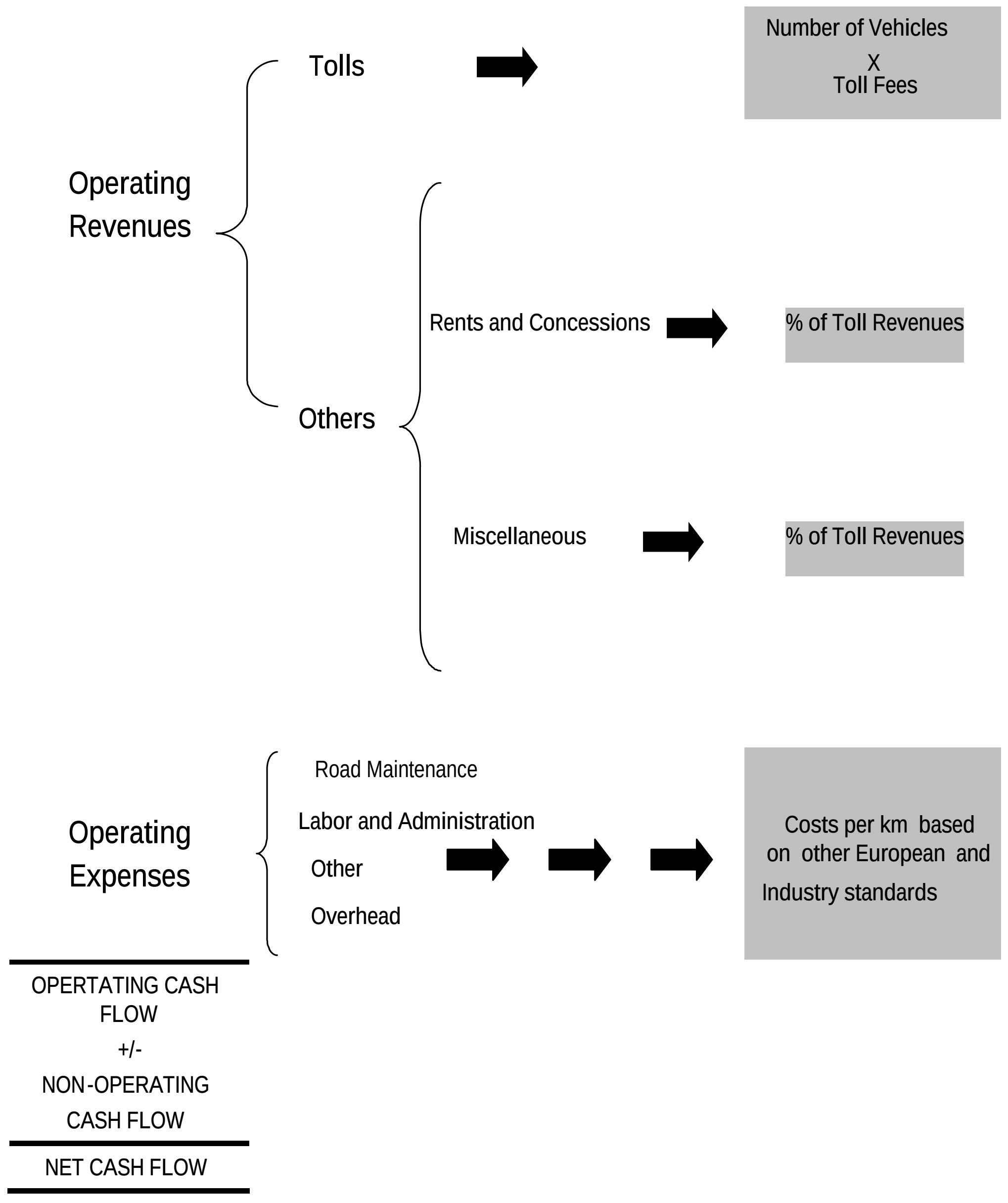


Figure 6-2: Simplified Structure of an Operating Cash Flow (OCFn) Formula (Conceptual)



6.1.2 Development of a Financial Model

As part of the financial feasibility study, a computerized financial evaluation model (in MS Excel) was developed, specifically designed for the requirements of the Project.

The model serves as a tool to help evaluate various scenarios and to conduct sensitivity analyses and test. Note however that the model was not designed to undertake analysis of potential financing structures that might be available to private entities (debt, equity, etc.).

The financial model uses the Discounted Free Cash Flow methodology, in which total income and expenses were estimated annually over the defined planning horizon, and the cash flows were discounted at an appropriate discount rate, from which the present value in monetary terms was determined. The discount rate, 8 percent annually, was calculated based on the Project's characteristics and by applying internationally accepted methodologies The methodology essentially involves a mathematical model which simulates operations on the motorway, as well as their ability to generate future cash flows.

The key metric used to estimate the Net Present Value (NPV) of the highway is the EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). The reasons for using the EBITDA as the key metric for the analysis are:

- EBITDA is the best operational metric to use since it looks at only the revenues from core operations and the costs incurred to support the core operations;
- Detailed financial information that identifies the long term assets (property, plant and equipment) held by the highway and the depreciation schedule for these long term assets was not available for this study. Therefore, the depreciation schedule for the upcoming years for the existing assets can not be projected. Since depreciation is a non-cash expense, it does not impact on the net free cash flow of the highway. Thus, by using EBITDA as the metric, the problem of estimating depreciation of existing assets is avoided.

The cash flows are then estimated for each year using the following relationship:

Free Cash Flow = EBITDA – Capital Investments

The Net Present Value (NPV) of the free cash flow stream is then estimated using an appropriate discount rate, as noted above.

The objective is to estimate the value of the highway to a potential private sector operator who will be given the rights to operate the highway for 30 years, after which the highway is returned to the Government of Montenegro at no cost.

6.2 Principal Assumptions

In developing the financial model and conducting the feasibility analysis, the Consultant has set parameters and made assumptions which include the following:

1) The evaluation horizon is 30 years, from 2008 to 2037.

2) The Traffic Forecast Scenario utilized in the model is firstly the 'Most Likely' growth scenario as presented in Technical Memorandum 13A. Secondly, the 'median traffic growth' and low traffic growth were examined and results obtained. (see results tables below)

3) The model results are expressed in Euros with constant purchasing power of January 2008.

4) Breakdown of Construction Costs:

   i) Alignment

   ii) Tunnels

   iii) Bridges

   iv) Junctions

   v) Other Works

   vi) Illumination, Communication

Construction costs include documentation, surveying, and supervision costs at 8% of works costs, and environmental protection / mitigation at 5% of works costs.

5) The discount rate is 8% in real terms (net of inflation) and further tests are using 10%.

6) Toll revenues were estimated based on current comparable European tariffs and forecast assumptions in terms of traffic.

7) Other Operating revenues were estimated based on comparable experiences with similar highways.

8) Operating costs - routine & periodic maintenance costs, snow clearance etc., were estimated using information output from HDM-4 analyses for the different highway sections.

6.3 Operating Revenues

Current operating revenues come from two major sources: toll revenues and, in much smaller amounts, from other operating revenues. The highway toll revenue is a function of the following:

- Starting forecast traffic tolls;
- Volume of traffic and category of vehicles;
- Increasing toll factor per category of vehicles.

The following assumptions have been made in the process of projecting toll revenues:

- The traffic volumes and generated traffic are defined using the study's prepared forecasts. The methodology and assumptions for the traffic forecasting are

- explained in detail in Technical Memoranda nos. 4, 13 and 13A. However in this analysis there are some variations (compared with the economic analysis) in total
- traffic; this is because there is some diminution of traffic growth resulting from real increases assumed for toll rates, see below;
- An elasticity ratio of -0.30 is assumed for an increase in real value of the toll (excluding inflation) where the toll increases and the traffic decreases as a consequence;
- Miscellaneous operating revenues are assumed at 2% of total toll revenues. Rent and Concessions revenues are assumed at 3% of total toll revenues;
- The toll fees are estimated using the rates shown in Table 6.1. Toll fees are collected by the highway operator on all vehicles using the facility. The toll rates below are shown per km, although in practice, for given sections, the cost per km to the user would vary slightly.

Table 6.1
Toll Rates (Eur/km) from 2008

Vehicle types	Toll Rate (Eur/km)
Cars/Motorcycles	0.06
Light Delivery Vehicle	0.09
Micro-Bus	0.12
Small Truck	0.15
Medium Truck	0.18
Bus	0.21
Articulated Trucks	0.24

Note: Toll rates in model increase by 2% per year in real terms.

6.4 Cost Estimates for Capital Expenditures (CAPEX)

According to the now recommended one-phase only construction method, an annual schedule of the investments has been included in the financial model. The proposed investment schedule is shown in the Table below.

Table 6.2
Capital Investments (Eur million)

Section	km	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Smokovac - Matesevo	43.5	160.2	160.2	160.2	160.2						640.8
Matesevo-Berane-Boljare	75.7				116.92	116.92	116.92	116.92	116.92		584.6
Virpazar-Smokovac	38.3					115.35	115.35	115.35	115.35		461.4
Durmani - Virpazar	11.65								57.95	57.95	115.9
Total	169.2	160.2	160.2	160.2	277.12	232.27	232.27	232.27	290.22	57.95	1,802.7

It should be noted that in this revision sensitivity tests for financial feasibility take account of construction schedules starting in year 2009 and 2010. These are given below in section 6.6.

6.5 Operating Expenses (OPEX)

The operating expenses for the highway were estimated using road maintenance costs and other general expenses from European standards and operators. The data was used to determine the labor, material and fuel, maintenance and other costs. Maintenance costs used here were output from the HDM-4 files, in financial cost terms. For maintenance, it is estimated that overlays and patching etc. will be needed roughly every 6 years in order to keep the highway at the same standards. Maintenance in the HDM-4 model is set to be responsive to road conditions. Additionally, salaries and other costs are estimated according to comparable European operators as a function of total expense per km, adjusted to reflect the economic and infrastructure condition of Montenegro.

6.6 Principal Results

The following table is the Net Present Value (NPV) and Internal Rate of Return (IRR) of cash flows obtained from the Financial Evaluation Model. Note that the Internal Rate of Return cannot be computed for a negative NPV. The present value of cash flow is discounted at 8 percent, see also sensitivity tests (below).

Table 6.3:
Summary of the Financial Feasibility Analysis
- Standard traffic growth scenario -

Year:	2012	2017	2022	2027	2032	2037	2039
Annual Demand in 000s							
Articulated Trucks	486	685	1,019	1,264	1,459	1,686	1,734
Bus	197	278	413	513	592	684	703
Cars/Motorcycles	11,343	16,004	23,801	29,525	34,076	39,370	40,503
Light Delivery Vehicle	302	426	634	786	907	1,048	1,078
Medium Truck	249	352	523	649	749	866	891
Micro-Bus	315	445	661	820	947	1,094	1,125
Small Truck	236	333	496	615	710	820	844
Total Demand	**13,128**	**18,523**	**27,547**	**34,173**	**39,440**	**45,567**	**46,878**
Revenues Euro 000s							
Toll Revenues	0	18,010	103,557	141,865	180,950	231,048	242,447
Other Operating Revenues	0	900	4,957	6,791	8,658	11,051	11,596
Total	**0**	**18,910**	**108,514**	**148,656**	**189,608**	**242,099**	**254,043**
Operations Costs (Euro 000s)	0	(2,225)	(28,004)	(8,715)	(12,128)	(16,742)	(8,715)
Operating Margins	**0**	**16,685**	**80,510**	**139,940**	**177,480**	**225,357**	**245,327**
Discount Rate 8.0%							
NPV Euro 000s	**(297,860)**						
Concessionaire							
Govt Payment Eur 000s	**35,000**	per year					
Concessionaire NPV	**99,383**						
Concessionaire IRR	**8.89%**						

Note: NPV is here estimated using a discount rate of 8%. For the IRR estimates, it is assumed that a private investor will pay 100% of the NPV for the rights to a concession for the motorway.

As shown above, the NPV for the project is negative which would make the project financially feasible only with subsidy or some form of annual external payment. A subsidy from government sources of an average 35 million Euros per year would make the project feasible, showing an IRR of nearly 9% for the concessionaire. Some sensitivity analyses are given in next section.

Sensitivity Analysis

Sensitivity analyses – for the standard traffic growth forecast - were run with different discount rates and different base toll rates, as shown in the tables below.

Table 6.4:
Sensitivity Tests

NPV (000 of Euros) - Changing Discount Rate		NPV
Discount	8%	(297,860)
Rate	10%	**(424,066)**
	11%	**(458,187)**
	12%	**(479,212)**
	13%	**(490,413)**

NPV (000 of Euros) - Changing Base Toll Rate		(297,860)
Base rate =	0.04	**(533,120)**
0.06	0.06	**(297,860)**
	0.08	**(62,601)**
	0.09	**55,029**

It might appear from the above that the toll rate for cars would need to be raised to about 9 eurocents per kilometer to achieve a positive NPV. However, it is important to note that the sensitivity analysis assumes that demand is relatively inelastic at -0.30 that is, the increase of toll rates to this level would not have a significant impact on the traffic volume.

Note that for a discount rate of 10% (if such were assumed as the risk hurdle) then the annual government subsidy would be in the range of 50-55 million euros.

Sensitivity Tests for lower traffic growth

The median and low growth forecasts can be expressed as follows:

- aggregate traffic in the 2012 -2017 period will be 7.4% lower for the median growth case and 14.8% lower for the low growth case, compared to the standard growth case.
- aggregate traffic in the 2012 -2022 period will be 10.7% lower for the median growth case and 20.7% lower for the low growth case.
- aggregate traffic in the 2012 -2027 period will be 15.7% lower for the median growth case and 27.4% lower for the low growth case.
- Precise calculations using the financial model were not made, however the NPV and annual subsidy in these lower growth cases was estimated - using the 8% discount rate, as follows:

	Median growth	Low growth
NPV	-450,0	-615,0
Annual payment	57,0	77,0

Additional tests were carried out for a building programme starting in 2009, and 2010. Results are shown in the table below.

Table 6.5:
Sensitivity tests for earlier start years

Amounts in Eur million	**2009**	**2010**
Discount rate = 8%		
NPV	-448.0	-380.5
Annual payment	45.0	45.0
Discount rate = 10%		
NPV	-608.0	-524.0
Annual payment	65.0	58.0
Discount rate = 12%		
NPV	-686.0	-589.4
Annual payment	85.0	74.0

It can be seen above that the effect of earlier construction starts is generally to induce a more negative NPV and consequently higher annual payments to the concessionaire would be required. Naturally also, as the discount rate (the 'hurdle' rate for a concessionaire) increases annual payments would increase very sharply.

6.7 Financing Strategy and Options

The results of the analysis discussed earlier provide us with different options in terms of private sector participation in the operations and maintenance of the motorway. It is clear that the motorway is not sustainable on its own, i.e., will not be able to entirely support its cost structure and generate reasonable returns for the investors.

It is important to comment that the financial analysis conducted here is only a financial assessment of possible scenarios. The actual profitability of the project will depend on other commercial, economic and political factors beyond the scope of this analysis. Also, note that the financial metrics used (principally NPV and IRR) reflect the current value of the highway, given the future traffic and revenue projections and future investment program. The financial analysis of a highway from a private investor's point of view is beyond the scope of work for this assignment.

The key results of this analysis can be summarized as:

- The traffic / revenue potential for the highway is not high enough to justify the proposed capital investments purely from a financial basis. However, the capital investment program should not only be viewed from a financial basis – other factors, such as social, political and economic must also be considered before making a decision on whether to go ahead with the proposed program;
- There are certain conditions under which the Bar–Boljare highway can be attractive to private entities for concession. The use of a subsidy would be beneficial and attractive for potential concessionaires. This is a preliminary assessment and, as noted above, this analysis is not intended as an investor's financial analysis.

Referenca: Technical Memoranda No. 26B i 27

7 PUBLIC-PRIVATE PARTNERSHIPS POTENTIAL CONTRIBUTIONS OF THE PRIVATE AND PUBLIC SECTORS IN THE IMPLEMENTATION STAGE

7.1 Introduction

The European road sector has consistently increased the stake of privately financed and managed road infrastructure. The whole of the Austrian and Greek networks are under concession, and many of the most important roads in Norway, Italy, Portugal, and France also have a private component. However, there are different methods with regards to the economic and legal framework.

Traditional models for the building and management of infrastructure, including financing, need to be distinguished. Some models include financing directly out of the government's budget, using tax revenues and general borrowing. In most countries, the majority of infrastructure financing is derived directly from government budgets. However, due to budget constraints an increasing number of governments are looking at the private sector for building, operating, and/or maintaining their highways.

7.1.1 Public Private Partnerships

Public Private Partnerships (PPP) are contracts between governments and private entities to provide the public sector infrastructure, facilities, or services for a specified term.

PPP generally involve the shift of some financial risk and responsibility to the private sector. These partnerships attempt to optimize the efficiency and effectiveness of products and services by leveraging the operational strengths of the private sector. In particular, governments may want to consider PPPs especially, if:

1) The jurisdiction does not have the financial capabilities for completing the project;
2) The quality of the project or the service would benefit;
3) Having a private partner would complete the project sooner (especially in the case of time constraints);
4) The legal framework is conducive to private sector involvement (in particular no prohibitions of private involvement); and
5) Citizens favor private sector involvement.

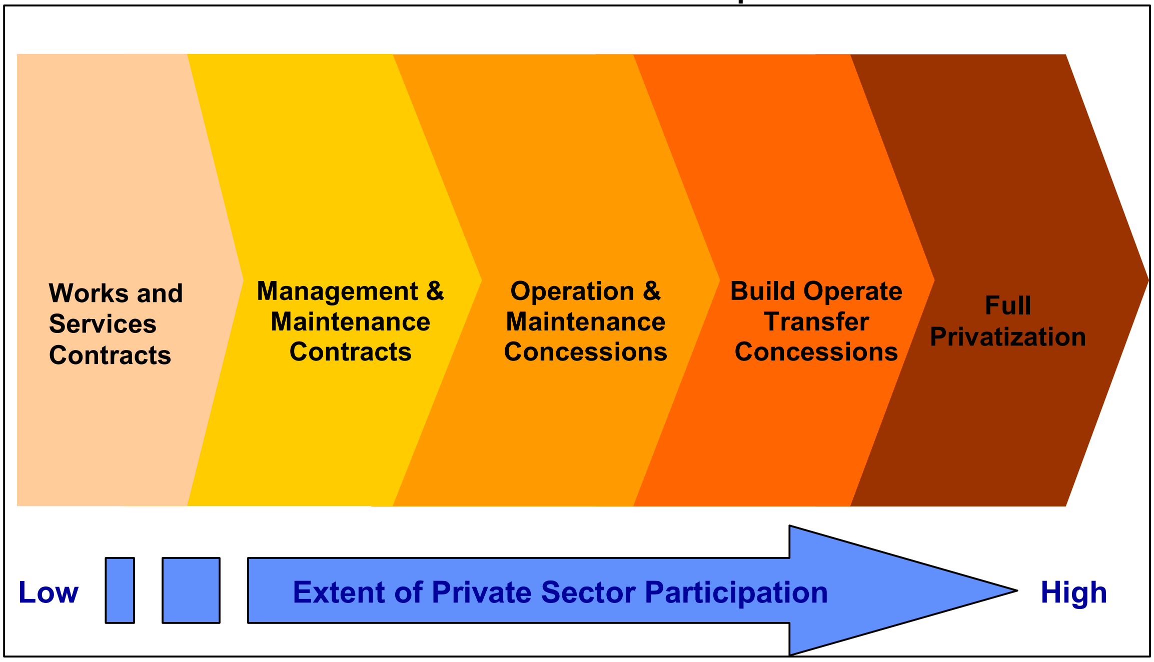
Governments sometimes face, from public or other agencies, opposition to proposed PPPs. Some governments may fear a decline in quality. There may also be resistance from unions, which fear that changes in structure would lead to job losses. For this reason, it is important to perform a feasibility study that involves a true cost assessment and cost-benefit analysis. This includes assessing the true cost of building the facility and operating it, as well as the loss of control that would follow. The benefits should also be analyzed, including non-market benefits like the transfer of risk.

Governments should keep in mind that the private sector is interested in projects with revenue generating capabilities, project viability, and strong local government support. This means that such a governmental entity must offer an attractive proposition to the private sector.

The role of the private sector can vary, depending on the nature of the projects, but it is ultimately the government's responsibility to ensure the integrity of the motorway. In writing contracts with private firms, the government must try to balance its obligations to protect firms' need to run its operations efficiently and effectively. If a government imposes too few regulations, the firm may have an incentive to act contrary to the government's interest; if it imposes too many regulations, it may be too costly for the firm to operate.

As Figure 1 shows, private firms operate under various types of contractual arrangements with the public sector with varying degrees of private sector involvement. The left-hand side of the exhibit denotes full public ownership, with limited private sector involvement while the right-hand side denotes full private ownership. Details of the type of contract and the extent of partnership are described below.

Figure 7-1:
Public-Private Partnerships



Thus it can be seen that there is not a single definition of a road PPP, and in fact a wide range of transaction types are covered in which the private sector takes some responsibility and accepts some financial risk in return for adequate reward. The key aspect is, as noted above, to leverage the operational and management strengths of the private sector.

Works and Services Contracts

A works and services contract is a public standard contract with a private firm to design, build, and maintain a public road which is operated by a country or local government. All revenues and expenses are the responsibility of the public sector. It is a fixed term contract and does not bear any risk by the private sector. Once the contract is completed, the firm does not have any interest or duties in the ownership or the operation of the facility.

Management and Maintenance Contracts

A management and maintenance contract is a contract with a private firm to operate and/or maintain a publicly-owned road and typically lasts 1-5 years. The public sector bears the operational risks, except for emergencies and *force majeure* (frees both parties from liability or obligation when an extraordinary event or circumstance beyond the control of the parties, such as war, strike, riot, crime, or an act of God prevents one or both parties from fulfilling their obligations under the contract). However, the longer the duration of the contract, the more the risk shifts to the private entity. The private firm has the freedom to choose the appropriate management and maintenance work methods which satisfy the quality level specified under the contract. There are three primary types of Management and Maintenance Contracts, including:

- ***Quantity Based Maintenance Contracts***

  The public sector supervises maintenance and pays the private firm accordingly to maintenance performed using unit prices.

- ***Performance Contracts***

  The private firm has more freedom because performance specifications are pre-defined for the duration of the contract. The private firm can utilize any reasonable methodologies or equipment to undertake the work.

- ***Management Contracts***

  Operation and maintenance of the facility is contracted for a fixed fee.

Operation and Maintenance Concessions

Operation and maintenance concessions involve the transfer of the operation and maintenance of the motorway to the private sector, which, in turn collects a toll user fee. This is a full PPP in which operational risk shifts from the government provider to the private entity. The private entity must also upgrade the facilities or infrastructure, which can result in service quality improvement for users.

This kind of PPP can be attractive to governments because of potential increased efficiency. However, the inability to respond quickly to changing demand needs and the partial loss of control in the operations can cause disadvantages.

Build-Operate-Transfer (BOT)

Under a build-operate-transfer PPP, private firms finance, build, and operate the motorway but the road is owned by the government and will return to its owner at the end of a fixed term lease. The private firm also collects toll fees as a partial return on the investment.

The public sector maintains ownership of the asset, meaning that it continues to control the service standards, the toll fees charged, and maintenance. The government has the ability to terminate agreements if the service or performance levels are below standard. This type of PPP could also bring operational savings if the private entity develops efficient ways to operate the road, in addition to savings on the build and design components.

The government identifies the projects that are eligible for BOT and the checklist given below must be followed:

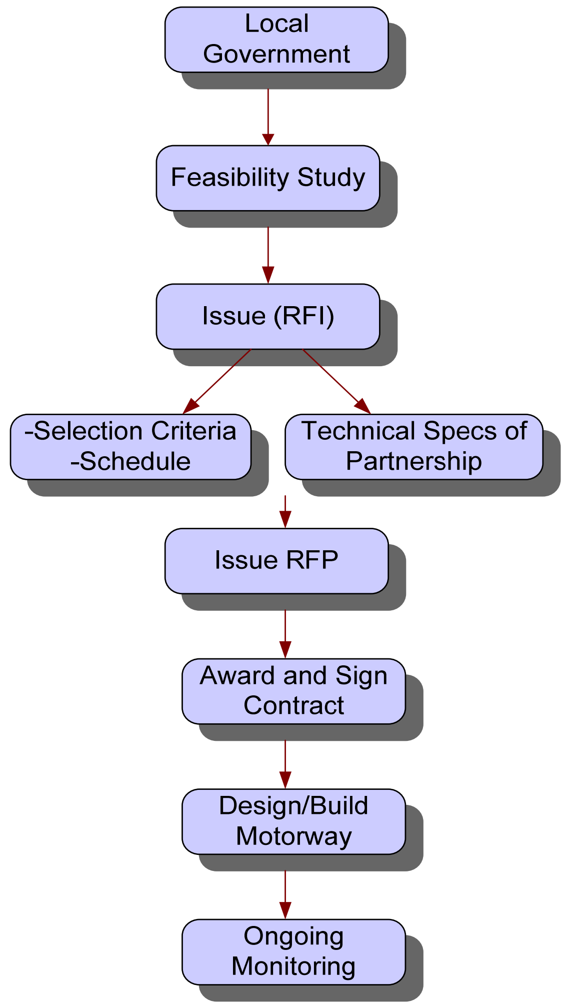
- Develop a Feasibility Study
- A feasibility study involves a variety of tasks that help the state government understand the financial fundamentals of the project. Details about the facility and cost estimates as well as an environmental assessment can help state governments understand whether the overall project is appropriate for a public-private partnership.
- Issue a Request for Information (RFI)
- The Montenegrin government should issue an RFI in order to notify potential bidders of the available contract. The RFI outlines the potential terms of the contract and the rules for proposal submission.
- Issue a Request for Proposals (RFP)
- The government should then issue an RFP. This document is more refined than the RFP and outlines technical specifications and the selection criteria for potential bidders. RFPs should also clearly define the required service and give providers a timeline for proposal submission.
- Select Private Concessionaire and Secure Necessary Approvals
- After receiving proposals, the government should set up an appropriate selection process to evaluate each offer and select the best one according to the parameters in the RFP. The government should then secure the necessary approvals to develop the contract.
- Seek Legal Counsel
- Legal counsel will generally be required for contract development and/or contract negotiations with the selected firm.
- Develop a Contract Monitoring Program
- The government should also develop a contract monitoring program to track for the correct execution of the contract from design to operation. This could include the use of inspectors and quality parameters to monitor satisfactory progress by the firm.

Below in Figure 7-2 is a description of the typical process of securing a BOT:

Figure 7-2:
Build-Operate-Transfer

Build Operate Transfer

Private Firms finance, build and operate the highway, but the highway is owned by the Montenegro Government and will return to the owner at the end of the lease. The Private entity also collects a toll fee.



Checklist of Information Needed to Move Ahead

- ☐ Identify Projects that can be amenable to BOT
- ☐ Develop a Feasibility Report
  - ☐ Demand Projections
  - ☐ Select Location
  - ☐ Layout of Facility
  - ☐ Preliminary Design
  - ☐ Establish a Schedule
  - ☐ Financing Alternatives
  - ☐ Environmental Analysis
  - ☐ Cost Estimate
- ☐ Issue a Request for Information (RFI)
  - ☐ Objective of PPP
  - ☐ Rules for Submission
- ☐ Seek Legal and Financial Advice
  - ☐ Legislative Framework
  - ☐ Establish Communication Protocol
  - ☐ Taxation Framework
  - ☐ Structure of PPP and Financing Plan
- ☐ Complete Technical Specifications and Scope of Work
- ☐ Identify Evaluation Parameters to Select Private Firm

Establish a Selection Panel
  - ☐ Government Technical Experts
  - ☐ Independent Members

- ☐ Select Private Partner and Secure Necessary Approvals
- ☐ Negotiate Contract
  - ☐ Outline Responsibilities and Liabilities
  - ☐ Insurance
  - ☐ Legislative Requirements
  - ☐ User Fees and Financing Arrangements
- ☐ Design/Build Motorway
- ☐ Develop Monitoring Program

Full Privatization

Some governments are trying to transfer their role from financers and operators of highways to facilitators and regulators of services provided by private firms. This can lower the government risk allocation, while still providing a needed service. Private firms independently own and operate highways and contract directly with the government. They make their revenue from the user fees. The Montenegrin government may write performance provisions into their contracts, but financing and operational risk is allocated to the private sector.

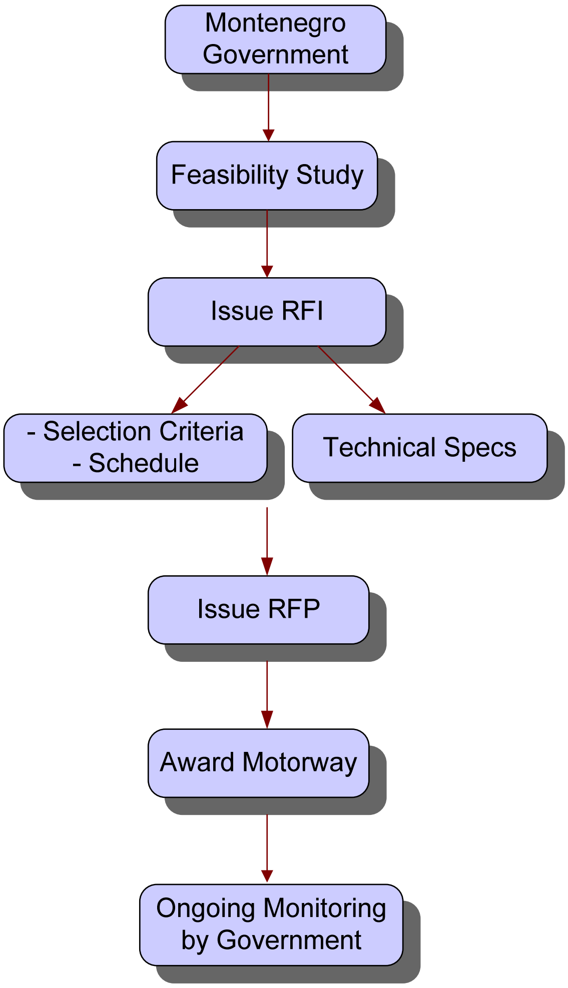
In addition, private firms have less financing constraints than the government. Many firms can raise substantial amounts of capital fairly quickly through capital markets and commercial banks.

As full privatization denotes, private firms make their own financing decisions based-on their analysis of how and where a highway would be most profitable. However, the Government of Montenegro - if involved in attracting a private firm to own and operate a motorway, can take the steps illustrated in Figure 7-3:

Figure 7-3:
Full Privatization

Privatization

Private Firms own, finance, build, and operate the motorway



Checklist of Information Needed to Move Ahead

- ☐ Identify Projects that can be amenable to Privatization
- ☐ Develop a Feasibility Report
  - ☐ Demand Projections
  - ☐ Select Location
  - ☐ Layout of Motorway
  - ☐ Preliminary Design
  - ☐ Establish a Schedule
  - ☐ Financing Alternatives
  - ☐ Environmental Analysis
  - ☐ Cost Estimate
- ☐ Issue a Request for Information (RFI)
  - ☐ Objectives of Concession
  - ☐ Rules for Submission
- ☐ Seek Legal and Financial Advice
  - ☐ Legislative Framework
  - ☐ Establish Communication Protocol
  - ☐ Taxation Framework
  - ☐ Structure of Concession and Financing Plan
- ☐ Complete Technical Specifications and Scope of Work
- ☐ Identify Evaluation Parameters to select private firm
  Establish a selection Panel
  - ☐ Government Technical Experts
  - ☐ Independent Members
- ☐ Select Private Partner and Secure necessary approvals
- ☐ Negotiate Contract
  - ☐ Outline Responsibilities and Liabilities
  - ☐ Insurance
  - ☐ Legislative Requirements
- ☐ Award Facility
- ☐ Develop Monitoring Program

Choosing Financing Options

The choice among private financing depends on a variety of characteristics unique to each country and government. Before choosing any of these financing options, the Government should review how it delivers all services, finances projects, and builds infrastructure. If a country has consistently provided efficient services to the community, there may be a resistance to private sector involvement. New infrastructures are often seen as an economic vehicle providing new jobs and economic linkages. In such cases, communities may not be opposed to private sector involvement.

In this way, how the government delivers services, as well as how those services are perceived, influence financing options. These are, in turn, shaped by local laws and regulations which may make it easier or more difficult to involve the private sector. Thus, local officials should consider the following when choosing financing options:

- Financial Status;
- Long-Term Community Objectives;
- Tax Framework; and
- Legal Framework.

The long-term objectives in terms of economic development, land use, employment, and social cohesion should all be considered when choosing a financing option. While some options may make sense economically, significant political or social opposition to any one option may have negative impacts on the community.

Individual state tax and legal frameworks can make private finance or the use of PPPs easier or more difficult, which will influence which options communities choose. In jurisdictions in which the tax and legal requirements are fairly restrictive for PPPs, there will generally be public financing.

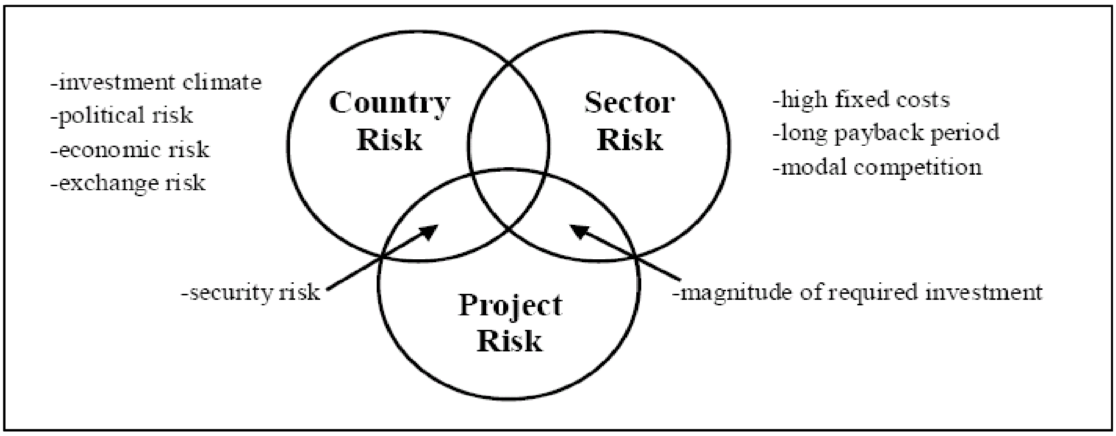
In the case of the Bar-Boljare motorway, financial analysis has showed that the project would not generate enough revenue to sustain by itself, as the capital and operating costs are great. However, an annual subsidy by the government of Montenegro could make the project feasible and profitable for any private entities. A subsidy would be an attractive means for private firms interested in building and/or operating the motorway.

7.2 Outline of inherent risk

The identification and management of risks is of central importance in the design[21] of any PPP. Each project faces a different set of risks and these must be identified at the outset and allocated to appropriate parties. Risks may be classified as country risks, sector specific risks, and project specific risks, as shown below in diagram form.

[21] Antonio Estache et al. "Public Private Partnerships in Transport" (World Bank Policy Research Working Paper no. 4436, December 2007)

Figure 7-4:
PPP Risk classifications



Source: CPCS Transcom presentation, MENA June 2007.

In the construction phase the major risks are:

- delays in start up and /or completion and hence delay in starting revenue flows;
- as result of delayed completion, higher total interest /debt service charges;
- cost overruns and increased capital needed to complete the road;
- insolvency or lack of experience of contractors;
- exceeding initial construction cost estimates, e.g., from inadequate engineering and design, escalation of materials and /or labour costs, etc.; and
- defects in construction, failure to conform with detailed designs, e.g., for bridges, or any other detailed aspects.

Cost overruns may be covered by a fixed price and fixed term contract, or incentives can be devised for meeting pre-specified completion dates. To cover this, contingency funds might be established, or some provisions made in advance for additional equity inflows, or ‘standby’ agreements made for additional debt financing. As for defects, the construction contract (between concessionaire/contractor) would have a liquidated damages clause under which a contractor would be obliged to repair or make good any kind of defects.

Another form of construction phase risk is that environmental impact or damage may be greater than originally assessed and consequently costs for mitigation become considerably higher than first estimated.

In the operating phase, risks will arise from principally, the traffic and revenue not reaching anticipated levels. There are also: possible legal and regulatory changes, interest rate risks, and technology changes making existing arrangements obsolete. An example of the latter item, in this case, might be the technology used for customs processing at the Serbian border. However, the main risk is clearly that of traffic and revenue.

A further risk in the operating phase is that (in some periods or circumstances) there may be inadequate institutional capacity to efficiently monitor the contract.

Reference: Technical Memorandums no. 27, 28 and 29

8 REVIEW AND COMMENT ON THE DRAFT LAW ON CONCESSION

8.1 Comments on the draft Law on Concession

As far as EU rules are concerned, EU Treaty can be summed up in a few obligations: fixing of the rules applicable to the selection of the private partner, adequate advertising of the intention to award a concession and of the rules governing the selection in order to be able to monitor impartiality throughout the procedure, introduction of genuine competition between operators, compliance with the principle of equality of treatment of all participants throughout the procedure, selection on the basis of objective, non-discriminatory criteria. Thus the Community law applicable to Concession and the award of Concessions is derived primarily from general obligations which involve no coordination of the legislation of Member States in the field of concession. In addition, and although the Member States are free to do so, very few have opted to adopt national laws to lay down general and detailed rules governing the award of works or services concessions. So there are very few rules which could be transferred directly from community law in the law of Montenegro.

In accordance with the Terms of Reference, the Consultant is obliged to review and comment on the PPP legislation currently in force. This paper records the Consultants' reviews and makes suggestions for changes to some clauses in the Law on Concessions (hereinafter the "Law"), which governs any form of PPP. It is important to note that the Law is written for all concessions and not only for highway schemes [see Article 6].

8.1.1 General remarks

The draft law is a comprehensive document, which covers a lot of useful points. In such matters, the nature of the concession subjects are so sophisticated, so complex, need so many expertises in the technical, financial and legal fields, that a law being very detailed, as this one, and therefore less flexible than a short one, faces the risk to miss some points that a future and different environment may bring. The second point arises out of the will to address in this law most of the questions, therefore not leaving room for negotiations, to the implementing tool which is the concession Agreement and its annexes. The risk is to block the subsequent building of the Agreementual set up. Some rules in the law designed to protect the public interest may be shown to be rigid and prevent a suitable negotiation. The third point in this draft law is the lack of articulation with applicable general legal principles or rules in force in Montenegro (arising out of either civil law, Agreement law, or administrative law), with sector laws and public law (public procurement law). We don't see any mention of other Law of Montenegro.

8.2 Provisions which are lacking

8.2.1 Easements

A provision of the law should lay down a rule on the fact that the competent authority or other public authority under the terms of the law and the concession Agreement shall make available to the concessionaire or, as appropriate, shall assist the concessionaire to enjoy the right to enter upon, transit through or do work or fix installations upon property of third parties, as appropriate and required for the implementation of the project in accordance with (*indicates the provisions of the laws that govern easements).*

8.2.2 Confidentiality

The law and the concession Agreement should prescribe provision on confidentiality ie the Competent Authority and bodies involved in the concession award process shall not disclose information forwarded to it by economic operators which they have designated as confidential; such information includes, in particular, technical or trade secrets and the confidential aspects of tenders. Such provisions are particularly important in the case of competitive dialogue.

8.2.3 Participation of Consortia

If such the participation of consortia is viewed in the law, there is no condition fixed in the law nor mentioned as possible or mandatory in the concession Agreement.

8.2.4 Transfer of controlling interest

The concession Agreement may provide that a controlling interest in the concessionaire may not be transferred to third parties without the consent of the competent authority, and the law should foresee that the concession Agreement shall set forth the conditions under which consent of the competent authority shall be given.

8.3 Concessionaire procurement

The Law covers this aspect in reasonable detail and the requirements are clearly defined in most cases, although there are some ambiguities.

> A pre-requisite of any concession being granted requires that the Ministry prepare a Concession Act [see Articles 20 and 21]. However, since the Act has to be presented to a Concession Commission, this body has to be formed in accordance with the Law [see Articles 10 to 14].

The Law allows for unsolicited proposals from interested parties and, if agreed by the competent authority (i.e. the Ministry), the interested party needs to deposit funds such that the work required to complete the Concession Act can be prepared. The Ministry has then to commence work on the Concession Act within 30 days of receipt of the funds.

If however, the usual procedures are undertaken, it is the Ministry which takes the initiative and prepares the Concession Act [see Article 20]. The Act requires a substantial amount of data to be provided[22] including the following major tasks:

- The Project Description – which will include the Design (assembled as part of this study);
- The Economic Feasibility – which will include possible options and risk assessment (presumably of the Economic Feasibility Study) (assembled as part of this study);
- Duration of the Concession;
- Technical Documentation – which will be required to be assembled prior to the granting of the concession;

[22] It has been estimated that a minimum period of 4 months would be required to gather this data together and complete the formalities of submitting this Act to the Commission.

- Public announcement;
- Background Data – such as the National Development Plan;
- Competency Description – which will define the abilities required by the potential Concessionaires;
- Draft Tender Documentation;
- Draft Concession Agreement;
- Evaluation Criteria – for the selection of the Concessionaire;
- Operational Plan;
- Bonds and Guarantees to be provided;
- The Anticipated Concession Fee – to be paid by the Concessionaire;
- Toll Rates – including reasons for the selection;
- Quality Control;
- Supervision Services (presumably the Independent Engineer, but see Section 5 below);
- Environmental Mitigation Measures; and
- Results of a Public Dialogue – lasting no longer than 30 days.

The Law allows for an "Open" or a "Two-Tier" procedure [see Article 22]. In the statement above the period for developing the Act could be used as well to include the Two-Tier procedure and go through the sequence of pre-qualification of potential Concessionaires. Under Article 20 (5), the Commission will adopt (or reject) the Act within 30 days of receipt. At this point, the Commission will advertise the Public Announcement. The Law is not clear on the point where the Two-Tier procedure is used as to whether the Public Announcement is made only to those consortia which are pre-qualified, in which case it is not really a "public" announcement or whether the Public Announcement may be considered as the call for Expressions of Interest which can be issued early in the process of completing the Concession Act and can run in parallel with that exercise. However, Article 21 (5) does show that the Concession Act should contain the *"basic elements of public announcement"* which suggests that the Public Announcement follows the approval of the Concession Act by the Commission.

After the approval of the Act by the Commission, Article 23 (4) allows for a period of a minimum of 52 days for the selected consortia to submit their "Statement of Intentions". This is presumably based upon the information submitted within the Concession Act, which basically includes the data usually found in a "Request for Proposals". This assumption is reinforced by Article 28 which refers to word "proposal"[23]. If this is the intention, then the period of 52 days is far too short for consortia to give a reasonable offer. Our estimate is a minimum period of 4 months.

During the period of the proposals, the Concession Commission needs to establish the Tender Commission in accordance with Articles 28 and 29. The Tender Commission then

[23] See also Article #31 "Verification of Proposals"

evaluates [Article 34] the proposals within a period of 30 days from their receipt. Their decision is then communicated to the Ministry as per Article 33. Under Article 35, the Concession Commission will review the decision of the Tender Commission and will then communicate their final decision to the Government. It is unclear at this point in the Law whether the Concession Commission also informs the bidders of their decision at the same time as it informs the Grantor, since Article 34 immediately discusses the appeals procedure open to the losing bidders. It seems more likely that the bidders would only be informed after the Grantor has considered the recommendation and given his approval. But this is by no means clear.

In order to make our assumptions clear on this issue, we have included a chart (see Figure 3-1) showing the sequence of events as we understand them.

8.4 Specific remarks on the Draft Concession Law

Article 2, paragraph (1) states that among the aims of the concession "*the participation of the private sector in the utilization of natural resources, property in general use and other property of general interest, performance of activities of general interest, development and functioning of infrastructure". S*uch wording is not related to the aim but is a part of the Concession definition and is as such repeated in article 4 1) below.

Article 2, second paragraph gives a list of specific objectives of the concession. It is unclear if every specific purpose therein mentioned, must be satisfied.

Article 3 on principles, states the Principle of freedom of will "*The principle of freedom of will includes the freedom of Agreementing parties to arrange, in accordance with the law and other regulations and good faith, the mutual rights and obligations at their own discretion."* One wonders if such a principle is not already contained in a general law such as civil law.

Article 4 bearing on Definitions, gives the definition of five terms. Some others, used in the draft, unless already defined in some general law, should be defined. For example, unless such definitions are already given in general laws of Montenegro, the following terms should be defined:

- "property in general use",
- "property of general interest",
- "activities of general interest",
- "Concession agreement"
- " Concession act" (in line with articles 10, 20 and 21),
- "Natural resources",
- "Concession Commission" (in line with articles 10 to 12),
- "Unsolicited proposal" (in line with article 19),
- "facility and infrastructure facility".

The definition of the Tenderer does not make the difference between an economic operator who has submitted a tender and the one which has just sought an invitation to take part in a restricted or negotiated procedure or a competitive dialogue. It is suggested to make the difference as in the EU law, and to designate the latter as a “candidate”.

The definition of the “concession” paragraph 2 should be, at least partly, reworded, unless it is a pure question of translation. “”…*or to perform activities of general interest, which are handed over to the Concessionaire…”.*

Article 6 “ Concession subject”, being very detailed, bears a risk of being incomplete. Many items are quoted, but either one chooses a very synthetic formula, or one chooses to be specific, and then some other items should be added. To avoid that, a general umbrella provision should be inserted in this article such as: “*The concession subject may be any facility or service which is used by and/or provided for the benefit of members of the public (or any section of the public) and, when appropriate, shall include, without limitation…. ».*

Items 8, 9, 13, 14, 15 and in fact the whole article could be rephrased.

Roads are quoted as a possible “concession subject”, but beside a road, some others constructions - facilities such as bridges, tunnels or other roads facilities may be part of a road concession or conceded separately. Therefore, they should be added in the list.

The same can be said for railways lines. Railways Facilities and any system linked to the railways lines construction and or exploitation should be mentioned.

Ports are mentioned as “concession subject”. Ports facilities and any ancillary ports facilities and services should also be mentioned.

Besides “medical institutions”, health sector facilities should also be acknowledged as concession subject, and the Power Sector is also a valid candidate.

In addition to the “performance of public proper education program” (item 11), one should also mention “education sector facilities”.

Sewerage and sewage facilities, wastes treatment and disposals facilities could also be the subject of concession.

The three first lines of article 6 (2) (*Besides the subject of concession as referred to in the paragraph 1 of this article, in accordance with the law, the subject of concession may also be the exploitation of other natural resources, property in general use and other property of general interest, in state*

ownership…) should be deleted and replaced by the word concession, as such a wording is already defined as a concession.

Article 6, (15), 3) decides: “*As and exception from paragraphs 1 and 2 of this Article, special law may determine what is not and cannot be the concession subject”.* Such a rule could be challenged, on grounds of legal policy.

Article 8 on the Duration of the Concession Period, lays down two options. The first one fixes a maximum of 60 years which seems a lot, and stands far above international standards and practices. Article 8 foresees that it may even be longer upon the consent of the Parliament of Montenegro. A term of thirty years would look as an already rather long period and it should be prescribed that the consent of the Parliament is to be sought for any concession lasting 20 or more years.

In article 9: "Competence for the granting of concessions", paragraph (3) provides that for all concession subjects located in the area of sea and national parks' property, the Concessionaire is obliged to pay the fee for using sea property, i.e. natural resources and national parks' property to public enterprises". Such a rule has nothing to do with the competence for the granting of a concession and should be removed and replaced elsewhere in the law.

> Paragraph 4 of the same article lays down the rule according to which the "*Parliament of Montenegro …., awards Concessions for the Concession Subjects above the value established by the law"*. A Parliament usually does not award Agreements, except for its own management. It is supposed that it was meant "*authorises"* and above the *"period*" established by the law.

Article 13 on conflict of interest, mentions the conflict of interest without any precision or qualification, without any reference to a general law which could define the concept of conflict of interest, without any provision or reference to a procedure on how to solve the case when a conflict of interest appears.

Article 19 on unsolicited proposal is rather unclear, for example paragraph (1) states that: "*Interested party may submit to the Competent Authority <u>an initiative</u> for starting process of granting concession…".* No procedural rules are provided on such "initiative". Written as it is, this article could endanger the effectiveness of the principles of fair competition and transparency.

> A set of procedural rules should be inserted in the law, as regards the criteria to admit unsolicited proposals, the procedures for determining this admissibility, the selection procedure in accordance with the other provisions of the law, the respective rules to be observed in case unsolicited proposals do involve or do not involve intellectual property, trade secrets or other exclusive rights.

Article 20 on Concession Act deserves to be clarified. First the word "*concession act*" is a bit confusing. It may come from the translation. The "*public discussion*" mentioned in item (3) is not defined. The article does (not?) foresee any procedure to conduct this "*public discussion".*

Article 21 on content of the Concession act, contains a very comprehensive provision of useful points, to deal with in a concession "act", a sort of check-list, but one always wonders if such a check-list has to figure in a law or should the matter be for a by-law. Some items may not be relevant in some specific cases. On one hand the Law should then prescribe that if one or some of the items are not included in the concession "act", the Competent Authority should report on the grounds for which these items were not included, to the Concession Commission, on the basis of the "general" article 10 (2).

> Aside from 2 oblique references [Article #20 paragraph 2 and Article #44 paragraph 3], the duties and role of the Independent Engineer are not covered. There should be a reference to this role and that it is a mandatory function. The details can reasonably left for definition in the Concession Agreement.

The point (2) of **article 22 "mode of granting of concession",** relating to the exclusion of public competition, has a very limited scope ("…*the expansion of region for the performance of concession activity, which due to technical-technological causes cannot be confirmed as a* *special exploitation field…"*) and should be enlarged. Under certain conditions, recourse to the negotiated procedure should sometimes be made possible in the case of a Agreement when *"the nature of the works or the risks attaching thereto do not permit prior overall pricing"*. Such a derogation would cover solely the exceptional situations in which there is uncertainty a priori, regarding the nature or scope of the work to be carried out, provided it does not to cover situations in which the uncertainties result from other causes, such as the difficulty of prior pricing owing to the complexity of the legal and financial package put in place. An example is given by the 2004 EU Green paper on PPP, according to which exclusion of public competition may apply, when the works are to be carried out in a geologically unstable or archaeological terrain. For this reason the extent of the necessary work is not known when launching the tender procedure and exclusion of public competition applies.

Procedure and more specific conditions should be foreseen in the case of the point (2) of article 22, to guarantee, in such cases, the public interests.

In addition, this article 22 should be articulated with article 40 below "Procedure in the case of a single proposal". (See our remarks under article 40).

There is a passing reference to Risk Assessment and this is restricted to the Economic Feasibility Study [see paragraph (2)]. This is a major aspect of any PPP or Concession and it is our view that the Law should be more specific in insisting that a robust Risk Assessment should be undertaken on the whole concession process not just the economic aspects.

Article 24 on public announcement establishes deadlines for submitting proposals, as referred to in paragraph 3, item 3, of this Article 24. This deadline deals with "*concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR"*; for which are fixed a deadline of 52 days, and another deadline of 30 days "*for concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR*." The difference between the two amounts is somewhat difficult to grasp at least in the English translation. But more important is the fact that under the amount of 5.278.000 €, figure arising out of the EC Directive 18/ 2004 on public Agreements, there is no deadline laid out. Some concessions in Montenegro may stand under these figures.

Article 27, on Sub-Agreement, is different from EU law, when applicable, in that sense that in the case of public works concession, the competent Authority may either fix a minimum percentage of works to be subAgreemented or leave to the bidder the choice to specify in its tender the percentage, if any, of the total value of the work for which the concession Agreement is to be awarded, which they intend to assign to third parties. The second point is that EU forbids any discrimination based on nationality, but such a rule is not applicable in Montenegro.

Article 30 bearing on right of priority contains provisions that are inspired of mining or gas research and exploitation law. Such concession subjects are usually subject to special legislative provisions, since research in these sectors implies heavy costs. Such rules in a "general" concession law appear unclear, and can't answer the questions raised by mining and gas research and exploitation. Such a matter is usually dealt with in one or several special laws or codes.

As for point 3 of the article 30 stating that "*With exception to paragraphs 1 and 2 of this article, under the conditions of equally evaluated proposals, the submitter of the unsolicited proposal has the right of priority in the granting of the concession*", we refer to the remarks already done under article 19 above.

Article 31 on verification of proposals mentions the concept of "*invalid*" and "*valid proposals*". But invalid proposals and valid proposals are not defined. The law should at least foresee in article 21 that the so called Concession Act, should in each case provide which elements are mandatory, if not all, the absence of which renders the proposal invalid.

Article 32 on Proposal Evaluation Criteria, **give a useful list of sub-criteria, but it should be mentioned that such sub-criteria could not be limited to the ones listed in this articles. A law has to be open and leave room to the specific subject of concession.**

Article 33 on Proposed ranking of Tenderers, **is somewhat vague when ruling that: (1) "*Tender Commission ranks proposals by assigning certain points based on each sub-criterion*", or "*In extraordinary complicated cases*". In the first case, the law should decide that the concession bidding document and the public announcement must mention the criteria to assign points on each evaluation sub-criteria mentioned in article 32.**

In the second case, the mention of "extraordinary complicated cases" is too vague and criteria of complication should be given.

Articles 34 and 35 on Right of insight and complaint, are confusing. We don't know which is the Commission mentioned in para. (1) and (2) since in case the "*Commission"* would establish *"a violation of the procedure or improper application of criteria"*, the proposed ranking would be returned "*to the Tender Commission for removal of irregularities".* We supposed that the "Commission" aimed at in this article is the Concession Commission, but it should be clearly mentioned.

Article 36 bearing on Proposition for granting concessions mentions that: *"Competent Authority submits to the Concession Grantor the proposition of the ranking of the Tenderers, ….In case of proper application of the rules of procedure and criteria*,".

The requirement of such a "*Proper application*" should be more precise or it should be required from the Competent Authority a reasoned opinion on the grounds on which its refusal of the ranking proposed by the Competent Authority. The same could be said for (para. (1) "*excerpt from the tender documentation provided by the Tenderers*", where a detailed list of the tender documentation should be submitted to the Concession Grantor.

Article 41, on two tier procedure and conducting procedure, rules that: "*In case the Competent Authority expects the tender to be: complicated in technical, legal, financial or other aspect, or"*

Such a wording could be bettered, it could be rephrased as follow:

"*when the Agreementing authority does not deem it to be feasible to describe in the request for proposals the characteristics of the project such as project specifications, performance indicators, financial arrangements or Agreementual terms in a manner sufficiently detailed and precise to permit final proposals to be formulated."*

After point (3): *"Prequalification criteria is established depending on the concession subject, and especially includes:*

The ability for concession realization (technical and/or financial requirements), previous experience in performing concession activities".

It is proposed to add: "*Personal situation of the candidate or tenderer, Suitability to pursue the professional activity, Economic and financial standing, Technical and/or professional ability, Quality assurance standards, Environmental management standards, Additional documentation and information, Official lists of approved economic operators and certification by bodies established under public or private law of the tenderer /candidate country. etc.)".*

But also the two tier procedure can be an opportunity to improve the quality of the concession requirements. If the procedure of competitive dialog is not used, such a two stage procedure could retain some elements inspired from the competitive dialog procedure. Thus in the initial request for proposals, could call upon the bidders to submit, in the first stage, initial proposals relating to project specifications, performance indicators, financing requirements or other characteristics of the project as well as to the main Agreementual terms proposed by the Agreementing authority.

Item 8 of article 41**,** on two tier procedure deals with the case where only one Tenderer satisfying the prequalification criteria, appears at the public tender, and rules that in this case "*the Competent Authority may continue or terminate the procedure for the granting of concession".*

Such provisions should be more specific and determine:

- precise rules to decide that the prequalification criteria have not been satisfied; and
- the cases and conditions to continue the procedure, in order to protect the public person interests when there is no longer any competition system to ensure that the best offer will be sought.

Such cases and conditions may make the negotiations subject to the approval of different higher authorities (Parliament for example for important concessions), depending on the nature of the services to be provided or the infrastructure sector concerned. In those cases, the law may add a reference to provisions of its law where these approval requirements are set forth.

Subject to certain conditions, the law could contain provision allowing the Competent Authority to continue the procedure:

- Where there is an urgent need for ensuring continuity in the provision of the service;
- Where terminating the procedure for the granting of concession would be impractical, (also providing that the circumstances giving rise to the urgency were neither foreseeable by the Agreementing authority nor the result of dilatory conduct on its part);
- Where the project is of short duration and the anticipated initial investment value does not exceed a certain amount set forth in an article of the law specifying the monetary threshold below which a concession may be awarded without competitive procedures;
- Where the project involves national defence or national security; and

- Where there is only one source capable of providing the required service, such as when the provision of the service requires the use of intellectual property, trade secrets or other exclusive rights owned or possessed by a certain person or persons.

The law could provide that in the above mentioned situations, the fulfilment of these conditions have to be duly proved and mentioned in a report to the Concession Commission established under article 10 above. Another condition, to ensure transparency in such cases would be to require publicity in newspapers in Montenegro.

Article 42 bearing on "*Consulting Dialogue*" elsewhere called "*Competitive dialogue*", just raises the principle of consultative dialogue in para. 1. Such a delicate procedure should encompass rules on how to ensure transparency, fair competition.

The law should lay down rules stating that the Competent Authority should:

- Publish a "concession Act" setting out their needs and requirements;
- Define in each case the exact content of the "concession Act" (notice) and/or in a descriptive document;
- If necessary, open a dialogue, with the candidates selected in accordance with provisions which could bear on the points already mentioned for prequalification in a two tier procedure;
- Define the aim of the dialogue which should be to identify and define the means best suited to satisfying their needs;
- Provide that during the dialogue, the Competent Authority will ensure equality of treatment among all tenderers and that in particular, it shall not provide information in a discriminatory manner which may give some tenderers an advantage over others;
- Not reveal to the other participants solutions proposed or other confidential information communicated by a candidate participating in the dialogue without his/her agreement;
- Foresee that the Competent Authority may provide for the procedure to take place in successive stages in order to reduce the number of solutions to be discussed during the dialogue stage by applying the award criteria in the "concession Act" (notice) or the descriptive document. The "concession Act"(notice) or the descriptive document shall indicate that recourse may be had to this option;
- Continue such dialogue until it can identify the solution or solutions, if necessary after comparing them, which are capable of meeting its needs; and
- Declare that the dialogue is concluded and having so informed the participants, Competent Authority shall ask them to submit their final tenders on the basis of the solution or solutions presented and specified during the dialogue.

The law should lay down rules stating that:

- These tenders may be clarified, specified and fine-tuned at the request of the competent authority. However, such clarification, specification, fine-tuning or additional information may not involve changes to the basic features of the tender or the call for tenders, variations in which are likely to distort competition or have a discriminatory effect; and

- At the request of the competent authority, the tenderer identified as having submitted the most financially advantageous tender may be asked to clarify aspects of the tender or confirm commitments contained in the tender provided this does not have the effect of modifying substantial aspects of the tender or of the call for tenders and does not risk distorting competition or causing discrimination.

Article 43 “Rights of the participants in the procedure for public announcement” rules that the participants in the public announcement have the right of refund of the tender bond in a manner as determined by the public announcement. This question is somewhat redundant with article 24 item 13, but the law should lay down rules on points on which the starting date could be based, and time limits to refund the tender bond, or rule that the public announcement should deal with the said questions.

Article 44 on conclusion and content of the Concession Agreement, contains a very comprehensive provision in point (2) 2, “rights and obligations of the Agreementing parties”, but also rather detailed provisions on what a concession Agreement should encompass. Some items may not be relevant in some specific cases. On the one hand the Law should then foresee that if one or some of the list of items are not included in the concession Agreement the Competent Authority should report on the grounds for which these items were not included, to the Concession Commission, on the basis of the “general” article 10 (2) 4) On the other hand, if one chooses to cover a maximum of items in the law as guidance for the drafting of the concession Agreement, the following points could be added:

- The assistance that the Agreementing authority may provide to the concessionaire in obtaining licences and permits to the extent necessary for the implementation of the infrastructure project;
- Any requirements relating to the establishment and minimum capital of a legal entity incorporated in Montenegro;
- Procedures for the review and approval of engineering designs, construction plans and specifications by the Agreementing authority, and the procedures for testing and final inspection, approval and acceptance of the infrastructure facility;
- The extent of the concessionaire’s obligations to ensure, as appropriate, the modification of the service so as to meet the actual demand for the service, its continuity and its provision under essentially the same conditions for all users;
- Mechanisms to deal with additional costs and other consequences that might result from any order issued by the Agreementing authority or another public authority in connection with item 7) above, including any compensation to which the concessionaire might be entitled;
- Any rights of the Agreementing authority to review and approve major Agreements to be entered into by the concessionaire, in particular with the concessionaire’s own shareholders or other affiliated persons;
- Insurance policies to be maintained by the concessionaire in connection with the implementation of the infrastructure project;
- Remedies available in the event of default of either party;
- The governing law;

- The rights and obligations of the parties with respect to confidential information;
- Compensation for specific changes in legislation;
- Revision of the concession Agreement;
- Takeover of an infrastructure project by the Agreementing authority;
- Substitution of the concessionnaire ;
- Transfer of controlling interest in the concessionaire,
- Step-in clause;
- Wind-up and transfer measures;
- Disputes involving customers or users of the infrastructure facility; and
- Independent Engineer (see above comment on Article 21).

The law should make mandatory for the Concession Agreement that are taken all the necessary measures to ensure that concessionaires which apply the transparency and non discrimination principles, advertising rules concerning publication of notice (public announcement), when subAgreementing or awarding works Agreements to third parties, and fix the minimum value of Agreements where these rules are applicable.

Article 44 (8) refers to the Financial Plan but there are no further articles defining this aspect. Since the financial aspect of the concession is the main reason for entering into the PPP, it is suggested that this aspect should be explained in more detail even though the Concession Agreement will concentrate on this issue.

Article 49 "Findings" should rule that the concession Agreement has to determine the other mutual rights and obligations of the Parties in such cases (financial indemnification).

Article 50 "Monitoring of the execution of Agreementual obligations" provides that *"Annual concession fee shall be calculated by the Competent Authority",* which may seem strange. One expects to read that the calculation is made in accordance with the concession Agreement, which could provide for methods and formulas, if needed, for the establishment and adjustment of those fees. In addition this rule is conflicting with article 58 *"Payment of the Concession fee*" which provides that: "*Certain concession Agreements may determine the payment of the Concession Fee, which is to be paid for the granted concession in accordance with the concession act and the Concession Agreement".*

Provision of article 50 (5), according to which: "*Commission has the right to, at least once per year, appoint certified experts for purposes of establishing compliance with the rights and obligations determined by the Concession Agreement*", is a principle and as such needs implementing rules. The law should refrain from being too detailed and the Concession Agreement should be entrusted with the task of providing rules and procedures to appoint certified experts, usually called independent engineer in infrastructure Agreements.

Article 53 bearing on the "Transfer of the Agreement", should also require that, when such a transfer is allowed, the concession Agreement stipulates other cases and other conditions under which such a transfer is allowed.

Article 54 on termination of the concession Agreement should be limited to require that the provisions it lists are dealt with, in the concession Agreement. This article lays incomplete and vague rules, such as for example: (1) 2) (*revocation of the concession for severe violation and repeating of material Concession Agreement violations related to the obligations of concessionaire*), or 3) *(breaking of Concession Agreement in accordance with the legislation regulating obligatory relationships).*

Notwithstanding the items included within the Law, there are a number of issues which are either missing or are not treated in the detail they deserve:-

- Article #59 covers disputes resolution but restricts such resolution to Montenegro. It is considered that there should be more flexibility in this regard since many such concessions and concessionaires would wish to know that difficult disputes could be handled internationally.

Relief from payment of the Concession Fee is foreseen in **Article 60**, but only in the case of unpredicted circumstances, i.e. in case of force majeure. Some other situations may happen such as a decision of the Competent Authority to suspend the Concession exploitation, for example, in the case of findings made on location of performance of concessionaire activities (See article 49), or for any other reasons decided by the Competent Authority.

Reference: Technical Memorandums no. 19 and 24

9 OPTIONS FOR TOLLING STRATEGIES

9.1 Introduction

This chapter describes the background behind the establishment of a possible strategy for tolling in Montenegro. The project currently under study looks at two new routes (namely, Bar to Boljare and The Adriatic-Ionian Highway) and the final objective should be to integrate both future toll roads with a view to complete a Toll Road network covering the two main axes in the Country. When completed, the high speed Motorway[24] network will link the major towns and activity centres and will complete major Corridors, which pass through from North to South and from East to West linking with neighbouring Countries.

At this time, the strategy covers only the Bar to Boljare Motorway, since this is viewed as the top priority project. As the Adriatic-Ionian Motorway is added later, the tolling strategy will be expanded.

The paper discusses the following main aspects:-

a) Definition of terms used in the paper;

b) A description of the existing toll road system, which is operating at the present time;

c) A description of the preferred future system when fully complete; and

d) A description of the gradual expansion of the network on the basis of a possible phased implementation programme.

The concepts provided here form inputs to the on-going financial assessments and thus provide a basis for deciding on the likely viability of the toll road network or parts thereof.

9.2 Systems Definitions

9.2.1 Introduction

This section provides a series of definitions of the terms used in the specification and designs of toll systems. It covers the subjects of the Tolling Strategy and the methods of Toll Collection.

9.2.2 Tolling Strategies

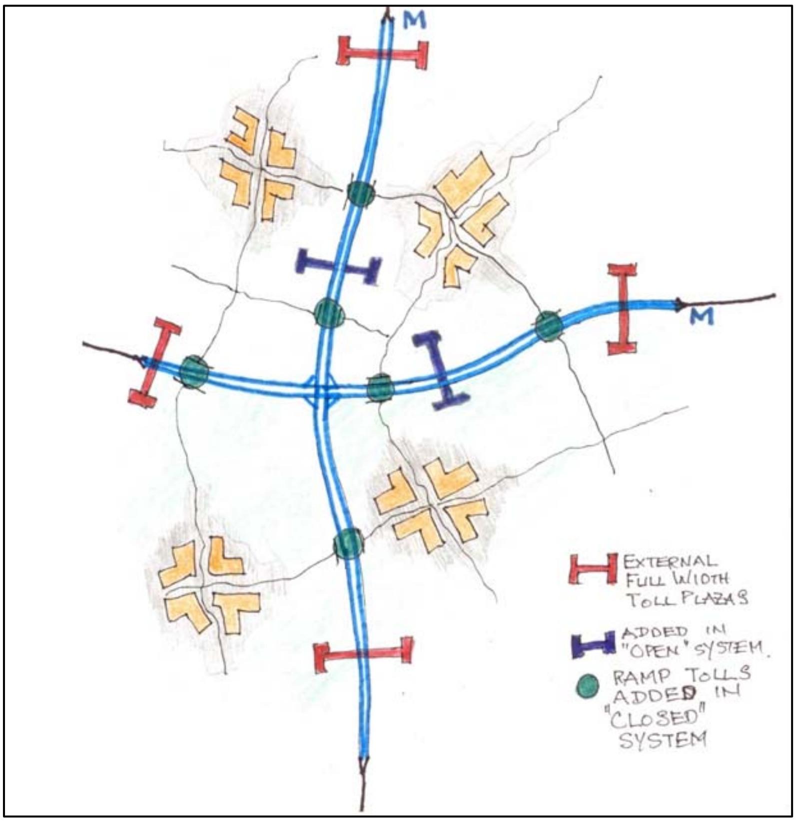
The design of the tolling system takes into account items such as continuity of the network, the number of interchanges, the spacing of interchanges, the traffic volumes and the trip patterns. Where there is a simple network of Toll Roads in place, the toll strategy can also be simple. As the network becomes more and more extensive and as traffic

[24] The term "Motorway" is used to designate a fully access-controlled highway with a minimum of two lanes in each direction designed and built to TEM standards or similar, and intended for operation as a Toll Road. The term is defined in Article #3 of the Law on Public Roads, 1996

volumes increase, the tolling strategy should reflect and respond to this more complicated network. Although there are variations within either of the two main methods, the tolling strategy can be divided into the so-called “Open” system and “Closed” system.

a) The Open System

The essential difference between this and a closed system is that there is the possibility for some journeys to take place without the payment of a toll. Usually in most cases, the numbers of such “free” journeys is a relatively small percentage of the total journeys taking place. In a pure closed system, all intermediate entry and exit ramps between the ends of each section should also be controlled with toll collection/distribution booths; in practice it is often the case that small local roads are not controlled and this leaves the system “open” for non-payment of tolls for some journeys.



Comparison of Open and Closed Systems showing multiple Toll Plazas for the Open System and full tolling on all entry and exit ramps for the Closed system.

A second important feature of open systems is the number of times when a driver is required to stop to pay a toll or collect a ticket. Unlike closed systems, longer distance journeys often require multiple stops which create time wasting and frustration on the part of drivers.

b) The Closed System

The essential difference between this and the open system is that all journeys are intercepted and all journeys therefore pay a toll. In a typical closed system the driver of any vehicle would only need to stop twice[25] – the first time to collect a ticket and the second time to pay his toll fee. In a normal approach to a closed system, there would be an external cordon at which all vehicles entering and leaving the network would be intercepted. These main external Toll Plazas would define the network and all entry and exit ramps would also be controlled. Other existing toll plazas would become superfluous and vehicles would pass through without stopping. This closed system therefore, requires that every entry and exit ramp must be controlled.

c) Directional Tolling

Directional tolling can be cost-effective in certain layouts. It is most suitable for a single link or series of links in which any alternative route is such a long diversion that the return trip is virtually captive traffic. A typical example is a Bridge. The diagram shows the two newest crossings (1966 and 1996) of the Severn river in England. (The alternative is a 100km trip via the previous lowest crossing, a stone bridge built by Telford in 1829). In this circumstance, tolls may be placed in one direction of travel and the fee levied would be typically twice the normally expected fee.

A layout for a river crossing in South-West England where tolls are collected in one direction only. If the driver were to try to avoid the non-tolled return, there would need to be a very long diversion.

Clearly this removes the need for half the toll booths and reduces land acquisition and personnel considerably.

9.2.3 Toll Collection Systems

One of the most important aspects to be decided at the outset is the likely volume of traffic passing through any and all of the toll plazas or ramps. This will have a major effect on the decision about the type of toll collection method. Low traffic volumes can be easily handled with manual methods; high volumes require more advanced technology if long delays are to be avoided.

[25] This relates to semi-automatic systems which are very common. In a fully automatic system, drivers do not stop at all and fees are collected automatically.

The following three terms (a, b, and c below) are used constantly, to describe the main options available[26] but it should be appreciated that there are many variations within each of the definitions.

a) Manual Collection Systems

As the name suggests these collection methods are done by hand. Conventionally, the toll fees are posted at the toll gate or, better still, a kilometre or so in advance of the toll collection booth. The motorist stops at the booth window and pays the prescribed fee to the booth operator. The driver receives a receipt as proof of payment. This approach is the common practice in Montenegro at the Sozina Tunnel.

b) Semi-Automatic Collections Systems

As traffic levels increase, the need to speed up the toll collection methods becomes more urgent. The move away from manual systems of collection can achieve some reduction in delays. Semi-automatic means reducing the intervention by personnel in some of the transactions. It is not a complete removal (this would be a fully automatic system). Semi-automatic systems can have wide variations in their approach all of which speed up the process and reduce the reliance on human intervention including the following:-

- Issuance of a ticket from a machine on entrance to the Toll Road, thereby lifting a barrier;
- Use of credit/debit cards or loyalty cards for toll fee payment; and
- Use of pre-paid tokens or tickets.

This last method also allows marketing options for frequent users to be introduced.

c) Fully Automatic Collection Systems

The ultimate, high technology collection systems virtually eliminate the need for human intervention on the Toll Road itself. There is always a need for administrative staff but these are housed remotely from the Toll Road itself. In these fully automated systems, vehicles are usually pre-registered and/or drivers establish bank accounts from which the toll fees may be debited. Other systems use transponders which carry a sum of money embedded in the chip in the transponder and which the toll collection system debits as vehicle pass across a beacon. A pre-requisite of such systems is that there is a data base of drivers, vehicles and addresses in existence which can be used reliably to identify and prosecute violators.

Below are two illustrations from a modern fully automated system in use in Ontario in Canada. The system is established on Highway 407 north of Toronto. The left picture

[26] As an example the system currently in use in Austria uses a "Vignette" which is a permit bought and displayed on a vehicle and is valid for a pre-determined period. There are thus no toll barriers and all the fee collection is completed at a roadside booth on entrance to the Toll Road network. However, the use of Vignettes goes against the current trend in setting tolling systems which pursue the idea of User Pays

shows a transponder used on Highway 407, which identifies the vehicle and applies the necessary charges to the account. The right picture shows a typical ramp to the highway

with overhead gantries[27] bearing cameras and detection equipment. All vehicles passing the gantries are recorded and their entry and exit points used to calculate the toll. For further information see the website - [www.407etr.com].

An example of a fully automated system showing the access ramp and overhead gantry with detector beacons.

An example of a Transponder

9.2.4 Toll Rates

The Toll Rate is conventionally considered to be calculated using a cost per kilometre. This is then translated into a price at each toll collection point to act as a proxy for the distance travelled on the particular journey. In open systems, an approximate average value for distance travelled is estimated and the rate applied giving a price at the toll booths. The selected rate will be set in consideration of various parameters as noted below:-

- Payback Levels. Often the rate is fixed to reflect the capital cost of construction. In this system, the rate will become a function of the cost and traffic volumes coupled with the time perceived over which the costs should be paid back;
- Harmonization. The standardization of rates for the payment of tolls has merit in that motorists feel that they have been treated equitably as they travel around long distances. In the case of the Trans European Network for example, these Trans European Motorways occur in many European countries and a reasonably constant toll rate is aimed at. For Montenegro therefore, there will be pressure to create a similar rate to that which exists in the surrounding countries;
- Ability to Pay. The rate which is payable needs to be set at a level at which the local people can afford (sometimes referred to as “social rates”). As economies vary, the ability of drivers to pay a toll will also vary. Hence there are usually surveys undertaken which will be planned to identify that rate which is acceptable to a

27 It should be clear from this that there is no need for Toll Plazas and hence, no need for additional land acquisition other than that for the Motorway itself.

reasonably large number of people. In this study, the Consultants undertook a Stated Preference survey which was (in part) designed to establish the acceptable level for toll rates[28];

- Free Market Rates. This approach to tolling allows the operator to vary the toll charges to suit traffic levels and hence balance traffic volumes by time of day or day of the week. The objective is to maximise the revenues by optimising the rate and traffic flows. As the rate increases, the diversion away will increase and the revenue might drop; conversely, as the rate drops more traffic will divert to the Motorway thereby increasing revenue. Although it is possible to activate the system using manual methods, the use of electronic tolling systems will enable the operator to vary the rate much more easily.

As an illustration of the variability of rates, the Toll Roads in Croatia use a rate of approximately 5 eurocents per kilometre; rates in Macedonia are lower at 4 eurocents per kilometre; the recently opened M6 Motorway in United Kingdom has a single charge, equivalent to approximately 13 eurocents per kilometre; finally, values of 6 eurocents per kilometre are frequently encountered in the south eastern Europe region.

9.3 Existing Tolling System

The only system of tolling currently in operation in Montenegro can be observed at the Sozina Tunnel.

There is a single set of booths located at the northern end of the tunnel serving traffic in both directions. This is a full width barrier toll plaza with 4 booths although at most times only two (one in each direction) booths are in operation.

The system of toll collection is manual with the operator making a visual identification of the vehicle classification. The operator records this vehicle by pressing a key on the till and a visual display shows the fee to be paid.

The fee transaction is completed by a cash payment which is deposited in the operator's till by the operator.

28 The Stated Preference survey and results are found in Technical Memorandum No: 6 November 2007

Other payment methods such as Credit Cards for example could be better used since these are in common usage in Montenegro. Although the possibility exists to use such cards and could speed up the toll collection process and also remove the build-up of cash at the booths and tolling plaza, there is no evidence that they are in use.

Although prepaid accounts are available for payments, we are not aware of any efforts in place to use marketing techniques to increase sales of toll tickets. Examples of these could be discounts for frequent travellers realised via their accounts or by sale of multiple tokens at a discount or special rates for off peak travel and weekend usage. Use of such techniques could increase revenue by relevant amounts.

9.4 Proposed System Based on a Fully Closed Toll Road Network

9.4.1 Introduction

The proposed tolling method for the Toll Roads system in Montenegro is based on a "Closed System". Initially, the fee collection is recommended to be by semi-automatic methods but this should be gradually developed until full automation is achieved. This section describes the initial system, and the gradual development through time leading up to the final system.

9.4.2 Assumptions on Project Phasing

A study was undertaken partly by the team's Engineers and partly by our Economists. The purpose was to investigate the likely construction sequences which would be most appropriate for the implementation of the project highways. Both disciplines had a major influence on the phasing:-

- From an economic point of view, the sequencing was chosen in order to maximise the rates of return. The economic assessment investigated the effects on the EIRR of the variations in timing investment in sections or variations in lateral and longitudinal phasing[29]; and

- From an engineering viewpoint, the investigation looked into items such as costs, ease of construction, difficult structural elements and need for accessibility.

[29] In this context, Longitudinal phasing means starting at one end and progressively building and opening sections until the complete Motorway is constructed. Lateral Phasing means building a half Motorway to begin with and then adding the second two lanes at a later date

Following these investigations, there was a consensus view on a logical implementation sequence.

Phase	Section	Opening year Half Motorway	Opening year Full Motorway
①	Smokovac to Matesevo	2012½	
②	Virpazar to Bar	2014	
③	Virpazar to Smokovac	2016	
④	Matesevo to Berane & Boljare	2016	
⑤	Virpazar to Bar[30]		2020
⑥	Virpazar to Smokovac		2020
⑦	Smokovac to Matesevo		2021
⑧	Matesevo to Berane & Boljare		2023

The table shows the assumptions which have been derived from the considerations of engineering and economics. These assumptions have been made in order to structure a phased sequence for construction and also to develop an evolving toll system.

9.4.3 Phasing of Toll Collection

Figures A and B below show how the tolling system should evolve through time. The following points of explanation should be noted:-

a) In Phase ① [Smokovac to Matesevo] toll booths would be built on the access and exit ramps at each end of the section. The section will be open to traffic in mid-2012. It has been assumed that there will be no intermediate interchanges due to minimal local access requirements. If, however, an intermediate access were to be provided, this would need to have toll booths placed on the ramps;

[30] At the time of writing, it is uncertain whether this section will be a full motorway or an Expressway. If the later is decided upon, then the phasing will be slightly altered to make Phase 5 from Virpazar to Sozina Tunnel as a Motorway and the extension of the Sozina access road to Bar as the wider four lane section.

b) In Phase ② [Bar to Virpazar] it is anticipated that the section to Bar from the Sozina Tunnel access road would be constructed first and a full width barrier would be erected somewhere suitable on the section between Bar and the Sozina Tunnel. There would also be a need to construct booths on access roads at E851 at Susanj and Durmanj. However, footnote 7 above shows that it is possible that the section Bar to Sozina Tunnel Access road may not be a full Motorway. In this event, the first full width barrier toll area could remain as it is presently, at the north end of the Sozina Tunnel. Following this section, the Motorway would be extended from the Sozina Tunnel to Virpazar and toll booths would be built on the access and exit ramps at Virpazar. The section will be open to traffic in 2014. Once these toll areas have been opened, and if the Bar to Sozina section is tolled, the toll collection facilities at Sozina tunnel would be removed, salvaged and used elsewhere. If however, the Bar to Sozina section is not tolled, the toll collection facilities at Sozina will remain and will be upgraded;

c) In Phase ③ [Virpazar to Smokovac] the new access ramps at Virpazar and Smokovac would be tolled and there would be a need to construct booths on access roads at the Bistrica, with Cetinje Road near Farmaci and with the Niksic road near Gorica. At this point, there will be a complete half-Motorway operational between Bar and Matesevo operating as a closed system open to traffic in mid-2016.

d) In Phase ④ [Matesevo to Berane and Boljare] a full width barrier would be constructed to the south of Boljare. There would be a need to construct booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca. At this point, there will be a complete half-Motorway operational between Bar and Boljare operating as a closed system open to traffic in mid-2016;

e) In Phase ⑤ [Bar to Virpazar] the second two lanes would be built (or the widening to four lanes from bar to Sozina Tunnel Access road) and the ramps at E851 at Susanj and Durmanj would be modified. There would also be modifications to the ramps at Virpazar. The full Motorway would be open to traffic in 2020;

f) In Phase ⑥ [Virpazar to Smokovac] the second two lanes would be built on the By-pass and the booths on access roads at the Bistrica Road, with Cetinje Road near Farmaci and with the Niksic Road near Gorica would be modified. The full Motorway would be open to traffic in 2020;

g) In Phase ⑦ [Smokovac to Matesevo] the second two lanes would be built and the booths on the access roads at Smokovac and Matesevo would be modified. The full Motorway would be open to traffic in mid-2021; and

h) In Phase⑧ [Matesevo to Berane and Boljare] the second two lanes would be built and booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca would be modified. The full Motorway would be open to traffic in 2023.

9.4.4 Re-organisation of Interchanges

In proposing this closed system of tolling, it will be of advantage to make some adjustments to the interchanges as designed. These interchanges have configurations which are wasteful of land and could be re-organised to require less land acquisition while at the same time be more conducive to tolling designs. The sketches in Annex A show recommendations for the general locations of toll booths.

Figure 9-1:
Motorway Phasing

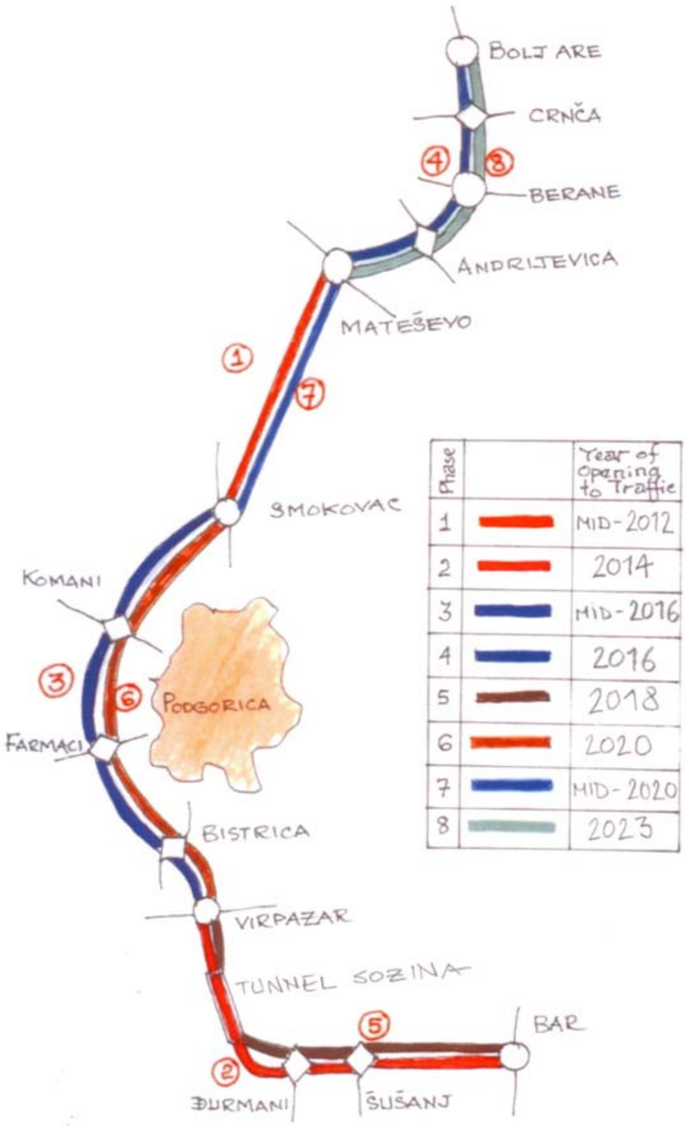
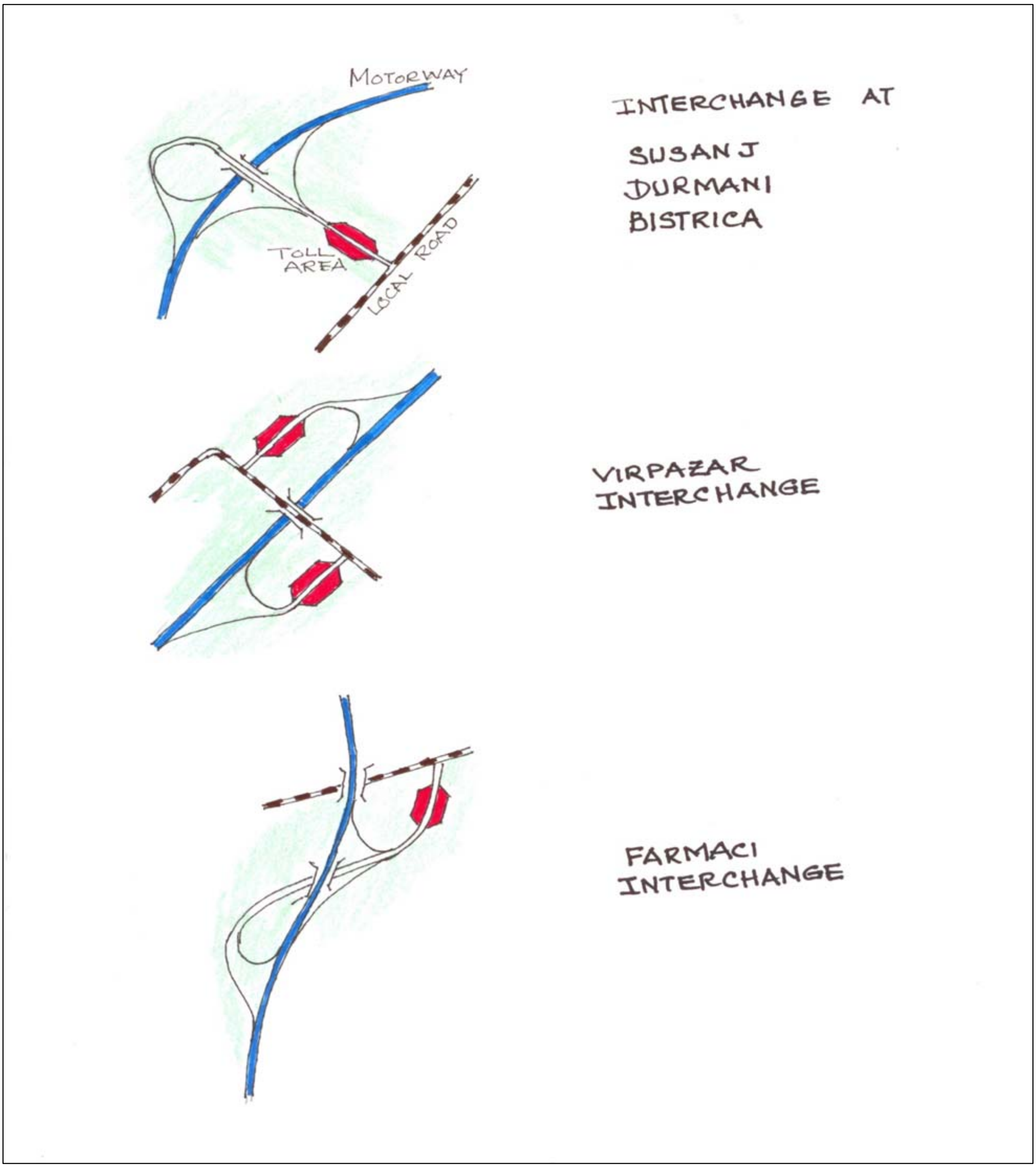
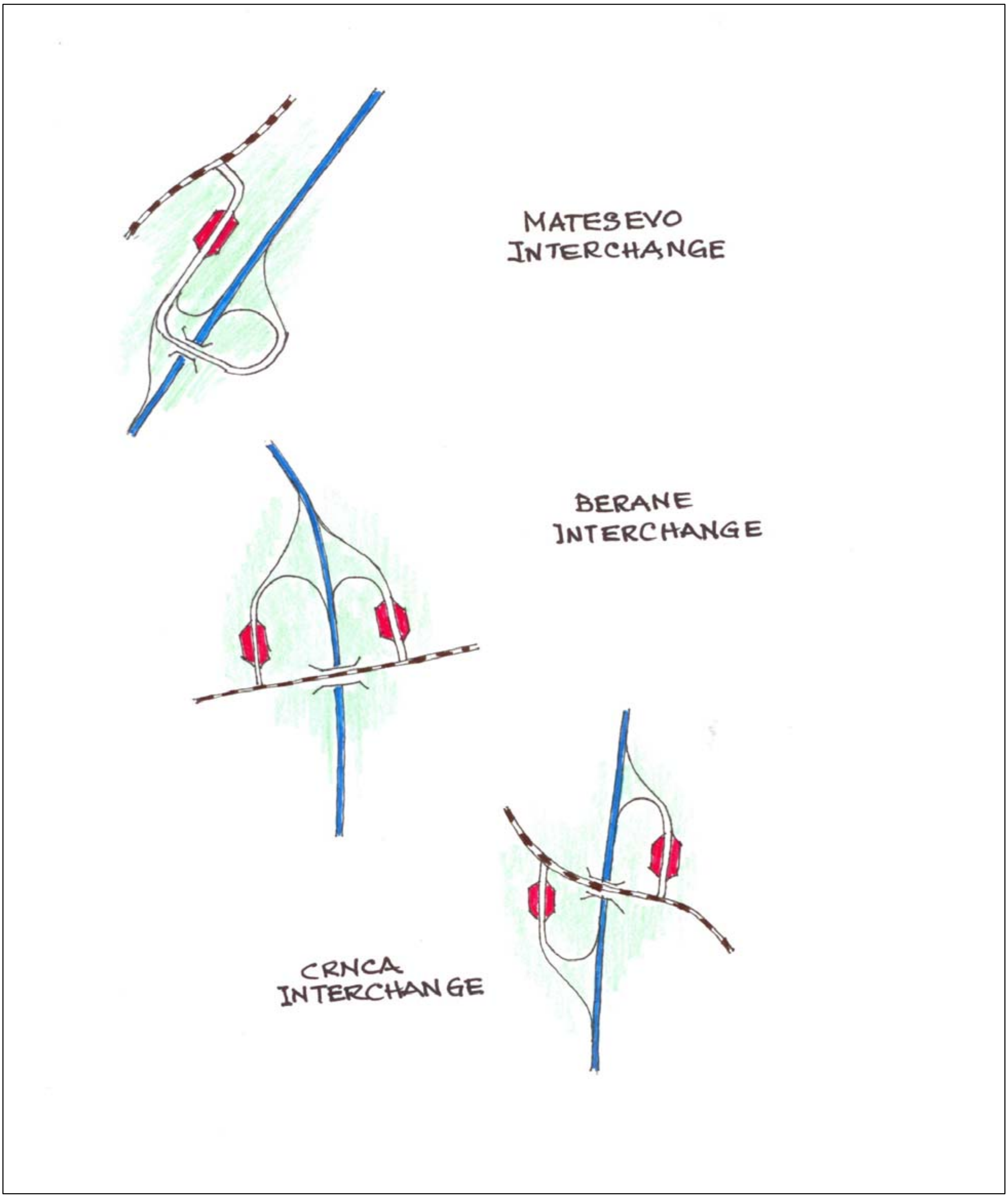


Figure 9-2:
Staging of Construction and Tolling Implementation

Description	Half-Motorway				Full-Motorway			
	2012½ Open Smokovac to Matesevo	2014 Open Virpazar to Bar	2016 Open Virpazar to Smokovac	2016 Open Matesevo to Boljare	2020 Open Virpazar to Bar	2020 Open Virpazar to Smokovac	2021 Open Smokovac to Matesevo	2023 Open Matesevo to Boljare
Existing Toll System includes Full Barrier Width Toll Gate at North end of Sozina Tunnel	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps south of Smokovac	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps north of Matesevo	☑	☑	☑	☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Bar		☑	☑	☑	Remove	Remove	Remove	Remove
Construct Toll Booths on Access Ramps with E851 at Durmanj		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E851 at Susanji		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Smokovac			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Virpazar			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Niksic Rd at Komani			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Farmaci			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Bistrica			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo				☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Road at Andrijevica				☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Boljare				☑	☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E851 at Durmanj					☑	☑	☑	☑
Exoand Toll Booths on Access Ramps with E851 at Susanji					☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Smokovac						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Virpazar						☑	☑	☑
Expand Toll Booths on Access Ramps with Niksic Rd at Komani						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Farmaci						☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Bistrica						☑	☑	☑
Expand Toll Booths on Access Ramps south of Smokovac							☑	☑
Expand Toll Booths on Access Ramps north of Matesevo							☑	☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo								☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Andrijevica								☑

APPENDIX 9 - A - Interchange Toll Areas





Reference: Technical Memorandum no. 25.

REPUBLIC OF MONTENEGRO
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RIMSKI TRG 46 "VEKTRA BUILDING"
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FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

TRAFFIC ANALYSIS AND TRANSPORT STUDY

VOLUME II

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE

PODGORICA, AUGUST, 2008

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Subject of the Study

The preparation of transport studies represents a part of planning-designing activities in the area of construction and reconstruction of transport infrastructure facilities. All input parameters are being dealt with regarding both prognosis of the quantity and the structure of traffic flows on the section of the existing and future transport network and establishing the elements necessary for dimensioning of sections and knots on the network. Apart from that, within transport study, criteria are being formed for evaluation of variants for new network sections and basic parameters which are being used in the process of determining cost-effectiveness of construction and reconstruction of certain parts of that network.

1.2 Objective of the Study

Within "The Feasibility Study for Two Motorways" the Transport study should provide all necessary data both for "base year" and for all future planning horizons required, first of all by the economic team of Consultants for determining the construction dynamics and the level of cost-effectiveness and by the design team for dimensioning sections and knots on the motorways.

1.3 Documentary base for Study preparation

1.3.1 Data on traffic counting

Traffic counting along the main and regional network of Montenegro is conducted by the Crnagoraput AD Company. By 2001 the traffic counting was conducted with automatic counters, while one-day manual "pilot" counting have been conducted once a year in October. After 2001, following the damage of automatic counters due to bad maintenance, the traffic counting was continued on the basis of one-day "pilot" counting. For the purpose of analysis, available were data by sections calculated on AADT for 2000, 2001, 2002, in hard copy and for 2005, 2006 and 2007 in soft copy. (Appendix 1-A shows traffic counting results from the last three years).

1.3.2 Strategic plan for road infrastructure maintenance and development

Within the preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, the BCEOM-COWI consultants prepared the "Strategic plan for maintenance and development of road infrastructure" in 2002-2003, in which the overall network of main and regional roads in Montenegro was included (see chapters 3 and 4). Interviews and traffic counting were conducted at 12 RSI stations, base-year transport model was defined and forecasts by time horizons by 2025 were created. There were three growth scenarios: optimistic, pessimistic and most likely.

All analysis was conducted at the level of municipalities and trip matrices have been made for 35 zones (21 inside and 14 outside zones). Since alignments of proposed new highways were not defined at the time, the prognosis options of network development by 2025 were not evaluated assuming existence of new highways. Thus, the recommendations of this "Strategic Plan" concerned only maintenance and reconstruction of sections of the existing road network.

This Transport study partly used data from „Road network inventory" done within „Strategic plan", which haven't been subject to any physical changes in the last four years.

These are section data for those parts of road network which haven't been reconstructed during this period and refer to upgrades and downgrades, curvatures, carriegeway width and base free-flow speed.

1.4 Initial planning period

Three basic planning periods are defined in transport analysis and prognosis and within them scenarios for evaluation are formed. These are "base year 2007" for which „traffic model" is formed and the calibration of network and all traffic counting and RSI interviews data was performed. Then, "the year of possible releasing of the first part of the motorway 2012 into operation" and the "target year of full realisation of the Physical plan of MN and the twentieth year of the prognosis defined by The Terms of Reference 2027."

2 DEFINITION OF THE RELEVANT NETWORK OF EXISTING ROADS

2.1 Rewiev of the existing network

Existing road network of Montenegro has (according to the official report of the Crnagoraput Company which is in charge of road maintenance) 844,724 km of main and 962,806 km of regional roads.
For the maintenance purposes these are divided into five sections:

1. Podgorica section 241,099 km of main and 126,250 km of regional roads
2. Kotor section 210,542 km of main and 213,116 km of regional roads
3. Niksic section 152,300 km of main and 243,660 km of regional roads
4. Berane section 198,973 km of main and 118,346 km of regional roads
5. Pljevlja section 41,810 km of main and 261,407 km of regional roads

This network was used in the Transport Model for the purpose of trip calibration and determination of transport state in the base year 2007.

2.2 Definition of traffic sections in respect to the contacts with the future motorway

In Transport study, in analysis and prognosis as well as in all models, all sections of Montenegrin road network were used in the same schedule by length and classification as officially registered in the Traffic Directorate of Montenegro.

All used sections of main road and regional road network are displayed in the following tables.

Main Roads

Number				Section	Chainage	length (km)
in order	of section	of road	of E-road			
1	001 01	M-2	E65 E80	Granica CG (Debeli Brijeg) - Igalo	852+440 - 863+100	10,660
2	001 02	M-2	E65 E80	Igalo - Kamenari	863+100 - 878+100	15,000
3	001 03	M-2.1	E65 E80	Kamenari - Risan	0+000 - 10+407	10,407
4	002 00	M-2.1	E65 E80	Risan - Kotor 1 (pošta)	10+407 - 27+983	17,576
5	003 01	M-2.1	E65 E80	Kotor 1 (pošta) - Lepetani	27+983 - 40+228	12,245
6	003 02	M-2	E65 E80	Lepetani -Radanovići 1 (Krašići)	878+100 - 888+219	10,119
7	004 00	M-2	E65 E80	Radanovići 1 (Krašići) - Radanovići 2 (Trojica)	888+219 - 890+014	1,795
8	005 00	M-2	E65 E80	Radanovići 2 (Trojica) - Budva	890+014 - 907.771	17,757
9	006 00	M-2	E65 E80	Budva - Petrovac	907+771 - 922+974	15,203

10	007 00	M-2	E65 E80	Petrovac - Virpazar	922+974 - 947+787	24,813
11	008 00	M-2	E65 E80	Virpazar - Podgorica 1 (Nikšić)	947+787 - 974+718	26,931
12	009 00	M-2	E65 E80	Podgorica 1 (Nikšić) - Podgorica 2 (Tuzi)	974+718 - 975+868	1,150
13	010 00	M-2	E65 E80	Podgorica 2 (Tuzi) - Bioče	975+868 - 989+403	13,535
14	011 00	M-2	E65 E80	Bioče - Mioska	989+403 - 1029+239	39,836
15	012 00	M-2	E65 E80	Mioska - Kolašin	1029+239 - 1046+575	17,336
16	013 00	M-2	E65 E80	Kolašin - Mojkovac	1046+575 - 1066+800	20,225
17	014 00	M-2	E65 E80	Mojkovac - Slijepač Most	1066+800 - 1084+057	17,257
18	015 00	M-2	E65 E80	Slijepač Most - Ribarevina	1084+057 - 1090+101	6,044
19	016 00	M-2	E65 E80	Ribarevina - Berane 1 (Andrijevica)	1090+101 - 1117+464	27,363
20	017 00	M-2	E65 E80	Berane 1 (Andrijevica) - Berane 2 (Turjak)	1117+464 - 1118+088	0,624
21	018 00	M-2	E65 E80	Berane 2 (Turjak) - Kalače	1118+088 - 1140+204	22,116
22	019 00	M-2	E65 E80	Kalače - Rožaje 1 (Kula)	1140+204 - 1148+520	8,316
23	020 00	M-2	E65 E80	Rožaje 1 (Kula) - Rožaje 2 (Vuča)	1148+520 - 1149+557	1,037
24	021 00	M-2	E65 E80	Rožaje 2 (Vuča) - Gran. CG (Špiljani)	1149+557 - 1168+301	18,744
25	022 00	M2.3		Podgorica 3 (Cetinje) - Cetinje 1 (Kotor)	0+000 - 30+608	30,608
26	023 00	M2.3		Cetinje 1 (Kotor) - Budva	30+608 - 58+299	27,691
27	024 01	M2.4	E752	Petrovac - Bar	0+000 - 19+265	19,265
28	024 02	M2.4	E752	Bar - Ulcinj	19+265 - 47+075	27,810
29	025 00	M2.4	E752	Ulcinj - Vladimir	47+075 - 65+516	18,441
30	026 00	M2.4	E752	Vladimir -Granica CG (Sukobin)	65+516 - 71+987	6,471
31	027 00	M-6		Granica CG (Klobuk) - Vilusi	130+720 - 134+178	3,458
32	028 00	M-6		Vilusi - Riđani	134+178 - 163+065	28,887
33	029 00	M-6		Riđani - Nikšić 1 (benz. stanica)	163+065 - 167+698	4,633
34	030 00	M-8		Gradac - Pljevlja 1 (most)	0+000 - 23+799	23,799
35	031 00	M-8		Pljevlja 1 (most) - Pljevlja 2 (auto škola)	23+799 - 24+962	1,163
36	032 00	M-8		Pljevlja 2 (auto škola) - Trlica	24+962 - 29+182	4,220
37	033 00	M-8		Trlica -Granica CG (Mihajlovica)	29+182 - 37+600	8,418
38	034 00	M-9		Kolašin - Mateševo	0+000 - 11+744	11,744
39	035 00	M-9		Mateševo - Andrijevica	11+744 - 45+943	34,199

40	036 00	M-9		Andrijevica - Murino	45+943 - 61+022	15,079
41	037 00	M-9		Murino - Granica CG (Bjeluha)	61+022 - 95+277	34,255
42	038 00	M18	E762	Granica CG(Šćepan Polje) - Plužine	0+000 - 24+491	24,491
43	039 01	M18	E762	Plužine - Jasenovo polje	24+491 - 63+868	39,377
44	039 02	M18	E762	Jasenovo polje-Gornje polje	63+868 - 73+868	10,000
45	040 00	M18	E762	Gornje Polje - Nikšić 1 (benz. stanica)	73+868 - 81769	7,901
46	041 00	M18	E762	Nikšić 1 (benz. stanica) - Nikšić 2 (Šavnik)	81+769 - 83+678	1,909
47	042 00	M18	E762	Nikšić 2 (Šavnik) - Danilovgrad	83+678 - 115+103	31,425
48	043 00	M18	E762	Danilovgrad - Podgorica 3 (Cetinje)	115+103 - 132+200	17,097
49	044 00	M18	E762	Podgorica 3 (Cetinje) - Podgorica 1 (Nikšić)	132+200 - 135+332	3,132
12	009 00	M18	E65 E80	Podgorica 1 (Nikšić) - Podgorica 2 (Tuzi)	974+718 - 975+868	1,150
50	045 01	M18	E762	Podgorica 2 (Tuzi) - Tuzi	169+142 - 178+142	9,000
51	045 02	M18	E-762	Tuzi - Granica CG (Božaj)	178+142 - 192+720	14,578
52	046 00	M21	E760	Granica CG (Barski Most) - Ribarevina	0+000 - 22+018	22,018
						838,308

Regional Roads

Number				Section	Chainage	length (km)
in order	of section	of road	of E-road			
1	047 00	R-1		Cetinje 1 (Kotor) - Cetinje 2 (Lovćen)	0+000 - 2+428	2,428
2	048 00	R-1		Cetinje 2 (Lovćen) - Čekanje	2+428 - 12+100	9,672
3	049 00	R-1		Čekanje - Trojica	12+100 - 39+553	27,453
4	050 00	R-1		Trojica - Kotor 2 (tunel Vrmac)	39+553 - 44+427	4,874
5	051 00	R-1		Kotor 2 (tunel Vrmac) - Kotor 1 (pošta)	44+427 - 45+219	0,792
6	052 00	R-1.1		Trojica - Radanovići 2 (Budva)	0+000 - 3+485	3,485
7	053 00	R-2		Berane 1 (Andrijevica) - Andrijevica	0+000 - 16+437	16,437
8	054 00	R-3		Pljevlja 1 (most) - Dajevića Han	0+000 - 3+151	3,151
9	055 00	R-3		Dajevića Han - Granica CG (Metaljka)	3+151 - 39+126	35,975
10	056 00	R-3.1		Dajevića Han - Granica CG (Čemerno)	0+0000 - 10+299	10,299
11	057 00	R-4		Pljevlja 2 (auto škola) - Đurđevića Tara	0+000 - 37+847	37,847
12	058 00	R-4		Đurđevića Tara - Mojkovac	37+847 - 83+839	45,992
13	059 00	R-5		Đurđevića Tara - Virak	0+000 - 27+466	27,466
14	060 00	R-5		Virak - Boan	27+466 - 50+082	22,616
15	061 00	R-5		Boan - Nikšić 2 (Šavnik)	50+082 - 111+226	61,144
16	062 00	R-6		Gornje Polje - Granica CG (Krstac)	0+000 - 44+527	44,527
17	063 00	R-7		Rožaje 2 (Vuča) - Granica CG (Vuča)	0+000 - 28+172	28,172

18	064 00	R-8		Rožaje 1 (Kula) - Granica CG (Kula)	0+000 - 17+406	17,406
19	065 00	R-9		Murino - Gusinje	0+000 - 18+703	18,703
20	066 00	R10		Slijepač Most - Trlica	0+000 - 65+368	65,368
21	067 00	R11		Risan - Grahovo 1 (Resna)	0+000 - 28+374	28,374
22	068 00	R11		Grahovo 1 (Resna) - Grahovo 2 (Nudo)	28+374 - 28+622	0,248
23	069 00	R11		Grahovo 2 (Nudo) - Vilusi	28+622 - 43+589	14,967
24	070 00	R12		Vilusi - Granica CG (Deleuša)	0+000 - 21+125	21,125
25	071 00	R13		Cetinje 2 (Lovćen) - Lovćen	0+000 - 19+708	19,708
26	072 00	R14		Virak - Plužine	0+000 - 48+700	48,700
27	073 00	R15		Čekanje - Resna	0+000 - 10+756	10,756
28	074 00	R15		Resna - Čevo	10+756 - 19+671	8,915
29	075 00	R15		Čevo - Riđani	19+671 - 56+404	36,733
30	076 00	R16		Virpazar - Vladimir	0+000 - 51+211	51,211
31	077 00	R17		Ulcinj - Ada Bojana	0+000 - 14+040	14,040
32	078 00	R18		Mioska - Boan	0+000 - 24+370	24,370
33	079 00	R19		Bioče - Mateševo	0+000 - 49+327	49,327
34	080 00	R20		Berane 2 (Turak) - Kalače	0+000 - 36+865	36,865
35	081 00	R21		Gradac - Šula	0+000 - 10+841	10,841
36	082 00	R22		Kotor 2 (tunel Vrmac) - Radanovići 1 (Krašići)	0+000 - 3+632	3,632
37	083 00	R23		Danilovgrad - Čevo	0+000 - 25+899	25,899
28	074 00	R23		Resna - Čevo	10+756 - 19+671	8,915
38	084 00	R23		Resna - Grahovo 1 (Resna)	25+899 - 59+850	33,951
22	068 00	R23		Grahovo 1 (Resna) - Grahovo 2 (Nudo)	28+374 - 28+622	0,248
39	085 00	R23		Grahovo 2 (Nudo) - Granica CG (Nudo)	59+850 - 77+153	17,303
40	086 00	L		Jasenovo Polje - Šavnik	0+000 - 28+512	28,512
						978,447

The next Table (below) shows clasiffied network of Montenegro used in the Transport Study.


CRNA GORA
MAGISTRALNI I REGIONALNI PUTEVI
Jadransko more
LEGENDA:
magistralni putevi
regionalni putevi
PODGORICA
NIKŠIĆ
CETINJE
BUDVA
BAR
ULCINJ
KOTOR
TIVAT
PLJEVLJA
BIJELO POLJE
BERANE
KOLAŠIN
ROŽAJE
PLAV
DANILOVGRAD
PETROVAC
HERCEG NOVI
RISAN
ŽABLJAK
PLUŽINE
ŠAVNIK
ANDRIJEVICA
VIRPAZAR
VLADIMIR
ADA

3 ANALYSIS OF ACHIEVED TRAFFIC FLOWS ON THE RELEVANT NETWORK OF THE EXISTING ROADS IN THE BASIC YEAR

3.1 Analysis of available data, as per data from up-to-date traffic counting and some other studies, if necessary

The annual traffic counting conducted regularly by the Crnagoraput Company is the base for traffic volume determination along the road network of Montenegro. Such are one-day counting carried out at 35 locations along the main and regional network once a year in September.

3.2 Additional and control investigations (counting and surveys)

However, in order to determine the “travel willingness” and “traffic flows” which are necessary in creating “the forecast transport models” it was also, apart from regular annual counting of Crnagoraput Company, necessary to conduct roadside interviews of vehicle drivers on the road.

This is the reason why the Louis Berger Company organized seven-day 12-hour and 24-hour counting and roadside interviews in October 2007, carried out at 16 RSI stations along the corridors of future highways at almost same places where Crnagoraput Company conducts its annual counting.

3.2.1 Terms of reference for additional surveys

For the purpose of database creation, it is necessary to perform the following activities:

1.) Traffic Counting

2.) Roadside Interview (RSI) of Vehicle Drivers along the Road

3.) Stated Preference

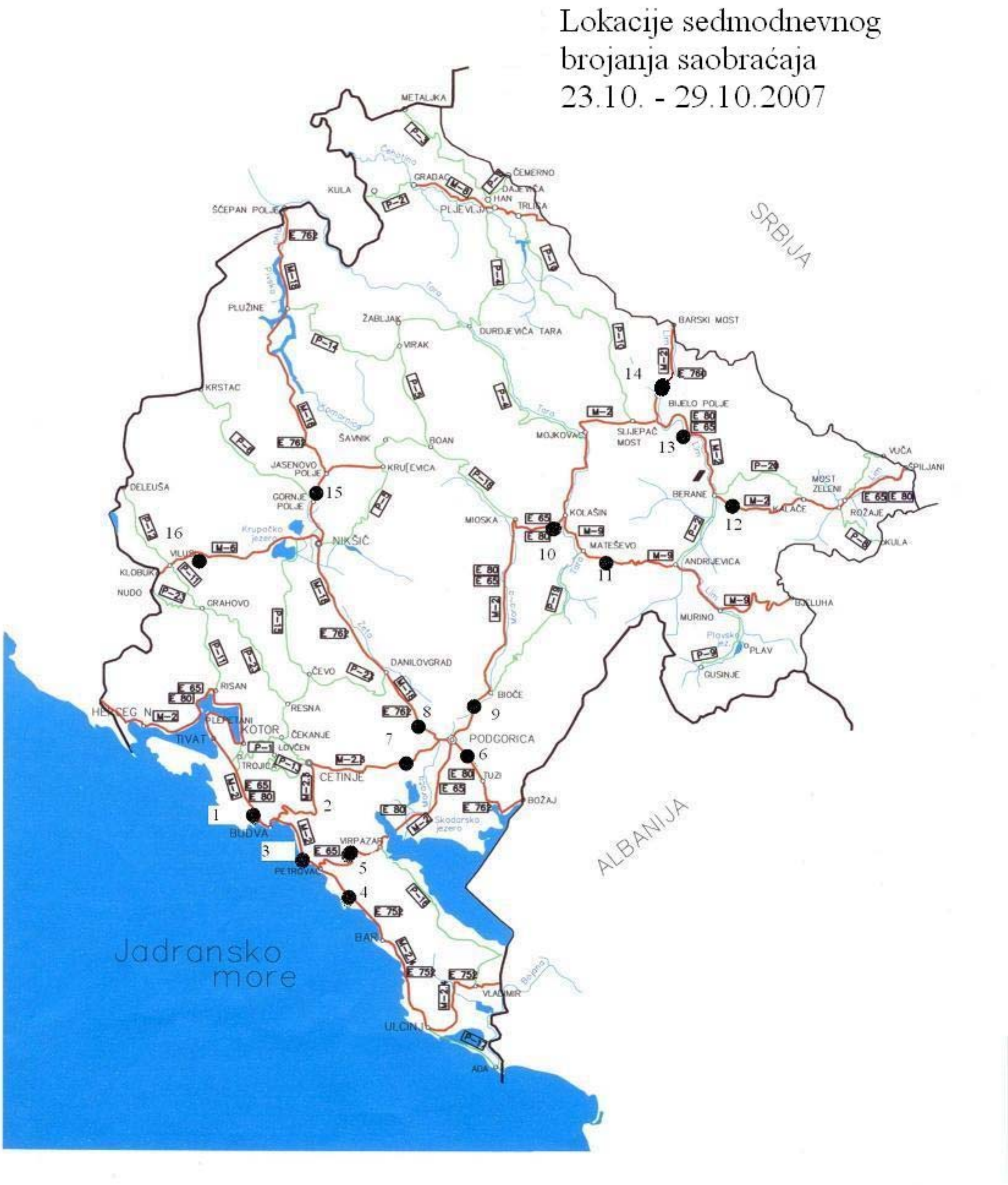
4.) Processing of Recorded Material

Traffic counting and interviews are conducted at 16 (sixteen) RSI stations along the road network in Montenegro, i.e. within the corridor of future highways (Appendix 1-B: map and list of traffic counting and RSI stations).

Traffic counting is conducted during 7 days period (Tuesday, 23.10.2007. – Monday, 29.10.2007.) for 12 hours (7:00 to 19:00), except on the day when also the interview is conducted in the zone of that counting station, the counting is also conducted for 24 hours (00 to 24.00).

Station			Relevant	Sample	Necessary no. of		
No.	Road no.	Location of RSI stations	AADT	25%	Interviewers		Counters
1	M-2	Between Budva and Tivta	11658	2915	(6 + 6)	12	2
2	M-2.3	Between Budva and Cetinje	7086	1772	(4 + 4)	8	2
3	M-2	Between Budva and Petrovac	5236	1309	(3 + 3)	6	2
4	E-752	Between Petrovac and Bar	6598	1650	(4 + 4)	8	2
5	M-2	Exit of "Sozina' tunnel'	4904	1226	(3 + 3)	6	2
6	M-18	Between Podgorica and Tuzi	7477	1869	(4 + 4)	8	2
7	M-2.3	Between Podgorica and Cetinje	8137	2034	(4 + 4)	8	2
8	M-18	Between Pogorica and Danilovgrad	5557	1389	(3 + 3)	6	2
9	M-2	Between Podgorica and Bioči	5755	1439	(3 + 3)	6	2
10	E-80	Between Crkvine and Kolašin	3249	812	(2 + 2)	4	2
11	M-9	Between Mateševo and Kraljske bare	977	244	(1 + 1)	2	2
12	M-2	Between Berane and Rožaje	3280	820	(2 + 2)	4	2
13	M-2	Interchange "Ribarevina"	4215	1054	(3 + 3)	6	2
14	M-2	Between B.Polje and Barski most	4949	1237	(3 + 3)	6	2
15	M-18	Between Nikšić and Jasenovo Polje	2861	715	(2 + 2)	4	2
16	M-6	Between Vilusi and Klobuk	1591	398	(2 + 2)	4	2
			83530	20883		98	32

MAP OF COUNTING AND RSI STATIONS



Vehicle interview is conducted at every RSI station during one day period from 7.00 to 19.00h. Total interview last three days (Tuesday, Wednesday and Thursday) within the week of traffic counting. On each day of interview 5-6 stations which are close to each other need to be arranged is groups for the purpose of easier transportation of interviewers and controlors. Interview is conducted at the same station for both O-D survey and for „travel time value“ in such way the sample of 20-25% of counted vehicles need to be provided for „O-D“ survey, and sample of 4-5% for „travel value“ interview.

For the vehicle interviews it is necessary to choose such a place which is safe for both interviewers and also traffic users.

There must be a passing place, wide enough so that several vehicles can be pulled over and stopped at the same time (parking place by the road, in front of a motel or restaurant etc.). In case such place can not be found one across the other, RSI stations can be moved along the road. RSI stations must be clearly marked with traffic signs. At each RSI station there must be a police patrol all the time which will stop the vehicles.

Contractor must visit, mark and photograph all RSI stations so they can be easily found on the day of interview.

Contractor must also conduct training for counters, interviewers and controllers along with total number of planned staff and also to provide necessary additional staff in case of absence of some of the interviewers.

Planned number of interviewers and counters (without controller which is engaged by the Contractor) which is shown in the previous table, is been defined according to number of vehicles along particular road section (data from “Crnagoraput” AD Company), and also according to planned dynamics that one interviewer can conduct 20 interviews per hour. For each direction there need to be two interviewers for the“travel time value“ interview. For both directions for the counting purposes, there need to be at least one counter and another three counters for 12 hours night shift. At those counting stations when there is no interview, there need to be at least two counters in 12 hours counting shift.

Interviewers must have signs so they are recognizable to drivers. They can be marked with “badges” on their uniforms, ribbons around their sleeves or vests that are slipped over their heads. Signs such as: interviewer, controller or counter can be written on their ‘badges’.

Contractor must provide safe transportation of interviewers and counters to the RSI stations, so that interview can start at exactly 7.00 o’clock. Interviewers and counters need to be insured from eventual injuries and accidents during the time of interviews/surveys.

a) Traffic counting

Traffic counting is conducted manually for both directions and data are inserted into the “Counting Sheet” (enclosed). The vehicles are divided into 12 categories the way it is shown in the sheet. Number of passed vehicles is marked with a slash in certain square in the sheet. Two vehicles (X) are inserted in each square. Previously, all requested data are written on the heading. One page of a sheet is used for one hour of counting. For every next hour, the new page is filled out. In case one page is filled out with one category before one hour time expires, new page is taken, ‘page number 2' is written on the heading and is used until one hour time expires. No matter how much information is filled out in the page, new page is taken for the next hour.

b) Roadside interview of vehicle drivers along the road

Roadside interview is conducted by using "Roadside Interview Sheet" (enclosed). All requested data are filled out previously in the sheet. Data are written in certain time period one by one, in such way that "time of interview" at the moment of interview is written under 'Survey hour' and only "page number" is changed. When one hour time expires, a new page in which next hour data are inserted is taken. Data are filled out the following way:

- **"TYPE OF VEHICLE" -** Number of type of vehicle is written using the table below (for example, number 2 stands for the 'passenger car').
- **"NUMBER OF PASSENGERS IN THE VEHICLE INCLUDING DRIVER" -** Number is written.
- **"PLATES" -** Only two-letter sign of town in Montenegro is written (PG,NK,). For those vehicles outside Montenegro, the sign of the country in which the vehicle is registered is written in "LATINIC' (SRB, H, CRO, I).
- **"DEPARTURE ZONE" -** Interviewer skips this column which is filled out in processing procedure.
- **"WHAT PLACE ARE YOU COMING FROM" -** The most common answer to this question is the name of the city or settlement (Niksic, Budva, Cevo etc.). The interviewer should ask additional question "WHICH MUNICIPALITY IS THAT" and then writes the answer in the column. If the interviewed driver does not know the municipality, the interviewer writes the name of the city or settlement. For those vehicles coming from the outside of Montenegro, 'the name of the origin country' is written.
- **''WHAT IS THE PURPOSE OF VISITING THE PLACE OF ORIGIN'' -** This is an important question that can confuse the interviewed driver. Interviewer should help the interviewed driver with additional question (for example "are you coming from your home, work or visit"), and then interviewer writes 'number of purpose' using the table in the sheet.
- **"ARRIVAL ZONE" -** Interviewer skips this column which is filled out in the processing procedure.
- **"WHERE ARE YOU TRAVELING TO" -** The most common answer to this question is also the name of the city or settlement (Niksic, Budva, Cevo etc). Interviewer should ask additional question such as "WHICH MUNICIPALITY IS THAT" and then writes the answer in the column. If the interviewed passenger does not know the municipality, the interviewer writes the name of the city (village or settlement). For those vehicles coming from outside of Montenegro, only "the name of the destination country is written".
- **''WATH IS THE PURPOSE OF TRAVELING TO THE PLACE'' -** If the interviewed driver can not give the answer right away or does not know, the interviewer should offer him/her several answers from the table (he goes 'home', 'to work', 'to school-education', 'in visit' etc).

- **"HOW OFTEN DO YOU TRAVEL" -** In the first two columns the interviewer writes the answer under the number, and if the answer is 'rarely', the interviewer writes number (1) in the column.

This set of questions is used only when interviewing "passenger vehicles', codes (1,2,3,4,5).

For trucks and buses (codes 6,7,8,9,10,11,12), data are inserted only in the following columns:

- Type of vehicle
- Number of passengers
- Plates
- Place of origin
- Place of destination

"Purposes of travelling" are skipped for both directions, so as "how often do you travel"

To avoid double interviews at more RSI stations in one direction, each interviewed driver gets sheet with information that he has been interviewed in that direction. He puts the sheet so it can be visible on the inside of windshield so the police do not stop him at the next RSI stations.

c) RSI interview of vehicle drivers (stated preference)

For the purpose of travel time identification, set of paired choises will be presented to respondents. The answer choices take the form of „Which would you prefer?"

c.1 reduction in journey time of 15 minutes?

c.2 reduction in journey cost of 0.75 euros (75 eurocents)?

It has been found in previous surveys that up to six choice pairs (with different time and cost values) can be presented without a decrease in most respondents' ability to answer the questions easily (datasheet enclosed).

The most satisfactory approach is to start the choice pair with an implicitly fairly low value of time and to vary the values of time and cost in such a way that they are progressively increased. In the example below the implicit value of time is equivalent to 3.00 euros per hour. If choice "A" is given then the person's value of time is greater than 3.00 euros per hour, and correspondingly if "B" is chosen then it is less than 3 euros. Normally, for most respondents, as the implicit value of time is raised, there would be a 'switch' from choosing time savings to preferring cash savings. Thus, the point at which the switch is made, to preferring cost savings, will reveal the person's true value of time. In the enclosed datasheet below the implicit value of a travel time saving varies from 0.40 euros/hour at the lowest, up to 6.00 euros per hour at the highest.

Information will be collected on the sex, age group, occupation, number of vehicles in household, trip purpose, and number of occupants. Information will also be collected on the current journey structure. In regression analysis of the sample data collected, these independent variables serve to normalize the results from the sample. Household income level is clearly an important factor in a person's valuation of travel time savings. However, because of the difficulty associated with asking questions about household income, better responses will be obtained by asking the respondent to estimate monthly household expenditure or consumption (see Appendix 1-B).

d) Processing of recorded material

For collected counting data, the "Collection Sheet" is created in Excel (sheet format enclosed), in which collected data for each hour of counting is registered. Data are registered for each interview-counting station for each direction and also total for both directions by all categories of vehicles from the 'counting sheet'.

For the purpose of interviewed data processing, it is necessary to perform 'coding' of zones of origin and destination. A "Coder" will be given to the Contractor as a separated sheet in which all municipalities and also the group of countries outside Montenegro will have their number which is inserted in the columns "zone of origin" and "zone of destination". In case there is no name of municipality as the answer but only a name of the city or settlement, the Contractor will get separated list of municipalities with names of settled places which belong to that municipality.
Using such a list, name and number of municipality is found from the list of names of the city or settlement which is written in the columns "zone of origin" and "zone of destination".

Coded material is inserted in the "EXCEL" database, for each RSI station separately. Database is created in such a way that each journey from the RSI sheet regardless direction, makes one line in database of RSI station. Database is created with the following "blocks" in EXCEL.

a) Number in order (1,2,3,4,… all sheets from particular RSI station in both directions from 7.00 to 19.00h)
b) Time of interview (7.00 – 8.00,…, 18.00 – 19.00)
c) Type of vehicle (1,2,3,…,12)
d) Number of passengers (1,2,3,…)
e) Plates (PG, NK, SRB, CRO, BiH)
f) Zone of origin (1,2,3,…total number of given areas)
g) Purpose of visiting the place (1,2,3,…7)
h) Zone of destination (1,2,3,…total number of given zones)
i) Purpose of travelling to the place (1,2,3,…7)
j) Number of travels per week (1,2…) if there is no answer in that column (0)
k) Number of travels per month (1,2,…), if there is no answer in that column (0)
l) If the answer is 'rarely' (1), if there is no answer in that column (0)

After data registration in EXCEL database is completed, the Contractor should create "travel matrix" zone-zone for four destination purposes of travelling and total (destination purpose of travelling 1-home, 2-work, 3-shopping, 4-education, and total (summary of all purposes), for the first group of vehicles from the table (a. passenger vehicles, codes 1,2,3,4,5). For second group of vehicles from the table (b. trucks and buses, codes 6,7,8,9,10,11,12), only the "matrix of total trips" will be created, without "purpose" which will not be even coded within the sheets. All "matrixes of trips" should be presented in EXCEL format. For each RSI stations 6 (six) travel matrixes zone-zone will be created.

Finally, "Summary Table" (enclosed) should be presented it EXCEL from which one can see by each RSI and counting station the number of counted vehicles and percentage of interviewed vehicles.

Results from the travel time analysis are processed separately. First, the zone of departure and zone of arrival is coded from the list, and then all data from the interview list are moved to EXCEL format, the way that one page makes one line in EXCEL.

3.2.2 Summary results of traffic counting and interviews

During seven-day counting organized by the Consultant, more than 450 000 vehicles classified in 12 types (5 types of passenger vehicles, 4 types of trucks and 3 types of buses) were counted, and on days when 24-hour interviews were carried out, 83 000 vehicles were counted.

Within the O-D and travel purpose surveys around 10 000 vehicle drivers were interviewed.
This action involved more than 150 counters and interviewers who were stopping the vehicles at RSI stations with the assistance of 16 mandatory police patrols in order to perform the interviews.

Beside regular questions “What is your place of origin/destination?”, drivers were also asked on “their trip purpose”, i.e. what is the main reason for their trip, so as how often do they travel (everyday, weekly, monthly etc.).

After all data were submitted the trip matrices were formed for the base year 2007 which were then being transformed into the Transport Model which is used, following the process of calibration, in creating “traffic picture” of the road network in Montenegro.

To determine the future traffic flows total traffic forecasts were made (“forecast trip matrices” were defined for the “base”, “control” and “target” year), and forecasted options of road network so as “no motorways” and “with motorways” cases were determined within the Transport Model as a base for decision making regarding the need and time of constructing certain sections (Summary trip matrices are shown in the Appendix 1-C).

The main categorization of vehicle types in the process of counting and interviews was the classification into 12 categories by which the counting and interviews were conducted.

In the counting analysis the number of vehicle type was adjusted to 6 categories for both need of using them in the models and also possibility of comparing them with multi-annual counting conducted by the Crnagoraput Company.

Defined were the following categories:

1. Passenger car
2. Van + minibus
3. Bus
4. Light truck
5. Medium truck
6. Heavy truck and Heavy truck with trailer

Within the O-D Survey analysis two types of matrices were formed.

1. Passenger vehicle matrix (passenger car, van and minibus) for which the travel purposes were also specified
2. Truck and bus matrix for which the origin and destination zones were specified.

SUMMARY OF COUNTING AND INTERVIEWS

				Counting		Interwiev			
				24h	12h	Apsolutno		%	
Count location	Count. 07-19h	Count. 19-07h	Count. Total	Interwiev Day and Night	Interwiev Day	SP	OD	SP%	OD%
1	55136	2932	58068	11280	8348	230	**1641**	2,76%	19,66%
2	26730	1367	28097	5447	4080	148	**819**	3,63%	20,07%
3	26344	869	27213	4767	3898	137	**717**	3,51%	18,39%
4	31219	2443	33662	6818	4375	126	**689**	2,88%	15,75%
5	3635	120	3755	597	477	32	**106**	6,71%	22,22%
6	38552	1325	39877	7727	6402	186	**1018**	2,91%	15,90%
7	46718	2024	48742	8743	6719	188	**1094**	2,15%	16,28%
8	50220	2031	52251	8789	6758	221	**893**	2,51%	13,21%
9	23495	1284	24779	4580	3296	114	**476**	2,49%	14,44%
10	28220	1855	30075	6211	4356	124	**641**	2,85%	14,72%
11	2098	143	2241	394	251	4	**21**	1,59%	8,37%
12	13479	1057	14536	2892	1835	34	**451**	1,85%	24,58%
13	22436	836	23272	4223	3387	75	**398**	2,21%	11,75%
14	44741	2243	46984	8766	6523	35	**463**	0,54%	7,10%
15	5728	235	5963	898	663	29	**121**	3,23%	18,25%
16	5108	241	5349	804	563	43	**169**	5,35%	30,02%
total	**423859**	**21005**	**444864**	**82936**	**61931**	**1726**	**9717**	**2,95%**	**15,69%**

	12 h counting		24 h counting		Expansion factors for traffic counting		12 hour interwiev		
Count location	PC	TRUCK	PC	TRUCK	F1-PC	F1-TRUCK	PC	TRUCK	F2-PC
1	7026	1322	9752	1528	1,39	1,16	1438	203	**4,89**
2	3582	498	4785	662	1,34	1,33	762	57	**4,70**
3	3111	787	3926	841	1,26	1,07	631	86	**4,93**
4	3543	832	5672	1146	1,6	1,38	569	120	**6,23**
5	295	182	385	212	1,31	1,16	88	18	**3,35**
6	5934	468	7196	531	1,21	1,13	934	84	**6,35**
7	6012	707	7846	897	1,31	1,27	1042	52	**5,77**
8	5962	796	7754	1035	1,3	1,3	793	100	**7,52**
9	2664	632	3624	956	1,36	1,51	382	94	**6,97**
10	3556	800	4753	1458	1,34	1,82	540	101	**6,59**
11	219	32	352	42	1,61	1,31	20	1	**10,95**
12	1618	217	2433	459	1,5	2,12	432	19	**3,75**
13	2773	614	3387	765	1,25	1,25	377	21	**7,36**
14	6134	389	8161	605	1,33	1,56	408	55	**15,03**
15	572	91	773	125	1,35	1,37	113	8	**5,06**
16	468	95	641	163	1,37	1,72	126	43	**3,71**
total	**53469**	**8462**	**71440**	**11425**			**8655**	**1062**	

3.2.3. Detailed traffic counting results analysis

From the seven-day traffic counting, derived were the expansion factors for average daily traffic on the day of counting and also average daily traffic in the week of counting (AWDT – Average Weekly Daily Traffic). From the Crnagoraput traffic counting data, derived were factors of Weekly Traffic Distribution in the month (October) of counting (AMDT – Average Monthly Daily Traffic) so as factors of Monthly Traffic Distribution in a year (AADT – Average Annual Daily Traffic).

Derived factors are the following:

Daily Traffic Distribution Factor (24 hour counting/12 hour counting)…………………..1,34

Weekly Traffic Distribution Factor (is obtained directly from 7-day counting)…………1,00

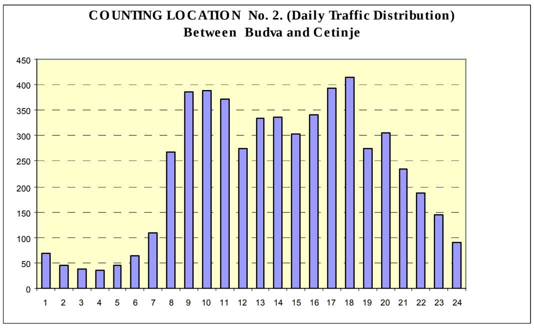
Monthly Traffic Distribution Factor (weekly counting (22-29) in October)……………....0,99

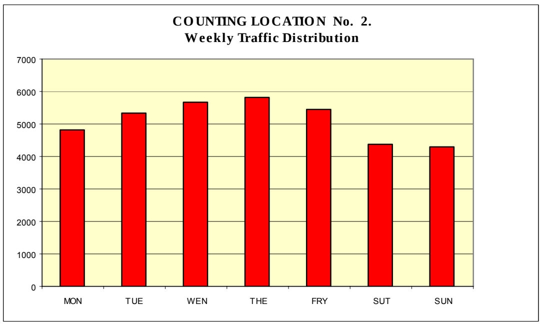
Annual Traffic Distribution Factor (AADT/AMDT)…..……………………………………..1,20

Tables below show seven-day counting summary results expanded to the level of Average Annual Daily Traffic (AADT) in 2007.

RSI & COUNTING LOCATION No. 1(Between Budva and Tivat)

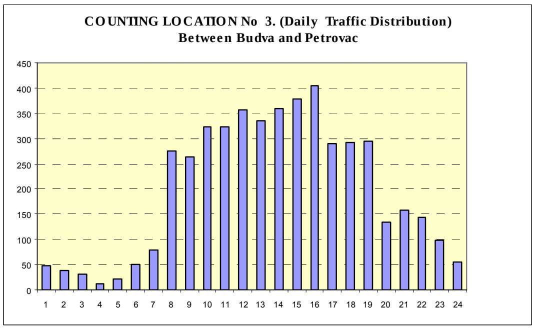
	29 Mon	2324 Tue	25 Wed	26 The	27 Fri	28 Sat	Sun	SUM (1,00)	AWDT (0,99)	AMDT (1,20)	AADT
1P.Car (1,2,3)	9042	9150	9030	9198	9014	8696	6793	**60923**	8703	8616	**10339**
2Light Delivery&Mikro bus (4,5)	700	756	793	724	738	570	271	**4553**	650	644	**773**
3Bus (more than 30 seats)(10,11,12)	279	277	290	277	316	273	255	**1968**	281	278	**334**
4Small truck (2-axle) (6,7)	453	465	472	426	475	340	150	**2782**	397	393	**472**
5Medium truck (2-axle) (8)	517	573	545	545	474	327	141	**3122**	446	441	**530**
6Heavy truck (5-axle art.) (9)	236	179	253	203	263	200	151	**1485**	212	210	**252**
TOT	**11228**	**11400**	**11383**	**11374**	**11280**	**10407**	**7760**	**74832**	10690	10583	**12700**

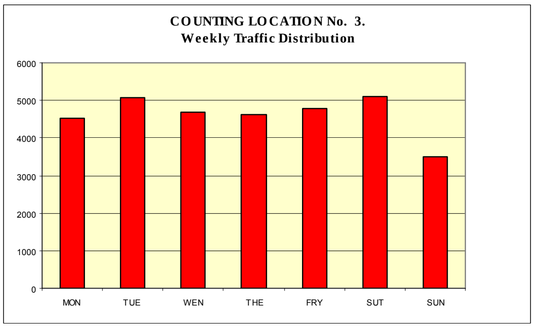




RSI & COUNTING LOCATION No. 3 (Between Budva and Petrovac

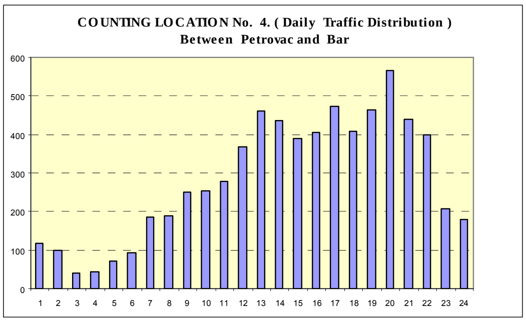
		29 Mon	23 Tue	24 Wed	25 The	26 Fri	27 Sat	28 Sun	SUM	AWDT (1,00)	AMDT (0,99)	AADT (1,20)
1	P.Car (1,2,3)	3480	3914	3588	3631	3605	3823	2695	**24736**	3534	3498	**4198**
2	Light Delivery&Mikro bus (4,5)	257	339	294	271	321	308	201	**1991**	284	282	**338**
3	Bus (more than 30 seats)(10,11,12)	164	114	114	97	113	153	133	**887**	127	125	**150**
4	Small truck (2-axle) (6,7)	175	187	180	159	197	209	129	**1236**	177	175	**210**
5	Medium truck (2-axle) (8)	174	196	183	167	173	206	131	**1231**	176	174	**209**
6	Heavy truck (5-axle art.) (9)	289	309	333	281	358	411	207	**2187**	312	309	**371**
	TOT	**4538**	**5059**	**4692**	**4605**	**4767**	**5110**	**3496**	**32266**	4609	4563	**5476**

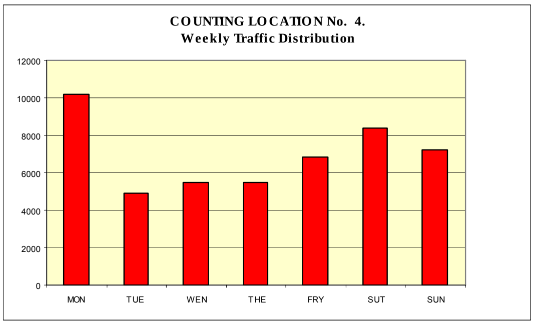




RSI & COUNTING LOCATION No. 4 (Between Petrovac and Bar)

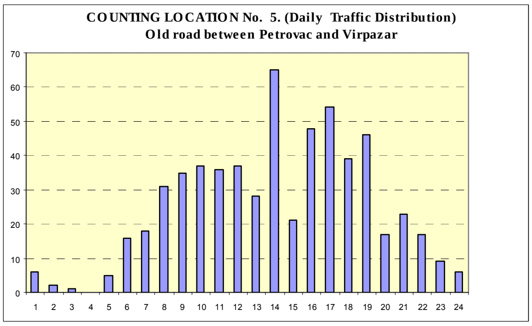
		29 Mon	23 Tue	24 Wed	25 The	26 Fri	27 Sat	28 Sun	SUM	AWDT (1,00)	AMDT (0,99)	AADT (1,20)
1	P.Car (1,2,3)	7970	3636	4145	4126	5280	6363	6030	**37551**	5364	5311	**6373**
2	Light Delivery&Mikro bus (4,5)	640	241	344	315	392	627	396	**2955**	422	418	**501**
3	Bus (more than 30 seats)(10,11,12)	131	78	92	71	115	147	62	**695**	99	98	**118**
4	Small truck (2-axle) (6,7)	350	294	254	271	236	305	172	**1881**	269	266	**319**
5	Medium truck (2-axle) (8)	488	310	228	287	339	401	247	**2299**	328	325	**390**
6	Heavy truck (5-axle art.) (9)	599	326	420	384	456	570	296	**3050**	436	431	**518**
	TOT	**10177**	**4884**	**5483**	**5453**	**6818**	**8414**	**7203**	**48431**	6919	6850	**8219**

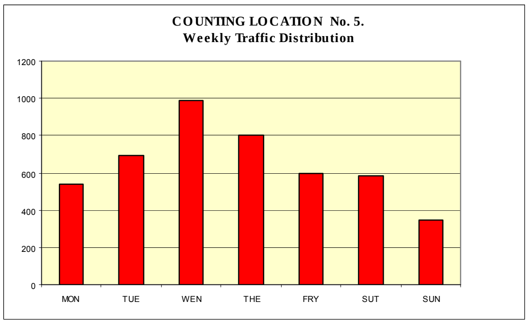




RSI & COUNTING LOCATION No. 5 (Between Petrovac and Virpazar)

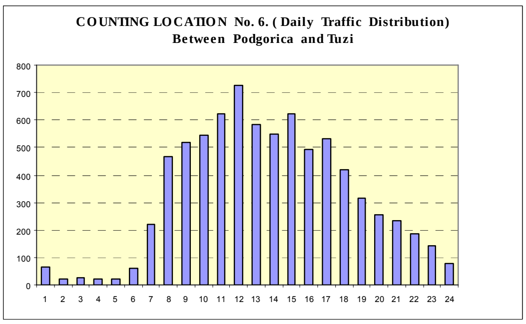
										FACTORS		
		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	279	418	502	424	330	315	253	**2522**	360	357	**428**
2	Light Delivery&Mikro bus (4,5)	51	63	68	59	55	47	30	**374**	53	53	**63**
3	Bus (more than 30 seats)(10,11,12)	2	1	1	4	1	1	0	**10**	1	1	**2**
4	Small truck (2-axle) (6,7)	57	44	92	62	45	34	21	**354**	51	50	**60**
5	Medium truck (2-axle) (8)	71	111	234	182	100	128	26	**851**	122	120	**145**
6	Heavy truck (5-axle art.) (9)	81	56	93	70	66	57	17	**440**	63	62	**75**
	TOT	**541**	**693**	**990**	**801**	**597**	**583**	**347**	**4552**	650	644	**773**

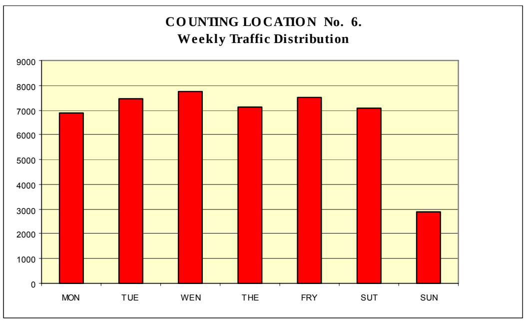




RSI & COUNTING LOCATION No. 6 (Between Podgorica and Tuzi)

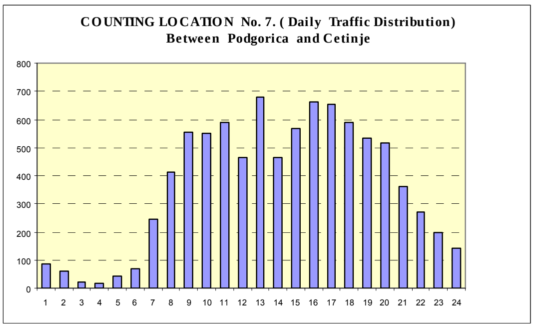
										FACTORS		
		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	6264	6703	6799	6444	6830	6493	2697	**42231**	6033	5973	**7167**
2	Light Delivery&Mikro bus (4,5)	306	392	397	353	309	311	75	**2143**	306	303	**364**
3	Bus (more than 30 seats)(10,11,12)	21	26	31	35	43	31	16	**201**	29	28	**34**
4	Small truck (2-axle) (6,7)	112	140	195	114	100	84	39	**783**	112	111	**133**
5	Medium truck (2-axle) (8)	71	119	163	98	87	85	24	**646**	92	91	**110**
6	Heavy truck (5-axle art.) (9)	113	90	142	87	117	90	24	**662**	95	94	**112**
	TOT	**6886**	**7471**	**7727**	**7130**	**7486**	**7093**	**2874**	**46667**	6667	6600	**7920**

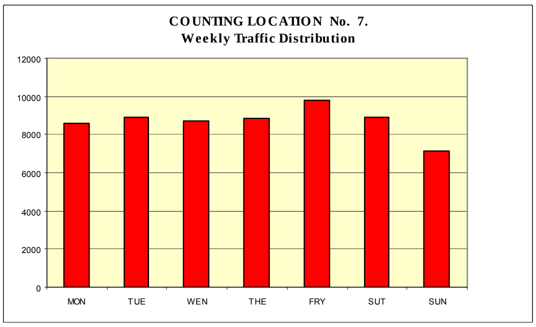




RSI & COUNTING LOCATION No. 7 (Between Podgorica and Cetinje)

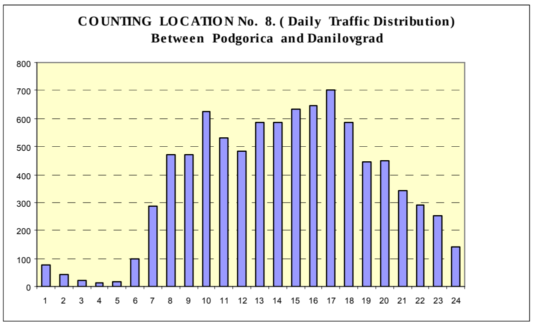
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	7269	7387	7250	7244	8265	7715	6436	**51566**	7367	7293	**8752**
2	Light Delivery&Mikro bus (4,5)	528	652	596	663	607	492	257	**3794**	542	537	**644**
3	Bus (more than 30 seats)(10,11,12)	145	155	162	153	177	128	149	**1070**	153	151	**182**
4	Small truck (2-axle) (6,7)	103	169	170	170	127	85	41	**866**	124	122	**147**
5	Medium truck (2-axle) (8)	220	257	317	315	283	181	98	**1670**	239	236	**283**
6	Heavy truck (5-axle art.) (9)	299	272	248	307	324	286	161	**1895**	271	268	**322**
	TOT	**8564**	**8892**	**8743**	**8852**	**9782**	**8886**	**7142**	**60862**	8695	8608	**10329**

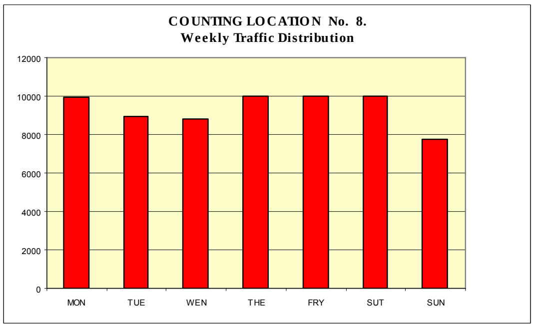




RSI & COUNTING LOCATION No. 8 (Between Podgorica and Danilovgrad)

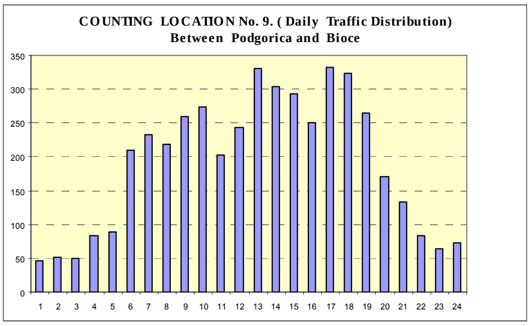
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	8423	7229	7096	8323	8133	8798	7011	**55013**	7859	7780	**9337**
2	Light Delivery&Mikro bus (4,5)	516	624	658	589	677	476	259	**3800**	543	537	**645**
3	Bus (more than 30 seats)(10,11,12)	321	309	306	322	336	222	166	**1983**	283	280	**336**
4	Small truck (2-axle) (6,7)	151	157	157	192	161	100	55	**973**	139	138	**165**
5	Medium truck (2-axle) (8)	269	278	260	275	330	181	116	**1709**	244	242	**290**
6	Heavy truck (5-axle art.) (9)	280	321	312	320	350	251	116	**1949**	278	276	**331**
	TOT	**9960**	**8919**	**8789**	**10022**	**9986**	**10028**	**7724**	**65428**	9347	9253	**1104**

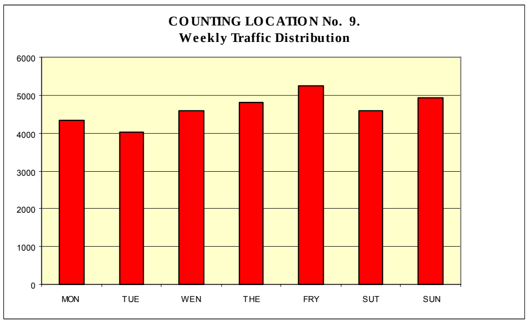




RSI & COUNTING LOCATION No. 9 (Between Podgorica and Bioče)

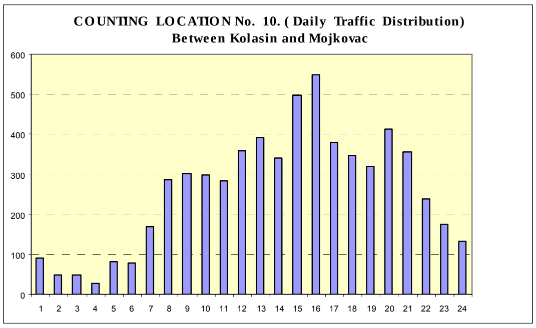
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3295	2818	3252	3450	3829	3613	4083	**24341**	3477	3443	**4131**
2	Light Delivery&Mikro bus (4,5)	269	292	372	344	354	269	262	**2162**	309	306	**367**
3	Bus (more than 30 seats)(10,11,12)	108	81	123	112	141	124	146	**835**	119	118	**142**
4	Small truck (2-axle) (6,7)	133	139	150	161	146	68	70	**869**	124	123	**147**
5	Medium truck (2-axle) (8)	224	254	243	279	285	187	136	**1607**	230	227	**273**
6	Heavy truck (5-axle art.) (9)	307	447	440	469	496	329	245	**2734**	391	387	**464**
	TOT	**4338**	**4031**	**4580**	**4814**	**5251**	**4590**	**4944**	**32548**	4650	4603	**5524**

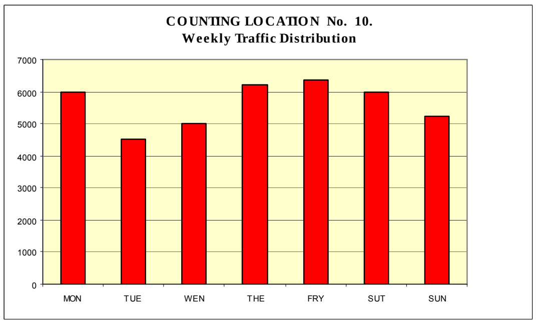




RSI & COUNTING LOCATION No. 10 (Between Kolašin and Mojkovac)

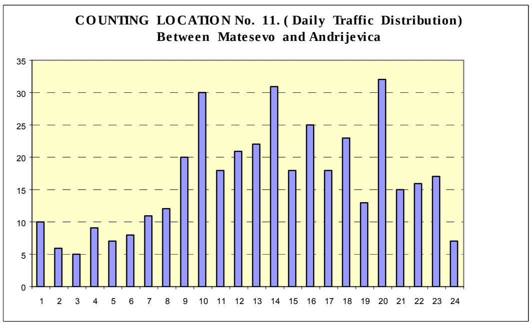
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	4739	3026	3657	4164	4710	4637	4115	**29049**	4150	4108	**4930**
2	Light Delivery&Mikro bus (4,5)	400	306	446	589	452	373	323	**2889**	413	409	**490**
3	Bus (more than 30 seats)(10,11,12)	93	104	83	167	111	126	109	**793**	113	112	**135**
4	Small truck (2-axle) (6,7)	92	147	87	203	140	121	84	**875**	125	124	**148**
5	Medium truck (2-axle) (8)	174	263	148	276	244	187	99	**1392**	199	197	**236**
6	Heavy truck (5-axle art.) (9)	484	658	583	812	697	557	489	**4281**	612	605	**727**
	TOT	**5982**	**4505**	**5005**	**6211**	**6354**	**6003**	**5220**	**39279**	5611	5555	**6666**

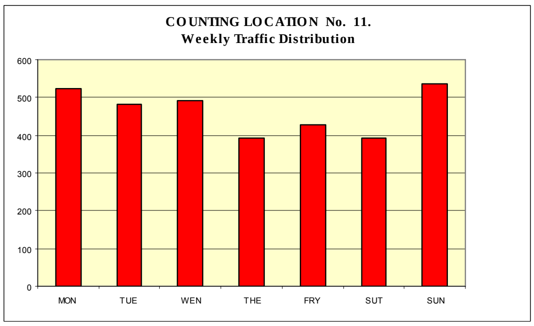




RSI & COUNTING LOCATION No. 11 (Between Mateševo and Andrijevica)

		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	451	407	441	336	354	370	489	**2848**	407	403	**483**
2	Light Delivery&Mikro bus (4,5)	20	6	14	16	14	8	2	**80**	11	11	**14**
3	Bus (more than 30 seats)(10,11,12)	0	0	0	0	0	0	0	**0**	0	0	**0**
4	Small truck (2-axle) (6,7)	9	15	7	10	17	4	12	**73**	10	10	**12**
5	Medium truck (2-axle) (8)	40	48	25	23	32	8	28	**202**	29	29	**34**
6	Heavy truck (5-axle art.) (9)	5	5	6	9	11	4	4	**44**	6	6	**7**
	TOT	**525**	**481**	**492**	**394**	**428**	**394**	**535**	**3248**	464	459	**551**

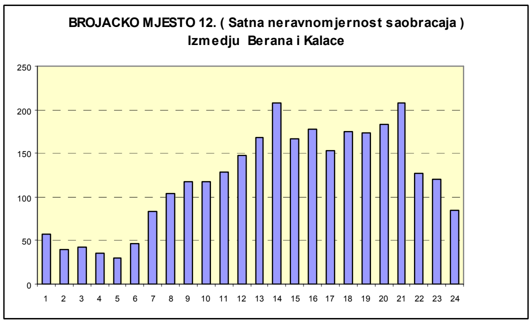


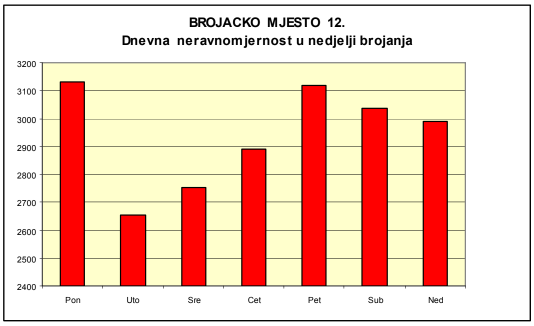


RSI & COUNTING LOCATION No. 12 (Between Berane and Kalače)

		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	2546	2072	2237	2263	2479	2393	2500	**16490**	2356	2332	**2799**
2	Light Delivery&Mikro bus (4,5)	176	166	150	170	210	199	139	**1210**	173	171	**205**
3	Bus (more than 30 seats)(10,11,12)	80	80	97	79	94	70	62	**561**	80	79	**95**
4	Small truck (2-axle) (6,7)	52	69	57	93	100	77	39	**488**	70	69	**83**
5	Medium truck (2-axle) (8)	96	81	68	92	68	120	50	**575**	82	81	**98**
6	Heavy truck (5-axle art.) (9)	181	186	143	195	170	178	199	**1252**	179	177	**213**
	TOT	**3131**	**2653**	**2753**	**2892**	**3120**	**3038**	**2989**	**20576**	2939	2910	**3492**

(FACTORS: 1,00 / 0,99 / 1,20)

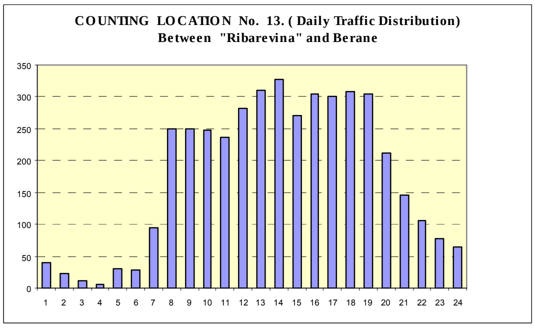


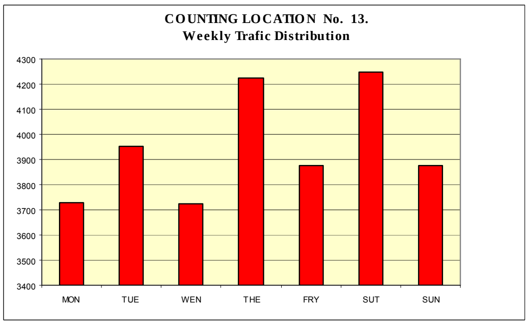


RSI & COUNTING LOCATION No. 13 (Between "Ribarevina" and Berane)

		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3013	3154	2902	3186	3150	3574	3279	**22258**	3180	3148	**3778**
2	Light Delivery&Mikro bus (4,5)	160	347	330	272	131	174	143	**1556**	222	220	**264**
3	Bus (more than 30 seats)(10,11,12)	117	79	115	134	107	91	93	**735**	105	104	**125**
4	Small truck (2-axle) (6,7)	129	50	71	176	165	108	95	**794**	113	112	**135**
5	Medium truck (2-axle) (8)	155	174	113	193	142	142	103	**1022**	146	145	**173**
6	Heavy truck (5-axle art.) (9)	153	150	194	262	182	162	162	**1266**	181	179	**215**
	TOT	**3726**	**3954**	**3725**	**4223**	**3877**	**4250**	**3876**	**27632**	3947	3908	**4689**

(FACTORS: 1,00 / 0,99 / 1,20)

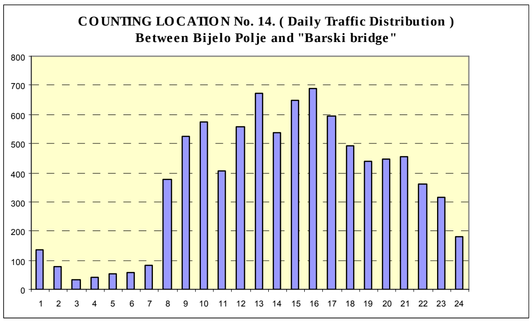


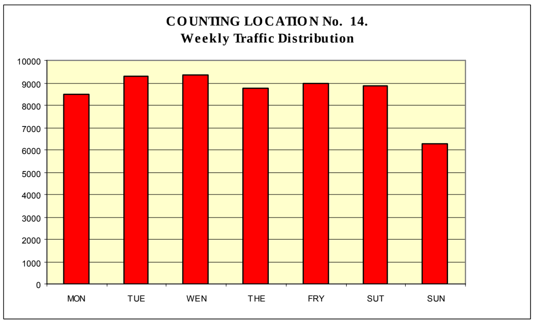


RSI & COUNTING LOCATION No. 14 (Between B.Polje and "Barski" bridge)

		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	AWDT	AMDT	**AADT**
1	P.Car (1,2,3)	7739	8188	8194	7842	7963	8121	5727	**53775**	7682	7605	**9126**
2	Light Delivery&Mikro bus (4,5)	237	506	400	319	350	295	231	**2338**	334	331	**397**
3	Bus (more than 30 seats)(10,11,12)	76	94	88	91	106	66	32	**551**	79	78	**94**
4	Small truck (2-axle) (6,7)	107	124	162	80	127	87	72	**760**	109	107	**129**
5	Medium truck (2-axle) (8)	144	124	219	182	147	129	74	**1019**	146	144	**173**
6	Heavy truck (5-axle art.) (9)	194	266	285	252	264	184	129	**1573**	225	222	**267**
	TOT	**8497**	**9302**	**9347**	**8766**	**8958**	**8882**	**6264**	**60016**	8574	8488	**10186**

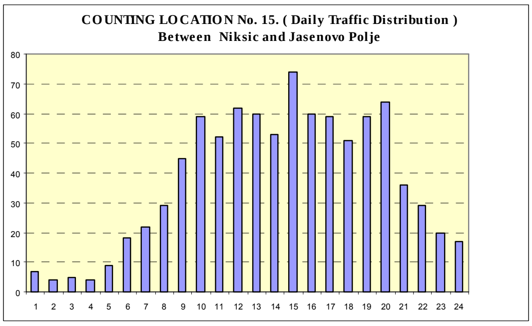
(FACTORS: 1,00 / 0,99 / 1,20)

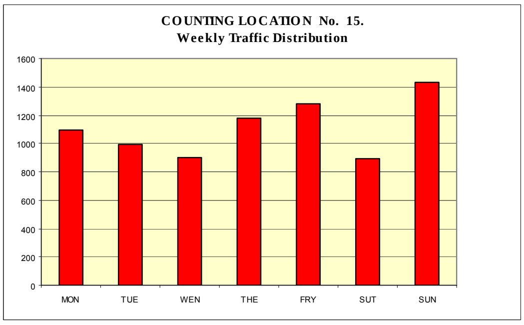




RSI & COUNTING LOCATION No. 15 (Between Nikšić and Jasnovo Polje)

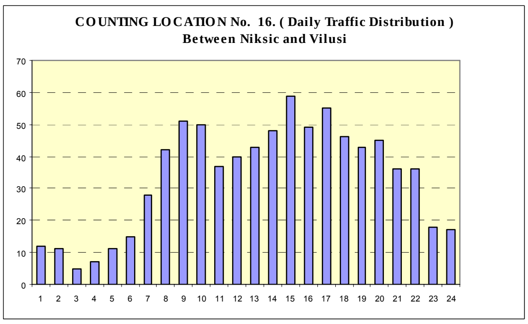
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	
	AADT											
1	P.Car (1,2,3)	851	756	704	928	987	748	1222	**6195**	885	876	**1051**
2	Light Delivery&Mikro bus (4,5)	89	82	69	65	91	64	94	**555**	79	78	**94**
3	Bus (more than 30 seats)(10,11,12)	19	15	13	15	25	4	16	**106**	15	15	**18**
4	Small truck (2-axle) (6,7)	66	51	49	80	79	35	51	**412**	59	58	**70**
5	Medium truck (2-axle) (8)	69	62	58	85	76	35	39	**424**	61	60	**72**
6	Heavy truck (5-axle art.) (9)	5	24	5	3	21	10	9	**77**	11	11	**13**
	TOT	**1098**	**990**	**898**	**1175**	**1279**	**896**	**1432**	**7769**	1110	1099	**1318**

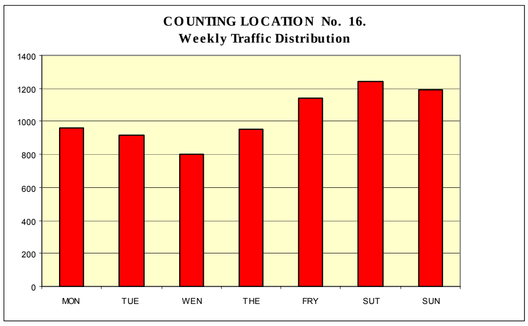




RSI & COUNTING LOCATION No. 16 (Between Vilusi and Klobuk)

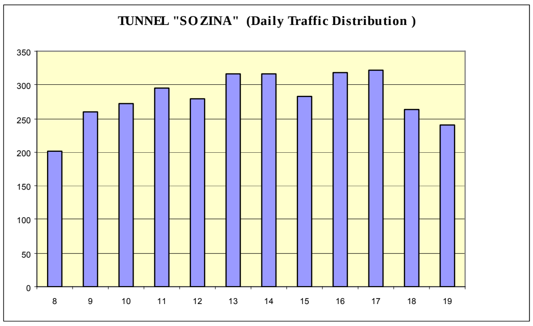
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	774	680	579	716	870	1048	990	**5657**	808	800	**960**
2	Light Delivery&Mikro bus (4,5)	42	56	62	71	75	43	47	**397**	57	56	**67**
3	Bus (more than 30 seats)(10,11,12)	7	1	2	4	5	2	3	**24**	3	3	**4**
4	Small truck (2-axle) (6,7)	14	22	22	30	31	16	16	**150**	21	21	**25**
5	Medium truck (2-axle) (8)	26	45	24	36	54	29	26	**240**	34	34	**41**
6	Heavy truck (5-axle art.) (9)	98	114	115	93	103	107	107	**737**	105	104	**125**
	TOT	**961**	**918**	**804**	**950**	**1138**	**1245**	**1189**	**7204**	1029	1019	**1223**

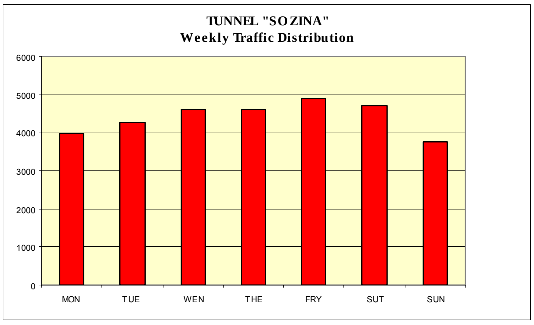




For traffic through the Sozina Tunnel data from the Monteput Company which is in charge of traffic management in the tunnel are used. The next table shows data on vehicles passing through the tunnel on days when counting and interviews took place.

	TYPE	23	24	25	26	27	28	29	Total
1	passenger car	3400	3701	3691	3867	4020	3348	3215	**25242**
2	passenger car with trailer	22	22	31	22	23	24	18	**162**
3	van	292	292	300	334	254	153	252	**1877**
4	small trucks	106	146	104	132	108	57	130	**783**
5	medium tricks	148	145	162	185	72	37	100	**849**
6	bus	34	39	37	44	34	42	40	**270**
7	heavy trucks	272	253	277	305	209	98	213	**1627**
	TOTAL	**4274**	**4598**	**4602**	**4889**	**4720**	**3759**	**3968**	**30810**



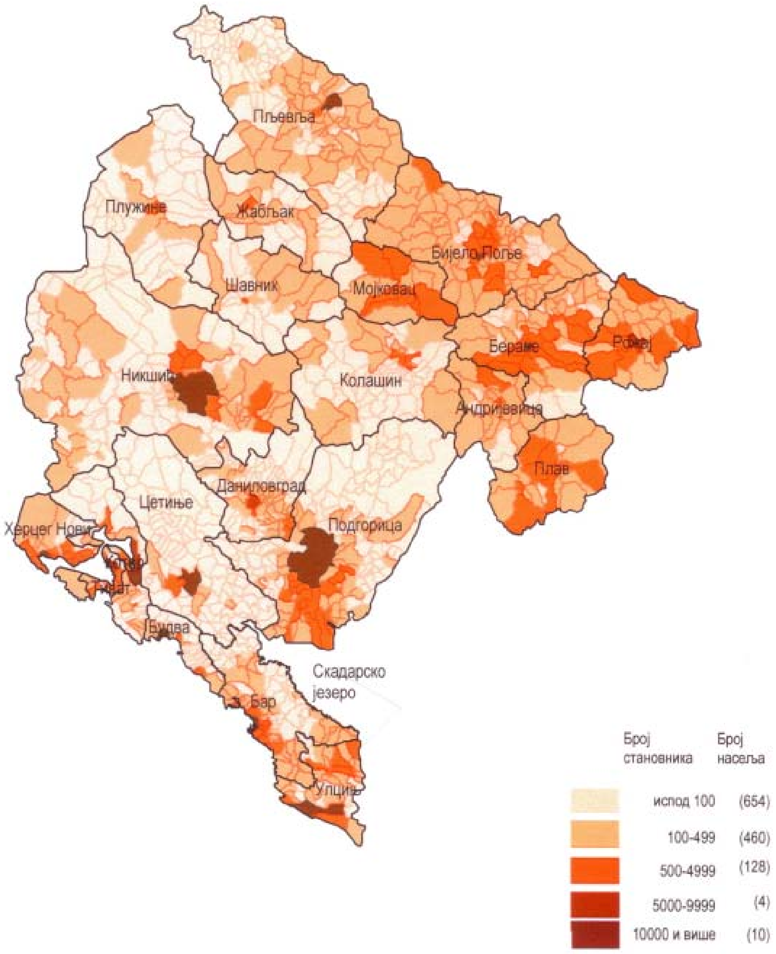


3.2.4 Origin-Destination survey results analysis

Although the roadside surveys were conducted only within the zones of two corridors (Bar-Boljare and Adriatic-Ionian) responses of road-users referred to the trips over the whole territory of Montenegro and out of the country. Therefore, it was necessary to divide the whole territory of Montenegro into several areal units (information carrier) in order to code the trips and insert them into the transport model.

The selected areal unit (traffic zone) is the Municipality. There are 21 Municipalities in Montenegro, so the zonal system was formed at such level.

Below is the map with the name and location of Municipalities in Montenegro.



Municipalities (Zones) were given the following code numbers:

1. Herceg Novi
2. Tivat
3. Kotor
4. Budva
5. Bar
6. Ulcinj
7. Cetinje
8. Nikšić
9. Danilovgrad
10. Podgorica
11. Plužine
12. Šavnik
13. Kolašin
14. Andrijevica
15. Plav
16. Žabljak
17. Mojkovac
18. Berane
19. Rožaje
20. Pljevlja
21. Bijelo Polje

Beside these, defined are also zones out of Montenegro:

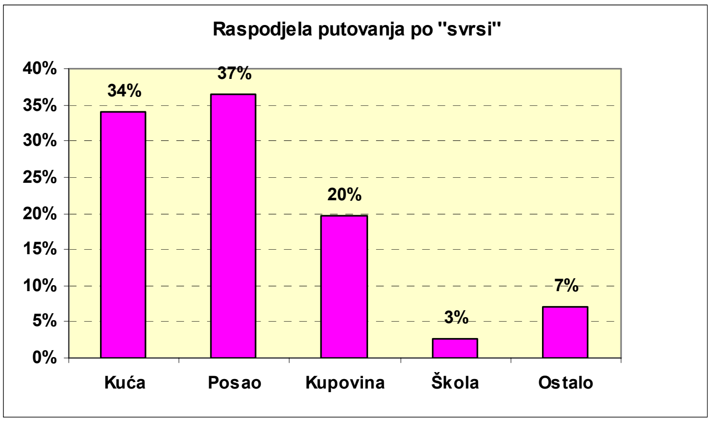
22. Croatia
23. Bosnia and Herzegovina
24. Serbia (1)
25. Serbia (2)
26. Albania
27. Slovenia
28. Bulgaria and Rumunia
29. Macedonia
30. Europe and all other countries

All passenger vehicle trips were divided into four basic trip purposes for which the 'matrices' were formed at the level of Municipalities (Zones) for the whole territory of Montenegro.
The following trip purposes were processed:

1. Home
2. Work
3. Shopping/selling
4. Education/school

Truck and bus trips were processed at the level of origin-destination zones (Municipalities) and separate 'trip matrices' were formed for them.

The chart below shows participation percentage of particular 'purposes' of total number of trips over the whole territory of Montenegro.



Unusually high percentage of trips "to work" is the result of the fact that in the 'out of town' trips majority of 'business' trips are defined as trips to work, and such trips will not necessarily finish in one day with the return 'home'.

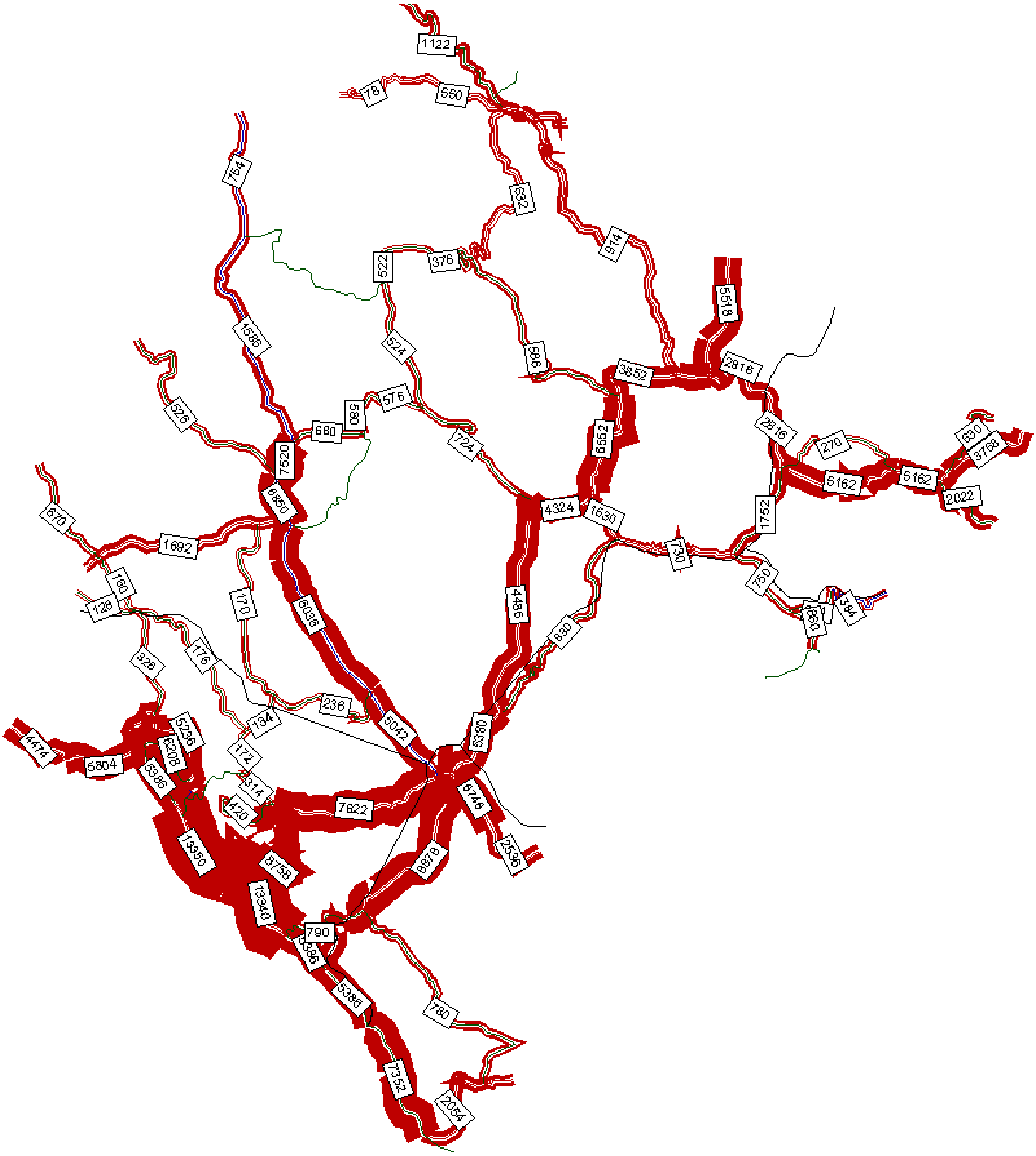
3.3 Definition of traffic flow structure for the basic year with indicators:

3.3.1. Network assignment model calibration of base year 2007

Trip matrices by O-D zones and trip purposes derived from 12-hour survey conducted at 16 RSI stations within the zones of future highways were first expanded to the level of 24-hours. The parallel counting conducted at the same time at RSI stations was used for this action.

For the purpose of obtaining as clear assignment model picture as possible in the Transport Model, and also due to the fact that the survey did not include those RSI stations which are because of the spatial and program limitations located far from the direct influence on future highways, the traffic counting data obtained by Crnagoraput in September 2007 were also used in this process of calibration.

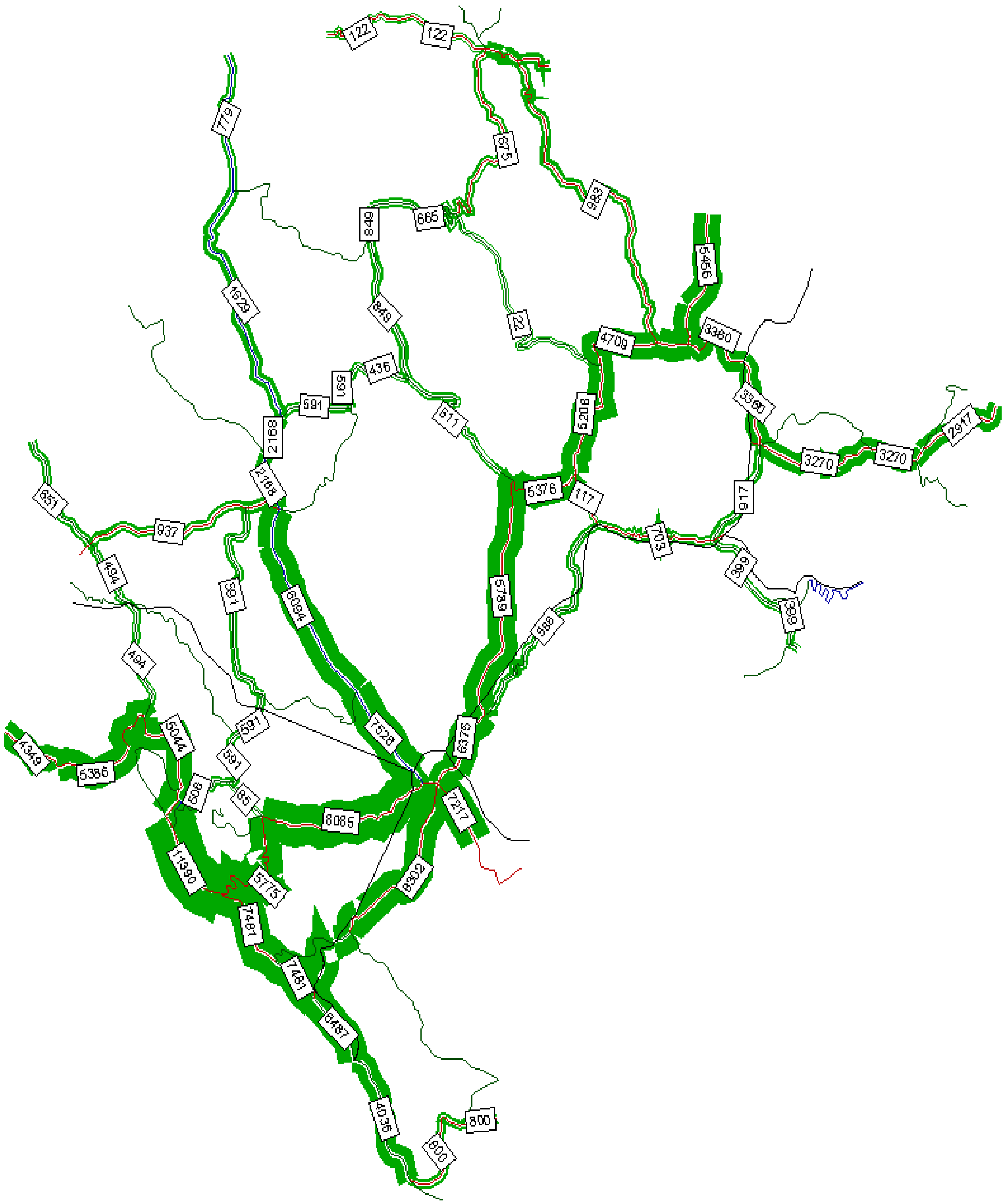
The map below shows road network load of Montenegro in 2007 on the basis of traffic counting conducted by Crnagoraput in September 2007.



Based on calibrated trip matrix and characteristics of the categorized road network of Montenegro in the Transport Model, the first iteration of 2007 Network Assignment Model was done.

In over 90% of sections the model simulation put nearly the same transport load on transport network, therefore the next phase of model simulation i.e. creation of forecast matrices and future corridor options can proceed.

Next image shows average annual daily model load of the road network of Montenegro (AADT 2007).



4 TRAFFIC FLOW FORECASTS ACCORDING TO NATURAL (NORMAL) INCREASE ON THE RELEVANT NETWORK OF THE EXISTING ROADS

4.1 Methodological framework and forecasts

The initial forcast horizon follwing the analysis of base year 2007 is the one in which the effects could be defined of the first constructed highway section which is up and running (2012), whereas for the target forcast horizon the period is defined 20 years following the base year. (2027).

All the analyses conducted in the base year and the results obtained both on the basis of previous researches and counting the traffic and surveys (performed by the Consultant), served for determination of a basic trip matrix (vehicle trips) in the territory of Montenegro) as well as the calibration of the assignment model in relation to official traffic counting undertaken by company "Crnagoraput".

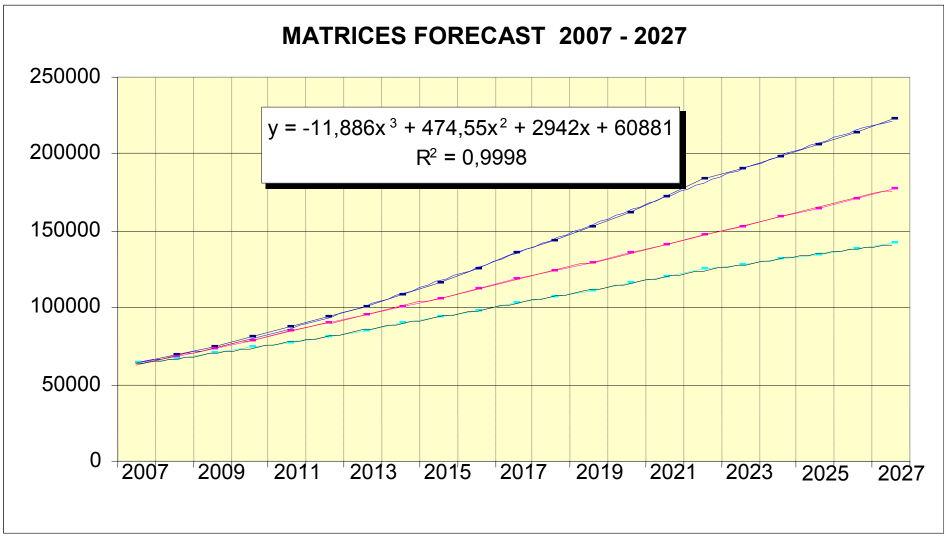
On the basis of previously collected relevant socio-economic data, the Consultant has established the possible variants of the traffic growth rate in the 20-year period and created a basis for defining trip matrix in forecast horizons along the timelines.

Three potential forecast functions have been defined: (normal, standard and low), whereby on the basis of all the analyses undertaken the „normal" forecast function for the creation of matrices has been adopted.

Figure No. 1 features tables and diagrams of the forecast functions.

Figure 1 MATRICES FORECAST 2007 – 2027

	Normal forecast			Standard forecast			Low forecast		
	Increment factor	Matrix value	Growth rate	Increment factor	Matrix value	Growth rate	Increment factor	Matrix value	Growth rate
2007		**63423**			**63423**			**63423**	
2008		68560			68066			66654	
2009		74114			73048			70049	
2010		80117			78395			73617	
2011		86606			84134			77367	
2012	**1,476**	**93612**	**1,081**	**1,424**	**90292**	**7,32%**	**1,282**	**81308**	**1,051**
2013		100689			95249			85183	
2014		108302			100478			89242	
2015		116489			105995			93495	
2016		125296			111814			97951	
2017	**2,125**	**134773,9**	**1,076**	**1,860**	**117952**	**5,49%**	**1,618**	**102618**	**1,048**
2018		143305			123355			106717	
2019		152376			129004			110980	
2020		162022			134913			115413	
2021		172278			141092			120022	
2022	**2,888**	**183165,6**	**1,063**	**2,326**	**147554**	**4,58%**	**1,968**	**124816**	**1,040**
2023		190382			152954			127964	
2024		197883			158552			131192	
2025		205680			164355			134500	
2026		213784			170371			137892	
2027	**3,504**	**222234,2**	**1,039**	**2,785**	**176606**	**3,66%**	**2,229**	**141370**	**1,025**



Considering the fact that ToR for the Consultant have been defined as ''The feasibility study for the construction of two highways" rather than "Development plan and masterplan for the road network in Montenegro", all the trip matrices (movement of vehicles) have been defined both in the base year and forecast as inter-zone (inter-municipal) travels. That said, the following have not been taken into account: intra-municipal, intra-city and intra-town internal movements which do not feature on the external road network of Montenegro and essentially do not affect the traffic on prospective highways.

In all the analyses and forecasts it has been agreed that a "basic information provider" (zone) be a municipality territory. There are 21 municipalities in Montenegro which have been used as internal zones for the purpose of the analysis. Additionally, nine external areas surrounding Montenegro have been defined in order to have a big picture of the external traffic which is connected with the road network of Montenegro through border crossing points.

Figure no. 2 shows internal and external zones used in the Study.

	MUNICIPALITIES-ZONES	THE POPULATION BY MUNICIPALITIES				
		1997	2003	2007	2012	2027
1	Herceg Novi	30080	33034	34010	35280	38620
2	Tivat	12860	13630	14210	14970	16900
3	Kotor	22335	22947	22050	20980	19320
4	Budva	12870	15909	16780	17930	20840
5	Bar	40406	40037	42640	46140	54960
6	Ulcinj	25555	20290	21770	23770	28840
7	Cetinje	20260	18482	18010	17440	16630
8	Nikšić	78205	75282	75340	75410	76870
9	Danilovgrad	15215	16523	16790	17130	18130
10	Podgorica	166935	169132	175300	183330	204030
11	Plužine	4935	4272	3900	3490	2840
12	Šavnik	3280	2947	2820	2660	2410
13	Kolašin	10767	9949	9920	9870	9960
14	Andrijevica	6590	5785	5530	5230	4750
15	Plav	19907	13805	14940	16480	20420
16	Žabljak	4755	4204	4360	4560	5090
17	Mojkovac	10870	10066	9310	8450	7080
18	Berane	39035	35068	35340	35680	37020
19	Rožaje	25270	22693	23890	25470	29470
20	Pljevlja	39830	35806	35130	34310	33300
21	Bijelo Polje	56780	50284	50820	51500	53820

External zones	
22	Crotia
23	B&H
24	Serbia 1
25	Serbia 2 Kosovo
26	Albania
27	Slovenia
28	Bulgaria and Romania
29	Macedonia
30	All other countries

Ord.No.	Border crossing point	Road no.
1	Jabuka	M-8
2	Morakovo	M-2
3	Špiljani	E-80
4	Čakor	M-9
5	Božaj	E-762
6	Šćepan Polje	M-18
7	Nudo	R.23
8	Klobuk	M-6
9	Debali Brijeg	M-2
10	Sukobin	E-752

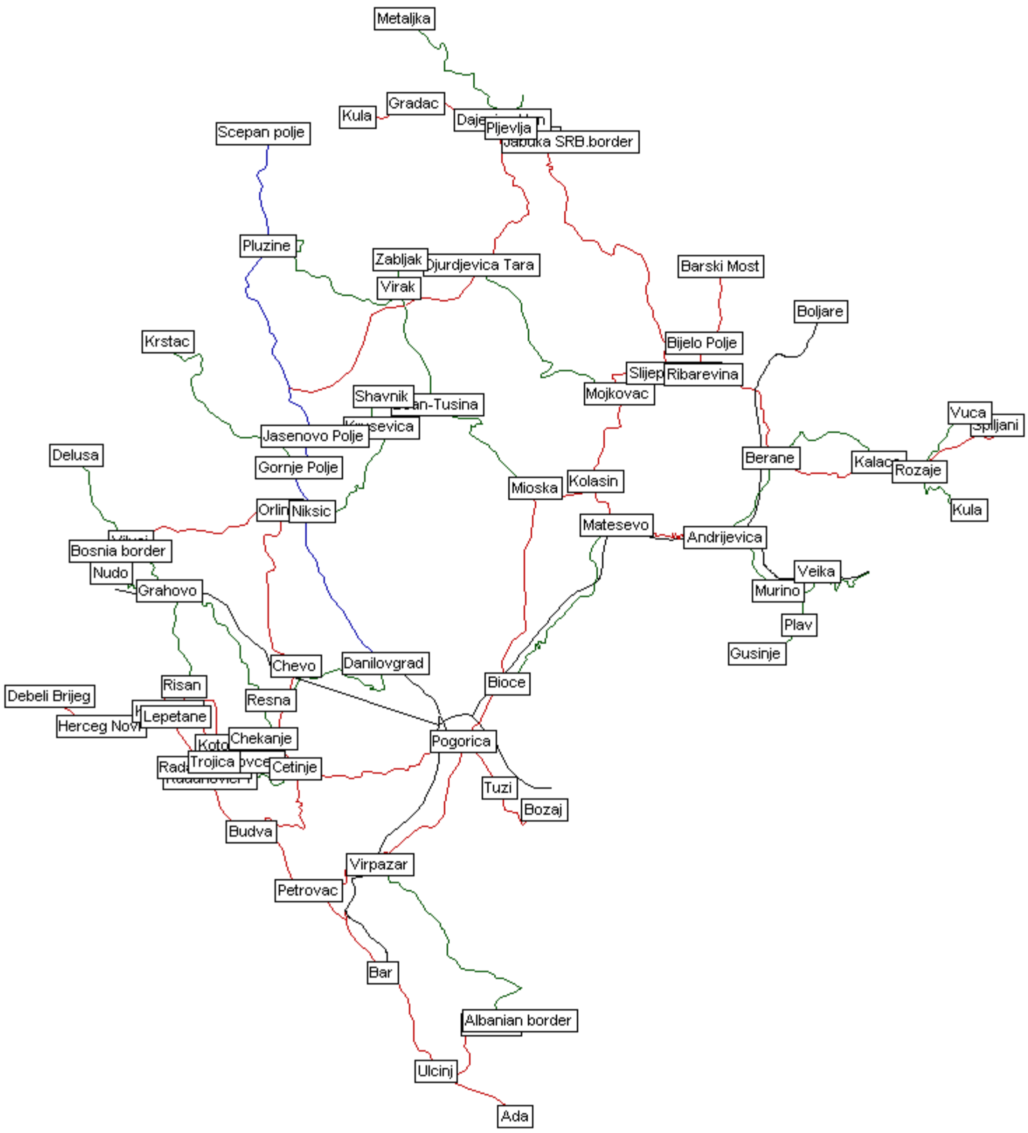
The categorisation of road network in Montenegro has been adopted in the Physical plan and it has also been used in the Feasibility study. Road network has been divided into four categories, viz:

1.Motorways 2.Expressways 3.Main roads 4.Regional roads

Within the network of Expressways and Main roads, a network of European (E) roads has been defined.

Within the scope of the design of the road network model which was used in the Study, apart from defining the zone system (municipality) and road categiries, all the intersections and junctions on the network have been defined and categorised.

(**Figure no. 3** shows main junctions on the network of Montenegro).



4.2 Network assignment model (assignment criteria)

In the next stage in the development of road network model, for every section between two junctions, all the available inventory information has been defined (length, number of lanes, the width of lanes), while form the counting data total number of vehicles by categories, daily, weekly and annual non-uniformity, as well as the factors for determination of such non-uniformity in the forecast. (the manner of calculating these factors is provided in Technical memorandum no 14.)

On the basis of documentation and results of the researches conducted in the *„Strategic plan for the development and maintenence of road infrastructure in Montenegro"* the initial speed values have been adopted in the free-flow traffic, as well as the capacities at the sections of the existing network. These speeds have been rectified in further calibration process with the actual data on the section load.

From the expanded base year matrix, the overview of the loaded network was obtained on the basis of Network assignment model applied.
A variety of „assignment" models have been used worldwide, as part of different programme packages, however they all function on the same principle.

Between the two zones, the road user, according to the proposed network, opts for the most optimum route in order to reach the other zone, with observance of one of the three principles (minimum distance, minimum travel time or minimum expense)

Transport model "assignment" provides the possibility of using 6 procedures/models of "loaded network" related to road traffic putni saobracaj, whereby the first five procedures are statistical without explicit time modelling, while the sixth procedure uses a time-dynamic model of the traffic flow.

For the purpose of this Study, a combination of two statistic models has been used, viz: "***Incremental***" model and "***Equilibrium***" model, thus avoiding the unilateral use of a minimal route (all or nothing) in the selection process.

- ***Incremental*** *assignment* model divides the matrices O-D on a percentage basis into several partial matrices. These matrices are then successively assigned to the network. The route search provides for „impedance" resulting from the traffic volume of the previous step.
- ***Equilibrium*** *assignment* model divides the needs according to "First Wardrop's principle": "Every individual road-user chooses his route in such a way so that his journey takes the same time on all alternative routes, while switching routes would only increase personal journey time." The state of equilibrium is reached by multi-successive iteration based on *Incremental* model as a starting solution. In the inner iteration step two related routes are brought into a state of equilibrium by shifting vehicles. The outer iteration step checks if new routes with lower impendance can be found as a result of the current network state.

Speed correction at the section, depending on the volume of traffic, is regulated by the model on the basis of "volume-delay function" which has been developed by the Public Roads Bureau within the US Ministry of transport, and has been applied for a number of years in almost all the studies in the world.

The function takes the following form:

$$T_{cur} = T_0*(1+a*SAT^b)$$

where $SAT = q/q_{max}*c$

T_{cur} – travel time reached at the loaded section
T_0 - departure time at the section with base speed
q - traffic load of the section
q_{max} – section capacity
a,b,c – calibration parametres

On the basis of this function, one of the selection parametres is defined for the road-users in search of a minimum distance beween the zones.
In this Study the parameter of the minimum „generalised costs“ has been used for the selection of the most favourable route in the "assignment" model.

The minimum cost function takes the following shape:

$$IMPEDANCE_{(section)} = F + T_{cur} + A$$

where F – factor of the value of time

T_{cur} – travel time reached at the selected loaded section
A - cost attribute for travelling at a section (pay toll fare, if any)

5 DISTRIBUTION OF THE FORECASTED SO-CALLED NORMAL TRAFFIC ON THE RELEVANT NETWORK AFTER CONSTRUCTION OF THE BAR – BOLJARE AND ADRIATIC – IONIAN MOTORWAY SECTIONS

5.1 Structure of traffic flow for the opening and target years on the relevant network by selected horizons and indicators:

5.1.1 Traffic on the first constructed motorway section in full-realisation year (2012)

On the basis of proposed dynamics for the construction of highways, the first priority section which would represent a functional stage and provide satisfactory traffic effects is the section from the junction "Smokovac" to junction "Mateševo" with part of the by-pass around Podgorica which is located on the highway route Bar-Boljare.

Within the scope of traffic analysis for 2012 several traffic scenarios have been considered which are relevant for the conclusions on the impact of the construction of this highway section on the overall traffic system in Montenegro.

a.) Normal traffic increase and network load „without investment“

b.) Normal traffic increase and network load „with investment“ – first-stage section constructed and launched, as follows:

Scenario (b.1) Section with pay toll

Scenario (b.2) Section without pay toll

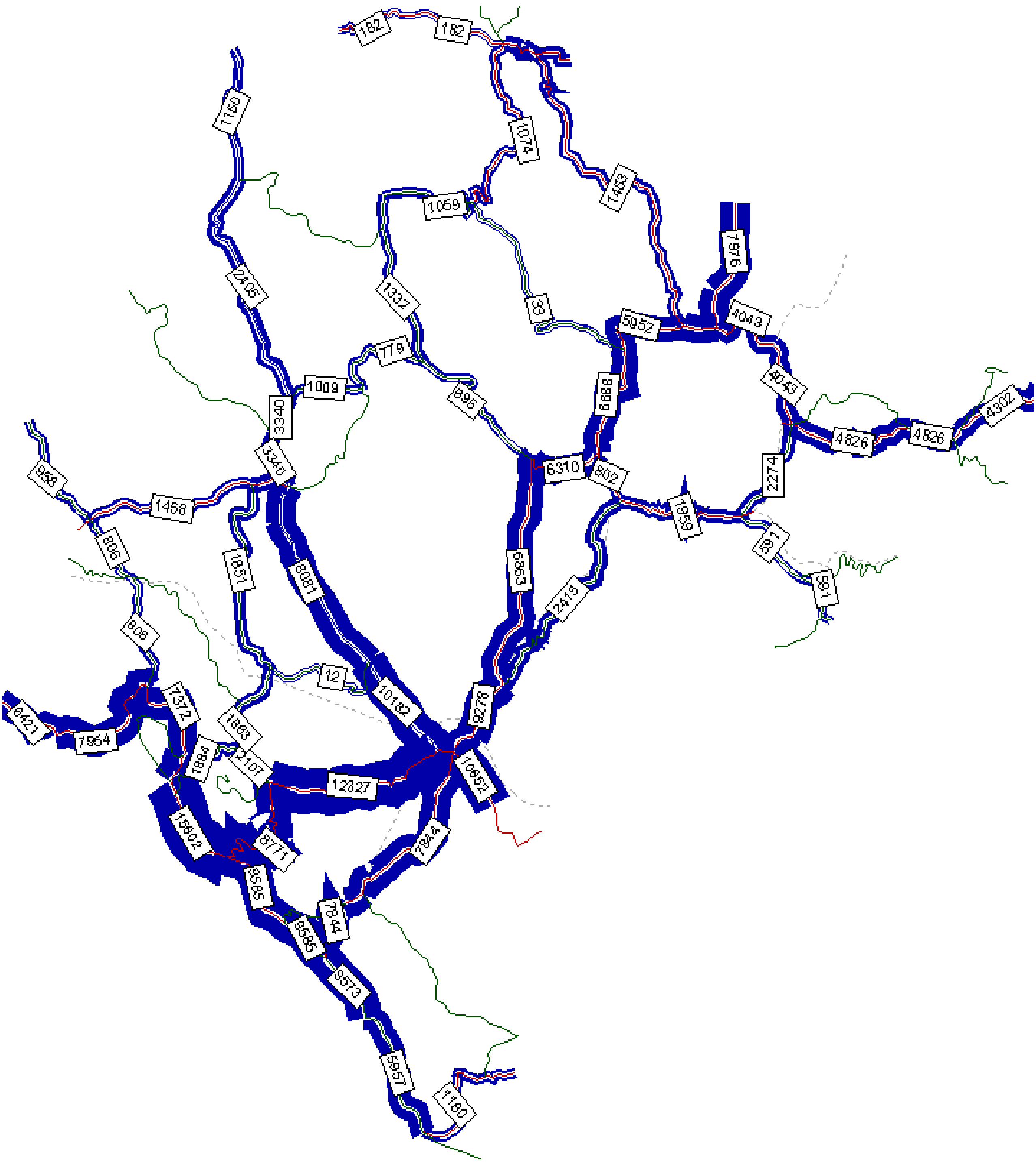
(Term „without investment“ reffers to investments in regular maintenance only without construction of new motorway sections).

The forecasts for the traffic growth rate in the period 2007 – 2012 are 8,1 % and the increase at such a rate leads to the overall inrease in traffic by 1,476 times in comparison to the base year 2007.

Total matrix of inter-zone vehicle trips (excluding intra-zone, intra-city and intra-town ones) is provided in the „Appendices“ section (Appendix 1-C: Trip Matrices).

Figure No. 4 shows forecasts for loaded network „without investment" where the "assignment" model was developed on the basis of minimum travel expenses.

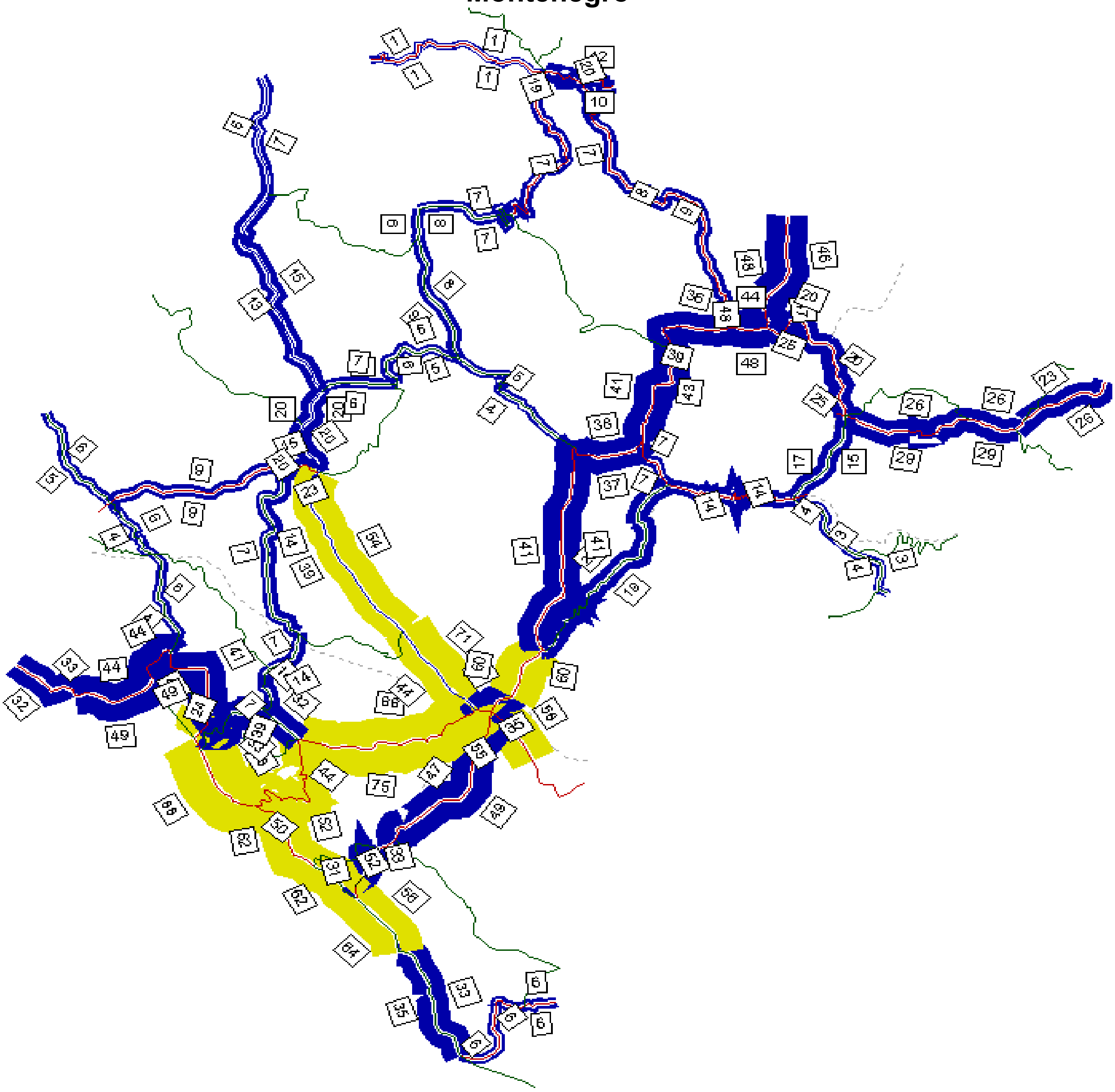
Figure 4: 2012 – Road network without intervention
Network assignment AADT (total number of vehicles)
Impedance – generalised costs (value of travel time 7.23 Euro/h)



On the road network in 2012 , at relevant surveyed length of 1840 km in the scenario „without investment“, there will be a daily flow of 401080 vehicle trips at average speed 49 km/h . The transport perofrmancewill amount to 5182766 vehicle-km i 112723 vehicle.-h. At a numer of sections the capacities will be utilised in excess of 50%.

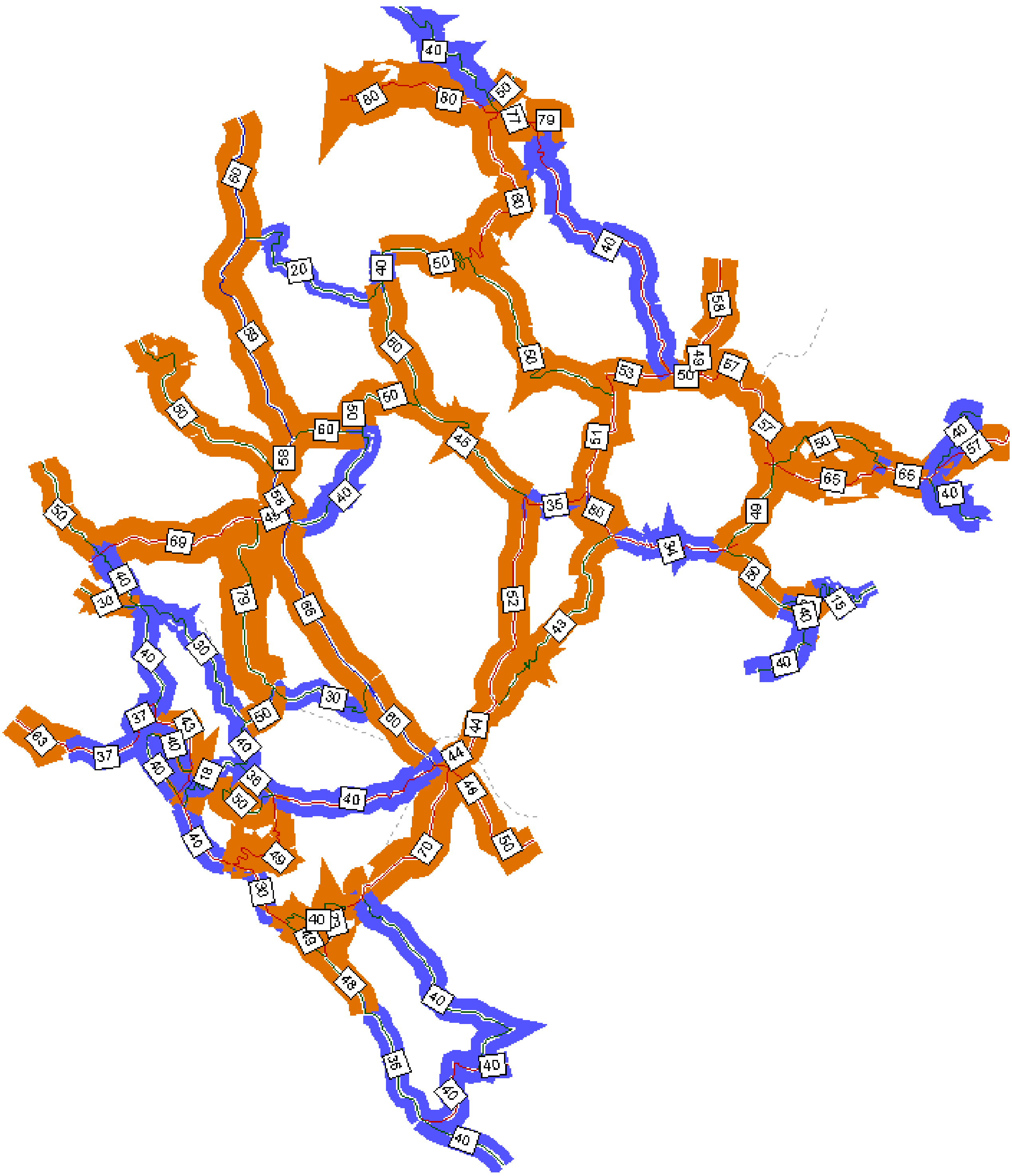
Figure no. 5 shows the percentage of utilisation of capacities by sections whreas the Figure 6 shows developed average sppeds. (V_{cur}).

Figure 5: 2012 – Road network without intervention
The percentage of capacity utilisation at the sections of road network of Montenegro



At the sections marked yellow the capacity reached is C =>50 %

Figure 6: 2012 – Road network without intervention
Developed average speeds (in km/h) on the road network of Montenegro
At the sections marked blue the developed speed is V=< 40 km/h



The construction and launching of the section ''Smokovac'' – ''Mateševo'' with part of the by-pass around Podgorica in the total length of approximately 59 km, will dramatically change the traffic situation in the Central part of Montenegro and overall road network alike.

The sheer existence of this highway section (in no pay toll scenario) will lead to distribution of traffic streams, where the highway section which comprises approximately 3% of the total length of the network, shall generate more than 9% of transport performance (504653 vehicle-km) i (5913 vehicle-h).

Developed mean speed at the highway section of 86 km/h will increase the mean travel speed on the whole network from 49 km/h, in the scenario ''without investment'', to above 52 km/h.

Out of 28049 vehicles which will be using all highway subsections in the course of a day (load will on average amount to maximum 9757 vehicles), around 4500 (cummulative) can be deemed attracted traffic since the total daily number of vehicles on the road network of Montenegro will increase by those figures.

The introduction of pay-toll system at the highway section will lead to a decrease in the volume of traffic. Approximately 25 % of the highway users will be de-motivated to use this section at which in this scenario there will be daily flow of 21148 (max load 9373) vehicles which will generate less transport performance by approximately 11% (451404 vehicle-km and 5225 vehicle-h). <u>However, in this case as well, this section as early as in the first year of operation will generate gross revenue of 3114686 € (from paytoll 6,9 Eurocents/km).</u>

Significant changes will take place in the distribution of traffic at by-pass around Podgorica.

<u>**All these changes can be seen in the following figures no. 7, 8 and 9.**</u>

Figure No. 7: 2012 – Highway section "Smokovac" – Mateševo"
Load on the by-pass around Podgorica (total number of vehicles AADT)
Impedance – generalised expenses (Value of the travel time 7.23 Euro/h)
(without pay toll at the highway section)

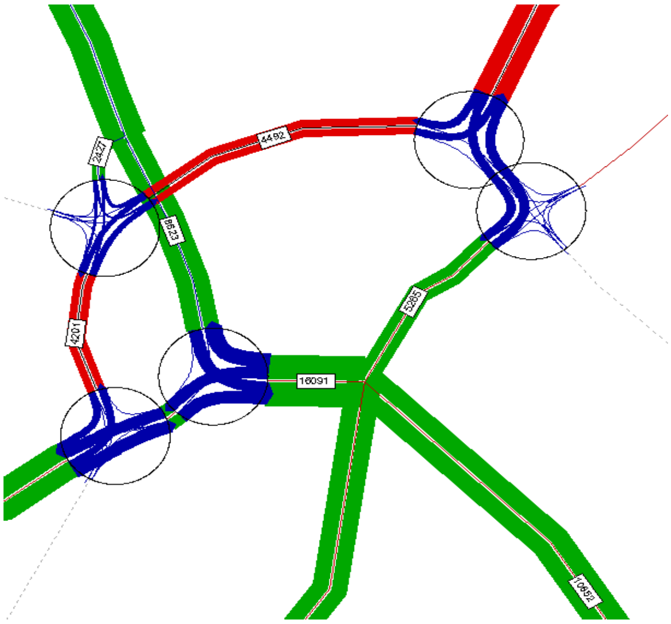


Figure 8: 2012 – Highway section "Smokovac" – Mateševo"
Total load of the road network in Montenegro (total number of vehicles AADT)
Impedance – generalised costs (Value of the travel time 7.23 Euro/h including Fuel consumption)
(without pay toll)

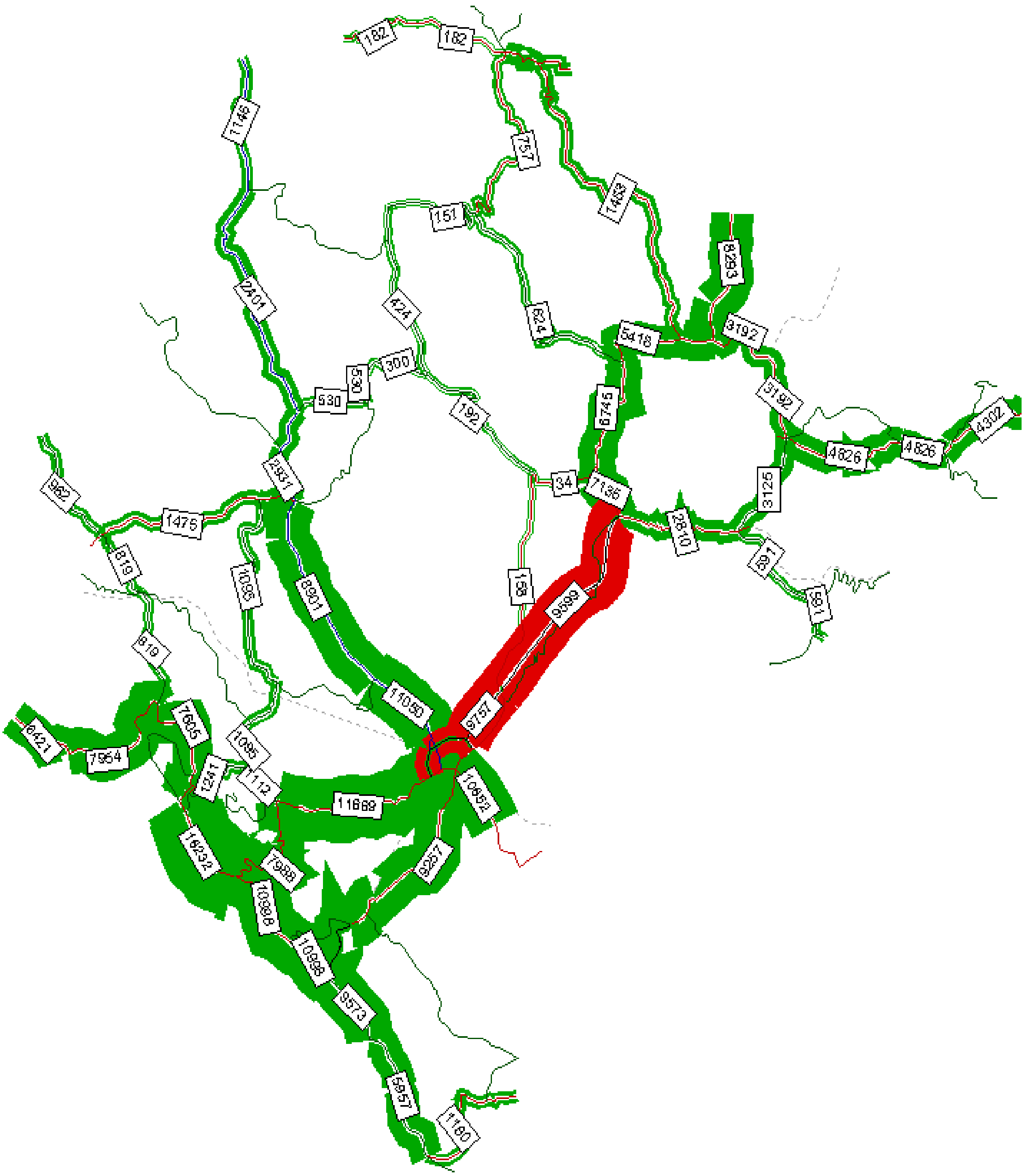
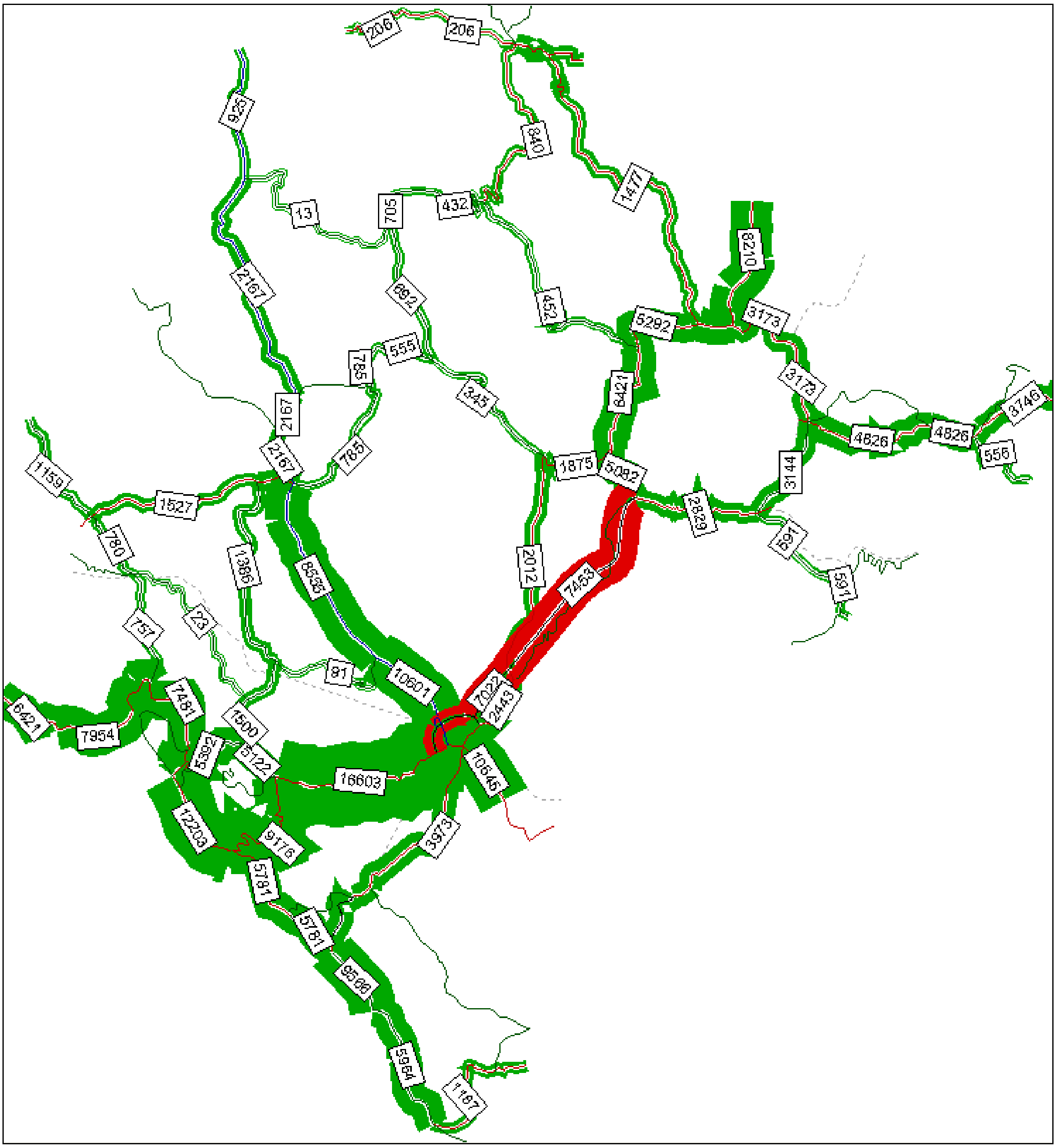


Figure 9: 2012 – Highway section "Smokovac" – Mateševo"
Total load of the road network in Montenegro
(Total number of vehicles AADT)
Impedance – generalised costs (Value of the travel time 7.23 Euro/h including Fuel consumption)
(Pay toll 6.0 Eurocents/km)



5.1.2 Traffic in the target full-realisation year of the Physical plan of Montenegro (2027) and 20 years following the base year

In the target realisation year of the Physical plan of Montenegro (2027) and 20 years following the base year, relevant road network has been defined, which contains, apart from fully constructed highways in full profile, also all other constructed and reconstructed parts of road network, as envisaged by the Plan.

On the basis of digressive traffic growth rate, which according to the adopted "normal" forecast five-annually has the following values:

1012 – 2017 - 7,6 %

2017 – 2022 - 6,6 %

2022 – 2027 - 3,9 %

the traffic, in comparison to the base year 2007, increases by 3.5 times and reaches the sum of 222234 vehicles in AADT inter-zone traffic. (the matrix of all inter-zone travels excluding internal ones is contained in the "Appendices" section) (Appendix 1-C: Trip matrices).

It is important to emphasise here that the applied „uniform growth" of traffic in zones (municipalities) of northern part of Montenegro as well as in zones (municipalities) of southern coastal area assumes basically the faster starting development of northern Montenegrin municipalities and in the future equalisation with development speed in other municipalities, which is also one of the basic aims of the Physical Plan of Montenegro.

In the analysis of the target year several scenarios-options of potential development have been considered and the effects on both constructed highways, as well as individually on every subsection, as follows:

a.) Traffic development scenario ''without investment" which was considered only as a theoretical possibility for the sake of comparison, since in practice such a situation cannot be expected.

b.) The variant with fully constructed road network, according to the Physical plan

Scenario (b.1) Highways without pay toll

Scenario (b.2) Highways with pay toll

c.) Variant with complete motorway network without construction of express way along

Adriatic coast (as a theoretic possibility for determining the influence on the position of Adriatic-Ionian motorway)

Scenario (c.1) Highways without pay toll

Scenario (c.2) Highways with pay toll

In the normal traffic development scenario, according to the model ''without investment" in 2027 on the network of total relevant length of 1840 km, at all subsections in total on an average day of the year there will be 921820 vehicles.

These vehicles would only theoretically be able to travel since at a high percentage of the network, the capacity will be exceeded by as much as 150 %, whereas at the sections where vehicle trips will be made possible, the speed would not be able to exceed 40 km/h.

Envisaged number of vehicles would generate on the total network daily transport performance of 12512144 vehicles-km and a huge number of 419591 vehicles-h with constant jams on the network.

The Figures 10, 11 and 12 present ''loaded network "without investment", ''The percentage of the utilisation of capacities" at the road network sections and ''Developed average speeds'' on the network.

Figure 10: 2027 – Road network without intervention
Loaded network AADT (total number of vehicles)
Impedance– generalised costs (Value of travel time 14.35 Euro/h)

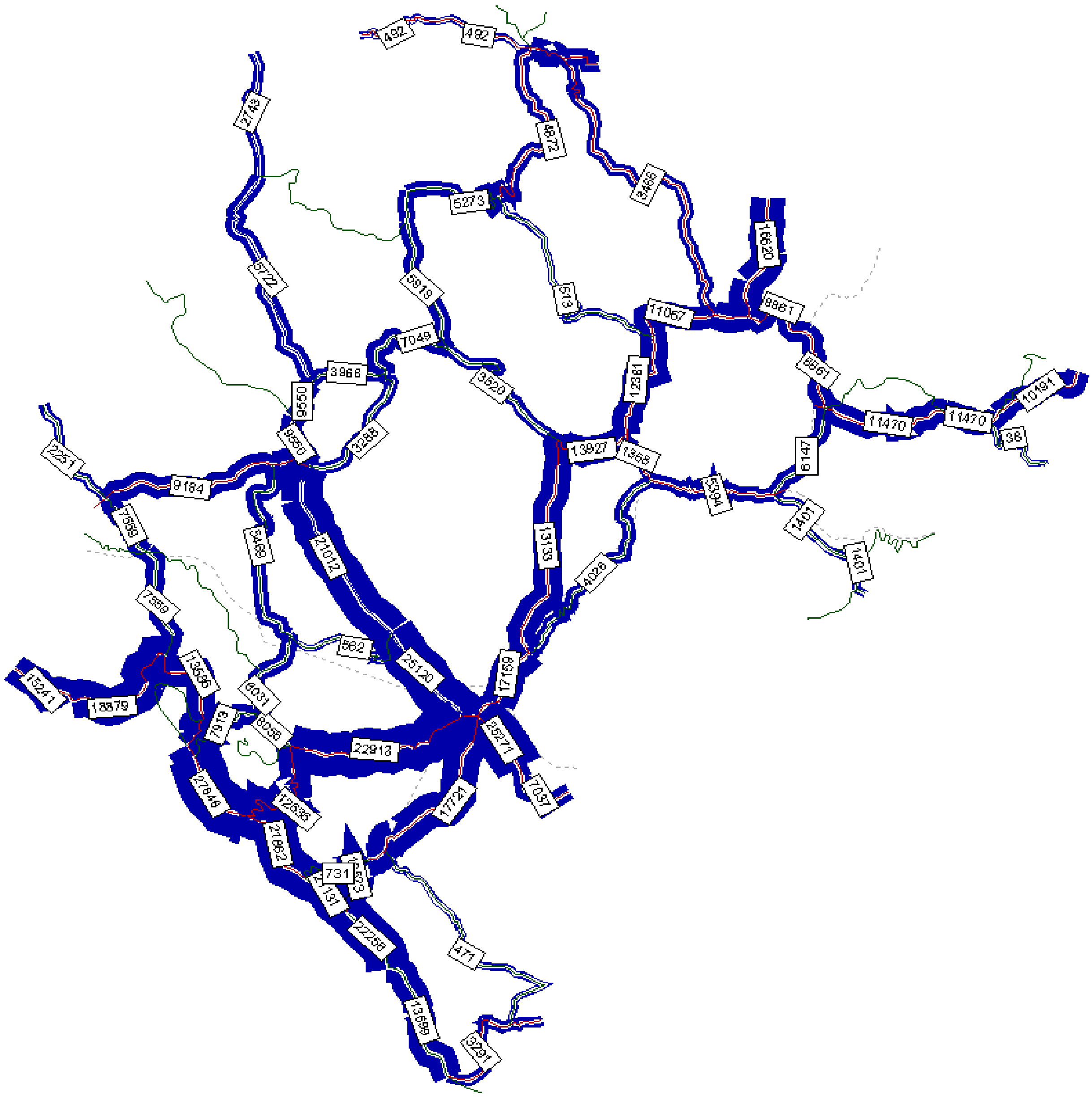


Figure 11: 2027 – Road network without interventions
The percentage of capacity utilisation at the sections of road network in Montenegro
Sections marked in red present theoretically exceeded capacity by 120 – 150 %

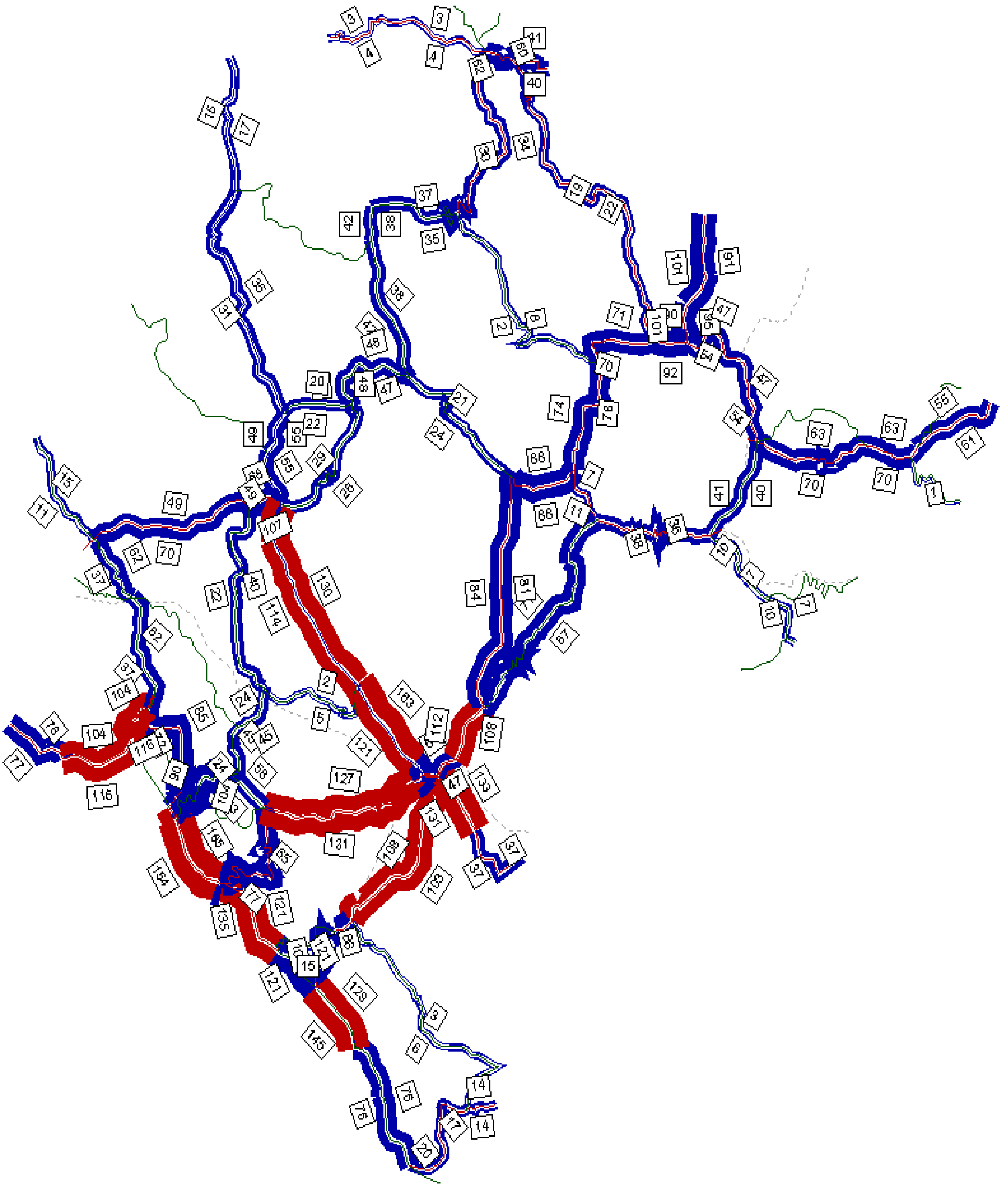
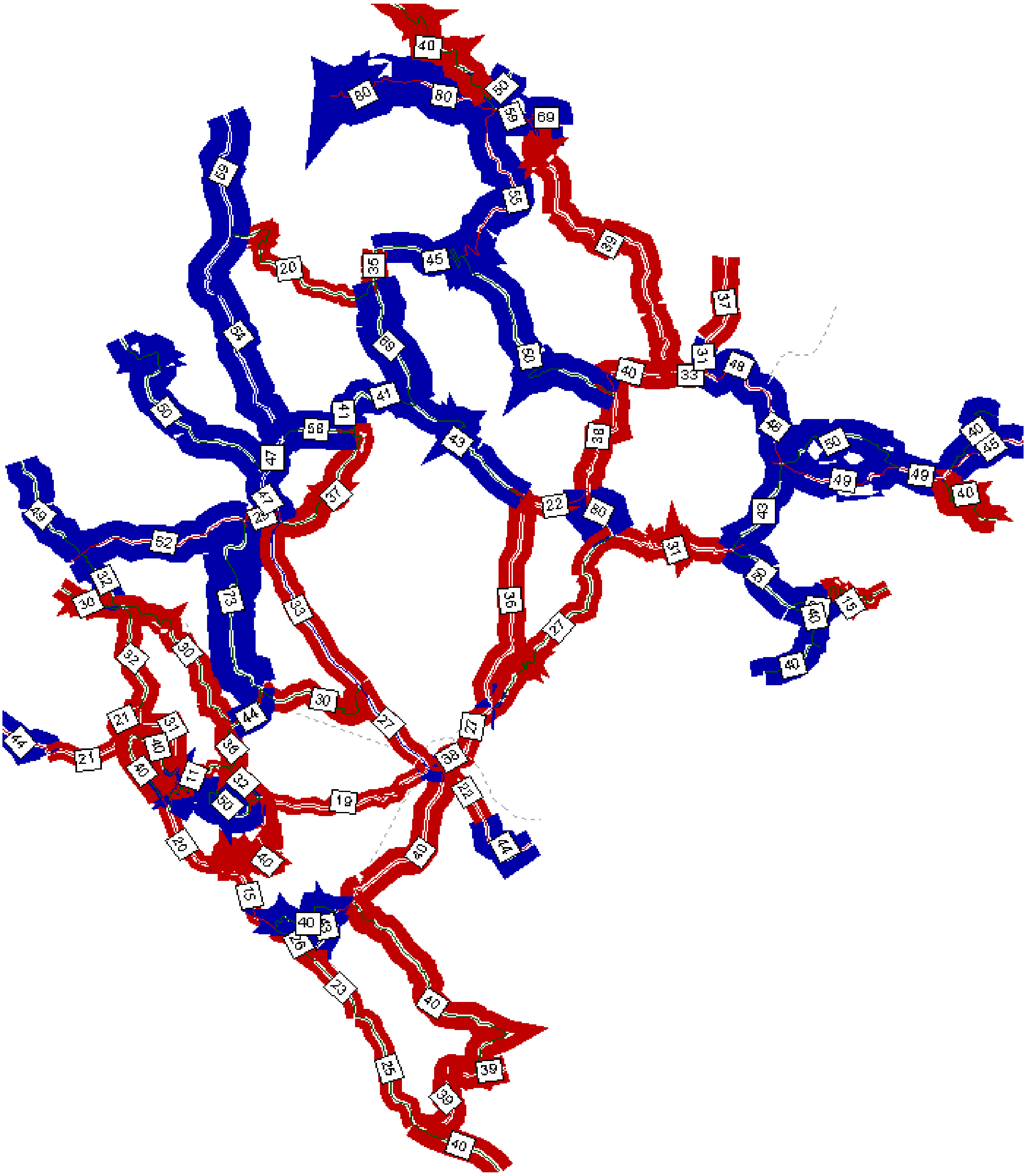


Figure 12: 2027 – Road network without interventions
Average developed speeds (in km/h) on the road network of Montenegro



At the sections marked red the speed V=< 40 km/h

In the traffic development scenario "with investment", with full realisation of the Physical plan of Montenegro, two options for the use of highways are considered:

- Highways without pay toll
- Highways with pay toll at 10.8 Eurocents/km

In the scenario ''without pay toll'' at the total length of constructed network of 2308 km, on an average day in 2027 at all subsections, there will be 949745 vehicles which will develop average speed on the whole network of 56 km/h.

The vehicles will generate transport performance of 12094431 vehicles-km and 220224, thus almost halving the time spent on the network for identical transport request, lower consumption of fuel and exhaust gasses.

Figure No. 13 shows the loaded network in 2027 without toll pay.

Figure 13: 2027 – Full realisation of the Physical plan of Montenegro Impedance – generalised costs (Value of the travel time 14.35 Euro/h including Fuel consumption) (without toll pay on the highways)

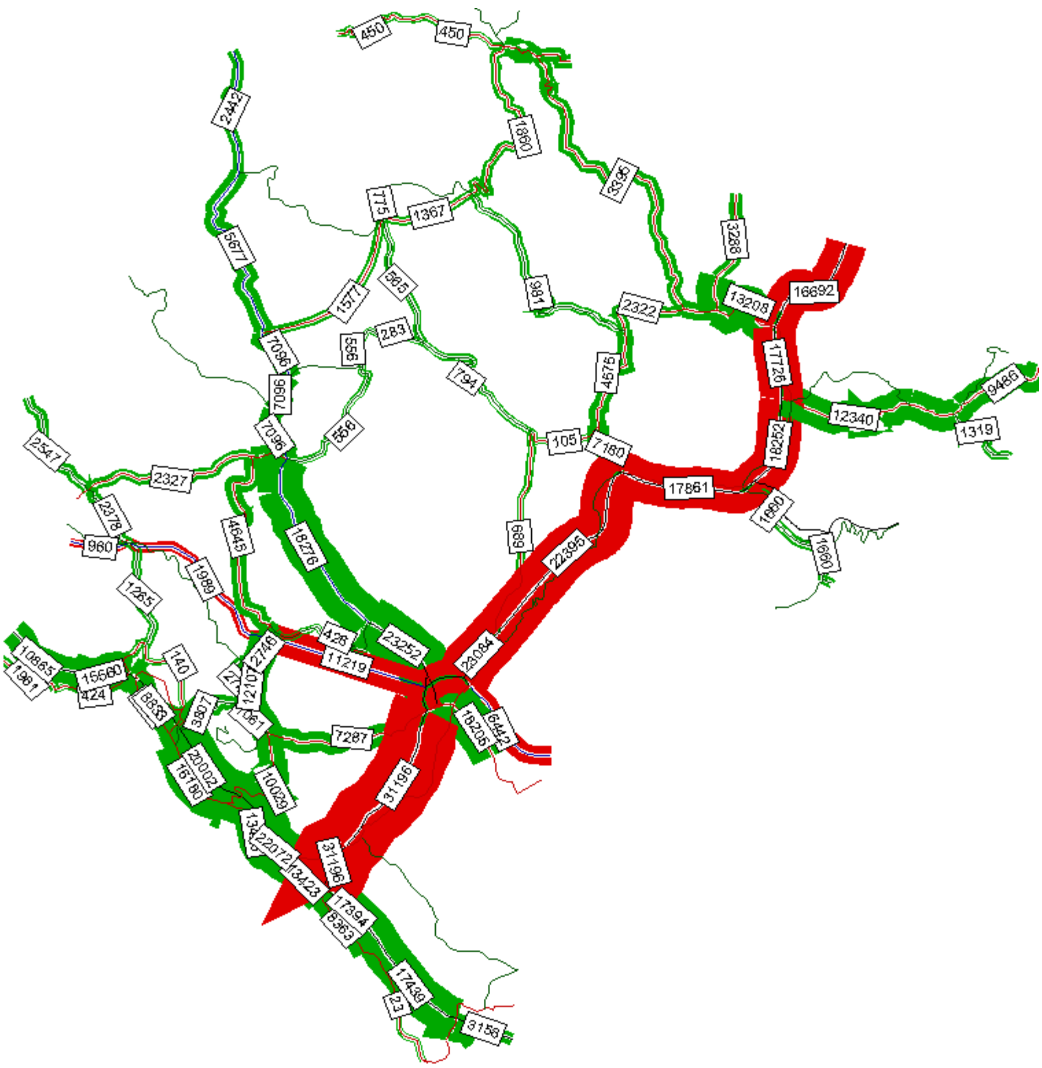
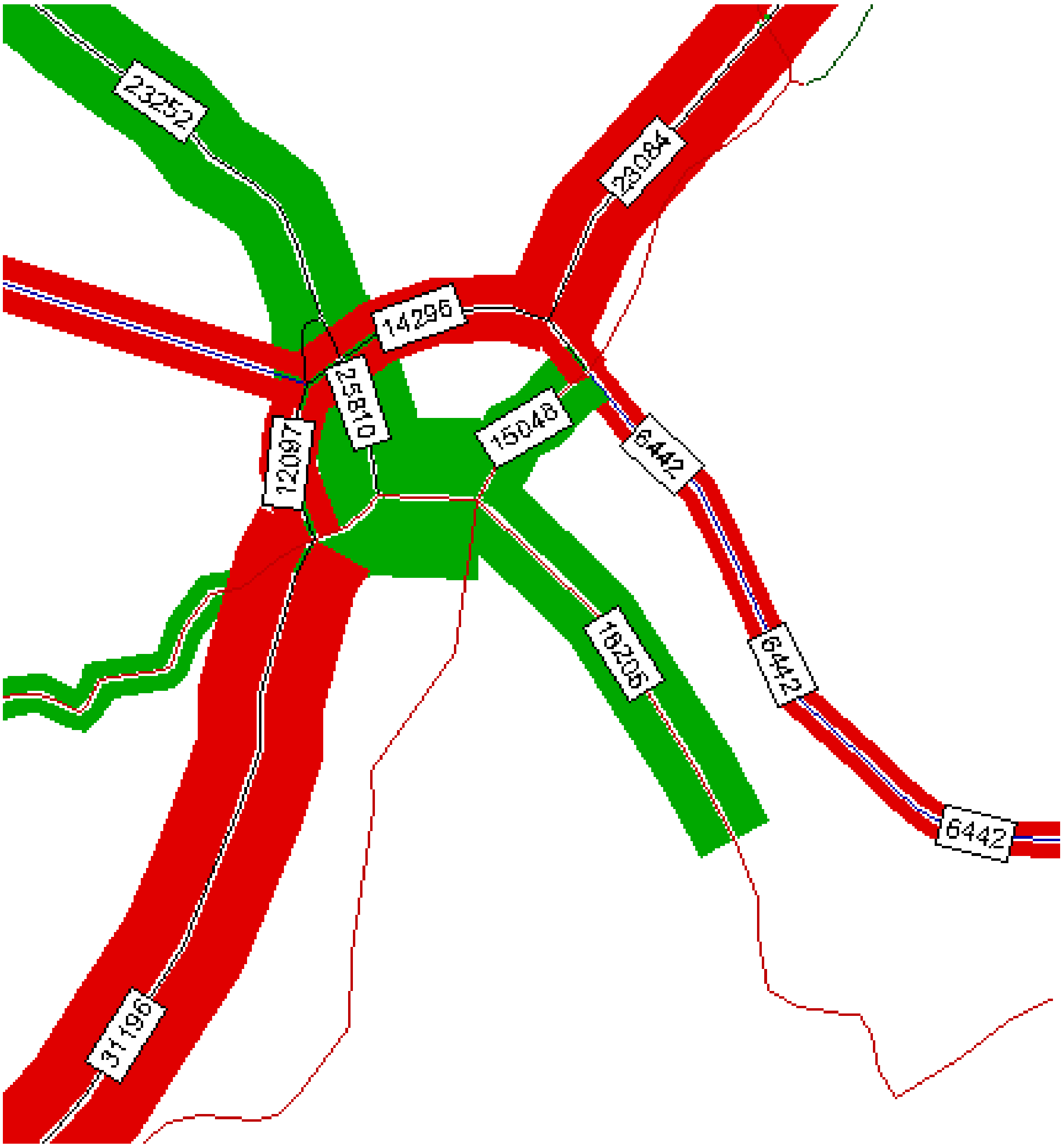


Figure 14: 2027 – Full realisation of the Physical plan of Montenegro Impedance – generalised costs (Value of the travel time 14.35 Euro/h including Fuel consumption) (without toll pay on the highways) PODGORICA BYPASS



Highways will in their total length constitute 11% of the network (264 km) perform 35% of transport performance (4179259 vehicle-km and 49273 vehicle-h) with average speed of 97 km/h.

On the highway network at all subsections there will be on an average day 242597 vehicles (maximum 28000 on average).

Figures 14, 15 and 16 show “Load of highway sections” , ‘’The percentage of utilisation of capacities “ and “The picture of those sections of road network of Montenegro from which users opt to use the highway section” Smokovac’’ – ‘’Mateševo’’.

Figure 15: 2027 – Full realisation of Physical plan of Montenegro
THE PERCENTAGE OF CAPACITY UTILISATION AT HIGHWAY SECTIONS ON THE BASIS OF AADT
Highways without paytoll

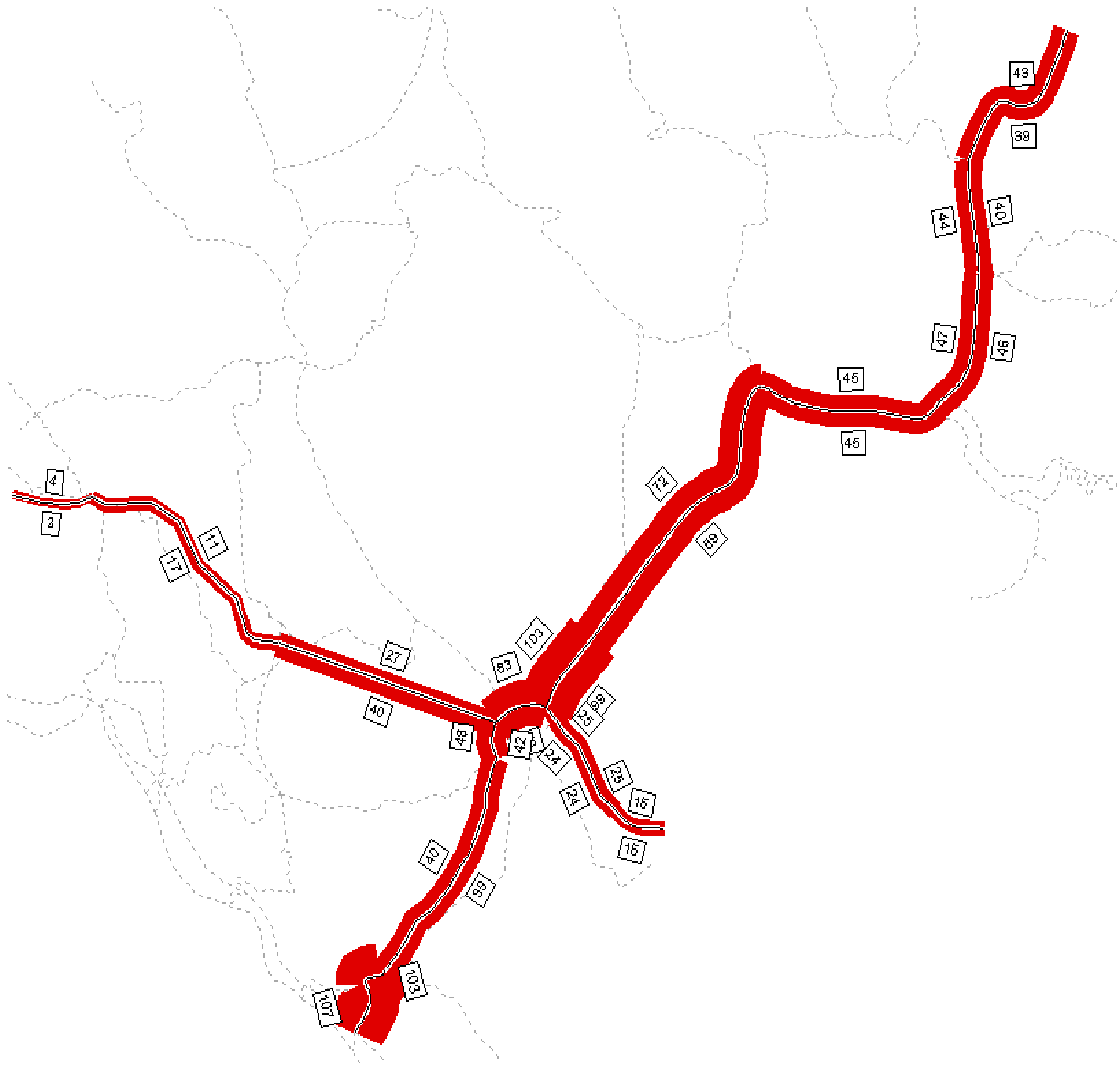
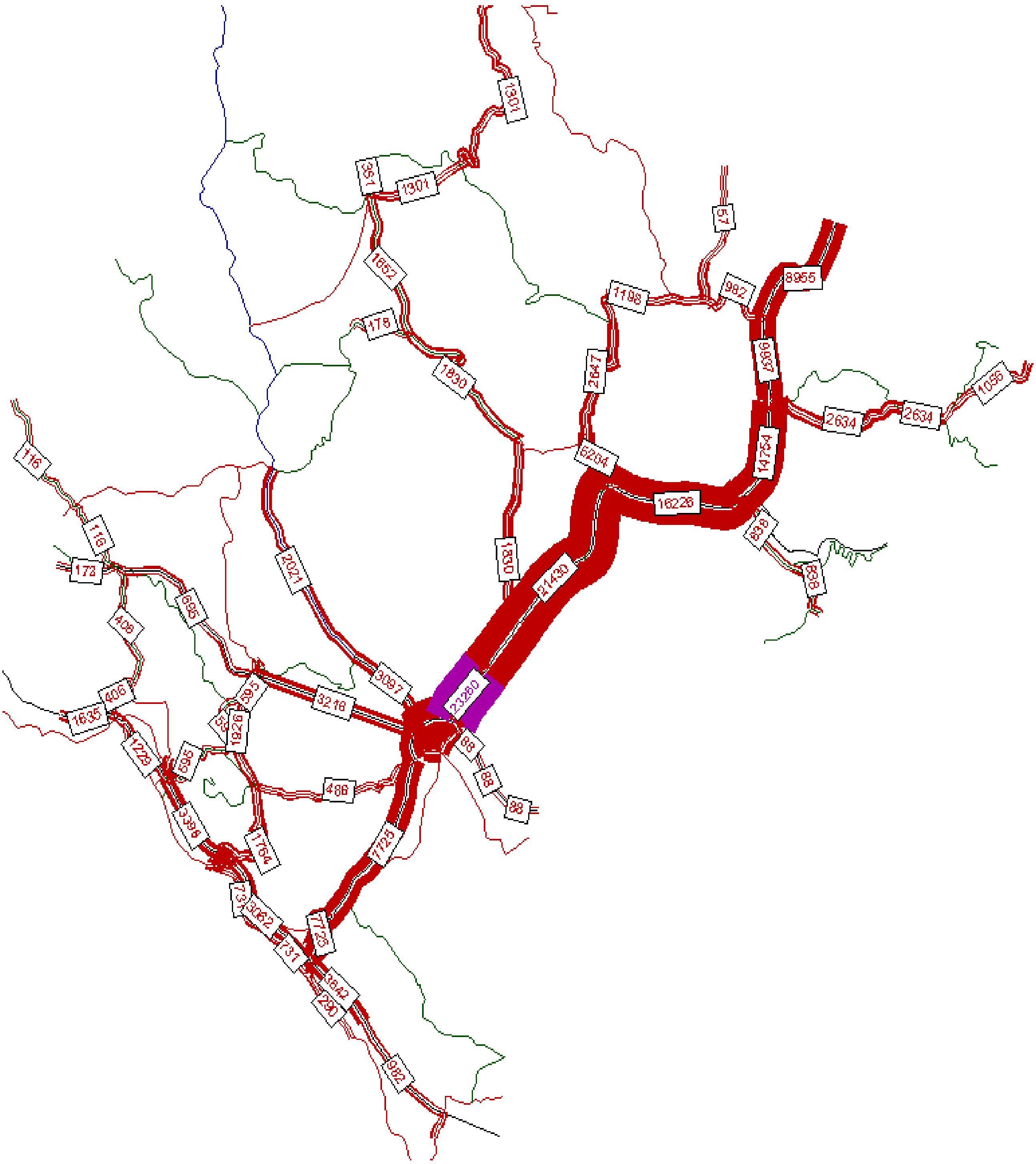


Figure 16: 2027 – Full realisation of the Physical plan of Montenegro
TRAFFIC USING HIGHWAY SECTION "SMOKOVAC" – "MATESEVO" WHEN THERE IS NO PAY TOLL



The introduction of pay toll at highways will undoubtedly de-motivate a certain number of users who will recourse to main road network without pay toll. On the highways this decrease will be approximately 11% in the total number of vehicles in all subsections, which makes in total 216496 vehicles (maximum 27000 on average) and around 16% decrease in the transport performance, which will be generated in the values of 3527122 vehicle-km i 35801 vehicle-h. The decrease in the traffic will most affect Adriatic-Ionic highway (section Čevo-Podgorica), where there will be barely 37 % of the traffic in comparison to traffic without pay toll.

The following figures present the effects of introduction of pay toll on the highways.

Figure 17: 2027 – Full realisation of Physical plan of Montenegro Impedance – generalised costs (Value of the travel time 14.35 Euro/h including Fuel consumption) (Pay toll 6.0 Eurocents/km)

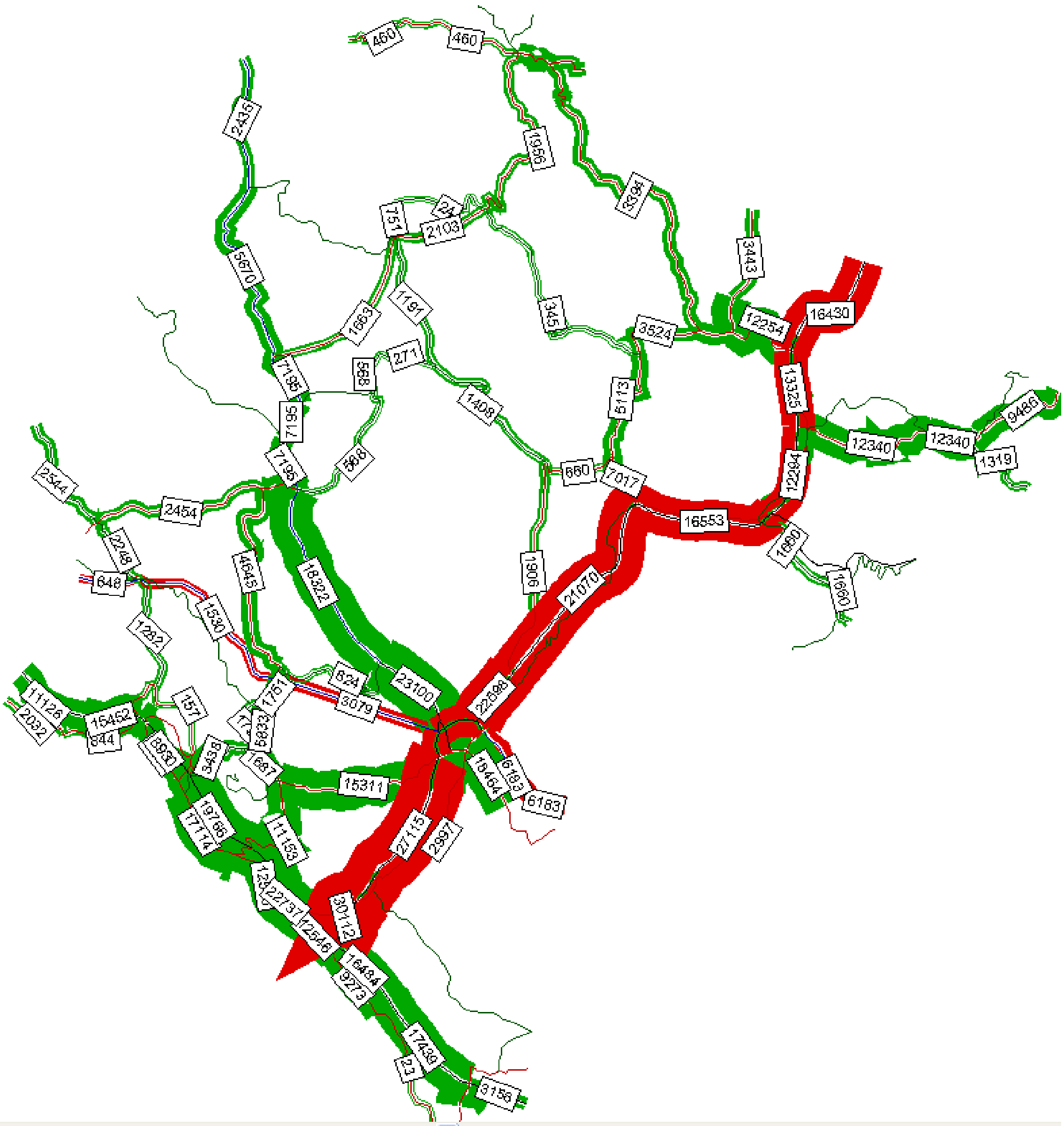


**Figure 18 : 2027 – Full realisation of Physical plan of Montenegro Impedance – generalised costs (Value of the travel time 14.35 Euro/h including Fuel consumption)
(Pay toll 6.0 Eurocents/km)
PODGORICA BYPASS**

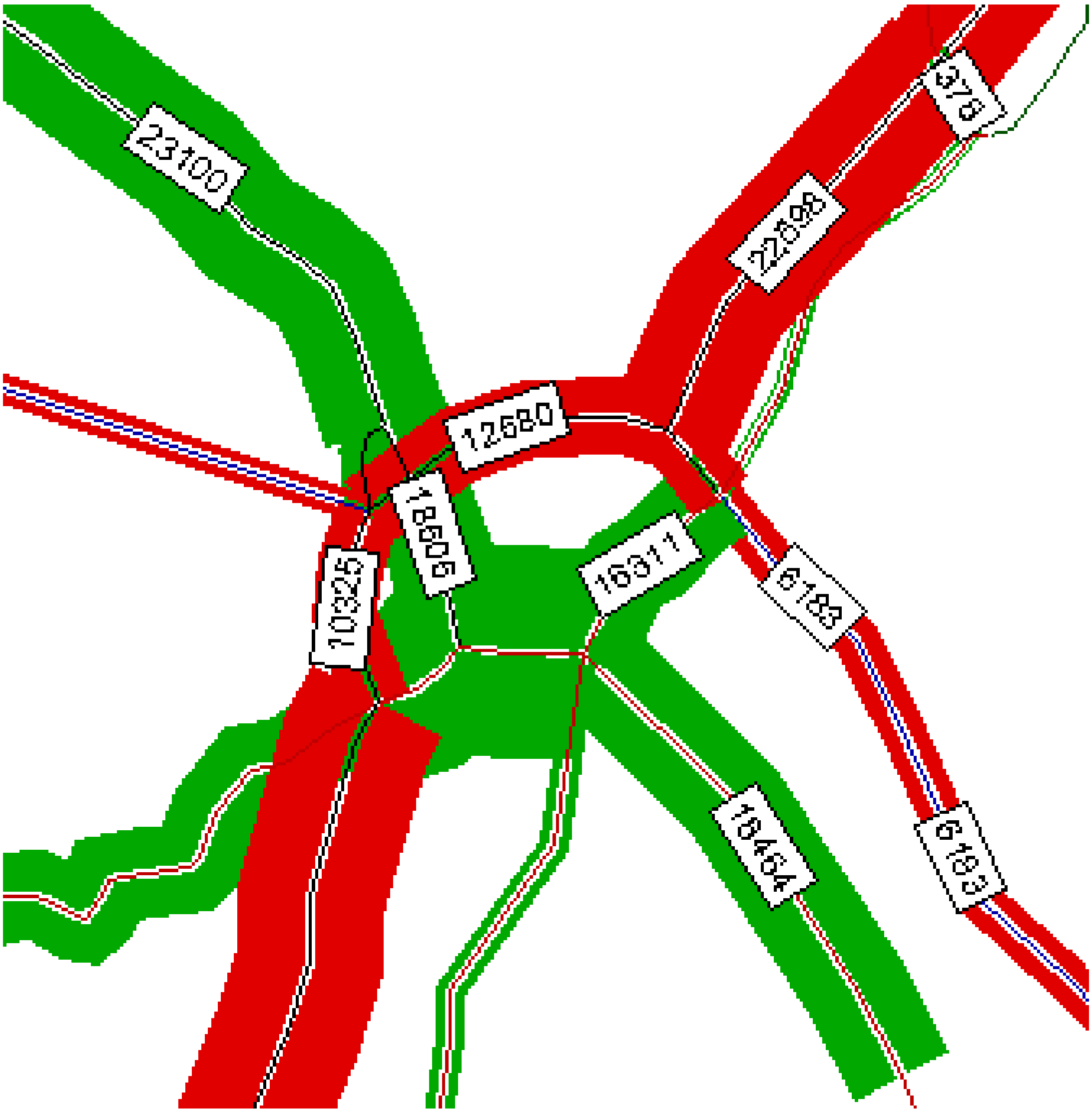


Figure 19: TRAFFIC ASSIGNMENT OF THE HIGHWAY SECTIONS
Total in PCU- Highways with pay toll
2027 Full relisation of the Physical plan of Montenegro

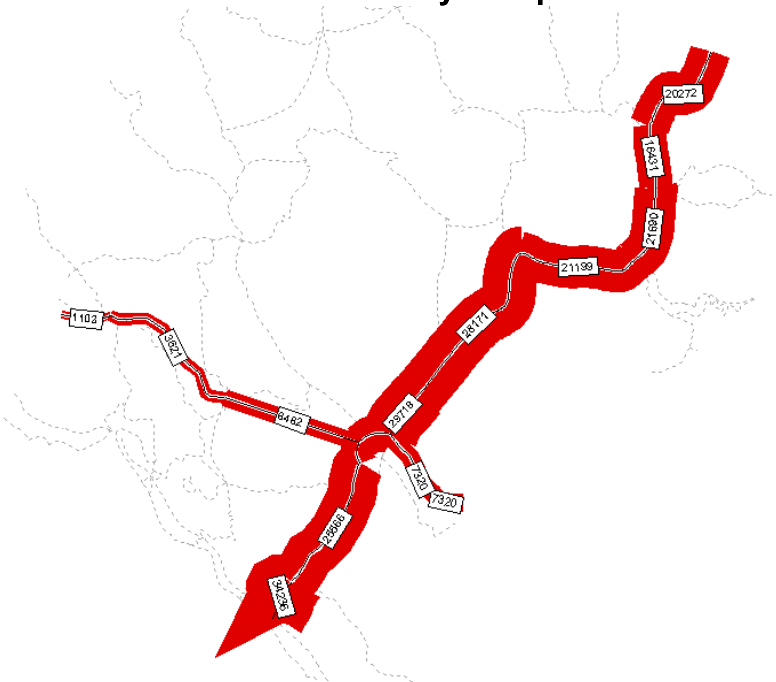


Figure 20: AVERAGE FLOW SPEEDS ON THE LOADED HIGHWAYS
(2027 Full realisation of the Physical plan of Montenegro)
Highways with pay toll

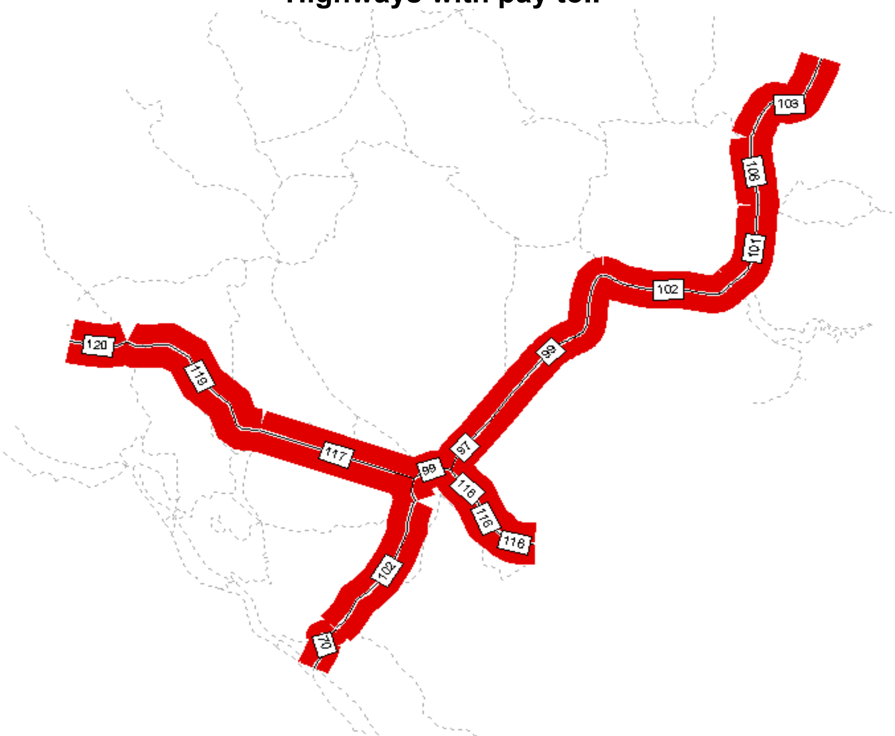


Figure 21: THE PERCENTAGE OF CAPACITY UTILISATION AT HIGHWAY SECTIONS ON THE BASIS OF «AADT»
2027 Full realisation of the Physical plan of Montenegro

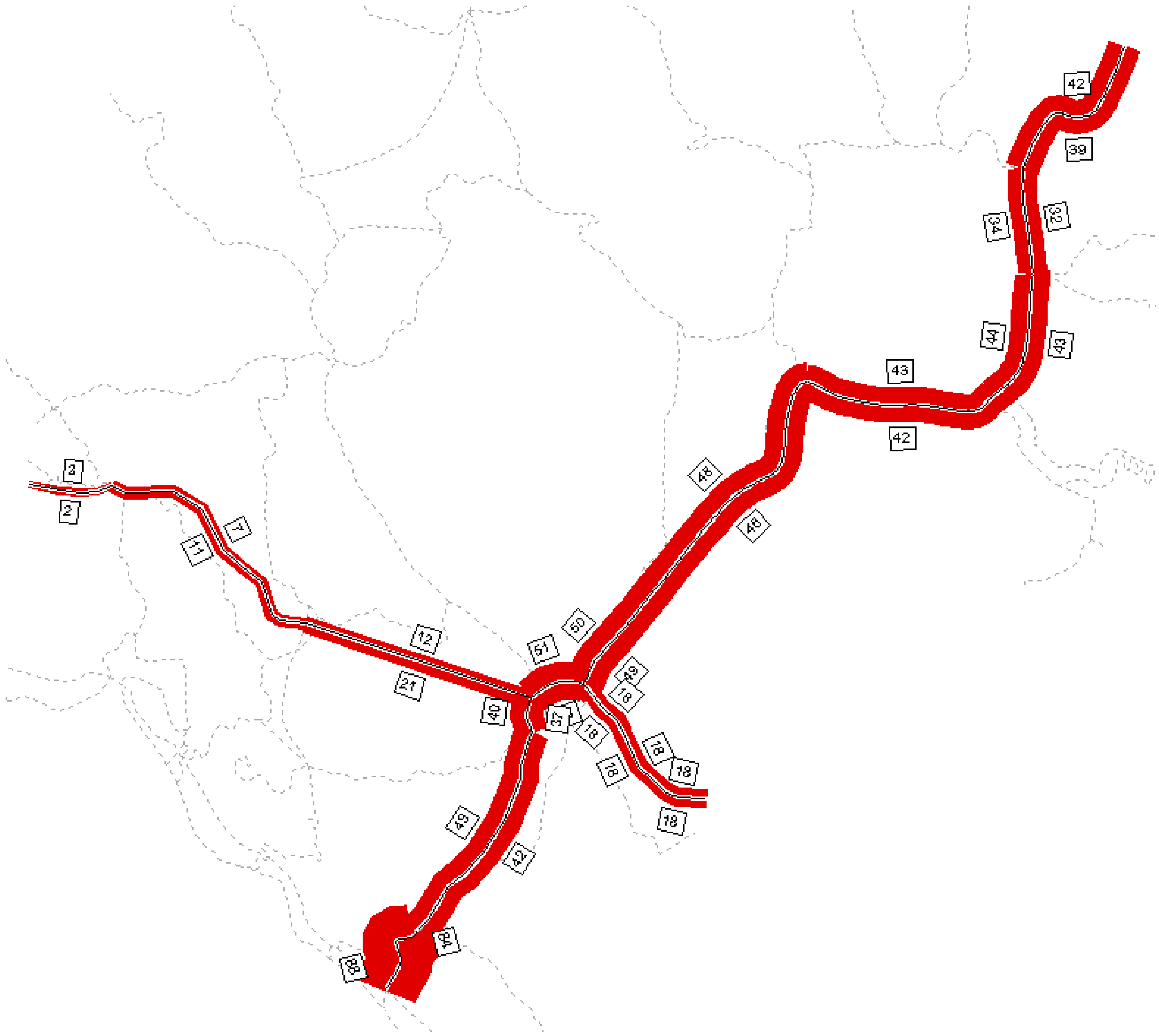
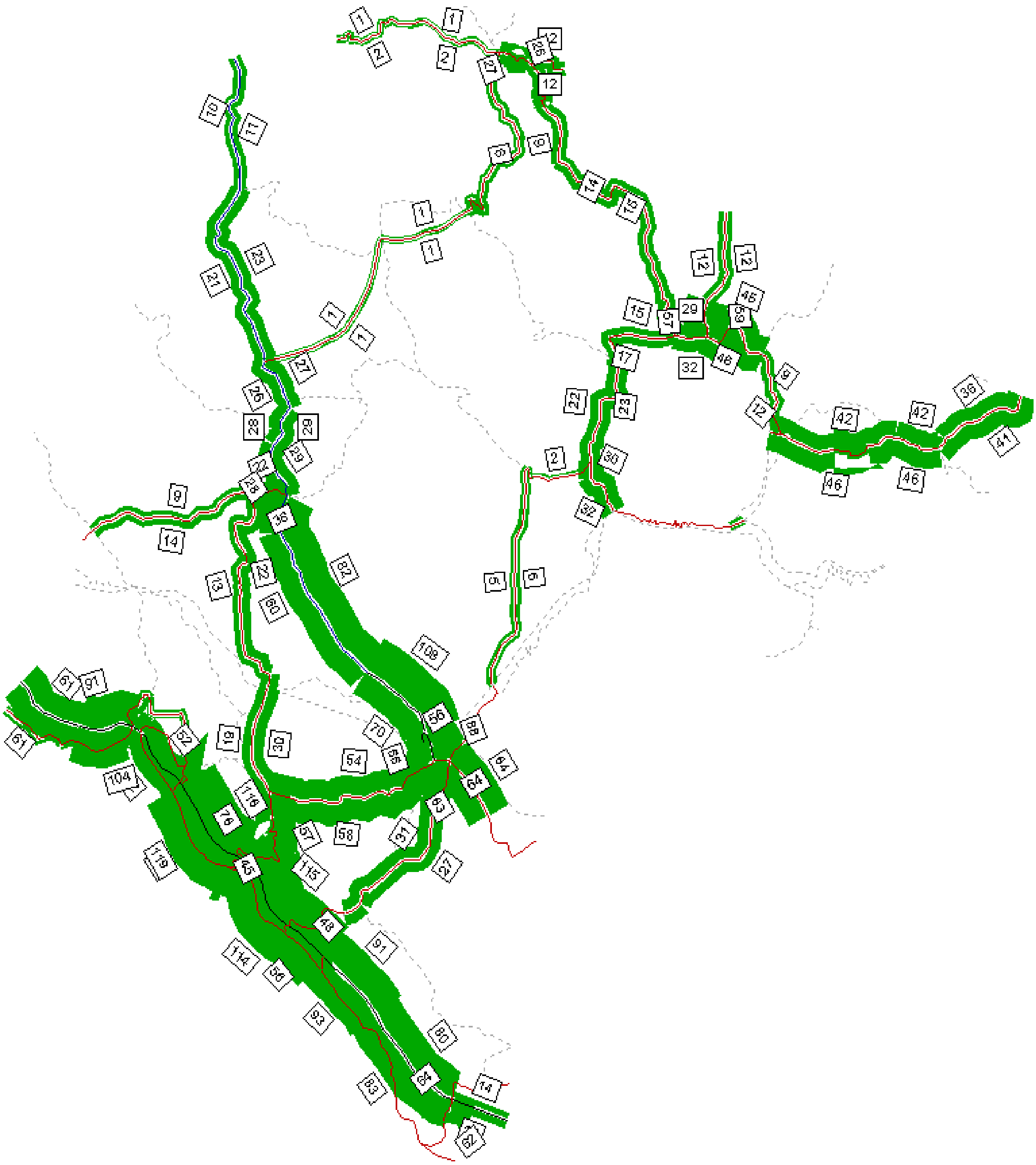


Figure 22: 2027 – Full realisation of the Physical plan of Montenegro
THE PERCENTAGE OF CAPACITIES UTILISATION OF THE REMAINING MAIN ROADS NETWORK IN MONTENEGRO ON THE BASIS OF «AADT»
Value of travel time 14.35 Euro/h
Highways with pay toll 10.8 Eurocents/km



At highway subsections the traffic in 2027 will be ranging from approximately 2200 vehicles at the weakest section of Adriatic – Ionic highway to approximately 28000 at the most loaded highway section of Bar- Boljare highway.
In any case, the highway Bar – Boljare will take over the majority of traffic, as follows:

	Bar-Boljare	Adriatic-Ionic
Total vehicle fleet by subsections	78%	22%
Transport performance (vehicle-km)	88%	12%
Transport performance (vehicle-hours)	89%	11%

However, the construction of Adriatic-Ionic highway is a strategic issue in Montenegro. Its construction may be prolonged or delayed due to low traffic assignment and insufficient econimic justification, but the corridor envisaged for this road must remain preserved for future realisation.

Therefore the following question may be also posed: Would it be possible to complete certain activities and make amendments to the concept of the Physical plan of Montenegro which would increase the attractiveness of the Adriatic-Ionic highway corridor, thus enabling its realisation earlier and increase in economic viability "?

One of the available options is the reduction of the effects of Expressway along the Adriatic coast which, with its parallel position and very high building costs at a close distance from Adriatic-Ionic highway, would significantly divert the traffic and consequently decrease the attractiveness of the highway.

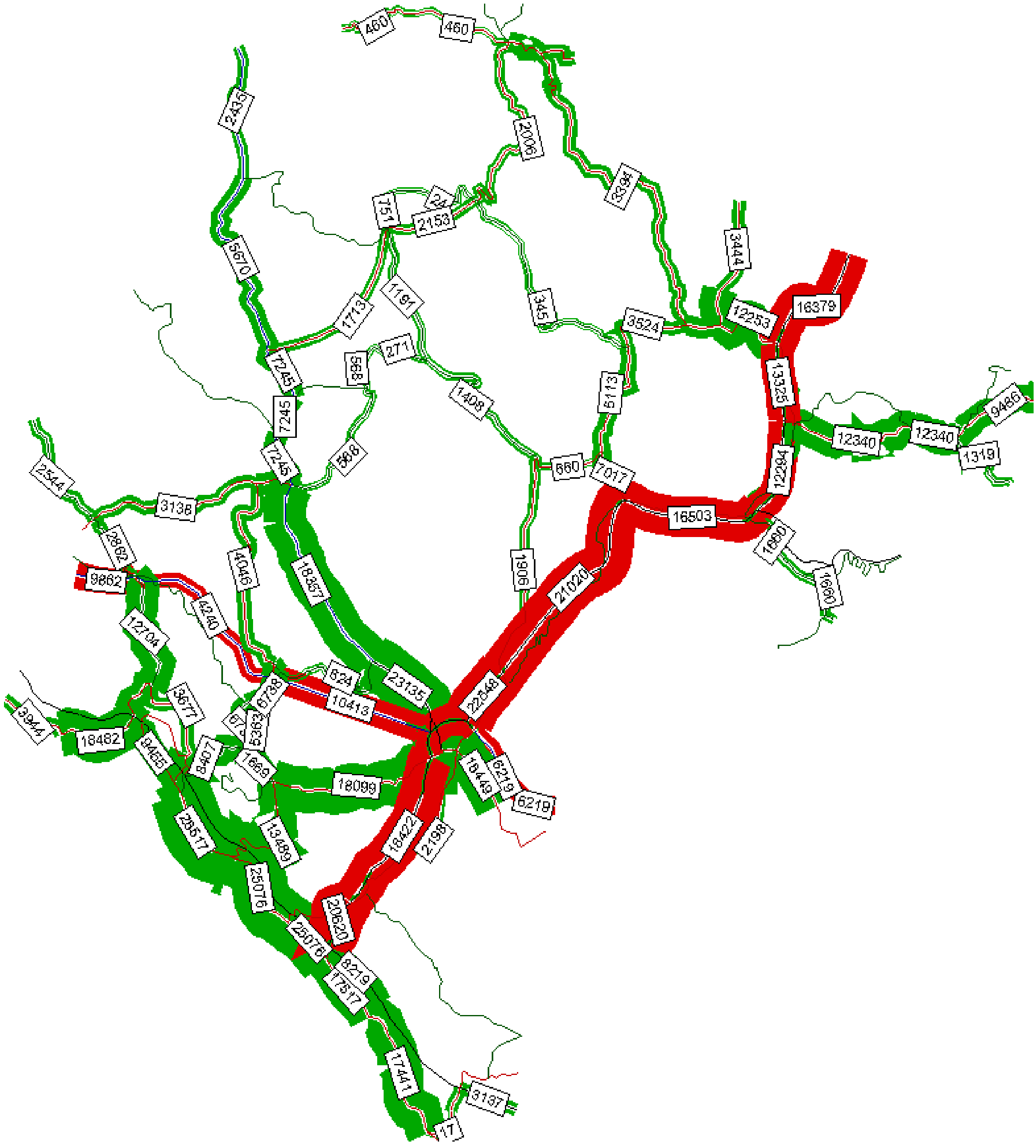
For that reason the possible variant of the development of traffic system of Montenegro by year 2027 without the construction of Expressway along the Adriatic coast has been analysed here. In such a case, all the bottle-necks in the coastal towns would be avioded by the construction of by-passes.

The development of "assignment" model with these assumptions has undoubtedly pointed out to the increased attractiveness of Adriatic-Ionic highway and also to better distribution of the traffic on the entire road network.

First of all, for the same transport demand a better distribution of transport performance is achived in vehicle-km, higher participation of the traffic on the highways, increase in the travel speed and decrease in the time spent on the network.

Figure no. 23 shows network load on an average day in 2027 with the realisation of all the sections envisaged by the Physical plan excluding the Expressway along the Adriatic coast.

Figure 23: 2027 – Realisation of the Physical plan of Montenegro – without the Adriatic expressway
Impedance – generalised costs (value of travel time 14.35 Euro/h including Fuel consumption)
(Pay toll fare 6.0 Eurocents/km)



6 CONCLUSION

All the analysis and model simulations done in this study point at several undisputable facts which should take significant place in further process of evaluation, designing and decision-making.

First of all, Montenegrin road network, although its density is satisfactory, is not, by its characteristics (carriageway condition, width, upgrades, curvature and evenness), capable of accepting a more serious traffic growth, which is expected in the near future according to the prognosis.

Secondly, transport links between northern part of Montenegro, which is on a considerably lower development level, and other parts are in such a bad condition that they virtually make any more serious exchange of people and cargo impossible which is one of the preconditions for speeding up and achieving the development of other municipalities in Montenegro.

That is why the proposal from the Physical Plan of Montenegro, to cover basic present and future traffic movements with two motorway corridors (north-south and west-east), can be considered as the crucial factor of country development.

Feasibility study will certainly define the construction dynamics and cost-effectiveness of certain sections but the most important thing is to observe these corridors also as the development strategic elements for which all future investment decisions are being brought.

This is the reason why all results from this study should be used primarily as input parameters in development models and feasibility study, and then as the terms of reference for the designers in dimensioning of certain elements of the network, sections and knots.

APPENDIX 1 – A

RECORDED TRAFFIC AND VEHICLE STRUCTURE 2005

Main Roads 2005

No.	Road	Section no.	Section	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	M-2	001 01	CG border (Debeli brijeg)-Igalo	Sutorina	6-6 h	2005	1250	312	84	223	58	1	77
						100	62,34	15,56	4,19	11,12	2,89	0,05	3,84
2	M-2	001 02	Igalo - Kamenari	Kamenari	6-6 h	5730	3525	878	498	203	325	142	159
						100	61,52	15,32	8,69	3,54	5,67	2,48	2,77
3	M-2.1	001 03	Kamenari - Risan	Lipci	6-6 h	2947	1898	474	155	224	151	4	41
						100	64,40	16,08	5,26	7,60	5,12	0,14	1,39
4	M-2.1	003 01	Kotor 1 - Lepetani	Prčanj	6-6 h	1583	1200	300	27	41	15	0	0
						100	75,81	18,95	1,71	2,59	0,95	0,00	0,00
5	M-2	005 00	Radanovići 2 - Budva	Radanovići	6-6 h	10513	6984	1746	288	566	526	295	108
						100	66,43	16,61	2,74	5,38	5,00	2,81	1,03
6	M-2	006 00	Budva-Petrovac	Petrovac 1	6-6 h	4714	3186	797	63	439	77	89	63
						100	67,59	16,91	1,34	9,31	1,63	1,89	1,34

7	M-2.3	023 00	Cetinje 1-Budva	Zavala 2	6-6 h	6364	4403	1101	240	266	226	80	48
						100	69,19	17,30	3,77	4,18	3,55	1,26	0,75
8	M-2.4	024 01	Petrovac-Bar	Haj-Nehaj	6-6 h	6029	3426	857	313	664	281	260	228
						100	56,83	14,21	5,19	11,01	4,66	4,31	3,78
9	M-2	007 00	Petrovac - Virpazar	Sotonići 1	6-6 h	4452	2782	556	198	480	151	157	128
						100	62,49	12,49	4,45	10,78	3,39	3,53	2,88
10	M-2	010 00	Podgorica 2 - Bioče	Bioče	6-6 h	5141	2952	982	242	218	198	197	352
						100	57,42	19,10	4,71	4,24	3,85	3,83	6,85
11	M-2	011 00	Bioče - Mioska	Bioče	6-6 h	3452	2140	535	146	117	116	129	269
						100	61,99	15,50	4,23	3,39	3,36	3,74	7,79
12	M-2	012 00	Mioska - Kolašin	Mioska	6-6 h	2889	1768	442	170	93	103	30	283
						100	61,20	15,30	5,88	3,22	3,57	1,04	9,80
13	M-2	013 00	Kolašin - Mojkovac	Bablja greda	6-6 h	3889	2173	543	197	160	235	161	420
						100	55,88	13,96	5,07	4,11	6,04	4,14	10,80
14	M-2	015 00	Slijepač most - Ribarevina	Ribarevina	6-6 h	3756	2246	562	168	146	198	140	296
						100	59,80	14,96	4,47	3,89	5,27	3,73	7,88
15	M-2	016 00	Ribarevina - Berane 1	Ribarevina	6-6 h	4042	2847	712	73	113	105	54	138
						100	70,44	17,62	1,81	2,80	2,60	1,34	3,41
16	M-2	018 00	Berane 2 - Kalače	Rudeš	6-6 h	3338	2322	580	60	115	104	41	116
						100	69,56	17,38	1,80	3,45	3,12	1,23	3,48

17	M-2	021 00	Rožaje 2 - Granica CG (Špiljani)	Most Zeleni	6-6 h	3599	2440	610	75	108	221	49	96
						100	67,80	16,95	2,08	3,00	6,14	1,36	2,67
18	M-2.4	024 02	Bar-Ulcinj	Kruče	6-6 h	3665	2568	644	128	61	221	34	9
						100	70,07	17,57	3,49	1,66	6,03	0,93	0,25
19	M-2.4	025 00	Ulcinj - Vladimir	Vladimir	6-6 h	2260	1568	387	81	48	161	12	3
						100	69,38	17,12	3,58	2,12	7,12	0,53	0,13
20	M-2.3	022 00	Podgorica 3 - Cetinje 1	Barutana	6-6 h	7446	4226	1056	494	204	637	403	426
						100	56,76	14,18	6,63	2,74	8,55	5,41	5,72
21	M-6	028 00	Vilusi - Riđani	Vilusi	6-6 h	1415	868	217	59	63	94	21	93
						100	61,34	15,34	4,17	4,45	6,64	1,48	6,57
22	M-18	039 01	Plužine - Jasenovo polje	Jasenovo polje	6-6 h	1640	954	232	74	98	82	58	142
						100	58,17	14,15	4,51	5,98	5,00	3,54	8,66
23	M-18	039 02	Jasenovo polje - Gornje polje	Gornje polje	6-6 h	2526	1734	433	74	72	74	38	101
						100	68,65	17,14	2,93	2,85	2,93	1,50	4,00
24	M-18	042 00	Nikšić 2 - Danilovgrad	Bogetići	6-6 h	5197	3223	806	266	251	221	168	262
						100	62,02	15,51	5,12	4,83	4,25	3,23	5,04
25	M-18	045 01	Podgorica 2 - Tuzi	Cijevna	6-6 h	6852	3987	997	416	156	561	366	369
						100	58,19	14,55	6,07	2,28	8,19	5,34	5,39

26	M-18	045 02	Tuzi - Granica CG (Božaj)	Vitoja	6-6 h	2489	1545	386	123	33	162	102	138
						100	62,07	15,51	4,94	1,33	6,51	4,10	5,54
27	M-21	046 00	Granica CG(Barski most)-Ribarevina	Sutivan	6-6 h	4378	2948	737	94	133	138	91	237
						100	67,34	16,83	2,15	3,04	3,15	2,08	5,41
28	M-8	032 00	Pljevlja 2 - Trlica	Trlica	6-6 h	1298	841	210	28	32	115	19	53
						100	64,79	16,18	2,16	2,47	8,86	1,46	4,08

Regional roads 2005

No.	Road	Section no.	Section	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	R-1.1	052 00	Trojica - Radanovići 2	Radanovići	6-6 h	6626	4518	1129	231	260	311	112	65
						100	68,19	17,04	3,49	3,92	4,69	1,69	0,98
2	R-19	079 00	Bioče - Mateševo	Mateševo	6-6 h	1159	724	158	125	21	65	37	29
						100	62,47	13,63	10,79	1,81	5,61	3,19	2,50
3	R-3.1	056 00	Dajevića Han-Granica CG (Čemerno)	Dajevića Han	6-6 h	368	276	69	5	2	15	0	1
						100	75,00	18,75	1,36	0,54	4,08	0,00	0,27
4	R-4	058 00	Đurđevića Tara - Mojkovac	Đurđevića Tara	6-6 h	581	327	81	17	27	39	18	72
						100	56,28	13,94	2,93	4,65	6,71	3,10	12,39
5	R-9	065 00	Murino - Gusinje	Murino	6-6 h	1076	756	189	42	31	36	9	13
						100	70,26	17,57	3,90	2,88	3,35	0,84	1,21
6	R-8	064 00	Rožaje 1 - Granica CG (Kula)	Kula	6-6 h	1441	966	242	25	22	71	42	73
						100	67,04	16,79	1,73	1,53	4,93	2,91	5,07

Highways 2005

No.	road	Section no.	S e c t i o n	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	A-1		Sotonići - Haj Nehaj	Sotonići	6-6 h	2673	1957	489	21	30	83	23	70
						100	73,21	18,29	0,79	1,12	3,11	0,86	2,62

RECORDED TRAFFIC AND VEHICLE STRUCTURE 2006.

Main Roads 2006

No.	road	Section no.	Section	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	M-2	001 01	Granica CG (Debeli brijeg)-Igalo	Sutorina	6-6 h	2480	1625	359	94	250	65	1	86
						100	65,53	14,47	3,79	10,07	2,62	0,05	3,48
2	M-2	001 02	Igalo - Kamenari	Kamenari	6-6 h	7079	4583	1010	558	227	364	159	178
						100	64,74	14,26	7,88	3,21	5,14	2,25	2,52
3	M-2.1	001 03	Kamenari - Risan	Lipci	6-6 h	3656	2467	545	174	251	169	4	46
						100	67,48	14,91	4,75	6,86	4,63	0,12	1,26
4	M-2.1	003 01	Kotor 1 - Lepetani	Prčanj	6-6 h	1998	1560	345	30	46	17	0	0

						100	78,08	17,27	1,51	2,30	0,84	0,00	0,00
5	M-2	005 00	Radanovići 2 - Budva	Radanovići	6-6 h	13084	9079	2008	323	634	589	330	121
						100	69,39	15,35	2,47	4,85	4,50	2,53	0,92
6	M-2	006 00	Budva-Petrovac	Petrovac 1	6-6 h	5877	4142	917	71	492	86	100	71
						100	70,47	15,59	1,20	8,37	1,47	1,70	1,20
7	M-2.3	023 00	Cetinje 1-Budva	Zavala 2	6-6 h	7953	5724	1266	269	298	253	90	54
						100	71,97	15,92	3,38	3,75	3,18	1,13	0,68
8	M-2.4	024 01	Petrovac-Bar	Haj-Nehaj	6-6 h	7395	4454	986	351	744	315	291	255
						100	60,23	13,33	4,74	10,06	4,26	3,94	3,45
9	M-2	007 00	Petrovac - Virpazar	Sotonići 1	6-6 h	5504	3617	639	222	538	169	176	143
						100	65,71	11,62	4,03	9,77	3,07	3,19	2,60
10	M-2	010 00	Podgorica 2 - Bioče	Bioče	6-6 h	6319	3838	1129	271	244	222	221	394
						100	60,74	17,87	4,29	3,86	3,51	3,49	6,24
11	M-2	011 00	Bioče - Mioska	Bioče	6-6 h	4267	2782	615	164	131	130	144	301
						100	65,19	14,42	3,83	3,07	3,04	3,39	7,06
12	M-2	012 00	Mioska - Kolašin	Mioska	6-6 h	3567	2298	508	190	104	115	34	317
						100	64,43	14,25	5,34	2,92	3,23	0,94	8,89
13	M-2	013 00	Kolašin - Mojkovac	Bablja greda	6-6 h	4763	2825	624	221	179	263	180	470
						100	59,31	13,11	4,63	3,76	5,53	3,79	9,88
14	M-2	015 00	Slijepač most - Ribarevina	Ribarevina	6-6 h	4628	2920	646	188	164	222	157	332
						100	63,09	13,96	4,07	3,53	4,79	3,39	7,16

15	M-2	016 00	Ribarevina - Berane 1	Ribarevina	6-6 h	5061	3701	819	82	127	118	60	155
						100	73,13	16,18	1,62	2,50	2,32	1,20	3,05
16	M-2	018 00	Berane 2 - Kalače	Rudeš	6-6 h	4174	3019	667	67	129	116	46	130
						100	72,32	15,98	1,61	3,09	2,79	1,10	3,11
17	M-2	021 00	Rožaje 2 - Granica CG (Špiljani)	Most Zeleni	6-6 h	4488	3172	702	84	121	248	55	108
						100	70,67	15,63	1,87	2,69	5,51	1,22	2,40
18	M-2.4	024 02	Bar-Ulcinj	Kruče	6-6 h	4586	3338	740,6	143,36	68,32	247,52	38,08	10,08
						100	72,79	16,15	3,13	1,49	5,40	0,83	0,22
19	M-2.4	025 00	Ulcinj - Vladimir	Vladimir	6-6 h	2825	2038	445,05	90,72	53,76	180,32	13,44	3,36
						100	72,15	15,76	3,21	1,90	6,38	0,48	0,12
20	M-2.3	022 00	Podgorica 3 - Cetinje 1	Barutana	6-6 h	9132	5494	1214	553	228	713	451	477
						100	60,16	13,30	6,06	2,50	7,81	4,94	5,22
21	M-6	028 00	Vilusi - Riđani	Vilusi	6-6 h	1747	1128	250	66	71	105	24	104
						100	64,56	14,28	3,78	4,04	6,03	1,35	5,96
22	M-18	039 01	Plužine - Jasenovo polje	Jasenovo polje	6-6 h	2008	1240	260	83	110	92	65	159
						100	61,74	12,94	4,13	5,47	4,57	3,23	7,92
23	M-18	039 02	Jasenovo polje - Gornje polje	Gornje polje	6-6 h	3141	2254	485	83	81	83	43	113
						100	71,76	15,44	2,64	2,57	2,64	1,35	3,60
24	M-18	042 00	Nikšić 2 - Danilovgrad	Bogetići	6-6 h	6401	4190	903	298	281	248	188	293
						100	65,46	14,10	4,65	4,39	3,87	2,94	4,58

25	M-18	045 01	Podgorica 2 - Tuzi	Cijevna	6-6 h	8392	5183	1116,64	465,92	174,72	628,32	409,92	413,28
						100	61,76	13,31	5,55	2,08	7,49	4,88	4,92
26	M-18	045 02	Tuzi - Granica CG (Božaj)	Vitoja	6-6 h	3066	2009	432,32	137,76	36,96	181,44	114,24	154,56
						100	65,52	14,10	4,49	1,21	5,92	3,73	5,04
27	M-21	046 00	Granica CG(Barski most)-Ribarevina	Sutivan	6-6 h	5434	3832	825,44	105,28	148,96	154,56	101,92	265,44
						100	70,52	15,19	1,94	2,74	2,84	1,88	4,89
28	M-8	032 00	Pljevlja 2 - Trlica	Trlica	6-6 h	1605	1093	235,2	31,36	35,84	128,8	21,28	59,36
						100	68,11	14,66	1,95	2,23	8,03	1,33	3,70

Regional Roads 2006

No.	road	Section no.	Section	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	R-1.1	052 00	Trojica - Radanovići 2	Radanovići	6-6 h	8268	5873	1298	259	291	348	125	73
						100	71,03	15,70	3,13	3,52	4,21	1,52	0,88
2	R-19	079 00	Bioče - Mateševo	Mateševo	6-6 h	1433	941	182	140	24	73	41	32
						100	65,67	12,68	9,77	1,64	5,08	2,89	2,27
3	R-3.1	056 00	Dajevića Han-Granica CG (Čemerno)	Dajevića Han	6-6 h	464	359	79	6	2	17	0	1
						100	77,34	17,10	1,21	0,48	3,62	0,00	0,24
4	R-4	058 00	Đurđevića Tara - Mojkovac	Đurđevića Tara	6-6 h	712	425	93	19	30	44	20	81
						100	59,70	13,08	2,67	4,25	6,13	2,83	11,33
5	R-9	065 00	Murino - Gusinje	Murino	6-6 h	1347	983	217	47	35	40	10	15
						100	72,97	16,14	3,49	2,58	2,99	0,75	1,08
6	R-8	064 00	Rožaje 1 - Granica CG (Kula)	Kula	6-6 h	1795	1256	278	28	25	80	47	82
						100	69,96	15,50	1,56	1,37	4,43	2,62	4,55

Highways 2006

No.	road	Section no.	S e c t i o n	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	A-1		Sotonići - Haj Nehaj	Sotonići	6-6 h	3361	2544	562	24	34	93	26	78
						100	75,70	16,73	0,70	1,26	2,77	0,77	2,33

RECORDED TRAFFIC AND VEHICLE STRUCTURE 2007.

Main Roads 2007

No.	road	Section no.	S e c t I o n	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	M-2	001 01	Granica CG (Debeli brijeg)-Igalo	Sutorina	6-6 h	5020	4015		419	325	65	127	69
						100	79,98	0,00	8,35	6,47	1,29	2,53	1,37
2	M-2	001 02	Igalo - Kamenari	Kamenari	6-6 h	6514	4858		341	402	705		208
						100	74,58	0,00	5,23	6,17	10,82	0,00	3,19
3	M-2.1	001 03	Kamenari - Risan	Lipci	6-6 h	3905	2892		201	292	498		22
						100	74,06	0,00	5,15	7,48	12,75	0,00	0,56

4	M-2.1	003 01	Kotor 1 - Lepetani	Prčanj	6-6 h	6968	6558	95	133	95	87	0	0
						100	94,12	1,36	1,91	1,36	1,25	0,00	0,00
5	M-2	005 00	Radanovići 2 - Budva	Radanovići	6-6 h	14982	12121		1147	508	956	169	81
						100	80,90	0,00	7,66	3,39	6,38	1,13	0,54
6	M-2	006 00	Budva-Petrovac	Petrovac 1	6-6 h	14973	13172	136	302	647	269	328	119
						100	87,97	0,91	2,02	4,32	1,80	2,19	0,79
7	M-2.3	023 00	Cetinje 1-Budva	Zavala 2	6-6 h	9831	8921		138	270	177	177	148
						100	90,74	0,00	1,40	2,75	1,80	1,80	1,51
8	M-2.4	024 01	Petrovac-Bar	Haj-Nehaj	6-6 h	6044	4566		405	301	410	232	130
						100	75,55	0,00	6,70	4,98	6,78	3,84	2,15
9	M-2	007 00	Petrovac - Virpazar	Sotonići 1	6-6 h	5118	3199	639	227	551	174	181	147
						100	62,51	12,48	4,44	10,77	3,40	3,54	2,87
10	M-2	010 00	Podgorica 2 - Bioče	Bioče	6-6 h	5907	3395	1129	278	251	227	225	402
						100	57,47	19,11	4,71	4,25	3,84	3,81	6,81
11	M-2	011 00	Bioče - Mioska	Bioče	6-6 h	4924	2923	395	305	209	387	189	516
						100	59,36	8,02	6,19	4,24	7,86	3,84	10,48
12	M-2	012 00	Mioska - Kolašin	Mioska	6-6 h	4749	2980	449	253	199	288	198	382
						100	62,75	9,45	5,33	4,19	6,06	4,17	8,04
13	M-2	013 00	Kolašin - Mojkovac	Bablja greda	6-6 h	7194	4250	885	223	461	454	144	777
						100	59,08	12,30	3,10	6,41	6,31	2,00	10,80

14	M-2	015 00	Slijepač most - Ribarevina	Ribarevina	6-6 h	5547	4119	186	232	167	242	161	440
						100	74,26	3,35	4,18	3,01	4,36	2,90	7,93
15	M-2	016 00	Ribarevina - Berane 1	Ribarevina	6-6 h	3092	2249	151	86	175	140	98	193
						100	72,74	4,88	2,78	5,66	4,53	3,17	6,24
16	M-2	018 00	Berane 2 - Kalače	Rudeš	6-6 h	5668	4253	381	213	182	34	309	296
						100	75,04	6,72	3,76	3,21	0,60	5,45	5,22
17	M-2	021 00	Rožaje 2 - Granica CG (Špiljani)	Most Zeleni	6-6 h	4138	2807	702	86	123	254	56	110
						100	67,83	16,96	2,08	2,97	6,14	1,35	2,66
18	M-2.4	024 02	Bar-Ulcinj	Kruče	6-6 h	8251	6991		309	117	497	266	71
						100	84,73	0,00	3,75	1,42	6,02	3,22	0,86
19	M-2.4	025 00	Ulcinj - Vladimir	Vladimir	6-6 h	2305	2210		5	57	13		20
						100	95,88	0,00	0,22	2,47	0,56	0,00	0,87
20	M-2.3	022 00	Podgorica 3 - Cetinje 1	Barutana	6-6 h	8556	4860	1213	567	235	733	463	485
						100	56,80	16,29	7,61	3,16	9,84	6,22	6,51
21	M-6	028 00	Vilusi - Riđani	Vilusi	6-6 h	1857	1299	74	78	53	76	92	185
						100	69,95	3,98	4,20	2,85	4,09	4,95	9,96
22	M-9	035 00	Mateševo-Andrijevica	Mateševo	6-18 h	802	417	77	52	0	132	122	2
						100	52,00	9,60	6,48	0,00	16,46	15,21	0,25
23	M-9	037 00	Murino-Granica CG	Bjeluha	6-6 h	423	227	22	60	16	50	48	0
						100	53,66	5,20	14,18	3,78	11,82	11,35	0,00

24	M-18	039 01	Plužine - Jasenovo polje	Jasenovo polje	6-6 h	1741	1400	90	62	44	95	37	13
						100	80,41	5,17	3,56	2,53	5,46	2,13	0,75
25	M-18	039 02	Jasenovo polje - Gornje polje	Gornje polje	6-6 h	8258	5992	510	574	292	414	320	156
						100	72,56	6,18	6,95	3,54	5,01	3,88	1,89
26	M-18	042 00	Nikšić 2 - Danilovgrad	Bogetići	6-6 h	6627	4919	407	217	215	238	156	475
						100	74,23	6,14	3,27	3,24	3,59	2,35	7,17
27	M-18	045 01	Podgorica 2 - Tuzi	Cijevna	6-6 h	7572	4575	1146	478	179	457	378	359
						100	60,42	16,73	6,98	2,61	6,67	5,52	5,24
28	M-18	045 02	Tuzi - Granica CG (Božaj)	Vitoja	6-6 h	2846	1775	435	139	37	186	117	157
						100	62,37	17,48	5,58	1,49	7,47	4,70	6,31
29	M-21	046 00	Granica CG(Barski most)-Ribarevina	Sutivan	6-6 h	6058	5053	254	141	129	177	63	241
						100	83,41	4,19	2,33	2,13	2,92	1,04	3,98
30	M-8	032 00	Pljevlja 2 - Trlica	Trlica	6-6 h	2260	1701	76	88	46	127	119	103
						100	75,27	3,36	3,89	2,04	5,62	5,27	4,56

Regional Roads 2007

No.	road	Section no.	Section	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	R-1.1	052 00	Trojica - Radanovići 2	Radanovići	6-6 h	1873	1617	106	65	44	41		
						100	86,33	5,66	3,47	2,35	2,19	0,00	0,00
2	R-2	053 00	Berane 1 (Andrijevica)-Andrijevica	Andrijevica	6-6 h	2062	1594	118	132	58	89	32	39
						100	77,30	5,72	6,40	2,81	4,32	1,55	1,89
3	R-7	063 00	Rožaje 2 (Vuča)-Granica CG (Vuča)	Vuča	6-6 h	906	650	99	22	8	69	55	3
						100	71,70	10,91	2,41	0,89	7,61	6,09	0,38
4	R-19	079 00	Bioče - Mateševo	Mateševo	6-6 h	1330	832	181	143	24	75	42	33
						100	62,56	15,62	12,34	2,07	6,47	3,62	2,85
5	R-3.1	056 00	Dajevića Han-Granica CG (Čemerno)	Dajevića Han	6-6 h	748	625	33	51	2	20	11	6
						100	83,56	4,41	6,82	0,27	2,67	1,47	0,80
6	R-4	058 00	Đurđevića Tara - Mojkovac	Đurđevića Tara	6-6 h	830	489	130	26	29	13	80	63
						100	58,92	15,66	3,13	3,49	1,57	9,64	7,59
7	R-8	064 00	Rožaje 1 - Granica CG (Kula)	Kula	6-6 h	2220	1930	108	20	28	40	45	49
						100	86,94	4,86	0,90	1,26	1,80	2,03	2,21
8	R-9	065 00	Murino - Gusinje	Murino	6-6 h	1047	745	83	77	29	72	11	30
						100	71,16	7,93	7,35	2,77	6,88	1,05	2,87

Highways 2007

	road	Section no.	S e c t I o n	Counting location	Counting time	Recorded traffic	Vehicle type						
						%	PC	Van	LV<3,5t	BUS	SV(3,5-10t)	TV>10t	AV
1	A-1		Sotonići - Haj Nehaj	Sotonići	6-6 h	4231	3381	587	20	35	97	35	76
						100	79,91	13,87	0,47	0,83	2,29	0,83	1,80

APPENDIX 1 – B

O-D Interview sheet

Counting sheet

SP Survey form

Pictures of counting and RSI stations

Louis Berger SAS

Highway Bar - Boljare

Survey location ______

Survey station ☐ direction ☐

Weather conditions ______

Date, day in a week ______

Checker: ______

Survey hour from ☐ to ☐

Sheet No. ☐

Prepared by: ______

No.	Vehicle type	Number of persons	Regestration Country Code	Departure zone	Origin	Origin purpose?	Arrival zone	Destination	Destination purpose?	Frequency Trip.		
		Number of persons in vehicle, driver included	Town letters **In case of foreign, country letters**		Where did you start this travel? (town,municipality, country)	1.home 2.work 3.shopping/ visiting friends/ personal trips 4.education 5.tourism short (weekend) 6.tourism long (vacation) 7.other		Where do you end this travel?	1.home 2.work 3.shopping/ visiting friends/ personal trips 4.education 5.tourism short (weekend) 6.tourism long (vacation) 7.other	number of times a week	number of times a month	less often
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												

Note:

Vehicle type:	Motorcycle	Car	Car + trailer	Van	Van + trailer	Small truck	Small truck + trailer	Medium truck	Heavy truck (articulated truck)	Bus (2 axels)	Bus (3 axels)	Bus + trailer
	1	2	3	4	5	6	7	8	9	10	11	12

Louis Berger SAS

Highway Bar - Boljare

Count location

Count station directions

Count hour from to

Weather conditions

Sheet no.

Date, day in a week

Checker:

Direction	Motorcycle	Car	Car + trailer	Van	Van + trailer	Small truck	Small truck + trailer	Medium truck	Articulated truck	Bus (2 axels)	Bus (3 axels)	Bus + trailer
	1	2	3	4	5	6	7	8	9	10	11	12

Note:

Counter:

Louis Berger SAS

Interview Stated Preference

1	**Interview Time**	from ______ to ______	
2	**Vehicle Type**	2. (passenger car) 4. (van)	
3	**Sex**	1.Male 2. Female	
4	**No of Passengers in the vehicle**		
5	**Place of Origin** (settlement, municipality, country)		
6	**Place of Destination** (settlement, municipality, country)		
7	**Travel purpose to**	1.home, 2.work, 3.shopping/visit, 4.education/school 5.tourist/vacation 6. holiday, 7. other	
8	**How long do you expect you trip will last (hours)**................		

Which answer would you prefer? **1 ili 2**

9	1	A saving in journey time of -	15	minuts	or	
	2	A reduction in journey cost of-	10	eurocents		
10	1	A saving in journey time of -	30	minuts	or	
	2	A reduction in journey cost of-	40	eurocents		
11	1	A saving in journey time of	30	minuts	or	
	2	A reduction in journey cost of-	80	eurocents		
12	1	A saving in journey time of	15	minuts	or	
	2	A reduction in journey cost of-	65	eurocents		
13	1	A saving in journey time of	30	minuts	or	
	2	A reduction in journey cost of-	2.0	euros		
14	1	A saving in journey time of	30	minuts	or	
	2	A reduction in journey cost of-	3.0	euros		

15	**What is your occu**	1.employed 2.own business 3.student 4.retired	
16	**How many vehicles in your household?**		
17	**Age**	- 1. (<40), 2. (40-60), 3. (>60)	
18	**What is your average household spending per month?**	1. (<400 Euro) 2. (400-800 Euro) 3. (>800 Euro)	


299-18


NK-269-56

APPENDIX 1 –C

INTRA-ZONE DAILY TRAFFIC FLOW IN 2007 (Total number of vehicles without intra-zone flows)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
		HERCEG NOVI	TIVAT	KOTOR	BUDVA	BAR	ULCINJ	CETINJE	NIKSIC	DANILOVGRAD	PODGORICA	PLUZINE	SAVNIK	KOLASIN	ANDRIJEVICA	PLAV	ZABLJAK	MOJKOVAC	BERANE	ROZAJE	PLJEVLJE	BIJELO POLJE	HRVATSKA	BOSNA I HERCEGOVINA	SRBIJA 1 (bez KIM)	SRBIJA 2 (KIM)	ALBANIJA	SLOVENIJA	BUGARSKA I RUMUNIJA	MAKEDONIJA	SVE OSTALE ZEMLJE	UKUPNO
1	HERCEG NOVI	0	15	500	155	229	65	67	139	39	625	4	0	13	12	6	0	12	40	12	41	24	1500	28	129	12	4	0	0	0	0	3671
2	TIVAT	10	0	10	986	137	19	86	119	51	568	0	0	4	0	0	4	0	7	0	10	25	4	0	94	0	0	0	0	0	0	2133
3	KOTOR	500	16	0	722	319	82	171	223	30	623	0	0	15	0	16	4	11	27	11	16	53	500	0	146	0	8	0	0	0	0	3493
4	BUDVA	166	1158	802	0	867	112	292	284	83	984	0	4	14	6	16	10	6	15	8	22	17	35	45	187	0	5	5	0	0	4	5148
5	BAR	239	221	239	630	0	1390	116	110	53	321	0	0	6	11	0	10	6	29	54	26	19	17	22	178	19	0	7	0	3	6	3731
6	ULCINJ	65	54	51	80	1370	0	41	18	0	107	0	0	0	0	0	0	0	1	42	6	8	29	7	52	28	400	0	0	0	0	2359
7	CETINJE	41	68	102	240	111	30	0	92	59	1740	0	0	21	0	6	0	10	6	0	0	16	6	25	30	5	0	3	0	0	0	2609
8	NIKSIC	111	58	98	222	164	29	78	0	1003	781	404	55	23	10	11	16	23	74	26	31	34	8	534	59	0	0	0	0	0	0	3854
9	DANILOVGRAD	17	16	20	61	0	9	22	1006	0	1321	4	0	6	0	6	0	0	0	0	0	23	2	0	6	0	0	0	0	0	0	2517
10	PODGORICA	503	505	571	871	490	149	1566	1534	1484	0	10	8	217	76	80	26	110	85	126	111	86	46	106	359	64	3554	14	0	5	2	12759
11	PLUZINE	0	0	0	0	4	6	0	391	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	419
12	SAVNIK	0	0	0	0	8	0	0	77	0	32	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	123
13	KOLASIN	14	4	5	38	10	8	11	29	18	274	0	0	0	28	10	0	148	62	6	6	71	0	0	46	3	0	0	0	3	0	793
14	ANDRIJEVICA	10	4	0	0	6	0	0	0	0	46	0	0	79	0	0	0	0	6	12	0	14	0	0	9	250	0	0	0	0	0	435
15	PLAV	0	0	0	0	23	0	0	10	0	58	0	0	0	0	0	0	0	0	15	0	35	0	6	6	6	0	3	0	0	6	170
16	ZABLJAK	6	0	6	9	0	0	6	62	0	31	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	125
17	MOJKOVAC	11	4	12	6	11	5	11	52	19	103	0	0	95	0	6	0	0	35	6	0	36	0	6	0	0	0	0	0	0	0	418
18	BERANE	16	12	62	24	42	7	18	61	42	47	0	23	6	0	0	0	35	0	250	29	474	6	6	141	500	0	3	0	0	0	1803
19	ROZAJE	11	4	4	29	18	16	6	0	30	49	9	0	12	9	15	0	14	234	0	6	173	0	6	6	500	6	0	0	0	0	1154
20	PLJEVLJE	19	34	12	9	27	15	0	18	13	75	0	0	0	0	0	0	0	12	0	0	435	4	6	500	0	0	0	0	0	0	1179
21	BIJELO POLJE	12	21	15	12	45	1	11	58	76	40	0	0	67	18	46	0	29	540	122	412	0	0	18	1223	9	0	0	0	0	12	2787

22	HRVATSKA	1500	4	500	18	44	30	0	0	0	42	0	0	0	0	0	0	0	0	0	0	7	0	0	6	14	4	0	0	0	0	2170
23	BOSNA I HERCEGOVINA	0	16	9	6	27	12	5	512	0	59	0	0	4	0	0	0	0	12	9	0	0	0	0	9	49	0	0	0	0	0	728
24	SRBIJA 1 (bez KIM)	106	59	82	163	262	50	17	103	82	293	0	0	29	21	6	0	0	146	0	524	1354	10	8	0	23	0	0	0	0	0	3339
25	SRBIJA 2 (KIM)	0	8	4	3	6	35	0	0	0	34	0	0	3	250	6	0	0	520	500	0	6	0	0	0	0	0	0	0	4	9	1390
26	ALBANIJA	0	0	0	6	5	400	0	18	0	3582	0	0	0	0	0	0	0	0	0	0	0	6	0	0	5	0	0	0	4	0	4024
27	SLOVENIJA	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	16
28	BUGARSKA I RUMUNIJA	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
29	MAKEDONIJA	0	0	0	7	5	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	3	6	0	0	0	0	0	0	0	0	27
30	SVE OSTALE ZEMLJE	6	0	5	2	0	4	8	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	10	0	0	0	0	44
	TOTAL	3362	2282	3108	4305	4235	2473	2532	4917	3081	11872	431	91	614	441	230	70	405	1858	1197	1245	2914	2176	821	3187	1492	3990	36	0	19	37	

INTRA-ZONE DAILY TRAFFIC FLOW IN 2012 (Total number of vehicles without intra-zone flows)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
		HERCEG NOVI	TIVAT	KOTOR	BUDVA	BAR	ULCINJ	CETINJE	NIKSIC	DANILOVGRAD	PODGORICA	PLUZINE	SAVNIK	KOLASIN	ANDRIJEVICA	PLAV	ZABLJAK	MOJKOVAC	BERANE	ROZAJE	PLJEVLJE	BIJELO POLJE	HRVATSKA	BOSNA I HERCEGOVINA	SRBIJA 1 (bez KIM)	SRBIJA 2 (KIM)	ALBANIJA	SLOVENIJA	BUGARSKA I RUMUNIJA	MAKEDONIJA	SVE OSTALE ZEMLJE	**UKUPNO**
1	HERCEG NOVI	0	24	738	229	338	96	101	205	58	921	6	0	19	18	9	0	18	59	18	61	35	2214	41	190	18	6	0	0	0	0	5422
2	TIVAT	15	0	15	1455	202	28	127	176	75	838	0	0	6	0	0	6	0	10	0	15	37	6	0	138	0	0	0	0	0	0	3149
3	KOTOR	738	24	0	1065	472	121	254	329	44	919	0	0	22	0	24	6	16	40	18	23	78	738	0	215	0	12	0	0	0	0	5158
4	BUDVA	245	1709	1185	0	1280	165	431	419	123	1452	0	6	21	9	24	15	9	22	12	32	25	52	66	276	0	7	7	0	0	6	7598
5	BAR	354	326	352	932	0	2052	171	163	78	474	0	0	9	16	0	15	9	43	78	39	28	25	33	262	28	0	10	0	4	9	5510
6	ULCINJ	96	82	76	118	2023	0	60	27	0	157	0	0	0	0	0	0	0	1	62	9	11	43	10	77	41	590	0	0	0	0	3483
7	CETINJE	60	101	151	354	165	46	0	136	87	2568	0	0	31	0	9	0	15	9	0	0	24	9	37	43	7	0	4	0	0	0	3856
8	NIKSIC	164	86	144	327	242	43	115	0	1481	1153	596	82	34	15	16	24	34	111	37	45	50	12	788	89	0	0	0	0	0	0	5688
9	DANILOVGRAD	25	24	30	90	0	13	31	1485	0	1950	6	0	9	0	9	0	0	0	0	0	34	3	0	9	0	0	0	0	0	0	3718
10	PODGORICA	743	746	843	1286	724	220	2312	2264	2191	0	15	12	321	112	118	39	163	126	185	164	126	68	157	530	95	5245	20	0	7	3	18835
11	PLUZINE	0	0	0	0	6	9	0	577	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	619
12	SAVNIK	0	0	0	0	12	0	0	114	0	47	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	182
13	KOLASIN	21	6	7	56	15	12	16	43	25	405	0	0	0	41	15	0	218	92	9	9	105	0	0	68	4	0	0	0	4	0	1171
14	ANDRIJEVICA	15	6	0	0	9	0	0	0	0	68	0	0	117	0	0	0	0	9	18	0	21	0	0	13	369	0	0	0	0	0	645
15	PLAV	0	0	0	0	34	0	0	16	0	86	0	0	0	0	0	0	0	0	22	0	52	0	9	9	9	0	4	0	0	9	250
16	ZABLJAK	9	0	9	13	0	0	9	91	0	46	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	186
17	MOJKOVAC	18	6	18	9	16	7	16	77	28	152	0	0	140	0	9	0	0	52	9	0	53	0	9	0	0	0	0	0	0	0	619
18	BERANE	23	18	92	36	62	10	27	90	62	70	0	34	9	0	0	0	52	0	368	43	698	9	9	208	738	0	4	0	0	0	2662
19	ROZAJE	16	6	6	43	27	24	9	0	44	72	13	0	17	13	22	0	21	346	0	9	256	0	9	9	738	9	0	0	0	0	1709
20	PLJEVLJE	28	50	18	13	41	24	0	27	18	111	0	0	0	0	0	0	0	18	0	0	642	6	9	738	0	0	0	0	0	0	1743
21	BIJELO POLJE	18	31	22	18	66	1	16	87	112	59	0	0	99	27	68	0	43	797	180	608	0	0	27	1805	13	0	0	0	0	18	4115
22	HRVATSKA	2214	6	738	27	65	44	0	0	0	64	0	0	0	0	0	0	0	0	0	0	10	0	0	9	20	6	0	0	0	0	3203

23	BOSNA I HERCEGOVINA	0	24	13	9	40	17	7	755	0	87	0	0	6	0	0	0	0	18	13	0	0	0	0	13	72	0	0	0	0	0	1074
24	SRBIJA 1 (bez KIM)	156	87	121	241	385	74	25	152	121	432	0	0	43	31	9	0	0	217	0	774	1999	15	12	0	34	0	0	0	0	0	4928
25	SRBIJA 2 (KIM)	0	12	6	4	9	52	0	0	0	50	0	0	4	369	9	0	0	768	738	0	9	0	0	0	0	0	0	0	6	13	2049
26	ALBANIJA	0	0	0	9	7	590	0	27	0	5287	0	0	0	0	0	0	0	0	0	0	0	9	0	0	7	0	0	0	6	0	5942
27	SLOVENIJA	0	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	24
28	BUGARSKA I RUMUNIJA	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
29	MAKEDONIJA	0	0	0	10	7	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	4	9	0	0	0	0	0	0	0	0	39
30	SVE OSTALE ZEMLJE	9	0	7	3	0	6	12	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	15	0	0	0	0	65
	TOTAL	4967	3374	4591	6356	6256	3654	3739	7260	4547	17522	636	134	907	651	341	105	598	2747	1767	1840	4297	3218	1216	4705	2199	5890	49	0	27	58	

INTRA-ZONE DAILY TRAFFIC FLOW IN 2027 (Total number of vehicles without intra-zone flows)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
		HERCEG NOVI	TIVAT	KOTOR	BUDVA	BAR	ULCINJ	CETINJE	NIKSIC	DANILOVGRAD	PODGORICA	PLUZINE	SAVNIK	KOLASIN	ANDRIJEVICA	PLAV	ZABLJAK	MOJKOVAC	BERANE	ROZAJE	PLJEVLJE	BIJELO POLJE	HRVATSKA	BOSNA I HERCEGOVINA	SRBIJA 1 (bez KIM)	SRBIJA 2 (KIM)	ALBANIJA	SLOVENIJA	BUGARSKA I RUMUNIJA	MAKEDONIJA	SVE OSTALE ZEMLJE	**UKUPNO**
1	HERCEG NOVI	0	56	1752	543	802	228	238	487	137	2187	14	0	46	42	21	0	42	140	42	144	85	5256	99	452	42	14	0	0	0	0	12869
2	TIVAT	35	0	35	3455	480	67	301	417	179	1991	0	0	14	0	0	14	0	25	0	35	88	14	0	329	0	0	0	0	0	0	7479
3	KOTOR	1752	56	0	2530	1121	287	603	781	105	2183	0	0	53	0	56	14	39	95	42	57	186	1752	0	511	0	28	0	0	0	0	12251
4	BUDVA	582	4058	2813	0	3038	392	1024	995	291	3448	0	14	49	21	56	35	21	53	28	77	60	123	158	656	0	18	18	0	0	14	18042
5	BAR	841	774	837	2211	0	4870	407	386	186	1125	0	0	21	39	0	35	21	102	186	91	67	60	77	620	67	0	25	0	11	21	13080
6	ULCINJ	228	193	179	281	4800	0	144	63	0	375	0	0	0	0	0	0	0	4	147	21	29	102	25	183	98	1402	0	0	0	0	8274
7	CETINJE	144	238	357	841	392	109	0	322	207	6097	0	0	74	0	21	0	35	21	0	0	56	21	88	102	18	0	11	0	0	0	9154
8	NIKSIC	389	203	340	778	575	102	273	0	3514	2736	1416	193	81	35	39	56	81	263	88	109	119	28	1871	210	0	0	0	0	0	0	13499
9	DANILOVGRAD	60	56	70	214	0	32	74	3525	0	4629	14	0	21	0	21	0	0	0	0	0	81	7	0	21	0	0	0	0	0	0	8825
10	PODGORICA	1762	1769	2001	3052	1720	522	5487	5375	5200	0	35	28	760	266	280	91	385	298	438	389	301	161	372	1257	224	12454	50	0	18	7	44702
11	PLUZINE	0	0	0	0	14	21	0	1370	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1468
12	SAVNIK	0	0	0	0	28	0	0	270	0	112	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	431
13	KOLASIN	49	14	18	133	35	28	39	102	60	960	0	0	0	98	35	0	519	217	21	21	249	0	0	161	11	0	0	0	11	0	2781
14	ANDRIJEVICA	35	14	0	0	21	0	0	0	0	161	0	0	277	0	0	0	0	21	42	0	49	0	0	32	876	0	0	0	0	0	1528
15	PLAV	0	0	0	0	81	0	0	39	0	203	0	0	0	0	0	0	0	0	53	0	123	0	21	21	21	0	11	0	0	21	594
16	ZABLJAK	21	0	21	32	0	0	21	218	0	109	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	443
17	MOJKOVAC	42	14	42	21	39	18	39	182	67	361	0	0	333	0	21	0	0	123	21	0	126	0	21	0	0	0	0	0	0	0	1470
18	BERANE	57	42	217	84	147	25	63	214	147	165	0	81	21	0	0	0	123	0	872	102	1657	21	21	494	1752	0	11	0	0	0	6316
19	ROZAJE	39	14	14	102	63	56	21	0	105	172	32	0	43	32	53	0	49	820	0	21	607	0	21	21	1752	21	0	0	0	0	4058
20	PLJEVLJE	67	119	42	32	98	56	0	63	42	263	0	0	0	0	0	0	0	42	0	0	1524	14	21	1752	0	0	0	0	0	0	4135
21	BIJELO POLJE	42	74	53	42	158	4	39	207	266	141	0	0	235	63	162	0	102	1892	427	1443	0	0	63	4286	32	0	0	0	0	42	9773
22	HRVATSKA	5256	14	1752	63	154	105	0	0	0	151	0	0	0	0	0	0	0	0	0	0	25	0	0	21	50	14	0	0	0	0	7605
23	BOSNA I HERCEGOVINA	0	56	32	21	95	43	18	1794	0	207	0	0	14	0	0	0	0	42	32	0	0	0	0	32	172	0	0	0	0	0	2558
24	SRBIJA 1 (bez KIM)	371	207	287	572	914	176	60	361	287	1027	0	0	102	74	21	0	0	515	0	1836	4745	35	28	0	81	0	0	0	0	0	11699
25	SRBIJA 2 (KIM)	0	28	14	11	21	123	0	0	0	119	0	0	11	876	21	0	0	1822	1752	0	21	0	0	0	0	0	0	0	14	32	4865
26	ALBANIJA	0	0	0	21	18	1402	0	63	0	12552	0	0	0	0	0	0	0	0	0	0	0	21	0	0	18	0	0	0	14	0	14109
27	SLOVENIJA	0	0	0	21	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	56
28	BUGARSKA I RUMUNIJA	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
29	MAKEDONIJA	0	0	0	25	18	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	11	21	0	0	0	0	0	0	0	0	96
30	SVE OSTALE ZEMLJE	21	0	18	7	0	14	28	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	35	0	0	0	0	155
	total	11793	7999	10894	15092	14853	8680	8879	17234	10793	41600	1511	316	2155	1546	807	245	1417	6516	4191	4367	10209	7636	2886	11172	5228	13986	126	0	68	137	

TECHNICAL MEMORANDUM NO. 10A

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE BAR – BOLJARE HIGHWAY (APPENDICES)

Appendix 1: Climate Conditions

Apart from geographic latitude and sea level, the climate in Montenegro is also determined by presence of large water areas (the Adriatic Sea, Skadar Lake), deep indentation by the sea into the coastline (Bay of Kotor), moderately high mountain hinterland near the coastline (Orjen, Lovcen and Rumija Mountains), Field of Ulcinj in the hindermost south-eastern part and by Durmitor, Bjelasica and Prokletije mountain massifs.

Southern part of Montenegro and Zetsko-Bjelopavlicka Valley are located in the Mediterranean climate region (long, hot and dry summers and relatively mild and rainy winters). Towns which are located in valleys like Podgorica and Danilovgrad, have lower temperatures in January than coastal towns situated at relatively same geographic latitude, while the temperature during the summer is somewhat higher. The warmest summers in our country are in the Zeta Plain, because of high serenity during the summer, which makes a land and air very warm. Podgorica is a town with highest mean monthly temperatures during the summer and with largest average number of tropical days. The lowest mean annual temperature is in Zabljak (Tara River basin).

Large karst valleys have more severe climate, whose bottoms are deep under the surrounding mountain peaks and which are 40 to 80 km far from the Adriatic. Karst valleys that are very close to the Adriatic (about 20km) but are separated from the sea by relatively high mountains also have severe climate. During the winter, a cold air is subsided in these valleys, going down the nearby mountains. During the summer, however, the bottoms of the Karst valleys get very warm, leading to increase of annual temperature fluctuation. During the winter, mainly in anticyclonic situations, low-level temperature inversions may occur in these Karst valleys.

Map of stations of Hydrological and Metrological service of Montenegro

Central and Northern part of Montenegro has certain characteristics of mountain climate, with apparent influence of the Mediterranean Sea, which is reflected in precipitation

regime and in higher mean temperature of the coldest month. In the ultimate north of Montenegro, the climate is continental, which is, apart from large daily and annual temperature variations, characterized by small annual quantity of precipitation, which is equitably distributed per month. In mountainous areas in the north of the Republic, summer is relatively cold and humid, and winter is long and severe, with frequent frosts and low temperatures, which rapidly decrease by the height.

The biggest mean annual value of the cloudiness is in the mountainous areas, about 55-66% in average, and then it decreases towards the seaside being 45-35% in average. The lowest cloudiness of the year is in July and in August, and the highest is in December. The lowest oscillation of the cloudiness is in the mountainous areas, while it is much bigger at the seaside. Duration of the sunshine is in opposite proportion to the cloudiness. At the seaside, duration of the insolation is 2750 hours in average, while in mountainous areas far from the seaside, average values are 1550-1900 hours. In all areas, July and August have 4 to 5 times longer insolation than winter months.

The rainiest area in Europe is mountainous area above the Kotor Bay (Krivosije). In that area annual precipitation is 4600 mm, i.e. at the steep slopes of the Orjen in the place of Crkvice (940m) average annual precipitation is 5000 mm, which is European maximum precipitation, and in the peak years it is almost 7000 l/m2, especially with precipitation of the orographic character. Central and northern parts of the Republic were hit with floods during last century (e.g. 1963 and 1979). That area, where there is upper watercourse of the Tara and the Lim, is characterized with especially big medium annual quantity of precipitation of about 1600-2000 mm per year. Years with biggest floods in these areas are 1963 and 1979, and then, the end of 1999 and first half of 2000.

Beside orographic effect, cyclone of Genoa has a very strong influence on the climate in Montenegro, which original area is suburb of the bay of Genoa and Siberian anticyclone, with the centre in north-east Russia. Under their influence, high grades of atmospheric pressure and temperatures are established in the whole Balkans, and especially in the territory of Montenegro. When the cyclone of Genoa is active, it doesn't stay for long, precipitation is intensive and they don't last many days. Precipitation of long duration happens when there is a strong high-altitude SW streaming within a cyclone above the Western Europe. In the whole Adriatic, there is the air depression during winter season. It is, actually, a series of depressions, moving from the west to the south-east and east and they cover southern areas. These depressions cause maximum precipitation in winter at the seaside. Areas with modified Mediterranean pluviographic regime of precipitation have mainly autumn and winter precipitation with its maximum in late autumn, from October to December, while summer is dry.

In south-west areas of Montenegro, there are about 10% of annual quantities of precipitation in summer-time. In so-called south-Adriatic pluviometric regime of precipitation, difference between the rainiest and the driest month is about 11,5%. The rainiest month is November and the driest is July. High mountains, beside quite big quantities of precipitation, also have more days with precipitation, than it is the case with the surrounding valleys and plains. In mountainous areas it's snowing more in spring than in autumn, because autumn is quite warmer than spring. Predominant winds are consequence of the general disposition of the atmospheric pressure in different months.
Regarding barometric depression at the Adriatic and in the east Mediterranean and high atmospheric pressure in the east and north-east Balkans, in winter months there are dominating winds from north-east square. Characteristic winds are bora and sirocco. Bora is cascading wind of north and of north-east direction. It is the most frequent and strongest

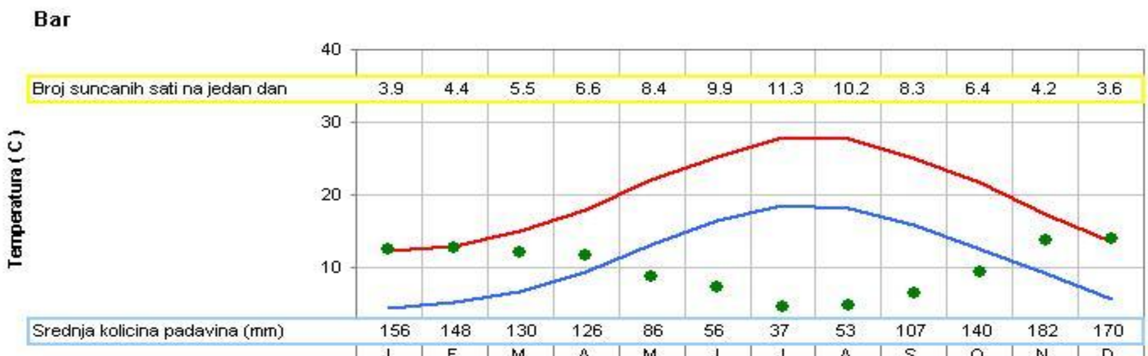
in cold half of the year, in winter, and it is present along all the eastern coast of the Adriatic. It blows when there is area of high air pressure north of the Dinaric Alps, and a cyclone is in the western part of the Mediterranean or the Adriatic Sea. At such horizontal grade of the air pressure, cold air from higher latitude passes over the Dinaric Alps and it swoops down the coast by high speed, thus causing fall of the temperature and of humidity, except in the case of the cyclonic or dark bora, when the weather is cloudy and rainy. One of the main characteristics of bora is its huge strength and motion. Its speed is between 16 and 33 m/s. It’s the strongest in the coastal parts, where the mountains vertically dominate it (the coast) and where on the mountainous cliffs there are gorges where the air streaming lines are gathered. Strength of bora decreases very quickly towards open sea, so that it doesn’t make breakers. South wind or sirocco, blows in bigger part of the Mediterranean with less or bigger differences in physical characteristics and direction.

It starts blowing when the cyclone moves across the Mediterranean or the Adriatic Sea, and when there is high pressure above North Africa. It blows in front part of the cyclone from south to south-east direction. Due to such circulation, it often includes dry and warm air from North Africa, which contains significant quantities of dust. When in the south stream it comes to the coast, that air, due to the orographic effect, causes cloudy and rainy weather there, as well as on the slopes of the coastal mountains. Biggest number of the precipitation which falls in these areas in colder part of the year is caused by this streaming. Biggest quantity of precipitation in Europe – in Crkvice, can be explained by its influence. When the air originating from the North Africa comes together with sirocco, there are coloured rains falling from time to time – of yellowish or reddish colour. Since it’s often very strong and since it covers big surface of the sea, sirocco causes breakers, from the open sea towards the coast. Strength and frequency of sirocco increase from the north to the south part of the seaside. Last decade of 20th century was warmer regarding many years measuring (from 1949 up to now).

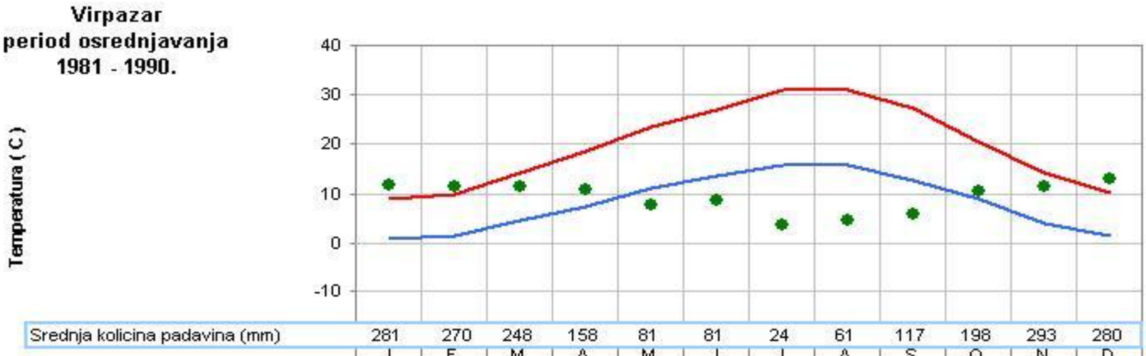
The warmest year in the territory of Montenegro was 2003. Reason for heat waves was strong field of high pressure above Western Europe within clear ridge of high pressure in high-altitude circulation of large scales. Heated air from the south reinforced the strength and keeping of the heat wave. Almost the whole radiation of the sun was directed to the heating, because both vegetation and soil were dry. Such ‘a blocking elevation’, which is kept for several days, is not rarity for Europe in summer-time. The highest recent maximum temperature was measured in Podgorica in August 2003, which was 42C, and there was continuous period of 100 tropical days then (days with maximum temperature higher than or as of 30C).

Some average annual characteristics such as average max and min temperatures per month, average rainy days and number of sunny hours in a day are given for five locations along N-S highway route in the tables bellow.

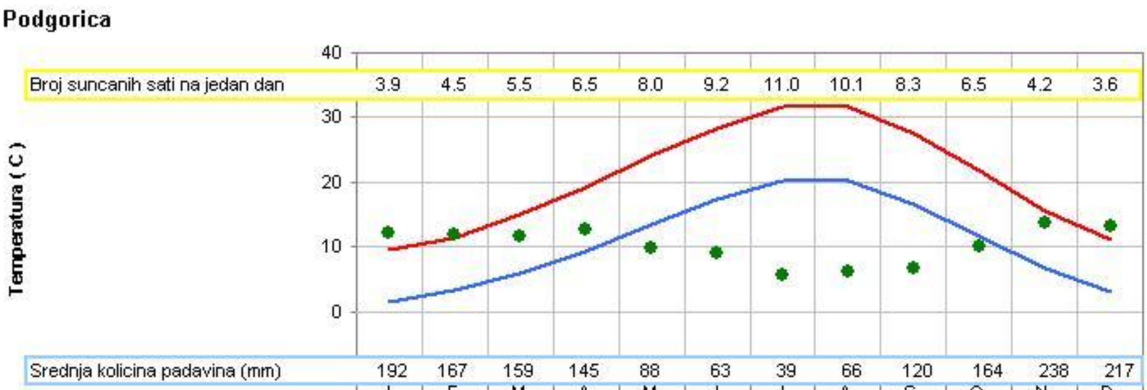
Source: Hydrological and Metrological service of Montenegro



	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	3.9	4.4	5.5	6.6	8.4	9.9	11.3	10.2	8.3	6.4	4.2	3.6
Srednja kolicina padavina (mm)	156	148	130	126	86	56	37	53	107	140	182	170
Srednja Tmax (C)	12.3	13.0	15.0	18.0	22.1	25.3	27.8	27.7	25.1	21.6	17.2	13.6
Srednja Tmin (C)	4.3	5.1	6.8	9.3	13.1	16.4	18.4	18.2	15.8	12.5	9.1	5.7
Srednji broj dana sa padavinama >=0.1mm	12.5	12.7	12.1	11.6	8.7	7.4	4.5	4.8	6.5	9.5	13.7	13.9

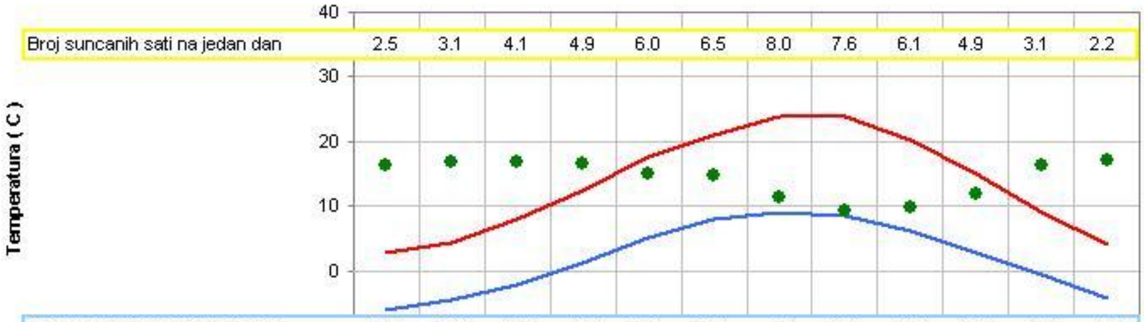


	J	F	M	A	M	J	J	A	S	O	N	D
Srednja kolicina padavina (mm)	281	270	248	158	81	81	24	61	117	198	293	280
Srednja Tmax (C)	8.9	9.9	14.2	18.6	23.5	26.9	31.1	31.1	27.2	20.4	14.1	10.2
Srednja Tmin (C)	1.0	1.3	4.5	7.3	11.0	13.6	15.8	15.7	12.7	8.8	3.9	1.6
Srednji broj dana sa padavinama >=0.1mm	11.8	11.5	11.5	10.8	7.8	8.5	3.5	4.5	5.8	10.5	11.3	13.0



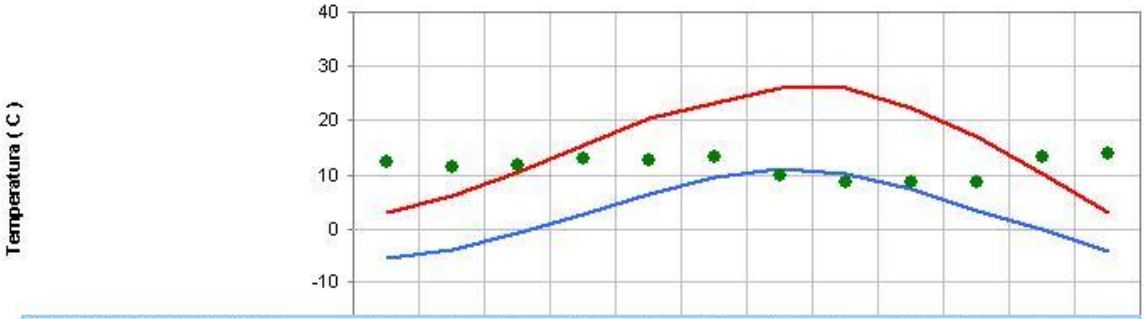
	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	3.9	4.5	5.5	6.5	8.0	9.2	11.0	10.1	8.3	6.5	4.2	3.6
Srednja kolicina padavina (mm)	192	167	159	145	88	63	39	66	120	164	238	217
Srednja Tmax (C)	9.5	11.3	14.9	19.1	24.2	28.2	31.7	31.6	27.4	21.7	15.4	11.0
Srednja Tmin (C)	1.4	3.2	5.8	9.1	13.5	17.3	20.3	20.2	16.5	11.6	6.8	2.9
Srednji broj dana sa padavinama >=0.1mm	12.2	11.9	11.6	12.5	9.8	8.9	5.7	6.0	6.8	10.1	13.8	13.1

Kolasin



	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	2.5	3.1	4.1	4.9	6.0	6.5	8.0	7.6	6.1	4.9	3.1	2.2
Srednja kolicina padavina (mm)	238	205	187	196	127	104	73	93	129	197	312	278
Srednja Tmax (C)	2.7	4.2	8.0	12.5	17.7	21.0	23.8	23.9	20.2	15.1	9.0	4.0
Srednja Tmin (C)	-6.1	-4.5	-2.1	1.2	5.0	7.9	9.0	8.4	6.2	2.7	-0.6	-4.3
Srednji broj dana sa padavinama >=0.1mm	16.3	16.7	16.8	16.6	15.0	14.8	11.4	9.3	9.8	11.8	16.4	17.1

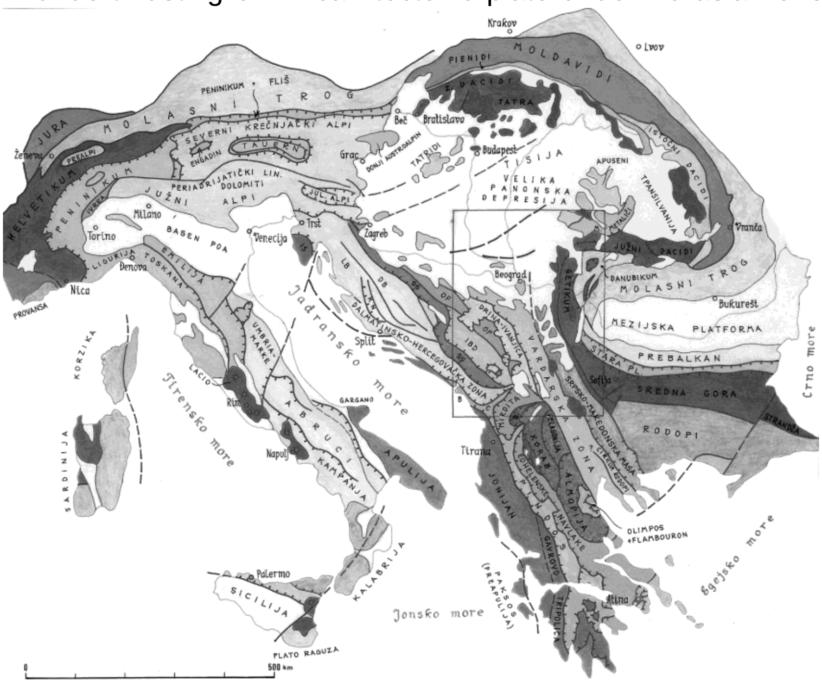
Berane



	J	F	M	A	M	J	J	A	S	O	N	D
Srednja kolicina padavina (mm)	83	67	63	82	72	72	59	61	69	76	119	101
Srednja Tmax (C)	2.9	6.1	10.5	15.3	20.3	23.1	26.0	26.1	22.4	17.0	10.3	3.1
Srednja Tmin (C)	-5.8	-3.9	-0.8	2.7	6.4	9.5	10.9	10.3	7.5	3.3	0.0	-4.2
Srednji broj dana sa padavinama >=0.1mm	12.4	11.4	11.6	12.9	12.7	13.3	9.8	8.7	8.6	8.5	13.3	13.9

Appendix 2: Geomorphology, Soils, Engineering-Geological Characteristics

Geological structure of the territory of Montenegro is result of influence of several factors, first of all: 1. sedimentation and geodynamics within this part of Mediterranean geosyncline; 2. underthrusting of African tectonic plate under Eurasian one; 3. intensive neotectonic



movements; 4. forming of very expressed exogenous relief.

Geological map of Montenegro with adjacent regions (Geological Atlas of Serbia, 1997)

That is why the project area is characterized not only by different lithostratigraphic content and complex tectonic structure, but also by unique geomorphologic, engineering-geological, hydrogeological and seismotectonic conditions.

At the northern Mediterranean, the lateral strain from the contact zone between African and Eurasian plate are transferred through the Adriatic micro-plate to the Dinarides – in the NE direction (Glavatovic, 2004). Strain concentration within lithosphere of Dinarides is performed by complex process of the segments moving through the Adriatic micro-plate (bellow the sediment complex, covering silicate and basalt rocks and the rest of lithosphere, in the direction of subducting Apennine plate – to the Tyrrhenian Sea).

Strong lateral stresses are also produced by thick sediment complex of Adriatic plate (up to the level of Triassic clastite), which is resistant to the horizontal deformation in the Adriatic region, simultaneously generating strong tectonic processes in the outer and inner Dinarides. As a result, horst and graben structures are formed, as well as mountain massifs, tectonic depressions, trenches, nappes and faults (normal, reverse and transform). System of normal and reverse fault structures are predominantly oriented parallel to Dinarides. These faults are mostly with regional dimensions, with dipping angle toward land 20-50 degrees. Transcurent faults are mostly generated perpendicularly to the previous ones, with small dimensions and steep slope of the fault plane.

Dinarides

Montenegro belongs to the Dinarides mountain chain where Paleozoic crystalline schist and Middle- and Upper Triassic limestone are distinguished. The main part of Montenegro and is made of limestone. Limestone formations are covered by diabase-chert ones. The formation is characterized by greater or smaller overtroughs of magmatic rocks and ultramaphites. Referring to the structure, the following two areas are distinguished: area of the Earth's crust compression (wide coastal belt in Montenegro, with numerous napes) and the area of the Earth's crust opening (the rest part, with numerous horsts and trenches, as well as confining neotectonic faults).

In the Dinarides the predominant topographic type is karst in terrains of carbonate rocks . Karst forms in exposed limestones are particularly well developed in Montenegro. Prokletije, Durmitor and other highest mountains have preserved relics of a glacial topography; cirques, troughs, moraines, formed during the Pleistocene. Snow and frost actions have produced periglacial topographic features: polygonal ground, felsenmeers (rock seas), solifluction teracettes, lobes, etc. above timberline on the mountains. The Dinarides consist predominantly of crushed and karstified Mesozoic limestones. This world famous karst region greatly differs in hydrogeology and geomorphology from the neighbouring regions. Groundwater flows through system of karst channels and fractures discharging by strong resurgence.

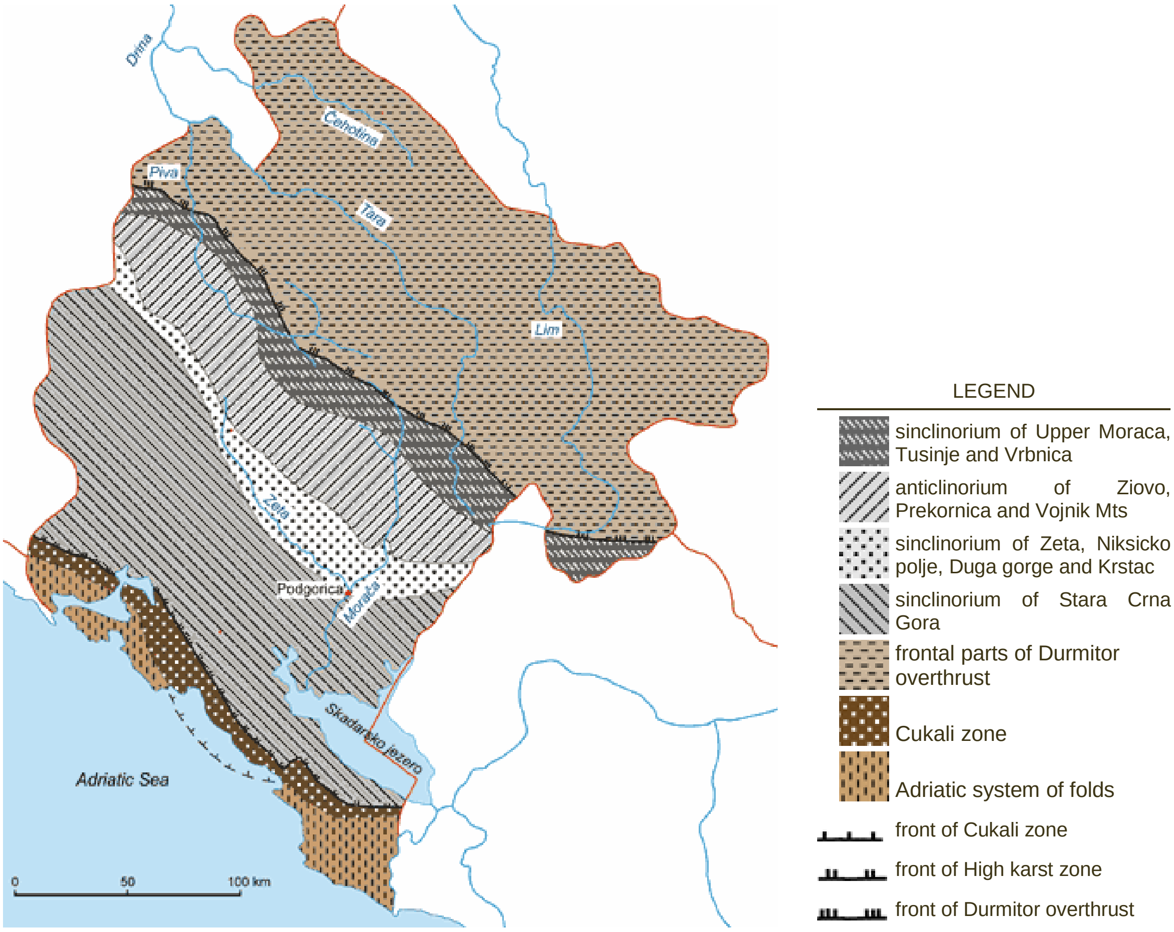
Karst of Montenegro

Over two-thirds of the territory of Montenegro belongs to the karst of south-eastern Dinarides.The karst in Montenegro differs along the territory, by its distribution and position, its position in relation to the non-karstic terrain and the Adriatic sea, and by its occurrences (various forms and dimensions) and processes. This comes as a consequence of diverse sedimentation conditions, as well as different geologic evolution of individual parts of the Dinaric geosyncline (both in space and time). A segment of the Dinaric geosyncline which forms the terrain of Montenegro, is predominantly (on two thirds of the territory) built up of limestone and dolomite sediments (from Devonian; to the nowadays). Since the end of Devonian period (ending phase of Caledonian orogeny), it has been uplifted and lowered by numerous phases of Hercynian and Alpine orogeny. Due to epeirogenic and orogenic movements in different geological times, since the end of the Devonian period to the final uplifting of Dinaric geosyncline, when present territory of Montenegro (end of Middle Miocene) has been formed, some parts of the geosyncline bottom have been, more or less, uplifted and lowered.

This caused favourable conditions for sedimentation of different products, among which were dominant those who have formed limestones and dolomites of great thickness and distribution. It is easily noticeable that the epeirogenic and orogenic movements have been advancing from north-east to south-west. During those movements, there were relatively quiet periods when small islands existed, protruding above the sea level as islands. The climate was also variable, but mostly favourable for the development of karstification. Simultaneously with these movements, particularly during the Laramidian orogeny (Upper Cretaceous - Lower Paleogene), the folding, faulting, overthrusting and even movements which caused creating of nappes occurred. As a result, the rock porosity

increased favouring the karstification process and forming today's karst - a geological product of very complex and enigmatic occurrences and processes.
With the aim to present the most important properties of the Montenegrin karst, its complexity as well as the characteristic differences of individual parts of the territory, karst zoning was carried out. The most logical way to do this was to identify the karstic properties of the individual geotectonic units of Dinarides, which built up the territory of Montenegro. Therefore, the properties of the Durmitor Overthrust, the High-Karst Zone, the Pindus-Cukali Zone (in the territory of Montenegro Budva-Bar Zone) and the Adriatic-Ionian fold System (in the territory of Montenegro Adriatic fold System) are presented.

We have deliberately kept the oldest, the most common and the most often cited names for geotectonic units of Dinarides. Parts of the Dinaric geosyncline, which formed rocks in general and by this the karst in the territory of Montenegro, had different and specific geologic evolutions. Subsequently, on the terrains of cited geotectonic units, specific karsts with present properties and appearance developed. With development of the karstification processes the karst differences of the geotectonic units became smaller. This characteristic is notable in the karst of Montenegro.



Geotectonic division of Montenegro.

Karst of the Durmitor nappe, although spacious (over 5.000 km^2) and several kilometres thick, with large aquifers, is divided into several regions among which are significant karst of northern and north-western Montenegro, karst of Bjelasica and karst of north-eastern Montenegro. Due to the presence of Late Palaeozoic and Lower Triassic clayey-marly-sandy beds, Middle Triassic eruptive rocks and Middle and Upper Jurassic diabase-chert formation rocks, karst in these regions does not represent a unique entity. Karst of these regions has the characteristic of holokarst. The limestones and dolomites of these regions are the oldest ones and they have been exposed to karstification for the longest period, even since the Upper Jurassic. The karstified limestones and dolomites of this geotectonic unit, although mutually separated, build up the largest and the highest mountain massifs in Montenegro.

Although there are canyons deeper then 1000 m, the karstification of limestone and dolomites of this geotectonic unit proceeds and descends deeper then fluvial erosion. Karst of this geotectonic unit is characterized by fluvial erosion (deep canyons), glacier erosion and lacustrine erosion. As a result, karst of this geotectonic unit, besides characteristics common to holokarst, has properties of high-mountain, fluvial, glacial and contact karst.

In the territory of Montenegro, the High-Karst Zone has the greatest extent. The terrain of this geotectonic unit is mainly built up of Mesozoic (Triassic, Jurassic and Cretaceous) limestones and dolomites of several kilometres of thickness. This thickness is even larger, due to the reverse faulting and overthrusting and thus repeating of carbonate series. The karst of this region is characterised by all surface occurrences and all processes characteristic for holokarst such as: karst plain; polje; uvala; sinkhole; dry, hanging, blind and karstified valley; lapies; canyon; shaft; cave; resurgence; vrulja; estavelle and so on. Within the karst of this geotectonic unit exist syncline regions build up of impermeable flycsh beds.

The layers of Durmitor flycsh of the uppermost north-eastern parts of this geotectonic unit have various hydrogeological features and functions. In the terrains built up of clayey-marly-sandy beds and at lower elevations, such as the valley of Vrbnica and Gornja Moraca, the layers of Durmitor flycsh are impermeable and represent a total barrier. In the terrains built up of varied, more or less marly limestones, comprising narrow zone and located at the height of over 1.000 m, as in the case of south-western slopes of the Durmitor massif, they represent a water permeable media. It is interesting to mention that the deepest cave (897 m) in the territory of Montenegro explored by speleologists is located in these rocks. The middle belt of High-Karst Zone in the territory of Montenegro is built up of Upper Cretaceous-Paleogene flysch beds. The distribution, position and impermeability cause this flycsh to have a function of elevated and lateral barrier. The karstification of limestones and dolomites in this area is below the base level of erosion, below the sea level and is deeper then 1.000 m. The High-Karst Zone has all the prominent characteristics of: fluvial erosion (deep canyons of Komarnica and Moraca rivers with their tributaries), glacial erosion (on the high mountains), lacustrine, sea and combined erosion. The spacious Zeta depression with the largest lake on the Balkan Peninsula - Skadar Lake, is situated In the High-Karst Zone. Parts of the bottom of this lake represents a cryptodepression. Sublacustrine springs (vruljas) exist in the Lake, with bottoms at depth of over 80 m below water level which is about 6,5 m above sea level. In the Zeta Plain loess deposits are found.

Along the internal belt of Bokokotorska Bay, from Morinj, across Risan, Perast and Orahovac to Kotor, the High-Karst Zone is in direct contact with the sea. In these terrains are located the largest vrulja on the Adriatic coast, called Sopot, and the greatest estavelle horizon - Gurdic-Skurda. The vast differences in water-yielding capacity of the constant and periodic karst springs point out to the strong karstification of High-Karst Zone limestones and dolomites. The difference between minimal and maximal water yielding capacity is over 350 m3.

Karst of the Pindus-Cukali zone, in the territory of Montenegro Budva-Bar Zone, is characterised by contact and contact-fluvial relatively low karst. Notable within this zone is frequent alteration of karstified limestones and dolomites with terrains built up of sedimentary and volcanic rocks. The seepage aquifers and the seepage karst aquifers in the karstic terrains of this zone, outside of the sea influence, are few and of small depth. Their dynamic reserves are small, providing hardly 5 l/s during the drought periods. The seepage karst aquifers of this geotectonic unit are, in several places, in immediate contact with the sea. These are low and shallow aquifers with brackish water. In this karstic area, water-rich aquifers with dynamic reserves do not exist.

The reason for this is a small distribution of cavernous limestones. In this region there are cavernous limestones with static reserve which give by pumping, during the drought period of the year, over 50 l/s of water (Opacica).

Karst of the Adriatic-Ionican fold System (in the territory of Montenegro-Adriatic fold System) is represented by karst with anticline structures, four of them situated in the hinterland of Ulcinj and separated by synclinal structures built up of flycsh deposits. These folds, which strike from Albania and across the hinterland of Ulcinj toward north-west, sink under the sea at the north-western margin of the Bar plain. Only one of them, the anticline structure of Grbalj and Lustica, appears again in south-eastern marginal part of Mrcevo plain trending to Dubrovnik. Karst of the Adriatic anticline structures in the hinterland of Ulcinj and external folds of the Bokokotorska Bay are characterized by the occurrences of exposed, coastal karst. This karst is low but with deep slope below the sea level. The karst aquifers in this region are, during the whole year or for shorter periods, under the influence of the sea water which has a high concentration of Cl ions.

Generally, waters of the karst terrain of Montenegro are clean, as the karstic water can be, except in the regions under the influence of the municipal, industrial and other waste waters. Karstic waters, not considering the influence of the sea water, belong to the magnesium-calcium- chloride-hydrocarbonate type of water.

Appendix 3: Hydrogeology and Surface Water

Adriatic Sea drainage basin

Area of the Adriatic Sea drainage basin in Montenegro covers about 6560 km^2. Moraca River, with its tributaries Zeta and Cijevna, Crnojevica River and Orahovstica River drain to the Adriatic Sea. These three rivers pour into the Skadar Lake and from that point on flow towards the Adriatic Sea through the Bojana River.

Moraca

In its upper and middle part of the flow, Moraca River is highly mountain river. Its length is 113,4 km, and area of the river basin to the Hydrological Station (H.S.) Podgorica is 2628 km^2. Currently, there are three measuring profiles at the Moraca River: Pernica, Zlatica and Podgorica, including one limnigraph station at the right tributary Mrtvica. Measuring at the above stations has been constantly performed for more than 20 years, and at the Podgorica station, measuring has started from 1948. Cijevna is a left tributary of Moraca, with the length of 64,7 km and river basin area of 383 km2 to the H.S. Trgaj, where measuring was performed from 1949 to 1989.

Source: Hydrological and Metrological service of Montenegro

Zeta

The most important tributary of the Moraca River is Zeta. Its length is 85 km, and river basin area to the H.S. Danilovgrad is 1216 km^2. Measuring places are Duklov most and Danilovgrad, and measuring activities have been preformed at the above locations from 1955 or 1948 respectively.

Skadar Lake

Skadar Lake covers less than 400 km^2 with minimum water level and up to 525 km^2 with maximum water level registered. The Lake is primarily filled by Moraca River, including Crnojevica River and Orahovstica as well as Kiri River in Albania. The Lake is drained by the Bojana River.

Black Sea drainage basin

Area of the Black Sea drainage basin in Montenegro is somewhat larger than the area of the Adriatic Sea drainage basin, covering about 7260 km^2. From this part on, the Ibar

River drains through the Zapadna Morava River, while Lim, Cehotina, Piva and Tara River with its tributary Komarnica drain through the Drina River.

Lim

Source: Hydrological and Metrological service of Montenegro

Lim River is the most important Montenegrin River from the hydrographic point of view. It flows out of the Lake Plav, although Vruja and Grncar rivers make a part of its source, which by confluence make Ljuca River that flows into the Lake Plav. Before the town of Andrijevica, Lim River receives Murino River and Zlorecica as its left tributaries, and Djuricka River, Rzenicka, Velicka and Komaraca as its right tributaries. From the town of Andrijevica to the town of Berane, Lim River receives Krastica, Trebicka, Sevarinska River from the left and Bistrica River from the right. From the town of Berane to the town of Bijelo Polje, Lim River receives Brzava and Ljuboviđa as its left tributaries, Dapsicka and Ljesnica as its right tributaries. From Bijelo Polje to Dobrakovo, it receives Bjelopoljska Ljesnica from the left and Bjelopoljska Bistrica from the right. Area of the Lim River basin to Dobrakovo is 2880 km^2. Its length is 234,2 km. Observations and measuring are currently performed at the stations: Plav, Andrijevica, Zaton, Berane, Bijelo Polje and Dobrakovo. With regard to the above hydrological station, the Hyd-met Institute has been keeping a long set of data (about 50 years). As regards its tributaries, the observations have been performed at Grncar-Gusinje, Zlorecica-Andrijevica and Ljubovića-Ravenna Rijeka.

Tara

Tara River emerges from the Maglic Kariman peaks (about 2400 mnm). From the source to the Drcka river mouth, right basin of the Tara River is more developed than the left one. Major tributaries are Opasanica and Drcka, Pcinja, Plasnica, Stitarica, Ravnjak and Ljutica spring. From the right side, the River Tara receives Skrbusa, Svinjaca, Jezerstica, Rudnjaca, Bjelojevicka and Selacka rivers. Area of the Tara River basin up to the Hydrological Station Scepan Polje is 2040 km^2. The length of the river is 148,4 km.

Measuring places along the Tara River are Crna Poljana, Trebaljevo, Bistrica and Djurđevica Tara.

Piva

The Piva River has created a basin at the high massif of Montenegrin mountains. This river bears several names along its flow. Its source part underneath the South-Western slopes of the Durmitor Mountain up to the town of Savnik is called Bukovica. It joins Bijela in Savnik and continues further under the name Pridvorica until it reaches the confluence of Gornja Komarnica into the Pridvorica. The river continues further downwards under the name Komarnica all the way to relocated Monastery of Piva, where it receives the tributary Sinjaci and is named Piva. The river flows to the Scepan Polje, where it meets Tara and creates Drina River. Area of the Piva River basin is estimated to be about 1784 km^2 up to Scepan Polje. Upper Komarnica springs from Durmitor and flows through a 600 m deep and about 40 km long canyon. Along the Komarnica flow, karst phenomena are being created, with insufficiently explored underground flows, overflowings from basin to basin and numerous springs. Measuring stations of the River are Bukovica Savnik, Komarnica Duzi and Komarnica Lonci.

Ibar

The Ibar River originates from the north-eastern slopes of the Hajla mountain at the hill 1760 mnm. Main tributaries are Zupanica, Limnicka River, Ibarac, Grahovska, Bukovacka, Balticka and Backa. The Ibar River basin is fan-shaped with quite developed hydrography and high possibilities for a fast creation of flood waves. Area of the Ibar River basin up to the H.S. Bac is 413,6 km^2., and its length is 273,8 km.

Cehotina

The Cehotina River originates from the Stozer mountain. It is the second largest tributary of Drina after the Lim River. It is composed of Koraci and Brezovski streams. Tributaries of the Cehotina River are Koricka, Maocnica, Vezisnica and Voloder. Area of the Cehotina River basin to the H.S. Gradac is 809,8 km^2. Its length is 128,5 km. Hydrological stations at the Cehotina River are Cirovici (became operational in 1978), Pljevlja (1948) and Gradac (1963). Measuring and observation of the water level are also performed at its tributary Maocnica (series 1985-2002.)

Underground water

Growing quantities of contaminated water and other harmful substances of settlements, industry and mining activity cause degradation of water potential of the territory of the whole country. Among groundwater resources, the most vulnerable to contamination are shallow aquifers with inter-granular porosity. As an example, we can present contamination of major part of groundwater from Cemovsko polje, southern from Podgorica (particularly close to aluminium plant). This aquifer is famous of huge reserves, high water quality and yield of wells (200 l/s).

The other aquifer significant from the standpoint of public water supply – karst aquifer is open for external contamination, but because of absence of population in mountainous watersheds (hence, without potential contaminants) is mainly protected. One of the problems is a fact that potential sources in Montenegro are not legally protected, and so – they are vulnerable to contamination and degradation or reserved for other purposes. Unfortunately, lack of care of the society related to groundwater resources, as a strategic raw material of the first order) will have harmful consequences in the future, when two opposite occurrences will be more expressed than now – growing demands for new amounts of high-quality drinking water and more and more vulnerable (reduced) available water resources.

Appendix 4: Main Environmental Assets along the Route.

This overview describes the most important environmental assets along the highway route, based on a review of existing data sources. Some of this information was developed as publicly available papers/books from which data is extracted.

The evaluation of baseline environmental conditions was undertaken through the verification of areas considered of key environmental significance along the highway route. In the review of literature the following areas have been scoped in the ecological aspect:

- Bar Municipality
- Podgorica Municipality
- Kolasin Municipality
- Andrijevica Municipality
- Berane Municipality
- Bijelo Polje Municipality

Bar Municipality

Relief forms have divided this area into Adriatic, lake and mountain region. Adriatic region is characterized by mild climate, which is a modified Mediterranean climate, especially distinctive in Bar valley region. Effects of heat from the Adriatic penetrate through the river Bojana; therefore the climate is mild in the coastal area of the Lake Skadar and especially in Crmnicko polje. Cliff tops on mountain ranges and higher mountains Sutorman, Rumija and Lisinj have characteristics of mountain Mediterranean climate. They serve as a rampart defending from cold and dry north and northeastern wind penetrations along the coastal area

The range of Lake Skadar has characteristics of the Adriatic climate with strong effects of continental climate and with substantial temperature oscillations since the height effect is stronger on promontories towards the lake than on slopes towards the sea.

Coastal zone

Bar is situated in the south-eastern part of Montenegro at the latitude 42 degrees north and at the longitude 19 degrees east using the area of 505km^2

Bar's municipality has have 83 settlements and 47.768 inhabitants. It is divided into 12 local communities. Bar is famous for its multi-nationalities. Its wealth consists of 25 nationalities which are settled in this area. The number of inhabitants increased from 1948 to 2003. more than 100% -from 21.000 to 47.768 in 2003.
Bar represents modern city that each day is expanding. As port city will amaze you with clean and done green spaces. There are many tourist attractions in its surrounding, like

Old town Bar, fortress of Haj Nehaj whose ruins from 15th century, King Nikola's castle represent historic and cultural monuments of the city, Olive tree old over 2000 years, large number of monasteries and churches for the visitors wishing this way of tourism, a handful of festivals and cultural manifestations: International TV festival, Gatherings under old olive tree and so forth.

Olive cultivation may be a quality indicator of the Mediterranean climate effect and this is the best indicator of this climate in the Adriatic area. This climate is characterized by long and dry summers and mild and rainy winters due to heat effects of the Adriatic Sea. Pretty high average winter temperatures in Bar (9,1oC) indicate that there is no true winter here.

The temperature seldom falls bellow zero, that is, there are only a few days during winter with seldom snowfalls and frost. Spring comes early and due to this some fruit blossom in February already (almond). Summers are very warm and dry with the average temperature of 22,6^{o}C, with long periods of heat that reflects in vegetation which dries up or scorches. Autumn is usually long and pleasant in Bar and it is significantly warmer than spring – temperatures are fairly higher in autumn for 3 to 4oC. In the last hundred years Bar had a maximum measured temperature of 37,7^{o}C on July 26, 1987 and minimum temperature of -7,2oC back in January 1963. The sea was the warmest on August 20, 1982 in 2pm – 28,6oC, and the lowest sea temperature was measured twice- on February 18, 1983 and on February 24, 2000 – it was 9,3oC.

Winds characteristic for the Adriatic are cold northeast wind (bora) and moist wind that blows from south named Jugo or Sirocco, as well as Pulenat, Maestral (Maistral), Burin, Danik (Daily wind) and Nocnik (Night wind). Bura (northeast wind) is the most frequent and at the same time the strongest wind. It occurs during wintertime and it blows from the high mountain towards the sea bringing the chillness. On the open sea this wind reaches the strength of a storm and it also creates short and low sea waves, up to 2,5m. Jugo or Sirocco blows in the south and southeastern parts of the Adriatic, from the sea to the shore. It blows horizontally with the medium temperature of 3 Bofor. Jugo churns sea surface and produces waves that reach the height of up to 6m.

At the end of spring and during summer, when the weather is warm and bright, there is a wind blowing from the sea, during the day, named Maestral. It is a cool summer breeze and the most important wind in the area. It only unsettles the sea surface. Pulenat is a moist west wind which is rather frequent during springtime. Levant is a warm south-eastern wind that brings moist air, and Lebic blows from southwest, from the African coast – this wind is called "libeccio" in Italy and this means that it blows "from Libya". Burin blows during the night, from the shore to the sea, from northeast and east. Due to uneven heating and cooling of the seaside and bare limestone mountains there is an alternation between Danik and Nocnik (daily and night wind). Danik blows during daytime from the seaside to the mountains and Nocnik blows from the mountain to the lowlands, mostly during summer period. Nevera is a stormy wind on the sea, without constant direction, it is a passing and very strong wind.

Agriculture is very developed in the area of the municipality of Bar. It is very rich and well known in producing southern fruit.

Skadar Lake National Park

Lake is located in Zeta – Skadar valley and is surrounded by mountains and 7 km far from Adriatic Sea. Two Thirds of Lake of Skadar is in Montenegro and rest one third is in Albania. Depending of level of water space of Lake varies from 530 to 370 km^2 it is considered 44 km long and 14 km wide. Coast line is very cut especially in north – west side. Low valley of north part of Lake is often flooded. Lake of Skadar is the largest lake at Balkan Peninsula one of the last fresh water spaces and largest national park in Montenegro and the most famous for its diversity of flora and fauna. Lake itself is unusual for mutual vicinity of different living areas and their chain of feeding.

There is a large number of birds' kinds. It is stated that 270 kinds of birds inhabit this Lake. Around 90% of birds are migratory and are of international importance. During season of migrating, white little egret, white spoonbill and various kinds of ducks pass over this region. Cormorant nest in north swamps and represent one of three most important colonies in the world (ITR, Ecological Research Study on Peat exploration, 2001). Rare and endangered kind of curly pelican nest at floating peat islands in north end of the Lake. There are 50 species of fish living in the Lake and 3 snake like. The most important from economic point of view are ukljeva and carp.

World of plants of this park is very important and is different from the regions where there are often floods, little stone islands and steep mountain cliffs. There are three rare and protected plants and trees and large number (30 +) of rare plants in park.

In region of Lake of Skadar there are 20 monasteries, churches, villages, fortresses and sacred monuments. This lake is witness of Montenegrin history from 11th century up to now. Around Lake itself there are 18 important historic monuments. of International recognition:

History of human kind around Lake of Skadar dates back to times of early manhood for its health and dispensable resources. Earliest written documents from this region are from 11th century or period of creating the first Montenegrin dynasty. Turning of Roman Catholics into Orthodox Church many monasteries and churches, in the beginning of 1400 AD built around the lake. In 1478 Turks occupied Zabljak and region of lake and ruled over it until 1878, when Montenegro was liberated from Turkish rule. During Turkish occupation Montenegro was ruled by Cetinje Metropolitans and it survived this period. Some strongholds were used by Italians during WWII.

Bird watching, fishing, hunting, renting and ride in boat, swimming and sunbathing are main recreational activities around the Lake.

National Park Skadar lake was founded in 1968 for keeping and protection of wonderful surrounding of the Lake and its shore. Plan of development for his park was made in 1997.

Park is easily accessible from direction of Podgorica and Bar by highway Podgorica – Petrovac or by rain from Bar or Podgorica through central part via Virpazar. To other regions inside park you can come in own car or taxi. Travellers' agents in Podgorica offer one day trips to Lake including boat ride at Lake and lunch at far fishermen village.

As national park it is special for its emphasized limnology characteristics and the biggest crypto depression on the Balkan Peninsula and one of the biggest in Europe. It is very interesting that the surface and depth of the lake vary depending from the quantity of precipitation. In rainy months the level of the lake grows to 2.5 to 3 meters This particularity lasts for 5-6 months per year. It belongs to a group of counter flow lakes with large number of tributaries providing the lake with fresh water and the only bayou is river Bojana which flows into Adriatic Sea.

Virpazar

Microclimate of Virpazar, Crmnica and of the lake is different than the climate in Bar. With the occurrence of the southwestern current the area of Bar is exposed to air humidity, and condensation in the atmosphere appears during the transition of this current over orographic barrier (a mountain). Precipitations occur on the mountain tops and the air, free of humidity and water, continues its voyage, comes down to the Virpazar area and causes the fan effect. Such conditions cause abrupt melting of snow. One meter thick snow cover can be melted within a couple of hours. In such situations it comes to floods since there are no river systems in Virpazar.

Local winds on the Skadar Lake used to condition lives of local people, thus it is not unusual that their tradition and folklore attach a great importance to those winds. People who used to live around Skadar Lake knew even 15 winds which had impacts on lake sailing, fishing or trade, and those are: danik, nocnik, sjeverika, murlan, bojanac, rumijas, orahovina, upor or smuta, vijorac, sijavica (prijepor), sjevernjak, hercegovac, silok, grbin and juznjak.

Podgorica Municipality

Podgorica is located in central Montenegro, in northern part of Zeta plain. The entire area in which is intersected with rivers, and the city itself is located only 15 km north of Lake Skadar. Moraca and Ribnica rivers flow through the city, while Zeta, Cijevna, Sitnica, Mareza rivers flow in the vicinity of the city. One of the main features of the city is richness in bodies of water.

The city itself, in contrast to most of Montenegro, is lying on predominantly flat area of northern Zeta plain. Only exceptions are hills that overlook the city. These are mostly steep hills that rise abruptly from the surface, and thus are not suitable for urbanisation.

They rather limit the city's expansion, especially to the north, shaping the city's development.

Podgorica has typical Mediterranean climate, with hot and dry summers, and mild winters. Snow is almost unknown phenomena in Podgorica. It has a mean annual rainfall of 1544 mm, and median daily temperature of 16,4°C. It has around 135 days with temperature higher than 25°C per annum. Podgorica is particularly known for extremely hot summers, as temperatures over 40° C are a common occurrence in July and August. Absolute maximum recorded in Podgorica is 44.8 °C, on 16th August 2007.
The municipality of Podgorica accounts for 10.4% of Montenegro's territory and 27.3% of its population. Besides being an administrative centre of Montenegro, Podgorica is also its

economic, cultural and educational focal point. There are around 170,000 people in Podgorica municipality, which includes the small towns of Tuzi and Golubovci, and around 140,000 people in the city itself. This is the official data from 2003 census, while estimates go up to 200,000.

Moraca Canyon

Departing from Podgorica, one of the major country road follows the canyon of the Moraca River and than continues further towards the North Montenegro and further on to Serbia and Belgrade. It is the most monumental limestone canyon in Montenegro. The countryside is initially soft and almost hilly with strange red-streaked rocks but then becomes gradually harsher, with mountains dominating the winding road which cuts through them, with long tunnels and borders on a deep gorge, creating a real master piece of nature. The scenery presents a continuous inspiration to Montenegrin artists, especially painters.

The Moraca Canyon runs 45 kilometres through the Municipality of Kolasin. The most interesting part of the canyon are the famous Platije, which are 37 km south from Kolasin, and its depth at certain places is over 1,000 metres. For centuries, the Moraca River has been the route to penetrate the Northern region and the Moraca Monastery was its gateway. The sanctuary appears without warning, almost as an oasis. The high canyon cliffs seclude various flora and fauna species, and the clear and pure waters of the Moraca River are rich with the most beautiful samples of trout and huchen, and therefore renowned for sports fishing. The canyon has a significant cultural historical treasure too as the most beautiful monastery of Montenegro

The new highway alignment is supposed to ascend from current road alignment before entering the gorge part of the canyon.

Kolasin Municipality

The Municipality of Kolasin is situated in the central part of the continental part of Montenegro. It stretches over an area of 897 m2 kilometres of the upper and middle courses of the Tara and Maraca Rivers. The basins of these two rivers make two natural unities, equal by size and spatially close by and yet different. The Crkvina saddle, situated between Maraca and Kolasin monasteries, is the watershed of the two basins. On its southern side, waters flow towards the Adriatic Sea, and on its northeast side, the waters flow through the Tara, Drina, Sava and the Danube Rivers, reaching the Black Sea. The curiosity is that the waters split on the roof of a building on this saddle and flow into two different basins.

The region of Kolasin is surrounded with cliffs and mountain peaks of Sinjavina, Javorje, Semolj, Kapa Moracka, Maganik, Stavnje, Ostrvica, Komovi, Kljuc, and Bjelasica Mounts, which makes it a true mountainous region rich in all the beauties and challenges offered by high mountains and a particularly diversified relief. Breathtaking canyons, glacial lakes like those in fairytales, mountain peaks exceeding 2000 meters, numerous springs, thick woods, spacious pastures, limestone plateaus – make this treasure of landscapes infinitely abundant, unforgettable and exciting always in a new way.

The relief should be added to above as the constant and expressed factor. The area of the Kolasin Municipality is featured by major changes in altitude at small distances. The very town of Kolasin is at 954 meters above sea level; only five or so percent of territory is at a height below 500, and 24 percent below 1000 meters above sea level. The eastern part of the Kolasin region has specific climatic conditions, where Bjelasica Mount dominates, rich with water and thick woods. Due to the relative openness over the Crkvina saddle and the Moraca valley, the winds from the Mediterranean region penetrate, which increases the precipitation. However, because the terrain is so rough and with deep river canyons and thick woods, there are many microclimatic conditions resulting in various climatic changes.

Average annual temperature is 7.3 ^{o}C. January is the coldest month with average temperature of -1.9 ^{o}C, the warmest is July with 16 ^{o}C. Autumns, with average temperature is only 6.5 oC. This is explained by the influence from the sea and that also applies to somewhat faster temperature transition from winter to summer than from summer to winter.

The highest temperature in Kolasin of 36 ^{o}C was recorded on August 29, 1956 and the lowest of -29.8 ^{o}C on January 13, 1985. During the year the town has 127.2 frosty days on the average and it sometimes happens that, in the middle of June, the temperature drops -3 oC. In the mountainous part of the Municipality, the number of frosty days goes over 150 days a year. The lowest parts lying, around the Tara and Moraca Rivers are featured by the biggest number of warm days with maximum temperatures of 25 oC. Considering the air temperature range, the conclusion is that the heating season in Kolasin lasts 249 days, i.e. the need to heat homes and working premises lasts from September 17 until May 24.

Average annual insolation period in the Kolasin region is 1830 hours. Its average precipitation during the year is 2106.2 millilitres. December is the rainiest month with 310.4 and July is the driest month with 72.3 millimetres. The higher the altitude, the higher is the precipitation. The precipitation in the south –western part of the Municipality can reach the values exceeding 2700 millilitres

It snows for 52 days on average and, on the higher grounds of Bjelasica Mt., over 60 days a year, mostly in January and February. In Kolasin proper, ground is covered with snow that can be measured for 82.8 days a year on average with big annual variations of as 108 days. In 1981, 141 days were recorded with snow and, in 1951, only 33 days. The regions 1500 meters above sea level can be covered with snow for over 120 days. For over one hundred days, the snow cover is minimum 30cm. The most frequent wind blows from the north with the maximum squalls of some 25.8 meters per second. Considerable winds also blow the west and southwest, sometimes more seldom from the southeast and west and most seldom from the east.

The north wind is the predominantly winter wind and it resembles the seaward north-eastern wind. It brings low temperatures and often snow, thereby creating big snow drifts. Strong winds sweep through Kolasin only 10.2 days a year. In the recent years even less. On average, only two days a year are with the winds, the speed of which is above code number eight on the Beaufort scale, i.e. above 19 meters per second.

Today, the Kolasin Municipality has more than 12000 inhabitants and over one third of them, around 4500, live in Kolasin itself. On average there are 13 inhabitants per km^2.The people of this region lived poverty and privation in the past because of the overpopulation of villages and the natural type of farming. This situation resulted in mass emigration, first to Serbia and, from the beginning of the 20th century, increasingly to other countries, especially the United States. With the construction of roads and other infrastructural facilities, particularly in the period after the Second World War, condition developed for better use of the natural resources of this, for tourism, very attractive region. That was the opportunity for better and richer life of the local population.

The nature of this region put the architects and builders before great challenges to follow in with esthetical and engineering excellence of recent times. It took a lot of courage, know – how and skills for some projects to be finished. This is, first of all, related to the bridges. The bridges and viaduct on Belgrade – Bar railroad command admiration because of their beauty and remarkable construction undertakings. Of all the bridges along Belgrade – Bar railroad in the territory of the Kolasin municipality, the ones over the Tara River stand out: The Mala Rijeka viaduct is a viaduct is the tallest railway viaduct in the world. It is 498, 8 m long and rises 200 m above the Mala Rijeka (meaning literally Little river). It is also the longest bridge on the Belgrade - Bar railway. Where .36, 000 m^3 of concrete and 100,000 tons of steel were built into the bridge. The largest of four pillars, upon which the bridge lies, has a base bigger than a tennis court.

Biogradska Gora National park

Even thou the proposed alignment of new highway is not passing through it, it is worth mentioning this national park with which Kolasin Municipality is connected, in the most beautiful way, with its nearest neighbours, the municipalities of Andrijevica, Berane, Bijelo Polje and Mojkovac, which spreads over 5400 hectares, occupying the central part of Bjelasica Mountain, between the Tara and Lim Rivers.

With its surroundings, this is a very important ‘‘climatic, hydro-geological and ecological node of Montenegro and the Balkans‘‘. One of the three last preserved primeval forests in Europe is in the park with trees old as much as 400 years and over 45 meters high, with the perimeters up to 150 cm. Biogradska Gora was statutory declared to be the National Park in 1952 but this area had been put under protection much earlier.

Three levels of protection have been established for Biogradska Gora. The first zone includes the primeval forest reserve, which stretches on some 1600 hectares. There all the activities that could disrupt the spontaneous life of the nature are prohibited. This zone is used for scientific research and some educational and cultural activities as well as for tourist and recreational activities. The second zone is under strict land, water, plant and animal life, and landscape environmental protection, but grazing is permitted provided the pasture vegetation is preserved. Damaged and diseased trees are allowed to be cut and there is a wide range of recreational activities that are allowed. The third, contact zone is dedicated to various forms of tourism, health food production, hunting, fishing, bee keeping, and harvesting of medicinal herbs. The experts claim that the area of the National Park Biogradska Gora contains all the vegetation of the Earth‘s northern hemisphere, where over 2000 species and subspecies of higher plants have been registered in the Park so far, of which every fifth is endemic to the Balkan region

The richness of plant life creates adequate conditions for survival of animal life. Deer, wolfs, foxes, martens(golden and white), otters, weasels, rabbits, squirrels and bears are all the original inhabitants of Biogradska Gora. The newcomers are deer and hinds and its passing guests are wild boars. In this area, the bird life includes about 150 species among them being: imperial eagle, hawk, rough-legged hawk, cock of the wood, deaf duck, calendar bowers (crested, yellow, blue…), sittine, woodpecker, finch, gold-finch and cinclidae. Out of 350 species of insects specially protected are : forest ant, hart's tongue, rhinoceros beetle, and butterflies swallowtail and Apollo. In the rivers and lakes there are many species of trout-stream, golden, Californian, etc. Those in the lakes are autochthonous and, therefore, specially protected, just like the relict Triterus montenegrinus.

Tara River

The part of the Municipality of Kolasin, in the Tara River basin, is on a higher average altitude above sea level and has a number of smaller valley expansions, such as Kolasinska terrace, Lipovska Valley, Trebaljevo, the Donja (i.e. Lower) and Gornja (i.e. Upper) Tara Rivers and valleys with a number of its tributaries.

Tara River is quiet and placid but, at the times of heavy rains and sudden melting of snow, it can become a raging torrent. The Tara River originates from two smaller rivers, the Verusa and the Opasnica. Near Matesevo, the Tara takes in the Drcka, the Skrbusa, then Pjescanica, and Pcinja before Kolasin , after that Svinjaca Plasnica and Bukovica. After than, it continues to flow across the territory of the neighbouring municipality of Mojkovac until it finally meets the Piva River and flows further on as the Drina River.

The Tara River, 144 km long, is the longest river in Montenegro. But its 82 km long and 1,300 m deep canyon is an extraordinary natural attraction which cuts between the mountains Sinjajevina and Durmitor on one side and Ljubisnja and Zlatni Bor on the other, and is the world's second deepest after the Colorado River canyon. The Tara River Canyon is a jewel of nature, placed on UNESCO's world heritage list in 1980 and has been protected as part of a network of international biosphere preserves. Tara is of fluvial origin. At this location the canyon was formed by a combination of the rushing waters of the river together with the tectonic forces making the mountains rise. With a variety of plant and animal species, its magnificence lies in its numerous contrasts.

Around the river, the vegetation is very dense: black pine, eastern hornbeam, black ash, elm, linden, and in higher areas, above rocks, one can see cork oaks, hornbeams, maples, beeches. In the areas more than 1000m high, fir and spruce forests can be found. The Canyon holds one of the last primary forests of black pine in Europe. "Crna poda" is the most valuable black pine forest with unusually high trees. Some trees are almost 50m high and 400 years old.

The Tara flows slowly, unhurriedly, in its rocky bed, free to unwind in a succession of bights and curves. It embraces little wooded islands and brushes the thick forests that cover its banks. Tara is limpid, exuberant, full of life, far from the dull, altered, shabby look that rivers have. Its waters are clear as crystal; the pebbles on the bottom are clean and smooth; there is no suspension, no algal carpet. Instead of being terrifying, the high cliffs are reassuring and charm the visitor with dozens of enchanted waterfalls, almost as if the mountains themselves were just moss-covered sponges. A multitude of fry moves quickly in the low water and several natrices hunt after them zigzagging among the pebbles.

Nowadays, the Tara canyon gathers all those who like adventures and exuberating contact with nature. Water attractions from the world's famous amusement parks are just a bad simulation of the real excitements that are unavoidable while rafting along the Tara River and over its 50 rapids. Besides nature's beauty, rafting and canoeing almost along the whole course will add to the excitement. The raft is made of logs and it is rowed by brave and skilled people who used to transport timber in the lower course of the river in this way.

Andrijevica Municipality

Andrijevica is based in the north-east part of Montenegro, situated in the Upper Polimlje (Lim river valley) on the left bank of the river Lim. It covers the space of 340 km^2 with about 6 600 inhabitants, out of which some 1000 live in city of Andrijevica, and others in rural areas. By its position, Andrijevica resembles a terrace, build above this beautiful river. It is situated between two mountainous rivers – Zlorecica and Kestica. Near it, there are the mountains Komovi and Visitor, as well as Lake of Bukumir – 1440 m above the sea level,

It is characterised by old and undeveloped communal and social infrastructure. The main resources except almost untouched nature are forests covering 13.912 ha. Arable land covers some 5.971 ha and 7.692 ha are covered with pasture. Parallel there are resources of construction stone, minerals and river sand and gravel.

Lim River

Lim River is the major tributary of Drina with a trans-boundary sub-catchments of 3,160 km^2. It has its source in eastern Montenegro (Prokletije Mountains at the Albanian border) and flows through the towns Andrijevica, Berane, Bijelo Polje and Priboj. Its source under the name of *Vrmosa* is only few kilometres away from the source of the Tara River, but the two rivers go in opposite directions.

Vrmosa flows to the east, and after only few kilometres it crosses over to Albania passing through Prokletije Mountains, it re-enters Montenegro under the name of *Grncar*. Receiving stream Vruje from the right at Gusinje, it continues as *Ljuca* for a few more kilometres where it empties into the Lake Plav, creating small delta. It flows out of the lake to the north, next to the mountain Visitor, under the name Lim for the remaining 197 km. It continues generally to the north through cities of Andrijevica, Berane, Bijelo Polje, entering Serbia between villages of Dobrakovo and Gostun.

The Lim is subject to serious exploitation of riparian vegetation and sand/gravel excavation and is impounded by several dams
Fertile valley of the river is called Polimlje (Lim valley). It represents area around composite river valley, made of several gorges and depressions. It is important agricultural region, especially for cultivating fruits and stockbreeding. It is also important route for the both road and railways from Serbia to Montenegro and Adriatic coast, most notably, Belgrade-Bar railway. Industry is not much developed (smaller industrial centres are Berane, Bijelo Polje and Prijepolje). Most use of the river has Serbian electricity production, with power station Potpec being constructed and several more stations on the Lim's major tributary, the Uvac.

Despite the potentials, the entire area the Lim flows through is undeveloped and for decades highly depopulating.

Berane Municipality

This town covers the space of 647 km^2 with about 40 000 inhabitants out of which some 13 000 lives in the city and others spread in 27 communities. Berane is the centre of the whole upper Polimlje (Lim valley). There are several important cultural and historical monuments in this region, such as: a medieval town Bihor, which was the headquarters of the tribal state (having the same name), situated at the confluence of the rivers Lim and Ljesnica and Budimlje, which was built on the remnants of the former roman settlement. Among cultural monuments, there are famous monuments Sudikova and Djurdjevi Stupovi, and from recent period – the monument on Jasikovac (a stone book containing 1 000 letters). There are favourable conditions for fruit growing and agriculture, in this region Out of total territory, some 91% is arable land (62 ha). Beside that, there is the coal mine and the factory for animal skin processing in Berane.

Climate is mild continental with temperature reaching 37oC during summer and -30oC during winter. Early spring matching calendar is favourable for early agriculture having vegetation period lasting 250 days a year. Winters are long and cold. Due to climate condition, landscape and nature, this area is rich with surface waters, which are 98% drained by Lim river.

Similar to Andrijevica it is one of the poorest municipalities of Montenegro. The industrial production is very small due to the collapse of country economy in the past decade. The fact that during second half of 20th century many families have moved to urban centres due to industrialisation the agriculture production is low as well. The latest developments are mainly in the segments of small scale trade and tourism. In total there is only 3000 employed

Bijelo Polje Municipality

The pleasant valley of the river Lim with its tributary rivers Bistrica, Ljubovidja and Ljesnica has always been attractive for people to settle and live in it. The traces of life in Illyrian, Greek and Roman period can be noticed there, up to the modern times. The region of Bijelo Polje coves the space of 924 square kilometres with about 57 000 inhabitants. Thanks to the railway Belgrade – Bar and developed road network, Bijelo Polje has a very favourable geographic position. Among cultural and historical monuments, the church of St Petar is of a special importance. The famous Miroslav`s gospel was written for its needs in the twelfth century – one of the most famous Cyrillic written works. In the vicinity of Bijelo Polje, there is the factory for mineral water processing “Bijela Rada” and the factory for wool processing – Bijelo Polje.

Appendix 5: Air Quality and Noise Level

Air Quality

In accordance with the Montenegrin regulations, a permanent quality control of air on the territory of Montenegro is being measured and reported. Such control is aimed at determining conditions and changes in water balance and qualitative composition of water. i.e. determining a class of bounty in surface waters and control and evaluation of the level of air pollution in lower layer of atmosphere. Evaluation of the water and air quality is made in accordance with legal regulations. Methodology of work has been fully standardized in all phases of sampling, analysis and data processing.

In addition to the national environmental monitoring program, the Centre for Ecotoxicological Research of Montenegro participates in implementation of international programs: Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air pollutants in Europe (EMEP) and Mediterranean Pollution Monitoring and Research Program (MEDPOL). Analytical data on environmental situation are published under Annual Reports, which are appropriately filed and sent to the competent Ministry and other interested parties. The outcomes are occasionally published at expert local and international gatherings.

A limited number of measurements of air quality have historically been collected within Montenegro, in the few locations along the highway route: at Bar, Podgorica, and Berane. Such measurements of air quality are available in the annual reports.

Municipality	Location	Coordinates		Altitude	Type of station
Bar	Dom zdravlja	420 93’	190 10’	4	urban, traffic
Podgorica	CETI	420 26’32’’	190 18’99’’	45	urban, traffic
Podgorica	D.Gorica	420 39’71’’	190 16’19’’	45	urban, traffic
Podgorica	Srpska	420 26’34’’	190 17’07’’	35	Industrial traffic
Podgorica	Konik	420 26’12’’	190 12’48;;	45	urban, industrial
Berane	Trafostanica	420 50’	190 52’	700	traffic

Source: Centre for Ecotoxicological Research of Montenegro

The majority of the proposed new sections lies in predominantly rural areas, where it is expected that air quality would be very good owing to the current relatively limited scale of industry and road traffic in Montenegro.

The Annual average values of restrain concentrations of pollutants from annual report for 2006 relevant to the highway route are shown in the tables bellow.

Annual average values of restrain concentrations of basic pollutants in 2006

Station	C_{av}.SO2	C_{max}.SO2	C 95 SO2	C_{av}.NOx	C_{max}.NOx	C 95 NOx	C_{av}.O3	Cmax.O3	C 95 O3
	µg/m3								
Bar	2.64	14.46	2.27	3.33	15.08	2.97	57.78	**138.83***	54.03
Podgorica - CETI	2.53	31.32	2.07	6.82	65.55	5.73	53.46	**139.94***	49.28
Podgorica - D.Gorica	3.12	14.56	2.69	3.73	11.04	3.43	55.01	**129.95***	51.71
Podgorica -Konik	7.12	73.47	5.31	3.62	36.65	2.86	57.92	**144.43***	54.40
Podgorica - Srpska	4.66	38.97	3.78	4.20	17.25	3.81	53.54	**166.60***	49.10
Berane	2.25	14.45	1.85	2.98	62.43	2.15	56.98	**160.27***	53.32
LIMIT VALUE	110			150**			125		

Station	C_{av}. smoke/soot	C_{max}. smoke/soot	C 95 smoke/soot	C_{av}. suspended particles	C_{max}. suspended particles	C_{av}. settling maters	C_{max}. settling maters
	µg/m3					mg/m2dan	
Bar	12.97	**60.49***	11.55	88.72	**184.24***	138.58	275.45
Podgorica - CETI	24.34	**71.35***	22.62	85.79	**120.50***	148.32	303.02
Podgorica - D.Gorica	17.04	**126.37***	14.95	66.38	108.77	152.59	**428.87***

Podgorica -Konik	21.33	**124.42***	19.32	**198.39***	**452.25***	333.59	**842.38***
Podgorica - Srpska	22.86	**133.45***	18.22	**200.80***	**380.40***	**352.07***	**1172.50***
Berane	16.02	**87.35***	13.91	102.94	**187.27***	136.66	**373.03***
LIMIT VALUE	60			110		350	

Annual average values of restrain concentrations of specific pollutants in 2006

Station	C_{av}.H2S	C_{max}.H2S	C 95 H2S	C_{av}.NH3	C_{max}.NH3	C 95 NH3	C_{av}.H2CO	C_{max}.H2CO	C 95 H2CO
	µg/m3								
Bar	0.23	1.31	0.19	1.83	12.53	1.41	1.13	5.00	0.97
Podgorica - CETI	0.35	4.25	0.26	2.83	14.24	2.44	1.46	8.50	1.14
Podgorica - D.Gorica	0.72	1.90	0.32	3.63	30.45	2.46	0.53	2.50	0.45
Podgorica -Konik	1.13	1.55	0.36	5.49	40.60	3.23	1.02	7.00	0.73
Podgorica - Srpska	0.48	2.50	0.35	2.68	23.10	1.87	1.39	8.65	0.96
Berane	0.37	2.90	0.26	1.51	6.65	1.30	0.28	2.00	0.20
LIMIT VALUE	8			200			12		

Source: Centre for Ecotoxicological Research of Montenegro

Baseline data indicates that levels of measured pollutants are mainly within limit values. The air quality along the highway route except urban areas is currently very good. These findings are unsurprising given the current extent of industrial activity and road transport currently within Montenegro. Contribution to the measured concentrations of target gases is likely to arise from domestic burning of wood and other fossil fuels, road transport, and limited industry.

Based on the given results it can be concluded that the air quality is on the satisfactory level. Suspended particles represent major problem in more less all urban areas in Montenegro. High concentrations of polycyclic aromatic hydrocarbons (PAH) are mainly result of exhaust gases from vehicles which are not up to standard as well as due to the quality of fuel.

The following conclusions can be drown up:

1. Restrain concentrations of global parameters (SO2 and NOx) are below national limit values (<110μg/m3) however sometimes exciding EU values (50 μg/m3). Increase in the number of vehicles and low quality of fuel results with high values of PAH and suspended particles especially in the urban areas.
2. Increased smoke/soot values are recorded during winter which can be explained by traditional usage of coal and wood as a major heating material.
3. Almost in all urban areas Cmax.O3 is recorded higher than limit values, which is direct consequence of UV radiation combined with soot coming from vehicle exhaust pipes.

Noise level

Similar to air quality monitoring Centre for Ecotoxicological Research of Montenegro is performing noise level measurement. This exercise is performed on the locations such as main squares in urban areas, medical facilities surroundings and national parks. The limit values of L_{eq} for different areas are shown in the table below:

Type of Area	L_{eq}		
	Unit	**Day**	**Night**
Recreation and resting area, hospitals, cultural and historical sites, parks	dB(A)	50	40
Tourist areas, small size settlements, camps and schools	dB(A)	50	45
Residential area	dB(A)	55	45
Business-residential area, trade-residential area, playgrounds	dB(A)	60	50
City centres, entrepreneurship, trade and administrative areas, areas along highways, main roads and city traffic lanes	dB(A)	65	55
Industrial zones, warehouse zones, service areas and non residential areas	dB(A)	Applied values of bordering zones	

Source: Centre for Ecotoxicological Research of Montenegro

The results from the monitoring from 2004, 2005 and 2006 shows that noise levels are over the set limits in the most of the locations with incising trend. The biggest exceeding difference is recorded in Podgorica, mainly due to the fact that distance from the traffic and subject area (hospital, park school) is very small. The noise level in the national parks is recorded higher than expected mainly due to the natural effects (birds, wind etc).

Thee main constrain is the fact that zones in the urban areas are not well defined (distinction between residential and industrial area is sometimes hard to distinguish) and therefore applying above table is not simple.

Appendix 6: General Conditions of the Existing Road

The existing road is used by mixed traffic. All types of vehicles from modern and speediest cars to 38 ton trailer trucks. Sometimes, a horse and cart is using this road. The variation of observed speed is from 15 km/h to 160 km/h (exceptionally on the flat sections near Podgorica). The pedestrian, the cows pass trough the road and very often, the cows slept on the road. Drivers are undisciplined, ignored all horizontal and vertical signs.

In Podgorica suburb, on the both side of the road there are the trade of fruits and local fruits. This process disturbs traffic and is source of many accidents. Usually the settlements are implanted on the both side and close to existing road. Typical small rural town is compound of one line of houses with a yard. Any attempt to wider the existing road to highway standards will results in destruction of half of settlement located on one side of the road. In this case the social cost of the construction of highway will be very high.

The visual assessment shows:

- Many features such as culvert wing walls, aprons, and headwalls are in the bad condition. Bridge parapets are sometimes partially broken away.
- There is the need to fix all drainage structures, culverts, pipes, both brickwork and concrete.
- The profiles of original roadside ditches are completely changed as they have become silted up over long periods or have become the receptacle for waste and garbage. The problem with solid waste dumping is particularly severe because of (i) highway drainage channels being directly used, in a targeted and purposeful manner, as waste disposal sites; (ii) Highway drainage channels picking up waste products indirectly by interconnection to supplementary drainage systems from adjoining lands and properties outside the ROW;
- Road safety conditions at most places are very poor. Cambers of road on bends have become damaged by the effects of heavy vehicles. Untreated pothole and patching repairs, particularly on bends where tire traction and adhesion is critical, pose risk of skidding and loss of control. There is also a lack of hazard warning boards, bollards, or any form of physical barrier on sites that clearly have experienced vehicles going over embankments through hedges and running into walls and roadside banks.
- On the whole length of existing road water provided from the pavement is going directly to the land without any process of cleaning of hydrocarbon products.
- The crossing of the settlements and built-up areas are especially dangerous regarding to drivers' and pedestrians' safety, due to the narrowness of the carriageway and several sharp bends.

Appendix 7: Socio-Economic Baseline

Many socio-economic problems along the route under consideration are directly attributable to the poor economic conditions in Montenegrin rural areas or in some way connected to them. Despite the foreign investment boom (mainly Montenegrin real-estate in the seaside area) economic conditions are reflected in the collapse of agriculture and industry, the lack of opportunities for well-paid, regular employment and the pressures on livelihoods that eventually affects the environment. It is also widely understood that poor economic conditions impose a constraint on sources and levels of investment in necessary infrastructure, services and economic sectors. The need for economic growth is of course a national issue, but the problem needs to be addressed in all sectors and geographical areas. This suggests strongly that value for money or potential to generate sustainable economic growth should be ranked highly as evaluation criteria for investments in transport infrastructure. This also accords with national policies and the priorities of international assistance projects which concentrate on poverty reduction.

Quality of life theme underlies issues relating to poor standards of services (e.g. drinking water, electrical supply, sewage disposal) and threats to human health from poor environmental conditions. Poor standards of waste disposal (both domestic waste and sewage) are one of the most pervasive and most persistent problems along the rout. Poor environmental conditions represent a very real threat to human health. Industrial pollution is widespread, domestic water supplies are regularly polluted with untreated sewage and river water quality is unrecorded but almost certainly very poor. Impacts on human health should therefore be also accorded a high priority as an evaluation criterion to judge any development interventions.

Infrastructure along the route is generally in a very poor state, ineffective or inoperable. Transport infrastructure is in a poor condition, with roads that are severely degraded and pot-holed. Energy is a major problem with communities receiving an infrequent supply of electricity, or no electricity at all. This results in a high reliance on coal and wood, which is cut and gathered by the communities themselves. Telecommunication and telephone lines are in very poor condition or non-existent. The infrastructure for mobile phones is available and reliable. Water supply is a problem in costal area during summer tourist season with some communities receiving running water for a few hours a day, or no piped water at all. Sanitation services are almost non-existent, and when they do exist, they are often ineffective.

Agricultural infrastructure was built for small-scale farming and is unsuited for current market competition. Rural roads and irrigations systems are not adjusted to the new land tenure structures. Nowadays, the Montenegrin rural agricultural sector is at subsistence level; it is producing food for self-consumption with a small surplus sold in markets and at roadside stalls. The small size of land parcels is sufficient for personal consumption but not large enough to provide a living from the land It is obvious that economic hardship is the underlying cause of low birth rates and high levels of out migration from rural to urban areas. Forecasts of future population growth are negative, but it may not result in reduced population and development pressure in the areas adjacent to the main transport artery. The various survey data do not reveal any great sub-regional variations in socio-economic conditions along the route. In common with most of Montenegro, economic conditions are hard and for households access to livelihood as well as to the main road is their greatest priority. For some of them today the highway itself represents the livelihood where they are involved in different legal and illegal businesses including trade and wide range of services.

The Bar-Boljare highway runs through the territory of 6 municipalities: Bar, Podgorica, Kolasin, Andrijevica, Berane and Bijelo Polje.

The highway runs through predominantly rural terrain with agriculture activities beyond the existing extent of the cities, except some minor cases where it passes through some of the outermost suburbs. Although not urban in character the highway is directly related to the economic and demographic development of the cities. In the same time highway has a considerably wide area of influence on rural regions through which it passes. Most of them have predominantly rural populations and limited industrial development.

Land ownership and the use of land is an important part of the social economy along the highway rout, as well as Montenegro as whole. The majority of the population in the communities along the rout relies on the land for subsistence, and it provides an integral part of their income if not the majority in many cases. The land is used for three main productive activities: crops/fruit/vegetable cultivation, livestock raising/grazing, timber harvesting and wood cutting. In general people use state land for pasture and for timber harvesting and woodcutting, and own the land they use for crop/fruit/vegetable cultivation. State land is used under a lease agreement or sometimes without formal permission. The average amount of land owned or used per household is almost one hectare. This includes: backyard gardens, summer plots (not attached to the house, largest piece of land owned by any one household – mainly used for vegetables), small vegetable plots (close to the house), collectively owned farm land (far from the house), privately-owned farm land (very small percentage). In general, vegetables are the most widespread type of crops cultivated, followed by herbs and fruit. However, the municipalities differ significantly in terms of what crops/fruit/vegetable are cultivated, based mainly on climatic and geographic conditions along the route. The land of the present road and, to great extent, the land needed for the widening belongs to the Montenegrin state territories. But for some of the new bypasses and alternative routs there is a need of expropriation and/or buying-out and compensation procedure.

At current preliminary environmental assessment stage, it is only possible to answer the general scoping questions on whether the project results in social changes, for example, in demography, traditional lifestyles, employment etc., which are indicated in the Scoping Check-list (see Appendix 11). The preliminary analysis of the possible socio-economic risks and impacts is also presented in the Section 6 of this report.

At the later stage, for the full-scale environmental and social impact assessment (ESIA), a socio-economic survey will/shall be undertaken in all the “highway affected communities” within the zone of influence of construction and operation (2-5 or more km - to be determined on the basis of previous or EU experience). The data will/shall be collected in a format that could be easily transferred to a database and GIS for later analysis using SPSS (standard specialist software), and mapping of attitudes and impacts to cover the following main topics:

- population and demographics
- labour and livelihoods
- infrastructure, resources and services
- culture, local administration, decision making and planning
- attitudes and perceptions.

Appendix 8: Cultural Heritage and Archaeology

Montenegro, a country of contrasts - of mild Mediterranean and a severe mountainous climate, fruitful plains and river valleys, and high and arid mountains - on its rather small surface area of 13.812 km^2, inherits cultural heritage originating from the time of creation of the first human communities until present. Privileged to be situated on the boundary of two large civilisations - eastern and western and three great religions - Orthodox, Catholic and Islamic, numerous known and unknown builders, painters and carvers, masters of sophisticated crafts, writers, transcribes and typographers, were leaving here the masterpieces of their hands and their spirit, sublimated nowadays into a wealthy cultural heritage.

Responsible for cultural heritage and archaeology is Republic Institute for Protection of Cultural Monuments with mission to work on finding, studying, collecting and conservation of cultural monuments and natural rarities of Montenegro. Versatile businesses on conservation of monuments and natural heritage lead to separation of these activities and establishment of Institute for Nature Protection. Internal organisation of the Institute has been implemented through work of organisational units (centre, departments and ateliers). Business on investigation, collecting, keeping and treatment of documentation is carried out by the Centre for Research and Documentation, whereas the activities of design, inspection and implementation of the works on the terrain take place through the Department for Protection of Civil Engineering Heritage.

All endeavours of the Republic of Montenegro to define its own concept of cultural policy during ultimate decades of 20th century did not give expected results. Montenegro did not have, neither has it today, a strategic document of that kind. Until ten years ago, Montenegro did not have relevant institutions either, that is Ministry of Culture, whose task would have been to conceive a strategy or programme and action plan for the cultural development of the country. Therefore, cultural policy was dealing with daily issues, in an uncontrolled manner and without transparency, in both, decision-making process and distribution of financial resources.

The new National Report on Cultural Policy points out inevitability of replacing present, mainly outdated, legal regulation with a new one, which would be adjusted according to the international standards and rules of the Council of Europe, European Union and World Trade Organization. Concerning the fact that numerous legislation are indirectly related to the culture, it is clearly visible from the report that the national cultural programmes, both short-term and long-term, must supervene strategic documents of the Government and that it is required by them (economic development strategy, urban plan, national program for higher education, financial and fiscal policy, etc).

In the field of protection and valorisation of the cultural heritage applicable Laws are the following: Law on Protection of Cultural Monuments (1991), Law on Museum Activity (1977 and 1989), Law on Library Activity (1977 and 1989), Law on Archive Activity (1991 and 1994), Law on Reconstruction and Revitalisation of Old Cities Damaged by the Earthquake on 15 April, 1979 (1984 and 1986), Law on Renewal of Monuments Holdings of Kotor (1991), and Law on Monuments, Memorial sites, Historic Events and Persons (1971, 1972 and 1988).

Protection of Cultural Monuments

Historic monuments are remaining structures that owing to aesthetic qualities, association with significant events or people, or through great age alone represent a significant and irreplaceable historic resource. Monuments, in addition to being of interest for art historical study, may also be highly visible and well known, symbolising the importance of past events and possibly historic persons to the general public. The value of an important historic monument is closely attached to its specific location and setting, and to the surrounding landscape. Unlike archaeological sites, it is very rare that an historic monument can be moved or altered without substantial loss of its scholarly and public value. Avoidance and direct protection are almost always preferred for historic monuments

The conditions for proper, modern and, according to international principles, standardised way of protection of monuments heritage in Montenegro were created only after the Second World War. Protection of cultural heritage was put on a solid legal basis and its care was given to Institute for Protection and Scientific Research of Cultural Monuments and Natural Rarities, Central Registry of Protected Cultural Monuments was introduced, and it contained all basic data about protected monuments.

In the basic plans and programs, long term or annual ones, the main program orientation of activities of the protection of cultural monuments is based on two elements - administrative norms and documentation. Protected cultural monuments in Montenegro are classified in three categories:

- I - Monuments of Special Importance;
- II- Monuments of High Importance;
- III – Important Monuments.

Local authorities should have an important role in protection of cultural monuments; since protected monuments are geographically situated in territories under the jurisdiction of local authorities. Previous experience shows that local authorities relies upon republic institutions (Institutes) when it comes to the protection of cultural monuments, and therefore their role is inadequate to the real needs. That is very important for those local authorities, which are supervising protected urban zones and historical sites.

However, based on the Law on Local Self-government from 2003, municipalities are obliged to provide necessary conditions and take care for protection of cultural monuments and memorial sites of local importance. Based on the Law on Protection of Cultural Monuments from 1991, in terms of protection of cultural heritage, municipalities are obliged to take care, maintain and use, and protect monuments from damaging impact of nature and men activities, to make them publicly available, bear the costs of regular maintenance of cultural monuments.

At the same time, with adoption of town planning, municipalities are obliged to obtain opinion from the Republic Institute for Protection of Cultural Monuments by reason of protection and preservation of urban or historical character or environmental ensemble of old towns and settlements. It is also stipulated by the Law that for carrying out construction works, which might cause changes on the cultural monuments, a prior licence from the Republic Institute must be obtained.

Protection of Natural Property

In the period after the Second World War protection of nature in Montenegro was carrying out in several phases, through which it was raised an awareness that effective protection could not be carried out only by legal protection of plant and animal species, but whole areas needed to be protected, such as those that were designated as natural parks in 1952 (Lovcen, Biogradska Gora and Durmitor). The protection of natural property became even more important after designation of Montenegro as Ecological State by the Parliament in 1991. Today, these issues are regulated in certain parts by: the Law on Protection of Nature, Law on National Parks, Law on Freshwater Fishing, Law on Maritime Assets; Hunting Law, Law on Town Planning, etc.

Montenegro has also a public enterprise called National Parks of Montenegro, which is responsible for four national parks: Biogradska gora, Durmitor, Skadar Lake and Lovcen.

Protection of nature is under the competence of the Ministry of Culture, although with forming of the Ministry for Protection of Environment (now it is a sector in the Ministry of Town Planning) during '90s, large part of responsibilities was delegated to this Ministry. Unfavourable situation in human resources in institutions dealing with the protection of nature, as well as scarce financial resources allocated for this area, significantly influence efficiency of implementation of plans, programs and protection measures.

There is a significant number of NGOs involved in nature protection activities in Montenegro on local, regional, republic and international level.

Republic Institute for Protection of Nature, National Parks and Natural History Museum in Podgorica own relatively good and modern equipment necessary for the process of inventorying, preparation and storage of natural and other materials. The role of the State in development of activities of nature protection is reflected in attempts to find adequate ways of financing, which, having in mind continuous economic difficulties, remains to be an unsolvable problem, especially when it comes to national parks.

Local authorities should have more important role in the protection of nature, since protected natural objects are located inside the territories of one or more municipalities. The more active role signifies that local authorities, with more responsibility and determination through its secretariats for town planning and construction inspections, should provide legal implementation and respect of adopted planned documents.

In the period of founding the activities related to the protection, up to the disintegration of the former Yugoslavia, Republic Institute for Protection of Nature and institutions for nature preservation had relatively intensive international cooperation. Cooperation was made through the Yugoslav Commission for Cooperation with UNESCO on the occasion of inclusion the National Park Durmitor, canyon of river Tara, and Kotor and Risan Bay on the list of international and worldwide important objects for the protection of natural and cultural heritage, as well as with inclusion of Skadar lake on Ramsar List (Ramsar bureau). Cooperation is also established with EUROPAEC federation, World Commission for Protected Areas, World Organization for Protection of Nature and other organisations and ecological associations.

Archaeology

Interest for archaeology in Montenegro began in the second half of the 19th century, when according to the decision of Prince Nikola I Petrovic Njegos, had started the archaeological researches of important Roman city of Duklja (Doclea) near Podgorica.

The Centre for Archaeological research was formed on the republic level with the aim to replace previous practice of disorganised, scattered and partial approach in performing archaeological research to more organised and planned one. Although it operates according to the Law on Museums, Law on Protection of Cultural Monuments, and Code of Conditions and Ways of Performing Archaeological Excavation and Research, the Centre discharged from its authority a part of work of museum character (collecting, preserving, and exhibiting the archaeological material). It would be necessary to bring a regulation, which would regulate and prevent numerous problems and misunderstanding in overlapping of competencies of the Centre and municipal museums containing archaeological collections and performing archaeological researches.

Archaeological resources consist of surface and near-surface artefacts and related materials in a spatial and stratigraphic context, which constitute a scientific record of the past cultures that created them. Where no contemporary written records of a culture exist, archaeological remains may constitute the only extant record of that culture. Without necessary knowledge and planning, ground-disturbing projects such as the proposed highway have the potential to damage archaeological sites and artefacts, thereby diminishing scientific and cultural resources that are a part of the cultural patrimony. Archaeological sites are considered to be an important and irreplaceable aspect of Montenegrin's cultural patrimony. Although heritage management principles always favour protection of archaeological sites by avoidance, such sites can often be rescued by scientific excavation, in which case a ground disturbing project may go forward with limited adverse impact to the resource.

The nearest known archaeological site to the foreseen corridor is Doclea, located in the vicinity of Podgorica town. Doclea is the most significant and the largest urban centre created in the period of Roman domination in Montenegro. The town was founded in the first decade of the 1st century AD. It is situated on the plateau elevating on the very mouth of the River Zeta into the Moraca.

Archaeological investigations of Doclea were initiated by the end of the 19th century and were continued from 1954 to 1964 and again in 1998. The highway corridor runs along Doclea and it covers a part of the place named Vranjske njive where the so called western necropolis of this antique city is located. Recently, probing excavations have been conducted.

Also the Bar-Boljare highway corridor runs along the Monastery Djurdjevi Stupovi, situated near the Municipality of Berane. The fact requires adequate caution. The same can be said for a place called Dolac, where the traces of the Roman military camp - castrum were discovered long ago, then a place called Lušci where the prehistoric tumulues were found as well as for many other locations in the Lim River valley that have not been dicovered yet but are presumed to exist.

The archaeological resource list should be used by project engineering staff to create corridor re-routes, avoiding potential impacts to the largest and most obvious known sites. Avoidance of monuments is a key consideration in route selection.

Potential project impacts, methodology, remedial measures

Potential project impacts to archaeological sites and monuments differ substantially. For archaeological sites the concern is direct physical impact on fragile subsurface resources from earthmoving equipment and heavy vehicle transit. For monuments the immediate concerns are accidental vehicle impacts, damage to the surrounding landscape setting, destabilisation and impact from continuous heavy vehicle passage or use of high explosives.

Monuments are also prone to secondary impacts such as those caused by temporary or permanent increases in population, sometimes referred to as induced development. Such impacts may include unauthorised and inappropriate occupation of monuments, robbing of monuments for building materials, and degrading of the monuments' surroundings from a variety of unplanned uses. Archaeological resources are less prone to such impacts because of their underground location.

In addition to the difference in impact types just noted, there is another important difference between archaeological sites and monuments.

- Archaeological sites are most often underground and are therefore difficult to identify. Further, those surface indications of archaeological sites that do exist are not always a reliable measure of the extent or importance of subsurface resources. Avoidance of archaeological remains that are discernible from the surface, large burial mounds for example, is good practice but does not ensure that less obvious subsurface remains will not be adversely affected
- Historic monuments are by definition above ground and are therefore easy to identify in project planning studies Their evaluation is also more straight-forward because subsurface investigation is seldom required. Visibility and accessibility make monuments protection studies less elaborate and less time-consuming. Ease of access is also a cause for the most common impacts noted above, requiring preservation solutions that operate to protect against impacts that result from continuous and long-term public access

Also, in the case of archaeological sites, there are further potential impacts associated with late finds. This is because any baseline data cannot include previously unreported subsurface sites. In this latter case of unreported finds, the historical context is particularly important for defining the types of impacts that might be expected. It thus provides a general background on events of scientific and public significance of each of the periods.

The fact that the planned highway corridors mainly pass through the river valleys, as well as through the fields and hills, actually going the same directions which were, in previous times starting from the old age, used as the basic communication, implies a logical expectation to find archaeological sites from different times and of different character.
Thus, apart from the already mentioned *Potential project impacts, methodology, remedial measures* by which “the monuments should be identified through published literature sources supplemented by the unpublished but validated field survey data”, it is necessary to emphasise that there are potential sites that can be identified only on the basis of the systematic recognition of the appropriate area. The methodology of recognising that is

being used in these cases as well as the results gained by the recognising, will provide necessary answers to almost all the questions related to the further protection of the sites, together with the proposed measures for protection or systematic excavations. If required due to significance of a site there will be a proposal for alignment relocation.

The highway E-75 can exemplify the systematic recognition in the area of Serbia. There on the corridor line 192 archaeological sites were found, out of which 25 were examined because they were discovered on the road alignment. A similar situation happened in Slovenia, where through the methodology of recognition 100 archaeological sites were discovered.

Out of these reasons, the need for conducting systematic archaeological recognitions of the highway corridor should be especially emphasised. All the relevant institutions from Montenegro starting from the Republic and Regional Centres for Protection of Cultural Monuments, Montenegrin Archaeological Centre to all the local museums which are located at the area where this corridor passes through, should participate. This is one of the primary conditions to reduce or even to avoid eventual misunderstandings or additional expenses which could appear, due to discovery of an archaeological site during the construction work.

The monuments shall be identified through published literature sources supplemented by unpublished but validated field survey data. Literature review process and consultation with various experts shall confirm that the proposed route alternatives are the best option in terms of limiting possible impacts on monuments. Moreover, the route can be further investigated in the course of project. Additional investigation will include recording of precise monument locations, further technical description and study of selected monuments, local inquiry and record searches regarding selected monuments.

Individual monuments typically have protection zones of 50m in radius while protection zones of monastery complexes and castles vary from 150m to 250m in radius, which also ensures protection of the adjacent natural landscapes and the visual setting (view shed) of the protected monument. Protection and landscape zones of monuments are specific for each feature and can be accurately indicated once a final option of the route is defined. It should be noted that some monuments may have unidentified archaeological resources associated with them that could require protection as well. In exceptional cases, if it proves impossible for an alignment to avoid a cultural site of value, salvage excavation should be undertaken. Relocating artefacts or ruins from a site is a last alternative and can be expensive.

Commonly-utilized mitigation measures include excavation, erosion control, restoration of structural elements, rerouting of traffic, and site mapping. Other measures that may be required on occasion are structural stabilization, soil and rock stabilization, control of groundwater levels, vegetative stabilization, control of flora and fauna, and site surveillance. A site management plan will be required. It should identify conservation actions required and, where necessary, provide guidance on other measures such as salvage or relocation. It should establish monitoring and evaluation procedures and a schedule of operations and budget. Particularly important is the inclusion in the plan of specific contract clauses to define responsibilities of companies and workers who discover new sites or artefacts, or who damage known sites. These chance find procedures, all too often, are given inadequate attention. At the very least, they should identify the authorities to whom the company or individual should report, the format for such reporting, the waiting period required before work can be resumed, and measures for interim care of the found items.

Dialogue between the road department and the ministry in charge of cultural heritage needs to be frequent and continuous to avoid situations which either damage the cultural site or delay the road project. In some countries, road projects have been delayed for years because of a lack of procedures governing cultural sites, or lack of funding for the protection, study, or restoration of these sites. In practice, a cooperative relationship between road builders and archaeological specialists is essential. If cultural heritage requirements are too rigid, some site discoveries may be hidden or destroyed to avoid compliance. If, however, road workers fail to allow for heritage sites, substantial delays and cost increases can occur.

All this suggests that if the mitigation plan is to be effective, in most countries it will have to include proposals for strengthening the legal framework and the institutional capacities for the on-going management of the cultural heritage in question. Thus, when the legislation is being examined in order to identify relevant information pertaining to the sites in question, an assessment of the effectiveness of that legislation and of supportive institutional capacity should also be conducted.

Examples of compensatory actions may be

- tourist development of the site where heritage elements are conserved and showcased,
  and
- classification of the site as protected under appropriate legislation. For sites of international quality, UNESCO listing as a World Heritage Site may be proposed.

Social Importance of the Cultural Heritage Issue

The protection of heritage resources from potential project impacts is a straightforward matter of planning, and of implementing practical measures of design and construction. The public value placed on heritage resources, however, is a subjective and culturally variable matter. It is therefore of interest to briefly consider the place of history and the past in Montenegrin society.

A concern for national history and cultural heritage, a common theme in all societies, is unusually strong in Montenegro and shows no sign of diminishing. Montenegrins, more than most, define their identity through a long and well-remembered past.

The Montenegrin sensitivity to history and tradition may come in part from being a small nation in an area of frequent imperial involvement, and violent invasion, and from being a Christian nation in an area with numerous adjacent Moslem populations. High levels of interest in history and archaeology are typical of countries in the process of 'nation building.' An additional factor particularly applicable to prehistoric relics is the strong archaeological research tradition. Because the discovery and study of sites and monuments is often a by-product of project preservation measures, the highway project has the - potential to create positive impacts on Montenegrin society.

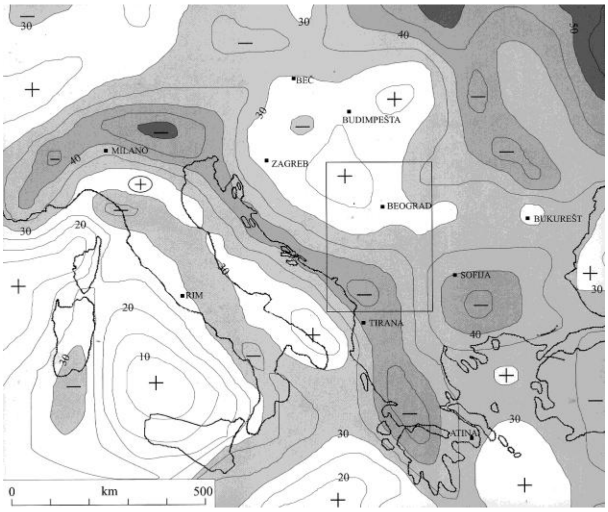
Appendix 9: Natural Risks

For the highway projects in Montenegro in general the natural risks are identified as earthquakes, erosion and landslides.

Gravity values and Seismology

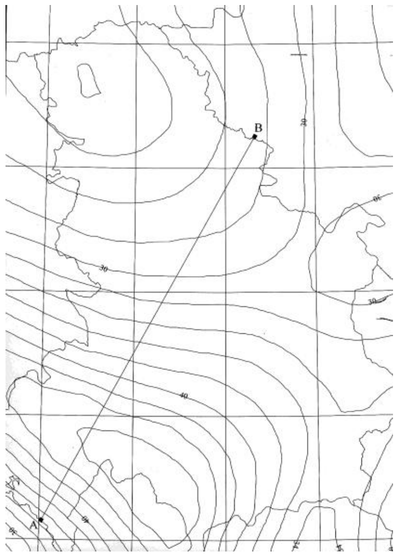
Montenegro has lowest gravity values in the region (approx. 110 mgal). The gravity minimum in Montenegro is result of great crust thickness in Dinarides. Anticlinoria and other geological uplifts, are marked by negative gravity anomalies. Hence, thickness of the crust is considerable in uplifted areas and reduced in depressed zones.

Increase of Bouguer values is toward northeast, with contours going parallel to Dinarides. From the other side, contours in the southern part of Serbia are in SW-NE direction, with a remarkable discontinuity along the line: Djakovica – Pristina – Dimitrovgrad. This discontinuity cuts the Dinaric complex in the area of the Albanian – Serbian border, where anomalies are perpendicular to Dinarides.



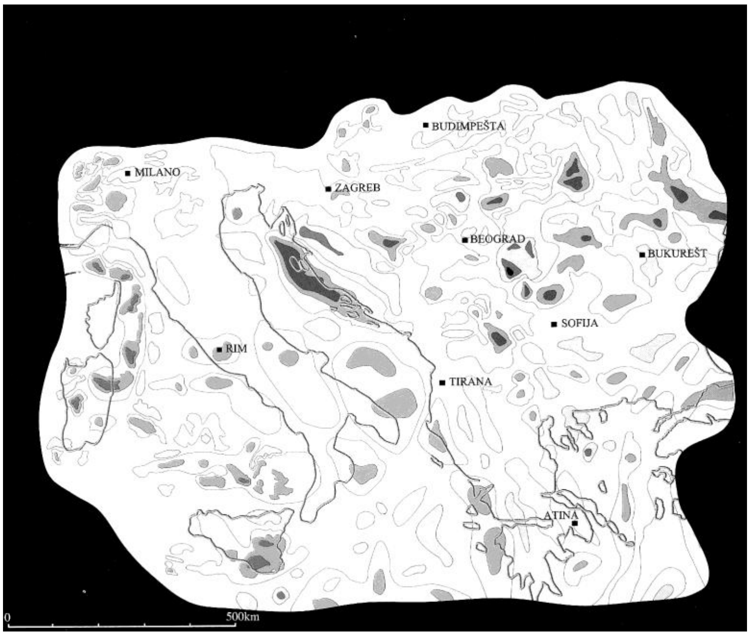
Bouguer gravity map of Serbia and Montenegro. The contour interval is 5 mgal (Geological Atlas of Serbia, 1997)

The map of Moho surface compiled on the basis of DSS (Deep Seismic Soundings) and calculations of the Crust's thickness according to three parameters: depth of Moho surface, Bouguer anomaly and altitude above the sea level. Shows maximum depth to Moho discontinuity is in Montenegro, 50 km north from Podgorica. Moho boundary gradually shallows to the northeast and in Pannonian basin amounts only about 20 km.



Map of Moho surface (Geological Atlas of Serbia, 1997)

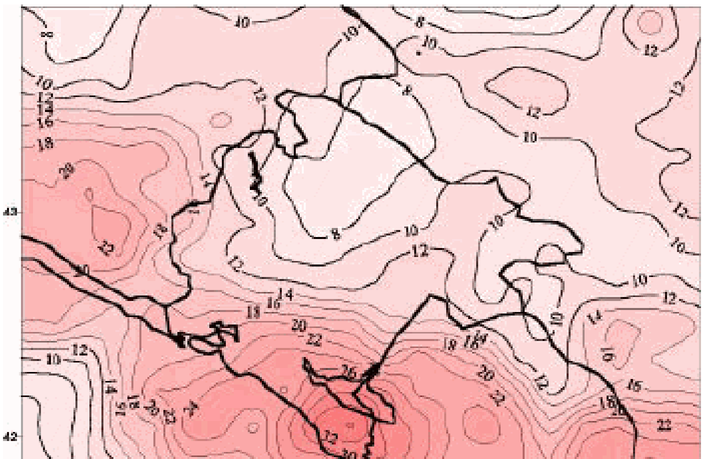
Complex geological interpretation of geomagnetic and gravity data is shown in the figure bellow. According to shape and position of geophysical anomalies and to geological data, regions with ultramafic and acidic intrusives are distinguished such as the areas with unique lithological characteristics, as carbonate rocks in Montenegro.



During the earthquake in 1979, liquefaction process was expressed at several localities of Adriatic coast in Montenegro and Skadar lake coast, causing intensive damages (destroying the “Fjord” hotel in Kotor, etc.). Generally, that area is defined as vulnerable to liquefaction.

At the territory of Balkans, the highest seismic activity is characteristic of Dinaridic seismogenous block (Montenegro and SW Serbia), with over 70% events. At the area of the block, disastrous earthquake in 1979 is famous of numerous victims and outstanding damages, initiating detailed complex geological and seismological investigations.

During the period 1983-1986, seismic regionalization, as well as detailed microzonation of all urban environments of the territory of Montenegro, was carried out. The strong earthquakes caused by intensive tectonic processes, predominantly occurring in the coastal part of the territory, produce destructive effects in the form of landslides, avalanches and soil liquefaction.



Seismic hazard of Montenegro for the return period of 200 years with maximum horizontal acceleration (expressed in % of g) and the probability of occurrence 70%)

Source: Seismological Observatory of Montenegro

Seismic activity at the Montenegro territory and neighbouring areas during XX century are distinguished by very large intensity. During this period at the

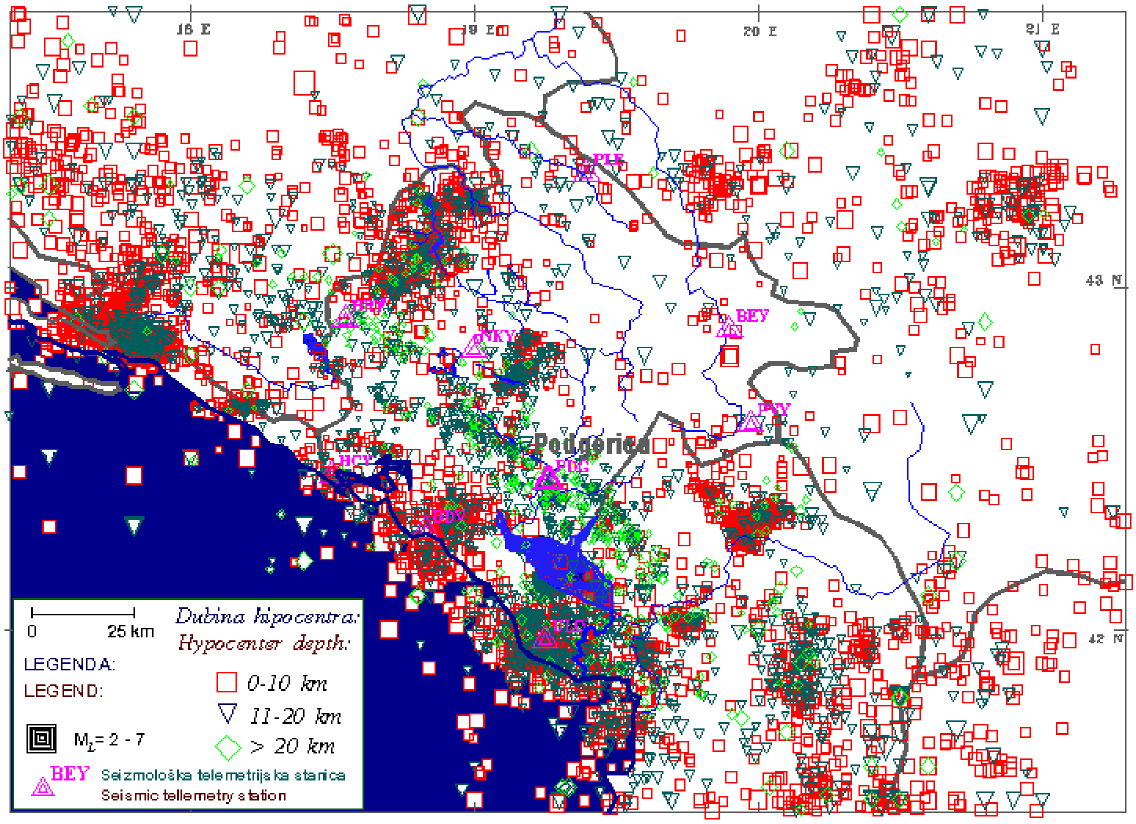
Montenegro occurred several thousand strong and very strong earthquakes. Some of them were characterized as destructive ones.

The earthquake of April 15, 1979, at 7:19 AM (local time), unfortunately belongs to the category of catastrophic. The magnitude of this earthquake was 7.0 Richter scale. The whole Montenegrin coastal area during this earthquake was shocked by the intensity of IX degree Mercaly scale. This earthquake took 101 lives in the Montenegro and 35 in Albania. Beside that, it was destroyed very huge part of the Montenegro hotel capacity, and also a great number of apartment buildings.

On the map of epicentres, it is presented all stronger recorded earthquakes (over 2.5 magnitude) occurred on the area of Montenegro and its vicinity during XX century. It is possible to make a conclusion that, practically, complete coastal area posses much higher seismic hazard comparing inland part not only at the Montenegro territory, but much broader region.

On the picture, using different colours, it is expressed the third dimension of the hypocentral parameter (the depth), so it can be recognized some deep seismoactive structure - as it is large tectonic trench which is placed in the Dinarides direction - beginning from northern Albania, via Podgorica in Montenegro, then Danilovgrad and Bratogost at the western part of Montenegro, and further - to the west in the Herzegovina (Republika Srpska). On the epicentral map this tectonic trench can be noticed by position of relatively deep hypocenters (green rhombs and dark blue triangles).

Also, on the map it is possible to notice at the north - western part of the Montenegro territory, effects of a pretty large seismic induced activity in the region of the artificial lake created by the dam "Piva" which is 220 meters high. The main part of the seismic activity in this region is connected with the oscillation of hydrostatic pressure of the reservoir water at the limestone masses in the basement, during the charging and discharging of the lake.



The epicenteral map for earthquakes in the Montenegro region during XX century

Source: Seismological Observatory of Montenegro

Erosion and landslides

Erosion and landslides are prevailing, contemporary engineering-geological process in the mountainous and hilly areas of the modernized road. Foot and side erosions are frequent in the region and stipulate significant separation of slopes. At the exposures and artificial slopes they are intensively weathered and settle down. On gentle slopes of hills and watersheds, argillite clays quickly loses their structure and form alluvial layer due to the influence of undergoing physical and chemical weathering, as well as precipitation and quick changes in temperature.

The relief is uneven, sometimes hilly, mainly separated by ravines and erosions in the lower part. Steepness of slopes varies. Mainly the hill sides are subject to mechanical weathering. Due to disturbance of structural links many macro cracks with circulating infiltration waters can be found in this zone. There are sections with significantly weathered bedrocks in the zone.

There are a landslide sections along the highway route. Depending on the direction of forces causing landslides, which may vary depending on seasons, the landslide body moves with different speed both in plan and by depth. The foot of the slope moves more slowly as compared with the top causing hardly compatible expansion-compression zones in the landslide and cracks. On some places those cracks lay on already existing system of cracks, stratifications and make situation more complicated. Cracks spread nearby the deformed section usually serve as main ways of waters circulation in the body of the landslide. These waters are easily drained and influence stability of the slope and the landslide activity.

Erosion usually takes place at the bottom of narrow gullies and along ravines, where deposits are washed off by temporary streams and taken down to the lower parts of the relief. At the rest of the sections the surface is washed-off by run-off waters.

Appendix 10: Mitigation Measures for Mining/Quarry Activity

The following environmental requirements should be proposed concerning extraction activities: Firstly, from an environmental point of view it would be desirable to use resources already being exploited, as this would prevent proliferation of extraction sites and make control and re-instatement more manageable.

If it is necessary to open new gravel extraction sites, investigations must be conducted in order to identify possible fossil deposits at a distance from active river beds. Extraction within these areas should first ensure that all re-usable surface materials are stockpiled for subsequent restoration purposes. The boundary of the extraction area should be clearly defined and, on the river side, a reserve bank should be maintained. Extraction depths would depend on the characteristics of the site and the mode of operation. Extraction of materials would be permitted below the current water table on condition that fuel oil and lubricants from the machinery do not come into contact with the water i.e. at depths of about 1 metre. Should use be made of a dragline, excavation could be made to a greater depth below the water table.

When extraction is approved from gravel bars within the existing river banks on the inside margins of meander curves, no gravel should be removed from within two metres of the upper water level at the time of extraction in order to protect the currently active river channel. The depth of material removed should not fall below the surface water level at the time of extraction and the existing river grade should be maintained. In such areas, extraction should not take place during periods of anticipated high river flows which could cause flooding during operations.

When extraction is in areas with less sensitive, shallower river flows, it might be permitted to remove gravel to the level of the existing river bed. The existing valley grade would be maintained and the operational area should be protected by a low 1 to 2 metre wide gravel bank.

In case of new-opening carrier site, the following recommendations should be implemented whatever the extraction site chosen:

- Installation of scrubbers and filters to cleanse the dust in crushing plant.
- Access must be via existing track ways and agreed with owners of the land crossed.
- In areas of natural vegetation near the river bank, care should be taken not to disturb mature trees.
- No plant or machinery should be left unattended at the extraction site overnight to minimise the possible impact caused by high flood levels. The existing flood protection bank or natural levee must be maintained.
- A decantation basin must be installed at the outlet of the crushing installation in order to trap the sediments before discharge of washing water into the watercourses.
- Vehicle access into the active river channel should not be permitted in order to minimise disturbance to the habitat and possible pollution with fuel oils and lubricants. Where access to sites is only possible by crossing the river, temporary culverts should be installed to alleviate possible pollution hazards.

- Upon completion of extraction activities, the site should be carefully levelled to form a grade consistent with that of the existing active river channel.

Where gravel extraction can be replaced by massive rock, the same requirements as for borrow pits apply to quarry rehabilitation. It should be emphasized that such extraction requires above all proper landscaping to hide the quarry or to integrate it in the overall landscape.

During quarries works execution, the contractor shall ensure: preservation of trees during piling of materials; spreading of stripped material to facilitate water percolation and allow natural vegetation growth; re-establishment of previous natural drainage flows; improvement of site appearance. When the works shall be completed, and at own expense, the contractor shall restore the environment around the worksite to its original state. The supervisor shall provide the contractor with a report confirming the restoration before acceptance of the works.

Appendix 11: Scoping Checklist

1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)?				
No.	**Questions to be considered in Scoping**	**Yes /No ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant?**
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes		Yes.
1.2	Clearance of existing land, vegetation and buildings?	Yes		Yes
1.3	Creation of new land uses?	Yes		Yes
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes		No
1.5	Construction works?	Yes		Yes
1.6	Demolition works?	Yes		No
1.7	Temporary sites used for construction works or housing of construction workers?	Yes		No
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes		Yes
1.9	Underground works including mining or tunnelling?	Yes		Yes
1.10	Reclamation works?	Yes		
1.11	Dredging?	Yes		No
1.12	Coastal structures eg seawalls, piers?	No		No
1.13	Offshore structures?	No		No
1.14	Production and manufacturing processes?	No		No
1.15	Facilities for storage of goods or materials?	Yes		Yes
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes		Possibly
1.17	Facilities for long term housing of operational workers?	No		No
1.18	New road, rail or sea traffic during construction or operation?	Yes		Yes
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes		Yes
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes		Yes
1.21	New or diverted transmission lines or pipelines?	Yes		No
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	Yes		Yes
1.23	Stream crossings?	Yes		Yes
1.24	Abstraction or transfers of water from ground or	No		No

	surface waters?			
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes		No
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes		Yes
1.27	Long term dismantling or decommissioning or restoration works?	Yes		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	Yes		
1.29	Influx of people to an area in either temporarily or permanently?	Yes		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?			

2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, <u>especially any resources which are non-renewable or in short supply?</u>

No.	Questions to be considered in Scoping	Yes /No ?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.1	Land especially undeveloped or agricultural land?	Yes		No
2.2	Water?	Yes		No
2.3	Minerals?			
2.4	Aggregates?	Yes		No
2.5	Forests and timber?	Yes		No
2.6	Energy including electricity and fuels?	Yes		Yes
2.7	Any other resources?			

3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?

3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes		No
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?	No		No
3.3	Will the project affect the welfare of people eg by changing living conditions?	Yes		No
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital	Yes		No

	patients, the elderly?			
3.5	Any other causes?			

4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes		Yes
4.2	Municipal waste (household and or commercial wastes)?	Yes		No
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes		No
4.4	Other industrial process wastes?			
4.5	Surplus product?			
4.6	Sewage sludge or other sludges from effluent treatment?	Yes		No
4.7	Construction or demolition wastes?	Yes		Yes
4.8	Redundant machinery or equipment?	Yes		No
4.9	Contaminated soils or other material?	Yes		No
4.10	Agricultural wastes?	No		No
4.11	Any other solid wastes?			

5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes		Yes
5.2	Emissions from production processes?	Yes		Yes
5.3	Emissions from materials handling including storage or transport?	Yes		Yes
5.4	Emissions from construction activities including plant and equipment?	Yes		Yes
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes		Yes
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (eg slash material, construction debris)?			
5.8	Emissions from any other sources?			

6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?

No.	Questions to be considered in Scoping	Yes /No/ ?	Which Characteristics of the Environment could be affected and how?	Is the effect likely to be significant? Why?
6.1	From operation of equipment (engines, crushers)?	Yes		Yes
6.2	From industrial or similar processes?	Yes		No
6.3	From construction or demolition?	Yes		Yes
6.4	From blasting or piling?	Yes		No
6.5	From construction or operational traffic?	Yes		Yes
6.6	From lighting or cooling systems?	Yes		Yes
6.7	From sources of electromagnetic radiation (effects on nearby sensitive equipment as well as people)?	No		No
6.8	From any other sources?			

7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes		Yes
7.2	From discharge of sewage or other effluents (treated or untreated) to water or the land?	Yes		Yes
7.3	By deposing of pollutants emitted to air, land, water?	No		
7.4	From any other sources?			
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	Yes		Yes

8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires, storage, handling, use or production of hazardous or toxic substances?	Yes		No
8.2	From events beyond normal environmental protection (failure of pollution control systems)?	Yes		No
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (floods, earthquakes,)?	Yes		No

9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, social groups	Yes		No

	etc?			
9.2	By resettlement of people or demolition of homes or communities or community facilities (schools, hospitals)?	Yes		No
9.3	Through in-migration of new residents or creation of new communities?	Yes		No
9.4	By placing increased demands on local facilities or services eg housing, education, health?	No		No
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes		Yes
9.6	Any other causes?			

10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment (more housing, new roads, , etc?)	Yes		Yes
10.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment (roads, power supply, waste or waste water treatment,) housing development,?	Yes		Yes
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	Yes		Yes
10.4	Will the project set a precedent for later developments?			
10.5	Will the project have cumulative effects due to proximity to other projects with similar effects?			

TECHNICAL MEMORANDUM NO 10B

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE ADRIATIC-IONIAN HIGHWAY (APPENDICES)

Appendix 1: Climate Conditions

Apart from geographic latitude and sea level, the climate in Montenegro is also determined by presence of large water areas (the Adriatic Sea, Skadar Lake), deep indentation by the sea into the coastline (Bay of Kotor), moderately high mountain hinterland near the coastline (Orjen, Lovcen and Rumija Mountains), Field of Ulcinj in the hindermost south-eastern part and by Durmitor, Bjelasica and Prokletije mountain massifs.

Southern part of Montenegro and Zetsko-Bjelopavlicka Valley are located in the Mediterranean climate region (long, hot and dry summers and relatively mild and rainy winters). Towns which are located in valleys like Podgorica and Danilovgrad, have lower temperatures in January than coastal towns situated at relatively same geographic latitude, while the temperature during the summer is somewhat higher. The warmest summers in our country are in the Zeta Plain, because of high serenity during the summer, which makes a land and air very warm. Podgorica is a town with highest mean monthly temperatures during the summer and with largest average number of tropical days. The lowest mean annual temperature is in Zabljak (Tara River basin).

Large karst valleys have more severe climate, whose bottoms are deep under the surrounding mountain peaks and which are 40 to 80 km far from the Adriatic. Karst valleys that are very close to the Adriatic (about 20km) but are separated from the sea by relatively high mountains also have severe climate. During the winter, a cold air is subsided in these valleys, going down the nearby mountains. During the summer, however, the bottoms of the Karst valleys get very warm, leading to increase of annual temperature fluctuation. During the winter, mainly in anticyclonic situations, low-level temperature inversions may occur in these Karst valleys.

Map of stations of Hydrological and Metrological service of Montenegro

Central and Northern part of Montenegro has certain characteristics of mountain climate, with apparent influence of the Mediterranean Sea, which is reflected in precipitation

regime and in higher mean temperature of the coldest month. In the ultimate north of Montenegro, the climate is continental, which is, apart from large daily and annual temperature variations, characterized by small annual quantity of precipitation, which is equitably distributed per month. In mountainous areas in the north of the Republic, summer is relatively cold and humid, and winter is long and severe, with frequent frosts and low temperatures, which rapidly decrease by the height.

The biggest mean annual value of the cloudiness is in the mountainous areas, about 55-66% in average, and then it decreases towards the seaside being 45-35% in average. The lowest cloudiness of the year is in July and in August, and the highest is in December. The lowest oscillation of the cloudiness is in the mountainous areas, while it is much bigger at the seaside. Duration of the sunshine is in opposite proportion to the cloudiness. At the seaside, duration of the insolation is 2750 hours in average, while in mountainous areas far from the seaside, average values are 1550-1900 hours. In all areas, July and August have 4 to 5 times longer insolation than winter months.

The rainiest area in Europe is mountainous area above the Kotor Bay (Krivosije). In that area annual precipitation is 4600 mm, i.e. at the steep slopes of the Orjen in the place of Crkvice (940m) average annual precipitation is 5000 mm, which is European maximum precipitation, and in the peak years it is almost 7000 l/m2, especially with precipitation of the orographic character. Central and northern parts of the Republic were hit with floods during last century (e.g. 1963 and 1979). That area, where there is upper watercourse of the Tara and the Lim, is characterized with especially big medium annual quantity of precipitation of about 1600-2000 mm per year. Years with biggest floods in these areas are 1963 and 1979, and then, the end of 1999 and first half of 2000.

Beside orographic effect, cyclone of Genoa has a very strong influence on the climate in Montenegro, which original area is suburb of the bay of Genoa and Siberian anticyclone, with the centre in north-east Russia. Under their influence, high grades of atmospheric pressure and temperatures are established in the whole Balkans, and especially in the territory of Montenegro. When the cyclone of Genoa is active, it doesn’t stay for long, precipitation is intensive and they don’t last many days. Precipitation of long duration happens when there is a strong high-altitude SW streaming within a cyclone above the Western Europe. In the whole Adriatic, there is the air depression during winter season. It is, actually, a series of depressions, moving from the west to the south-east and east and they cover southern areas. These depressions cause maximum precipitation in winter at the seaside. Areas with modified Mediterranean pluviographic regime of precipitation have mainly autumn and winter precipitation with its maximum in late autumn, from October to December, while summer is dry.

In south-west areas of Montenegro, there are about 10% of annual quantities of precipitation in summer-time. In so-called south-Adriatic pluviometric regime of precipitation, difference between the rainiest and the driest month is about 11,5%. The rainiest month is November and the driest is July. High mountains, beside quite big quantities of precipitation, also have more days with precipitation, than it is the case with the surrounding valleys and plains. In mountainous areas it’s snowing more in spring than in autumn, because autumn is quite warmer than spring. Predominant winds are consequence of the general disposition of the atmospheric pressure in different months.
Regarding barometric depression at the Adriatic and in the east Mediterranean and high atmospheric pressure in the east and north-east Balkans, in winter months there are dominating winds from north-east square. Characteristic winds are bora and sirocco. Bora is cascading wind of north and of north-east direction. It is the most frequent and strongest

in cold half of the year, in winter, and it is present along all the eastern coast of the Adriatic. It blows when there is area of high air pressure north of the Dinaric Alps, and a cyclone is in the western part of the Mediterranean or the Adriatic Sea. At such horizontal grade of the air pressure, cold air from higher latitude passes over the Dinaric Alps and it swoops down the coast by high speed, thus causing fall of the temperature and of humidity, except in the case of the cyclonic or dark bora, when the weather is cloudy and rainy. One of the main characteristics of bora is its huge strength and motion. Its speed is between 16 and 33 m/s. It's the strongest in the coastal parts, where the mountains vertically dominate it (the coast) and where on the mountainous cliffs there are gorges where the air streaming lines are gathered. Strength of bora decreases very quickly towards open sea, so that it doesn't make breakers. South wind or sirocco, blows in bigger part of the Mediterranean with less or bigger differences in physical characteristics and direction.

It starts blowing when the cyclone moves across the Mediterranean or the Adriatic Sea, and when there is high pressure above North Africa. It blows in front part of the cyclone from south to south-east direction. Due to such circulation, it often includes dry and warm air from North Africa, which contains significant quantities of dust. When in the south stream it comes to the coast, that air, due to the orographic effect, causes cloudy and rainy weather there, as well as on the slopes of the coastal mountains. Biggest number of the precipitation which falls in these areas in colder part of the year is caused by this streaming. Biggest quantity of precipitation in Europe – in Crkvice, can be explained by its influence. When the air originating from the North Africa comes together with sirocco, there are coloured rains falling from time to time – of yellowish or reddish colour. Since it's often very strong and since it covers big surface of the sea, sirocco causes breakers, from the open sea towards the coast. Strength and frequency of sirocco increase from the north to the south part of the seaside. Last decade of 20th century was warmer regarding many years measuring (from 1949 up to now).

The warmest year in the territory of Montenegro was 2003. Reason for heat waves was strong field of high pressure above Western Europe within clear ridge of high pressure in high-altitude circulation of large scales. Heated air from the south reinforced the strength and keeping of the heat wave. Almost the whole radiation of the sun was directed to the heating, because both vegetation and soil were dry. Such 'a blocking elevation', which is kept for several days, is not rarity for Europe in summer-time. The highest recent maximum temperature was measured in Podgorica in August 2003, which was 42C, and there was continuous period of 100 tropical days then (days with maximum temperature higher than or as of 30C).

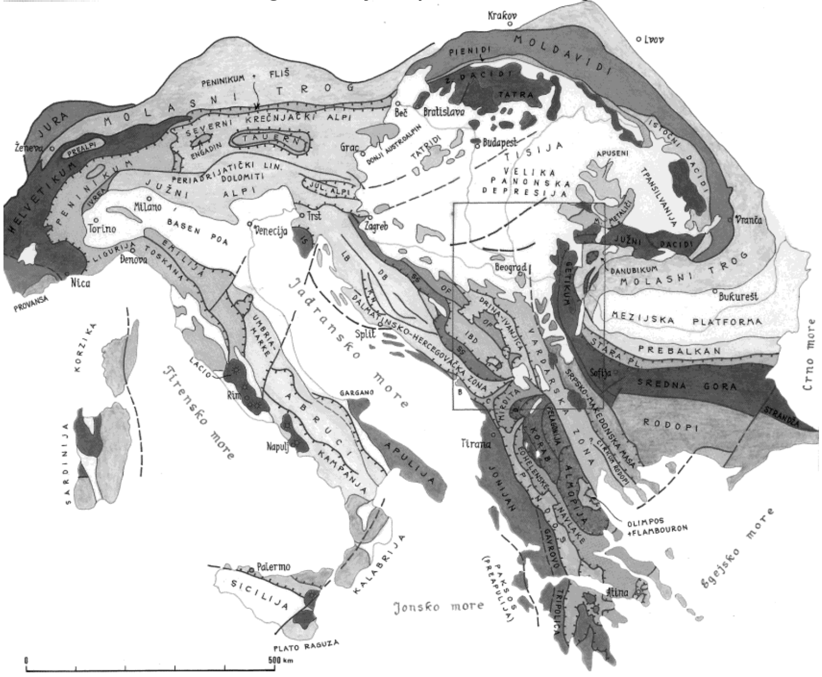
Some characteristics such as max and min temperatures, RR and snow measured are given for three locations along Adriatic-Ionian highway route in the table below.

Station	Tmax (^oC)	Tmin (^oC)	RR24-max (mm)	Snow(cm)
Grahovo	37.2	-26.8	390.4	170
Cetinje	38.9	-22.8	428.3	205
Danilovgrad	42.8	-14.6	250	53

Source: Hydrological and Metrological service of Montenegro

Appendix 2: Geomorphology, Soils, Engineering-Geological Characteristics

Geological structure of the territory of Montenegro is result of influence of several factors, first of all: 1. sedimentation and geodynamics within this part of Mediterranean geosyncline; 2. underthrusting of African tectonic plate under Eurasian one; 3. intensive neotectonic movements; 4. forming of very expressed exogenous relief.



Geological map of Montenegro with adjacent regions (Geological Atlas of Serbia, 1997)

That is why the project area is characterized not only by different lithostratigraphic content and complex tectonic structure, but also by unique geomorphologic, engineering-geological, hydro geological and seismotectonic conditions.

At the northern Mediterranean, the lateral strain from the contact zone between African and Eurasian plate are transferred through the Adriatic micro-plate to the Dinarides – in the NE direction (Glavatovic, 2004). Strain concentration within lithosphere of Dinarides is performed by complex process of the segments moving through the Adriatic micro-plate (below the sediment complex, covering silicate and basalt rocks and the rest of lithosphere, in the direction of subducting Apennine plate – to the Tyrrhenian Sea).

Strong lateral stresses are also produced by thick sediment complex of Adriatic plate (up to the level of Triassic clastite), which is resistant to the horizontal deformation in the Adriatic region, simultaneously generating strong tectonic processes in the outer and inner Dinarides. As a result, horst and graben structures are formed, as well as mountain massifs, tectonic depressions, trenches, nappes and faults (normal, reverse and transform). System of normal and reverse fault structures are predominantly oriented parallel to Dinarides. These faults are mostly with regional dimensions, with dipping angle toward land 20-50 degrees. Transcurent faults are mostly generated perpendicularly to the previous ones, with small dimensions and steep slope of the fault plane.

Dinarides

Montenegro belongs to the Dinarides mountain chain where Palaeozoic crystalline schist and Middle- and Upper Triassic limestone are distinguished. The main part of Montenegro and is made of limestone. Limestone formations are covered by diabase-chert ones. The formation is characterized by greater or smaller overtroughs of magmatic rocks and ultramaphites. Referring to the structure, the following two areas are distinguished: area of the Earth's crust compression (wide coastal belt in Montenegro, with numerous napes) and the area of the Earth's crust opening (the rest part, with numerous horsts and trenches, as well as confining neotectonic faults).

In the Dinarides the predominant topographic type is karst in terrains of carbonate rocks . Karst forms in exposed limestones are particularly well developed in Montenegro. Prokletije, Durmitor and other highest mountains have preserved relics of a glacial topography; cirques, troughs, moraines, formed during the Pleistocene. Snow and frost actions have produced periglacial topographic features: polygonal ground, felsenmeers (rock seas), solifluction teracettes, lobes, etc. above timberline on the mountains. The Dinarides consist predominantly of crushed and karstified Mesozoic limestones. This world famous karst region greatly differs in hydrogeology and geomorphology from the neighbouring regions. Groundwater flows through system of karst channels and fractures discharging by strong resurgence.

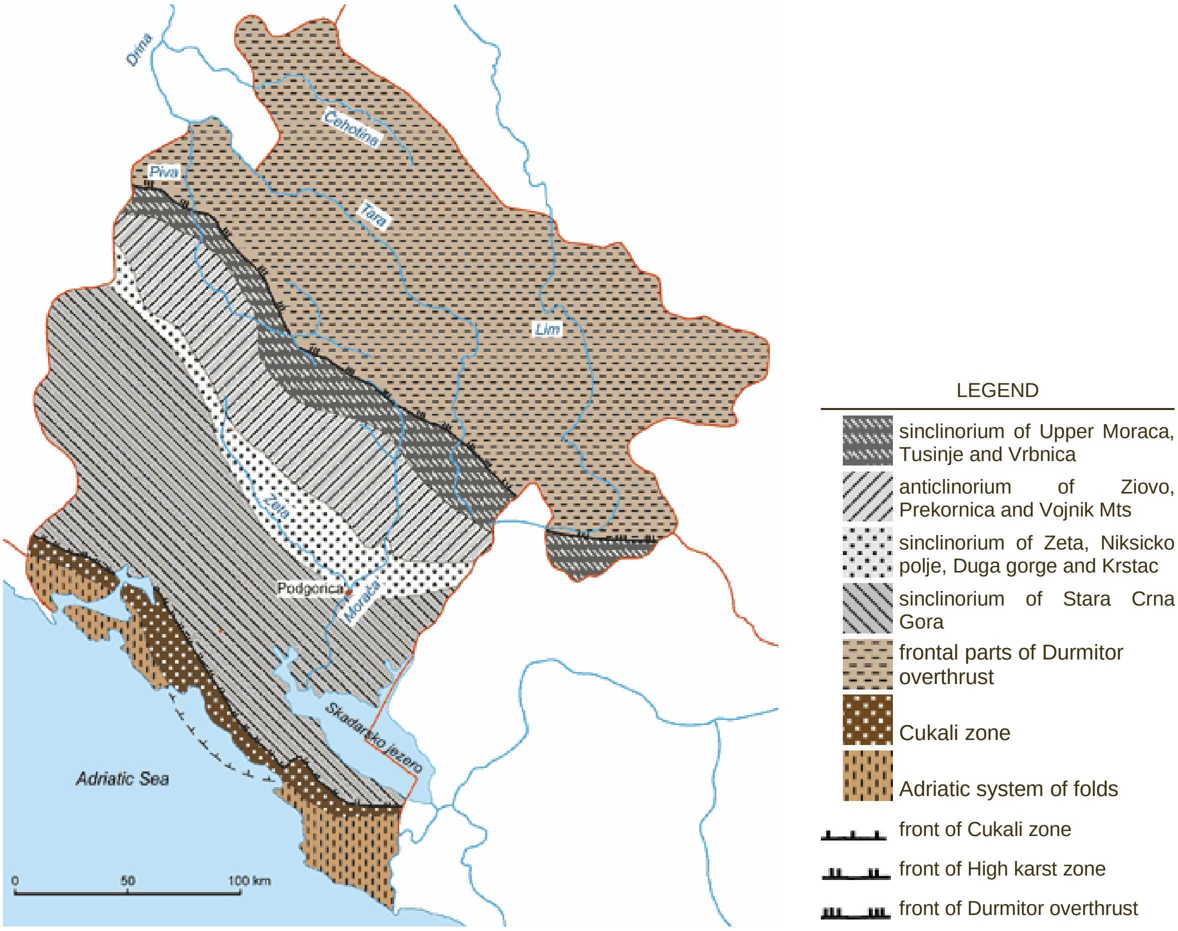
Karst of Montenegro

Over two-thirds of the territory of Montenegro belongs to the karst of south-eastern Dinarides. The karst in Montenegro differs along the territory, by its distribution and position, its position in relation to the non-karstic terrain and the Adriatic sea, and by its occurrences (various forms and dimensions) and processes. This comes as a consequence of diverse sedimentation conditions, as well as different geologic evolution of individual parts of the Dinaric geosyncline (both in space and time). A segment of the Dinaric geosyncline which forms the terrain of Montenegro, is predominantly (on two thirds of the territory) built up of limestone and dolomite sediments (from Devonian; to the nowadays). Since the end of Devonian period (ending phase of Caledonian orogeny), it has been uplifted and lowered by numerous phases of Hercynian and Alpine orogeny. Due to epeirogenic and orogenic movements in different geological times, since the end of the Devonian period to the final uplifting of Dinaric geosyncline, when present territory of Montenegro (end of Middle Miocene) has been formed, some parts of the geosyncline bottom have been, more or less, uplifted and lowered.

This caused favourable conditions for sedimentation of different products, among which were dominant those who have formed limestones and dolomites of great thickness and distribution. It is easily noticeable that the epeirogenic and orogenic movements have been advancing from north-east to south-west. During those movements, there were relatively quiet periods when small islands existed, protruding above the sea level as islands. The climate was also variable, but mostly favourable for the development of karstification. Simultaneously with these movements, particularly during the Laramidian orogeny (Upper Cretaceous - Lower Palaeogene), the folding, faulting, overthrusting and even movements which caused creating of nappes occurred. As a result, the rock porosity increased favouring the karstification process and forming today's karst - a geological product of very complex and enigmatic occurrences and processes.
With the aim to present the most important properties of the Montenegrin karst, its complexity as well as the characteristic differences of individual parts of the territory, karst zoning was carried out. The most logical way to do this was to identify the karstic properties of the individual geotectonic units of Dinarides, which built up the territory of

Montenegro. Therefore, the properties of the Durmitor Overthrust, the High-Karst Zone, the Pindus-Cukali Zone (in the territory of Montenegro Budva-Bar Zone) and the Adriatic-Ionian fold System (in the territory of Montenegro Adriatic fold System) are presented.

We have deliberately kept the oldest, the most common and the most often cited names for geotectonic units of Dinarides. Parts of the Dinaric geosyncline, which formed rocks in general and by this the karst in the territory of Montenegro, had different and specific geologic evolutions. Subsequently, on the terrains of cited geotectonic units, specific karsts with present properties and appearance developed. With development of the karstification processes the karst differences of the geotectonic units became smaller. This characteristic is notable in the karst of Montenegro.



Geotectonic division of Montenegro.

Karst of the Durmitor nappe, although spacious (over 5.000 km^2) and several kilometres thick, with large aquifers, is divided into several regions among which are significant karst of northern and north-western Montenegro, karst of Bjelasica and karst of north-eastern Montenegro. Due to the presence of Late Palaeozoic and Lower Triassic clayey-marl-

sandy beds, Middle Triassic eruptive rocks and Middle and Upper Jurassic diabase-chert formation rocks, karst in these regions does not represent a unique entity. Karst of these regions has the characteristic of holokarst. The limestones and dolomites of these regions are the oldest ones and they have been exposed to karstification for the longest period, even since the Upper Jurassic. The karstified limestones and dolomites of this geotectonic unit, although mutually separated, build up the largest and the highest mountain massifs in Montenegro.

Although there are canyons deeper then 1000 m, the karstification of limestone and dolomites of this geotectonic unit proceeds and descends deeper then fluvial erosion. Karst of this geotectonic unit is characterized by fluvial erosion (deep canyons), glacier erosion and lacustrine erosion. As a result, karst of this geotectonic unit, besides characteristics common to holokarst, has properties of high-mountain, fluvial, glacial and contact karst.

In the territory of Montenegro, the High-Karst Zone has the greatest extent. The terrain of this geotectonic unit is mainly built up of Mesozoic (Triassic, Jurassic and Cretaceous) limestones and dolomites of several kilometres of thickness. This thickness is even larger, due to the reverse faulting and overthrusting and thus repeating of carbonate series. The karst of this region is characterised by all surface occurrences and all processes characteristic for holokarst such as: karst plain; polje; uvala; sinkhole; dry, hanging, blind and karstified valley; lapies; canyon; shaft; cave; resurgence; vrulja; estavelle and so on. Within the karst of this geotectonic unit exist syncline regions build up of impermeable flycsh beds.

The layers of Durmitor flycsh of the uppermost north-eastern parts of this geotectonic unit have various hydrogeological features and functions. In the terrains built up of clayey-marl-sandy beds and at lower elevations, such as the valley of Vrbnica and Gornja Moraca, the layers of Durmitor flycsh are impermeable and represent a total barrier. In the terrains built up of varied, more or less marly limestones, comprising narrow zone and located at the height of over 1.000 m, as in the case of south-western slopes of the Durmitor massif, they represent a water permeable media. It is interesting to mention that the deepest cave (897 m) in the territory of Montenegro explored by speleologists is located in these rocks. The middle belt of High-Karst Zone in the territory of Montenegro is built up of Upper Cretaceous-Palaeogene flysch beds. The distribution, position and impermeability cause this flycsh to have a function of elevated and lateral barrier. The karstification of limestones and dolomites in this area is below the base level of erosion, below the sea level and is deeper then 1.000 m. The High-Karst Zone has all the prominent characteristics of: fluvial erosion (deep canyons of Komarnica and Moraca rivers with their tributaries), glacial erosion (on the high mountains), lacustrine, sea and combined erosion. The spacious Zeta depression with the largest lake on the Balkan Peninsula - Skadar Lake, is situated In the High-Karst Zone. Parts of the bottom of this lake represents a cryptodepression. Sublacustrine springs (vruljas) exist in the Lake, with bottoms at depth of over 80 m below water level which is about 6,5 m above sea level. In the Zeta Plain loess deposits are found.

Along the internal belt of Bokokotorska Bay, from Morinj, across Risan, Perast and Orahovac to Kotor, the High-Karst Zone is in direct contact with the sea. In these terrains are located the largest vrulja on the Adriatic coast, called Sopot, and the greatest estavelle horizon - Gurdic-Skurda. The vast differences in water-yielding capacity of the constant and periodic karst springs point out to the strong karstification of High-Karst Zone limestones and dolomites. The difference between minimal and maximal water yielding capacity is over 350 m3.

Karst of the Pindus-Cukali zone, in the territory of Montenegro Budva-Bar Zone, is characterised by contact and contact-fluvial relatively low karst. Notable within this zone is frequent alteration of karstified limestones and dolomites with terrains built up of sedimentary and volcanic rocks. The seepage aquifers and the seepage karst aquifers in the karstic terrains of this zone, outside of the sea influence, are few and of small depth. Their dynamic reserves are small, providing hardly 5 l/s during the drought periods. The seepage karst aquifers of this geotectonic unit are, in several places, in immediate contact with the sea. These are low and shallow aquifers with brackish water. In this karstic area, water-rich aquifers with dynamic reserves do not exist.

The reason for this is a small distribution of cavernous limestones. In this region there are cavernous limestones with static reserve which give by pumping, during the drought period of the year, over 50 l/s of water (Opacica).

Karst of the Adriatic-Ionican fold System (in the territory of Montenegro-Adriatic fold System) is represented by karst with anticline structures, four of them situated in the hinterland of Ulcinj and separated by synclinal structures built up of flycsh deposits. These folds, which strike from Albania and across the hinterland of Ulcinj toward north-west, sink under the sea at the north-western margin of the Bar plain. Only one of them, the anticline structure of Grbalj and Lustica, appears again in south-eastern marginal part of Mrcevo plain trending to Dubrovnik. Karst of the Adriatic anticline structures in the hinterland of Ulcinj and external folds of the Bokokotorska Bay are characterized by the occurrences of exposed, coastal karst. This karst is low but with deep slope below the sea level. The karst aquifers in this region are, during the whole year or for shorter periods, under the influence of the sea water which has a high concentration of Cl ions.

Generally, waters of the karst terrain of Montenegro are clean, as the karstic water can be, except in the regions under the influence of the municipal, industrial and other waste waters. Karstic waters, not considering the influence of the sea water, belong to the magnesium-calcium- chloride-hydro carbonate type of water.

Appendix 3: Hydrogeology and Surface Water

Adriatic Sea drainage basin

Area of the Adriatic Sea drainage basin in Montenegro covers about 6560 km^2. Moraca River, with its tributaries Zeta and Cijevna, Crnojevica River and Orahovstica River drain to the Adriatic Sea. These three rivers pour into the Skadar Lake and from that point on flow towards the Adriatic Sea through the Bojana River.

Source: Hydrological and Metrological service of Montenegro

Moraca

In its upper and middle part of the flow, Moraca River is highly mountain river. Its length is 113,4 km, and area of the river basin to the Hydrological Station (H.S.) Podgorica is 2628 km^2. Currently, there are three measuring profiles at the Moraca River: Pernica, Zlatica and Podgorica, including one limnigraph station at the right tributary Mrtvica. Measuring at the above stations has been constantly performed for more than 20 years, and at the Podgorica station, measuring has started from 1948. Cijevna is a left tributary of Moraca, with the length of 64,7 km and river basin area of 383 km2 to the H.S. Trgaj, where measuring was performed from 1949 to 1989.

Zeta

The most important tributary of the Moraca River is Zeta. Its length is 85 km, and river basin area to the H.S. Danilovgrad is 1216 km^2. Measuring places are Duklov most and Danilovgrad, and measuring activities have been preformed at the above locations from 1955 or 1948 respectively.

Skadar Lake

Skadar Lake covers less than 400 km^2 with minimum water level and up to 525 km^2 with maximum water level registered. The Lake is primarily filled by Moraca River, including Crnojevica River and Orahovstica as well as Kiri River in Albania. The Lake is drained by the Bojana River.

Black Sea drainage basin

Area of the Black Sea drainage basin in Montenegro is somewhat larger than the area of the Adriatic Sea drainage basin, covering about 7260 km^2. From this part on, the Ibar

River drains through the Zapadna Morava River, while Lim, Cehotina, Piva and Tara River with its tributary Komarnica drain through the Drina River.

Lim

Source: Hydrological and Metrological service of Montenegro

Lim River is the most important Montenegrin River from the hydrographic point of view. It flows out of the Lake Plav, although Vruja and Grncar rivers make a part of its source, which by confluence make Ljuca River that flows into the Lake Plav. Before the town of Andrijevica, Lim River receives Murino River and Zlorecica as its left tributaries, and Djuricka River, Rzenicka, Velicka and Komaraca as its right tributaries. From the town of Andrijevica to the town of Berane, Lim River receives Krastica, Trebicka, Sevarinska River from the left and Bistrica River from the right. From the town of Berane to the town of Bijelo Polje, Lim River receives Brzava and Ljuboviđa as its left tributaries, Dapsicka and Ljesnica as its right tributaries. From Bijelo Polje to Dobrakovo, it receives Bjelopoljska Ljesnica from the left and Bjelopoljska Bistrica from the right. Area of the Lim River basin to Dobrakovo is 2880 km^2. Its length is 234,2 km. Observations and measuring are currently performed at the stations: Plav, Andrijevica, Zaton, Berane, Bijelo Polje and Dobrakovo. With regard to the above hydrological station, the Hyd-met Institute has been keeping a long set of data (about 50 years). As regards its tributaries, the observations have been performed at Grncar-Gusinje, Zlorecica-Andrijevica and Ljubovida-Ravna Rijeka.

Tara

Tara River emerges from the Maglic Kariman peaks (about 2400 mnm). From the source to the Drcka river mouth, right basin of the Tara River is more developed than the left one. Major tributaries are Opasanica and Drcka, Pcinja, Plasnica, Stitarica, Ravnjak and Ljutica spring. From the right side, the River Tara receives Skrbusa, Svinjaca, Jezerstica, Rudnjaca, Bjelojevicka and Selacka rivers. Area of the Tara River basin up to the Hydrological Station Scepan Polje is 2040 km^2. The length of the river is 148,4 km. Measuring places along the Tara River are Crna Poljana, Trebaljevo, Bistrica and Djurđevica Tara.

Piva

The Piva River has created a basin at the high massif of Montenegrin mountains. This river bears several names along its flow. Its source part underneath the South-Western slopes of the Durmitor Mountain up to the town of Savnik is called Bukovica. It joins Bijela in Savnik and continues further under the name Pridvorica until it reaches the confluence of Gornja Komarnica into the Pridvorica. The river continues further downwards under the name Komarnica all the way to relocated Monastery of Piva, where it receives the tributary Sinjaci and is named Piva. The river flows to the Scepan Polje, where it meets Tara and creates Drina River. Area of the Piva River basin is estimated to be about 1784 km^2 up to Scepan Polje. Upper Komarnica springs from Durmitor and flows through a 600 m deep and about 40 km long canyon. Along the Komarnica flow, karst phenomena are being created, with insufficiently explored underground flows, overflowings from basin to basin and numerous springs. Measuring stations of the River are Bukovica Savnik, Komarnica Duzi and Komarnica Lonci.

Ibar

The Ibar River originates from the north-eastern slopes of the Hajla mountain at the hill 1760 mnm. Main tributaries are Zupanica, Limnicka River, Ibarac, Grahovska, Bukovacka, Balticka and Backa. The Ibar River basin is fan-shaped with quite developed hydrography and high possibilities for a fast creation of flood waves. Area of the Ibar River basin up to the H.S. Bac is 413,6 km^2., and its length is 273,8 km.

Cehotina

The Cehotina River originates from the Stozer mountain. It is the second largest tributary of Drina after the Lim River. It is composed of Koraci and Brezovski streams. Tributaries of the Cehotina River are Koricka, Maocnica, Vezisnica and Voloder. Area of the Cehotina River basin to the H.S. Gradac is 809,8 km^2. Its length is 128,5 km. Hydrological stations at the Cehotina River are Cirovici (became operational in 1978), Pljevlja (1948) and Gradac (1963). Measuring and observation of the water level are also performed at its tributary Maocnica (series 1985-2002.)

Underground water

Growing quantities of contaminated water and other harmful substances of settlements, industry and mining activity cause degradation of water potential of the territory of the whole country. Among groundwater resources, the most vulnerable to contamination are shallow aquifers with inter-granular porosity. As an example, we can present contamination of major part of groundwater from Cemovsko polje, southern from Podgorica (particularly close to aluminium plant). This aquifer is famous of huge reserves, high water quality and yield of wells (200 l/s).

The other aquifer significant from the standpoint of public water supply – karst aquifer is open for external contamination, but because of absence of population in mountainous watersheds (hence, without potential contaminants) is mainly protected. One of the problems is a fact that potential sources in Montenegro are not legally protected, and so – they are vulnerable to contamination and degradation or reserved for other purposes. Unfortunately, lack of care of the society related to groundwater resources, as a strategic raw material of the first order) will have harmful consequences in the future, when two opposite occurrences will be more expressed than now – growing demands for new amounts of high-quality drinking water and more and more vulnerable (reduced) available water resources.

Appendix 4: Main Environmental Assets along the Route

This overview describes the most important environmental assets along the highway route, based on a review of existing data sources. Some of this information was developed as publicly available papers/books from which data is extracted.

The evaluation of baseline environmental conditions was undertaken through the verification of areas considered of key environmental significance along the highway route. In the review of literature the following areas have been scoped in the ecological aspect:

- Podgorica Municipality
- Danilovgrad Municipality
- Cetinje Municipality
- Niksic Municipality

Podgorica Municipality

Podgorica is located in central Montenegro, in northern part of Zeta plain. The entire area in which is intersected with rivers, and the city itself is located only 15 km north of Lake Skadar. Moraca and Ribnica rivers flow through the city, while Zeta, Cijevna, Sitnica, Mareza rivers flow in the vicinity of the city. One of the main features of the city is richness in bodies of water.

The city itself, in contrast to most of Montenegro, is lying on predominantly flat area of northern Zeta plain. Only exceptions are hills that overlook the city. These are mostly steep hills that rise abruptly from the surface, and thus are not suitable for urbanisation. They rather limit the city's expansion, especially to the north, shaping the city's development.

Podgorica has typical Mediterranean climate, with hot and dry summers, and mild winters. Snow is almost unknown phenomena in Podgorica. It has a mean annual rainfall of 1544 mm, and median daily temperature of 16,4°C. It has around 135 days with temperature higher than 25°C per annum. Podgorica is particularly known for extremely hot summers, as temperatures over 40° C are a common occurrence in July and August. Absolute maximum recorded in Podgorica is 44.8 °C, on 16th August 2007.

The municipality of Podgorica accounts for 10.4% of Montenegro's territory and 27.3% of its population. Besides being an administrative centre of Montenegro, Podgorica is also its economic, cultural and educational focal point. There are around 170,000 people in Podgorica municipality, which includes the small towns of Tuzi and Golubovci, and around 140,000 people in the city itself. This is the official data from 2003 census, while some estimates go up to 200,000.

Danilovgrad Municipality

The new highway route is only tangent Danilovgrad municipality from the south.

Danilovgrad was founded in 1869. Together with Spuz and part of Katunska valley it makes Danilovgrad municipality.

Situated in the central part of Montenegro it is connected by rail and roads with Podgorica and Niksic. It is 25 km away from the main airport in Podgorica, 75 km remote from the cost by rail and about 120 km from the winter centres such as Zabljak, and Kolasin. This municipality covers 501 km^2. It has population of about 16.600 citizens out of which some 4,000 are based in the Danilovgrad city. Mediterranean climate and high average temperatures make this region highly suitable for recreation and vacation.

Natural characteristics can be mainly described as plain (known as Bjelopavlici plain) situated, between high mountains Garac /1436 m/ on the south-west and Maganik /2139m/ on the north-west, and between spring of the river Zeta which is under Palencia /700m/ on the north-east up to Velje Brdo /283 m/ on the far soth-est. Many springs and rivers run through the valley - Susica and Graeanica as right and Brestiea, Ljutotuk, Morava and Suvi Do as left branches of the river Zeta. The river Zeta runs through Bjelopavlici plain and its clear water, beaches and plants which grow around are a real beauty.

Zeta starts near Niksic, under the Planinica hill flows eastwards for 86 km until it confluxes into Moraca River, as its most significant tributary, just north of Podgorica. The name "Zeta" derives from an early root meaning "harvest" or "grain".

Zeta river valley has historically been densely populated, as fertile lowlands are rare in mountainous Montenegro.

The area around Zeta-Bjelopavlici Plain have similar temperature characteristics as the Coast area due to the stronger influence and large water surface of Lake Skadar.

This part of Montenegro has the highest July temperatures, partly as a result of a low altitude, low cloudiness, small quantity of precipitation in summer and partly bare lime rocks by the borders of the valley, which are strongly heated in the summer. It is characterized by slightly modified Mediterranean type of annual precipitation movement, featured by maximum precipitation in late autumn and at the beginning of winter, and by the obvious minimum in summer months.

The basic geological substratum consists of: crystal slate, marls, sandy soils, limestone, dolomites, flisch, with the small participation of eruptive rocks. On this substratum different types of soil have been developed, particularly terra-rossa, black gray or gray brown soils and there was a considerable participation of anthropogenized alluvial-delluvial soils of different depths and skeleton soils on fluvial-glacier gravel. In this plain area in neogen, there were lakes which deposited their sediments, so that these valleys are the most fertile parts of Montenegro. One part of valley consists of fluvial- glacier okonglomerated sand and pebbles,so it is not fit for the cultures,but only for spring grazing and grapevine. Confusingly, the other significant plain in Montenegro, Zeta plain has been named after

Zeta river, although Zeta river itself does not flow through it. The Bjelopavlici plain provided a corridor for road and rail connection between two biggest Montenegrin cities, Podgorica and Niksic

Cetinje Municipality

Cetinje is expanded on 910 km2 which is 6,6 % of total expanse of Montenegro. (13,812 km2). City itself is expanded on about 5 km^2 with average height above sea level of 671 m. Based on the census from 2003 Cetinje has 18,482 inhabitants. This is 2,98 % of total population in Montenegro. In the city live, according to this census, 8,879 men and 9,603 women. 90 % of the populations are Montenegrins. It is on the main road Podgorica-Cetinje-Budva, which makes it open to the inside of Montenegro and Montenegrin coast. Cetinje is 29 km far from the airport in Podgorica, 49 km far from the airport in Tivat and 67 km far from the port in Bar.

Cetinje field was formed in The east Karst-continental bottom of the mountain Lovcen, whose highest peaks are Stirovnik (1749 m) and Jezerski vrh (1660 m) where is situated mausoleum of Petar II Petrovic Njegos. From all sides, defoliated limestone slopes close view.

Cetinje has middling continental climate, with dry and warm summers with temperature of approximately 20oC and mild and wet winters with temperature of approximately 2,1oC. Average temperature on the yearly basis is about 11oC, with year amplitude of 20,1oC. Cetinje is well known by plentiful precipitations during spring and autumn, and it is one of the rainiest towns in Europe with about 4,000 mm of water sediment on the yearly basis. Even beside enormous precipitations, Cetinje field and its surrounding do not have water flows on the surface and it has rare water sources. This is the consequence of Karst configuration and geologic structure.

Niksic Municipality

The Municipality of Niksic is situated in the central and west area of Montenegro on the 2.065 km², with its 15 % share of the territory makes it the largest municipality in Montenegro. Niksic is situated at the 630m height above the sea level.

The citizens of Niksic make 12% of the whole population of the Montenegro. Geographical, economical, as well as historical position of the town, apart from the natural increase in the population, contributes to the constant growth of the number of people living there. There are about 90.000 citizens living there.

The climate of Niksic is from the Mediterranean to mountainous and continental, with the average temperature in January is 1,3ºC, and in July is 21,1ºC. The average value of the relative humidity is 68,6%. There are 2.245 hours of sunshine in per year. The summers are hot with little rainfall and the winters are rainy. The largest rainfalls are in November and December. It is snowing for about 19 days, and is preserved for about 29 days per year in Niksic field, but at the mountains and in the surroundings of the town, it is preserved even to six months per year. The dominant winds are the north (24,4%) and the south (21,7%).

Within Herceg Novi municipality on the border with the Municipality of Niksic, and in the vicinity of the foreseen corridor, a new national park Orjen (defined also within Montenegrin Physical Plan) is proposed and it should be taken into account when planning motorway section approaching western border.

Appendix 5: Air Quality and Noise Level

Air Quality

In accordance with the Montenegrin regulation a permanent quality control of air on the territory of Montenegro is being measured and reported. Such control is aimed at determining conditions and changes in water balance and qualitative composition of water. i.e. determining a class of bonity in surface waters and control and evaluation of the level of air pollution in lower layer of atmosphere. Evaluation of the water and air quality is made in accordance with legal regulations. Methodology of work has been fully standardized in all phases of sampling, analysis and data processing.

In addition to the national environmental monitoring program, the Centre for Ecotoxicological Research of Montenegro participates in implementation of international programs: Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air pollutants in Europe (EMEP) and Mediterranean Pollution Monitoring and Research Program (MEDPOL). Analytical data on environmental situation are published under Annual Reports, which are appropriately filed and sent to the competent Ministry and other interested parties. The outcomes are occasionally published at expert local and international gatherings.

A limited number of measurements of air quality have historically been collected within Montenegro, in the few locations along the highway route: at Podgorica, and Niksic. Such measurements of air quality are available in the annual reports.

Municipality	Location	Coordinates		Altitude	Type of station
Podgorica	CETI	42_0 26’32’’	19_0 18’99’’	45	urban, traffic
Podgorica	D.Gorica	42_0 39’71’’	19_0 16’19’’	45	urban, traffic
Podgorica	Srpska	42_0 26’34’’	19_0 17’07’’	35	Industrial traffic
Podgorica	Konik	42_0 26’12’’	19_0 12’48;;	45	urban, industrial
Niksic	Municipality	42_0 46’	18_0 56’	600	urban, traffic

Source: Centre for Ecotoxicological Research of Montenegro

The majority of the proposed new sections lies in predominantly rural areas, where it is expected that air quality would be very good owing to the current relatively limited scale of industry and road traffic in Montenegro.

The Annual average values of restrain concentrations of pollutants from annual report for 2006 relevant to the highway route are shown in the tables below.

Annual average values of restrain concentrations of basic pollutants in 2006

Station	C_{av}.SO2	C_{max}.SO2	C 95 SO2	C_{av}.NOx	C_{max}.NOx	C 95 NOx	C_{av}.O3	Cmax.O3	C 95 O3
	µg/m^3								
Podgorica - CETI	2.53	31.32	2.07	6.82	65.55	5.73	53.46	**139.94***	49.28
Podgorica - D.Gorica	3.12	14.56	2.69	3.73	11.04	3.43	55.01	**129.95***	51.71
Podgorica -Konik	7.12	73.47	5.31	3.62	36.65	2.86	57.92	**144.43***	54.40
Podgorica -Srpska	4.66	38.97	3.78	4.20	17.25	3.81	53.54	**166.60***	49.10
Niksic	3.33	31.43	2.41	3.94	16.42	3.51	53.80	121.62	50.17
LIMIT VALUE	110			150**			125		

Station	C_{av}. smoke/soot	C_{max}. smoke/soot	C 95 smoke/soot	C_{av}. suspended particles	C_{max}. suspended particles	C_{av}. settling maters	C_{max}. settling maters
	µg/m^3					mg/m^2dan	
Podgorica - CETI	24.34	**71.35***	22.62	85.79	**120.50***	148.32	303.02
Podgorica - D.Gorica	17.04	**126.37***	14.95	66.38	108.77	152.59	**428.87***
Podgorica -Konik	21.33	**124.42***	19.32	**198.39***	**452.25***	333.59	**842.38***
Podgorica -Srpska	22.86	**133.45***	18.22	**200.80***	**380.40***	**352.07***	**1172.50***
Niksic	21.27	**91.44***	18.60	85.87	**116.96***	252.36	**811.02***
LIMIT VALUE	60			110		350	

Annual average values of restrain concentrations of specific pollutants in 2006

Station	C_{av}.H2S	C_{max}.H2S	C 95 H2S	C_{av}.NH3	C_{max}.NH3	C 95 NH3	C_{av}.H2CO	C_{max}.H2CO	C 95 H2CO
	μg/m3								
Podgorica - CETI	0.35	4.25	0.26	2.83	14.24	2.44	1.46	8.50	1.14
Podgorica - D.Gorica	0.72	1.90	0.32	3.63	30.45	2.46	0.53	2.50	0.45
Podgorica -Konik	1.13	1.55	0.36	5.49	40.60	3.23	1.02	7.00	0.73
Podgorica -Srpska	0.48	2.50	0.35	2.68	23.10	1.87	1.39	8.65	0.96
Niksic	0.19	0.85	0.16	2.05	6.67	1.73	0.34	6.00	0.12
LIMIT VALUE	8			200			12		

Source: Centre for Ecotoxicological Research of Montenegro

Baseline data indicates that levels of measured pollutants are mainly within limit values. The air quality along the highway route except urban areas is currently very good. These findings are unsurprising given the current extent of industrial activity and road transport currently within Montenegro. Contribution to the measured concentrations of target gases is likely to arise from domestic burning of wood and other fossil fuels, road transport, and limited industry.

Based on the given results it can be concluded that the air quality is on the satisfactory level. Suspended particles represent major problem in more less all urban areas in Montenegro. High concentrations of polycyclic aromatic hydrocarbons (PAH) are mainly result of exhaust gases from vehicles which are not up to standard as well as due to the quality of fuel.

The following conclusions can be drown up:

1. Restrain concentrations of global parameters (SO_2 and NO_x) are below national limit values (<110μg/m3) however sometimes exciding EU values (50 μg/m^3). Increase in the number of vehicles and low quality of fuel results with high values of PAH and suspended particles especially in the urban areas.
2. Increased smoke/soot values are recorded during winter which can be explained by traditional usage of coal and wood as a major heating material.
3. Almost in all urban areas Cmax.O3 is recorded higher than limit values, which is direct consequence of UV radiation combined with soot coming from vehicle exhaust pipes.

Noise level

Similar to air quality monitoring Centre for Ecotoxicological Research of Montenegro is performing noise level measurement. This exercise is performed on the locations such as main squares in urban areas, medical facilities surroundings and national parks. The limit values of L_{eq} for different areas are shown in the table below:

Type of Area	L_{eq}		
	Unit	Day	Night
Recreation and resting area, hospitals, cultural and historical sites, parks	dB(A)	50	40
Tourist areas, small size settlements, camps and schools	dB(A)	50	45
Residential area	dB(A)	55	45
Business-residential area, trade-residential area, playgrounds	dB(A)	60	50
City centres, entrepreneurship, trade and administrative areas, areas along highways, main roads and city traffic lanes	dB(A)	65	55
Industrial zones, warehouse zones, service areas and non residential areas	dB(A)	Applied values of bordering zones	

Source: Centre for Ecotoxicological Research of Montenegro

The results from the monitoring from 2004, 2005 and 2006 shows that noise levels are over the set limits in the most of the locations with incising trend. The biggest exceeding difference is recorded in Podgorica, mainly due to the fact that distance from the traffic and subject area (hospital, park school) is very small. The noise level in the national parks is recorded higher than expected mainly due to the natural effects (birds, wind etc)

Thee main constrain is the fact that zones in the urban areas are not well defined (distinction between residential and industrial area is sometimes hard to distinguish) and therefore applying above table is not simple.

Appendix 6: General Conditions of the Existing Road

In general, the baseline ecological conditions of the road vary from satisfactory to very poor. The technical design assessment shows a contradiction between a requirement of ToRs and reality of the presented situation on the site. The technical parameters of existing road are below these of highway standards. Generally a pavement width is 8 m to 9 m. The pavement and also the shoulders are in poor condition. The total length of the road is about 200 km. Only few kilometres have a dual two-lane carriageway without emergency lanes. The rest is single two-lane carriageway. The pavement, base and sub base appear generally in poor condition.

The existing road is used by mixed traffic. All types of vehicles from modern cars to 38 tonne trailer trucks. Sometimes horse drawn carts are using this road. The variation of observed speed is from 15 km/h to 160 km/h (exceptionally, on the flat sections near Podgorica). The pedestrian, the cows pass through the road and very often, the cows slept on the road. Drivers are undisciplined, ignored all horizontal and vertical signs.

In Podgorica suburb, on the both side of the road there are the trade of fruits and local fruits. This process disturbs traffic and is source of many accidents. Usually the settlements are implanted on the both side and close to existing road. Typical small rural town is compound of one line of houses with a yard. Any attempt to wider the existing road to highway standards will results in destruction of half of settlement located on one side of the road. In this case the social cost of the construction of highway will be very high.

The visual assessment shows:

- Many features such as culvert wing walls, aprons, and headwalls are in the bad condition. Bridge parapets are sometimes partially broken away.
- There is the need to fix all drainage structures, culverts, pipes, both brickwork and concrete.
- The profiles of original roadside ditches are completely changed as they have become silted up over long periods or have become the receptacle for waste and garbage. The problem with solid waste dumping is particularly severe because of (i) highway drainage channels being directly used, in a targeted and purposeful manner, as waste disposal sites; (ii) Highway drainage channels picking up waste products indirectly by interconnection to supplementary drainage systems from adjoining lands and properties outside the ROW;
- Road safety conditions at most places are very poor. Cambers of road on bends have become damaged by the effects of heavy vehicles. Untreated pothole and patching repairs, particularly on bends where tire traction and adhesion is critical, pose risk of skidding and loss of control. There is also a lack of hazard warning boards, bollards, or any form of physical barrier on sites that clearly have experienced vehicles going over embankments through hedges and running into walls and roadside banks.
- On the whole length of existing road water provided from the pavement is going directly to the land without any process of cleaning of hydrocarbon products.

- The crossing of the settlements and built-up areas are especially dangerous regarding to drivers' and pedestrians' safety, due to the narrowness of the carriageway and several sharp bends.

Appendix 7: Socio-Economic Baseline

Many socio-economic problems along the route under consideration are directly attributable to the poor economic conditions in Montenegrin rural areas or in some way connected to them. Desperate the foreign investment boom (mainly Montenegrin real-estate in the seaside area) economic conditions are reflected in the collapse of agriculture and industry, the lack of opportunities for well-paid, regular employment and the pressures on livelihoods that eventually affects the environment. It is also widely understood that poor economic conditions impose a constraint on sources and levels of investment in necessary infrastructure, services and economic sectors. The need for economic growth is of course a national issue, but the problem is so endemic that it needs to be addressed in all sectors and geographical areas. This suggests strongly that value for money or potential to generate sustainable economic growth should be ranked highly as evaluation criteria for investments in transport infrastructure. This also accords with national policies and the priorities of international assistance projects which concentrate on poverty reduction.

Quality of life theme underlies issues relating to poor standards of services (e.g. drinking water, electrical supply, sewage disposal) and threats to human health from poor environmental conditions. Poor standards of waste disposal (both domestic waste and sewage) are one of the most pervasive and most persistent problems along the route. Poor environmental conditions represent a very real threat to human health. Industrial pollution is widespread, domestic water supplies are regularly polluted with untreated sewage and river water quality is unrecorded but almost certainly very poor. Impacts on human health should therefore be also accorded a high priority as an evaluation criterion to judge any development interventions.

Infrastructure along the route is generally in a very poor state, ineffective or inoperable. Transport infrastructure is in a poor condition, with roads that are severely degraded and pot-holed. Energy is a major problem with communities receiving an infrequent supply of electricity, or no electricity at all. This results in a high reliance on coal and wood, which is cut and gathered by the communities themselves. Telecommunication and telephone lines are in very poor condition or non-existent The infrastructure for mobile phones is available and reliable. Water supply is a problem in coastal area during summer tourist season with some communities receiving running water for a few hours a day, or no piped water at all. Sanitation services are almost non-existent, and when they do exist, they are often ineffective.

Agricultural infrastructure was built for small-scale farming and is unsuited for current market competition. Rural roads and irrigations systems are not adjusted to the new land tenure structures. Nowadays, the Montenegrin rural agricultural sector is at subsistence level; it is producing food for self-consumption with a small surplus sold in markets and at roadside stalls. The small size of land parcels is sufficient for personal consumption but not large enough to provide a living from the land.

It is obvious that economic hardship is the underlying cause of low birth rates and high levels of out migration from rural to urban areas. Forecasts of future population growth are negative, but it may not result in reduced population and development pressure in the areas adjacent to the main transport artery. The various survey data do not reveal any great sub-regional variations in socio-economic conditions along the route. In common with most of Montenegro, economic conditions are hard and for households access to livelihood as well as to the main road is their greatest priority. For some of them today the highway itself represents the livelihood where they are involved in different legal and illegal businesses including trade and wide range of services.

The Adriatic-Ionian highway runs through the territory of 4 municipalities: Podgorica, Danilovgrad, Cetinje, and Niksic.

The proposed highway runs through predominantly rural terrain with agriculture activities beyond the existing extent of the cities, except some minor cases where it passes through some of the outermost suburbs (Podgorica and Grahovo). Although not urban in character the highway is directly related to the economic and demographic development of the cities. In the same time highway has a considerably wide area of influence on rural regions through which it passes. Most of them have predominantly rural populations and limited industrial development.

Land ownership and the use of land is an important part of the social economy along the highway route, as well as Montenegro as whole. The majority of the population in the communities along the route relies on the land for subsistence, and it provides an integral part of their income if not the majority in many cases. The land is used for three main productive activities: crops/fruit/vegetable cultivation, livestock raising/grazing, timber harvesting and wood cutting. In general people use state land for pasture and for timber harvesting and woodcutting, and own the land they use for crop/fruit/vegetable cultivation. State land is used under a lease agreement or sometimes without formal permission. This includes: backyard gardens, summer plots (not attached to the house, largest piece of land owned by any one household – mainly used for vegetables), small vegetable plots (close to the house), collectively owned farm land (far from the house), privately-owned farm land. In general, vegetables are the most widespread type of crops cultivated, followed by herbs and fruit. However, the municipalities differ significantly in terms of what crops/fruit/vegetable are cultivated, based mainly on climatic and geographic conditions along the route. The land of the present road and, to great extent, the land needed for the widening belongs to the Montenegrin state territories. But for some of the new bypasses and alternative routes there is a need of expropriation and/or buying-out and compensation procedure.

At current preliminary or strategic environmental assessment stage, it is only possible to answer the general scoping questions on whether the project results in social changes, for example, in demography, traditional lifestyles, employment etc., which are indicated in the Scoping Check-list (see Appendix 11). The preliminary analysis of the possible socio-economic risks and impacts is also presented in the Section 6 of this report.

At the later stage, for the full-scale environmental and social impact assessment (ESIA), a socio-economic survey will/shall be undertaken in all the “highway affected communities” within the zone of influence of construction and operation (2-5 or more km - to be determined on the basis of previous or EU experience). The data will/shall be collected in a format that could be easily transferred to a database and GIS for later analysis using SPSS (standard specialist software), and mapping of attitudes and impacts to cover the following main topics:

- population and demographics
- labour and livelihoods
- infrastructure, resources and services

- culture, local administration, decision making and planning
- attitudes and perceptions.

Appendix 8: Cultural Heritage and Archaeology

Montenegro, a country of contrasts - of mild Mediterranean and a severe mountainous climate, fruitful plains and river valleys, and high and arid mountains - on its rather small surface area of 13.812 km^2, inherits cultural heritage originating from the time of creation of the first human communities until present. Privileged to be situated on the boundary of two large civilisations - eastern and western and three great religions - Orthodox, Catholic and Islamic, numerous known and unknown builders, painters and carvers, masters of sophisticated crafts, writers, transcribes and typographers, were leaving here the masterpieces of their hands and their spirit, sublimated nowadays into a wealthy cultural heritage.

Responsible for cultural heritage and archaeology is Republic Institute for Protection of Cultural Monuments with mission to work on finding, studying, collecting and conservation of cultural monuments and natural rarities of Montenegro. Versatile businesses on conservation of monuments and natural heritage lead to separation of these activities and establishment of Institute for Nature Protection. Internal organisation of the Institute has been implemented through work of organisational units (centre, departments and ateliers). Business on investigation, collecting, keeping and treatment of documentation is carried out by the Centre for Research and Documentation, whereas the activities of design, inspection and implementation of the works on the terrain take place through the Department for Protection of Civil Engineering Heritage.

All endeavours of the Republic of Montenegro to define its own concept of cultural policy during ultimate decades of 20th century did not give expected results. Montenegro did not have, neither has it today, a strategic document of that kind. Until ten years ago, Montenegro did not have relevant institutions either, that is Ministry of Culture, whose task would have been to conceive a strategy or programme and action plan for the cultural development of the country. Therefore, cultural policy was dealing with daily issues, in an uncontrolled manner and without transparency, in both, decision-making process and distribution of financial resources.

The new National Report on Cultural Policy points out inevitability of replacing present, mainly outdated, legal regulation with a new one, which would be adjusted according to the international standards and rules of the Council of Europe, European Union and World Trade Organization. Concerning the fact that numerous legislation are indirectly related to the culture, it is clearly visible from the report that the national cultural programmes, both short-term and long-term, must supervene strategic documents of the Government and that it is required by them (economic development strategy, urban plan, national program for higher education, financial and fiscal policy, etc).

In the field of protection and valorisation of the cultural heritage applicable Laws are the following: Law on Protection of Cultural Monuments (1991), Law on Museum Activity (1977 and 1989), Law on Library Activity (1977 and 1989), Law on Archive Activity (1991 and 1994), Law on Reconstruction and Revitalisation of Old Cities Damaged by the Earthquake on 15 April, 1979 (1984 and 1986), Law on Renewal of Monuments Holdings of Kotor (1991), and Law on Monuments, Memorial sites, Historic Events and Persons (1971, 1972 and 1988).

Protection of Cultural Monuments

Historic monuments are remaining structures that owing to aesthetic qualities, association with significant events or people, or through great age alone represent a significant and irreplaceable historic resource. Monuments, in addition to being of interest for art historical study, may also be highly visible and well known, symbolising the importance of past events and possibly historic persons to the general public. The value of an important historic monument is closely attached to its specific location and setting, and to the surrounding landscape. Unlike archaeological sites, it is very rare that an historic monument can be moved or altered without substantial loss of its scholarly and public value. Avoidance and direct protection are almost always preferred for historic monuments

The conditions for proper, modern and, according to international principles, standardised way of protection of monuments heritage in Montenegro were created only after the Second World War. Protection of cultural heritage was put on a solid legal basis and its care was given to Institute for Protection and Scientific Research of Cultural Monuments and Natural Rarities, Central Registry of Protected Cultural Monuments was introduced, and it contained all basic data about protected monuments.

In the basic plans and programs, long term or annual ones, the main program orientation of activities of the protection of cultural monuments is based on two elements - administrative norms and documentation. Protected cultural monuments in Montenegro are classified in three categories:

- I - Monuments of Special Importance;
- II- Monuments of High Importance;
- III – Important Monuments.

Local authorities should have an important role in protection of cultural monuments; since protected monuments are geographically situated in territories under the jurisdiction of local authorities. Previous experience shows that local authorities relies upon republic institutions (Institutes) when it comes to the protection of cultural monuments, and therefore their role is inadequate to the real needs. That is very important for those local authorities, which are supervising protected urban zones and historical sites.

However, based on the Law on Local Self-government from 2003, municipalities are obliged to provide necessary conditions and take care for protection of cultural monuments and memorial sites of local importance. Based on the Law on Protection of Cultural Monuments from 1991, in terms of protection of cultural heritage, municipalities are obliged to take care, maintain and use, and protect monuments from damaging impact of nature and men activities, to make them publicly available, bear the costs of regular maintenance of cultural monuments.

At the same time, with adoption of town planning, municipalities are obliged to obtain opinion from the Republic Institute for Protection of Cultural Monuments by reason of protection and preservation of urban or historical character or environmental ensemble of old towns and settlements. It is also stipulated by the Law that for carrying out construction works, which might cause changes on the cultural monuments, a prior licence from the Republic Institute must be obtained.

Protection of Natural Property

In the period after the Second World War protection of nature in Montenegro was carrying out in several phases, through which it was raised an awareness that effective protection could not be carried out only by legal protection of plant and animal species, but whole areas needed to be protected, such as those that were designated as natural parks in 1952 (Lovcen, Biogradska Gora and Durmitor). The protection of natural property became even more important after designation of Montenegro as Ecological State by the Parliament in 1991. Today, these issues are regulated in certain parts by: the Law on Protection of Nature, Law on National Parks, Law on Freshwater Fishing, Law on Maritime Assets; Hunting Law, Law on Town Planning, etc.

Montenegro has also a public enterprise called National Parks of Montenegro, which is responsible for four national parks: Biogradska Gora, Durmitor, Skadar Lake and Lovcen.

Protection of nature is under the competence of the Ministry of Culture, although with forming of the Ministry for Protection of Environment (now it is a sector in the Ministry of Town Planning) during ‘90s, large part of responsibilities was delegated to this Ministry. Unfavourable situation in human resources in institutions dealing with the protection of nature, as well as scarce financial resources allocated for this area, significantly influence efficiency of implementation of plans, programs and protection measures.

There is a significant number of NGOs involved in nature protection activities in Montenegro on local, regional, republic and international level.

Republic Institute for Protection of Nature, National Parks and Natural History Museum in Podgorica own relatively good and modern equipment necessary for the process of inventorying, preparation and storage of natural and other materials. The role of the State in development of activities of nature protection is reflected in attempts to find adequate ways of financing, which, having in mind continuous economic difficulties, remains to be an unsolvable problem, especially when it comes to national parks.

Local authorities should have more important role in the protection of nature, since protected natural objects are located inside the territories of one or more municipalities. The more active role signifies that local authorities, with more responsibility and determination through its secretariats for town planning and construction inspections, should provide legal implementation and respect of adopted planned documents.

In the period of founding the activities related to the protection, up to the disintegration of the former Yugoslavia, Republic Institute for Protection of Nature and institutions for nature preservation had relatively intensive international cooperation. Cooperation was made through the Yugoslav Commission for Cooperation with UNESCO on the occasion of inclusion the National Park Durmitor, canyon of river Tara, and Kotor and Risan Bay on the list of international and worldwide important objects for the protection of natural and cultural heritage, as well as with inclusion of Skadar lake on Ramsar List (Ramsar bureau). Cooperation is also established with EUROPAEC federation, World Commission for Protected Areas, World Organization for Protection of Nature and other organisations and ecological associations.

Archaeology

Interest for archaeology in Montenegro began in the second half of the 19th century, when according to the decision of Prince Nikola I Petrovic Njegos, had started the archaeological researches of important Roman city of Duklja (Doclea) near Podgorica.

The Centre for Archaeological research was formed on the republic level with the aim to replace previous practice of disorganised, scattered and partial approach in performing archaeological research to more organised and planned one. Although it operates according to the Law on Museums, Law on Protection of Cultural Monuments, and Code of Conditions and Ways of Performing Archaeological Excavation and Research, the Centre discharged from its authority a part of work of museum character (collecting, preserving, and exhibiting the archaeological material). It would be necessary to bring a regulation, which would regulate and prevent numerous problems and misunderstanding in overlapping of competencies of the Centre and municipal museums containing archaeological collections and performing archaeological researches.

Archaeological resources consist of surface and near-surface artefacts and related materials in a spatial and stratigraphic context, which constitute a scientific record of the past cultures that created them. Where no contemporary written records of a culture exist, archaeological remains may constitute the only extant record of that culture. Without necessary knowledge and planning, ground-disturbing projects such as the proposed highway have the potential to damage archaeological sites and artefacts, thereby diminishing scientific and cultural resources that are a part of the cultural patrimony. Archaeological sites are considered to be an important and irreplaceable aspect of Montenegrin's cultural patrimony. Although heritage management principles always favour protection of archaeological sites by avoidance, such sites can often be rescued by scientific excavation, in which case a ground disturbing project may go forward with limited adverse impact to the resource.

The nearest archaeological site, where the corridor connects with the corridor Bar-Boljare (Podgorica by-pass) is Doclea in the vicinity of Podgorica town. Doclea is the most significant and the largest urban centre created in period of Roman domination in Montenegro. The town was founded in the first decade of the 1st century AD. It is situated on the plateau elevating on the very mouth of the River Zeta into the Moraca.

Archaeological investigations of Doclea were initiated by the end of the 19th century and were continued from 1954 to 1964 and again in 1998.

The by-pass around Podgorica runs along Doclea and it covers a part of the place called Vranjske njive where the so called western necropolis of this antique town is located. Recently, the probing excavations have been conducted.

The archaeological resource list should be used by project engineering staff to create corridor re-routes, avoiding potential impacts to the largest and most obvious known sites. Avoidance of monuments is a key consideration in route selection.

Potential project impacts, methodology, remedial measures

Potential project impacts to archaeological sites and monuments differ substantially. For archaeological sites the concern is direct physical impact on fragile subsurface resources from earthmoving equipment and heavy vehicle transit. For monuments the immediate concerns are accidental vehicle impacts, damage to the surrounding landscape setting, destabilisation and impact from continuous heavy vehicle passage or use of high explosives.

Monuments are also prone to secondary impacts such as those caused by temporary or permanent increases in population, sometimes referred to as induced development. Such impacts may include unauthorised and inappropriate occupation of monuments, robbing of monuments for building materials, and degrading of the monuments' surroundings from a variety of unplanned uses. Archaeological resources are less prone to such impacts because of their underground location.

In addition to the difference in impact types just noted, there is another important difference between archaeological sites and monuments.

- Archaeological sites are most often underground and are therefore difficult to identify. Further, those surface indications of archaeological sites that do exist are not always a reliable measure of the extent or importance of subsurface resources. Avoidance of archaeological remains that are discernible from the surface, large burial mounds for example, is good practice but does not ensure that less obvious subsurface remains will not be adversely affected;
- Historic monuments are by definition above ground and are therefore easy to identify in project planning studies Their evaluation is also more straight-forward because subsurface investigation is seldom required. Visibility and accessibility make monuments protection studies less elaborate and less time-consuming. Ease of access is also a cause for the most common impacts noted above, requiring preservation solutions that operate to protect against impacts that result from continuous and long-term public access.

Also, in the case of archaeological sites, there are further potential impacts associated with late finds. This is because any baseline data cannot include previously unreported subsurface sites. In this latter case of unreported finds, the historical context is particularly important for defining the types of impacts that might be expected.

The fact that the planned highway corridors mainly pass through the river valleys, as well as through the fields and hills, actually going the same directions which were, in previous times starting from the old age, used as the basic communication, implies a logical expectation to find archaeological sites from different times and of different character. Thus, apart from the already mentioned *Potential project impacts, methodology, remedial measures* by which “the monuments should be identified through published literature sources supplemented by the unpublished but validated field survey data”, it is necessary to emphasise that there are potential sites that can be identified only on the basis of the systematic recognition of the appropriate area. The methodology of recognising that is being used in these cases as well as the results gained by the recognising, will provide necessary answers to almost all the questions related to the further protection of the sites, together with the proposed measures for protection or systematic excavations. If required due to significance of a site there will be a proposal for alignment relocation.

The highway E-75 can exemplify the systematic recognition in the area of Serbia. There on the corridor line 192 archaeological sites were found, out of which 25 were examined because they were discovered on the road alignment. A similar situation happened in

Slovenia, where through the methodology of recognition 100 archaeological sites were discovered.

Out of these reasons, the need for conducting systematic archaeological recognitions of the highway corridor should be especially emphasised. All the relevant institutions from Montenegro starting from the Republic and Regional Centres for Protection of Cultural Monuments, Montenegrin Archaeological Centre to all the local museums which are located at the area where this corridor passes through, should participate. This is one of the primary conditions to reduce or even to avoid eventual misunderstandings or additional expenses which could appear, due to discovery of an archaeological site during the construction work.

A historic context consists of culture-historical information needed to understand the significance of a particular archaeological site or monument and to predict what types of sites might be present in a previously un-investigated zone. The historic context developed below is a period-by-period series of brief vignettes of Montenegrin prehistory and history. It thus provides a general background on events of scientific and public significance of each of the periods.

The monuments shall be identified through published literature sources supplemented by unpublished but validated field survey data. Literature review process and consultation with various experts shall confirm that the proposed route alternatives are the best option in terms of limiting possible impacts on monuments. Moreover, the route can be further investigated in the course of project. Additional investigation will include recording of precise monument locations, further technical description and study of selected monuments, local inquiry and record searches regarding selected monuments.

Individual monuments typically have protection zones of 50m in radius while protection zones of monastery complexes and castles vary from 150m to 250m in radius, which also ensures protection of the adjacent natural landscapes and the visual setting (view shed) of the protected monument. Protection and landscape zones of monuments are specific for each feature and can be accurately indicated once a final option of the route is defined. It should be noted that some monuments may have unidentified archaeological resources associated with them that could require protection as well. In exceptional cases, if it proves impossible for an alignment to avoid a cultural site of value, salvage excavation should be undertaken. Relocating artefacts or ruins from a site is a last alternative and can be expensive.

Commonly-utilized mitigation measures include excavation, erosion control, restoration of structural elements, rerouting of traffic, and site mapping. Other measures that may be required on occasion are structural stabilization, soil and rock stabilization, control of groundwater levels, vegetative stabilization, control of flora and fauna, and site surveillance. A site management plan will be required. It should identify conservation actions required and, where necessary, provide guidance on other measures such as salvage or relocation. It should establish monitoring and evaluation procedures and a schedule of operations and budget. Particularly important is the inclusion in the plan of specific contract clauses to define responsibilities of companies and workers who discover new sites or artefacts, or who damage known sites. These chance find procedures, all too often, are given inadequate attention. At the very least, they should identify the authorities to whom the company or individual should report, the format for such reporting, the waiting period required before work can be resumed, and measures for interim care of the found items.

Dialogue between the road department and the ministry in charge of cultural heritage needs to be frequent and continuous to avoid situations which either damage the cultural site or delay the road project. In some countries, road projects have been delayed for years because of a lack of procedures governing cultural sites, or lack of funding for the protection, study, or restoration of these sites. In practice, a cooperative relationship between road builders and archaeological specialists is essential. If cultural heritage requirements are too rigid, some site discoveries may be hidden or destroyed to avoid compliance. If, however, road workers fail to allow for heritage sites, substantial delays and cost increases can occur.

All this suggests that if the mitigation plan is to be effective, in most countries it will have to include proposals for strengthening the legal framework and the institutional capacities for the on-going management of the cultural heritage in question. Thus, when the legislation is being examined in order to identify relevant information pertaining to the sites in question, an assessment of the effectiveness of that legislation and of supportive institutional capacity should also be conducted.

Examples of compensatory actions may be:

- tourist development of the site where heritage elements are conserved and showcased; and
- classification of the site as protected under appropriate legislation. For sites of international quality, UNESCO listing as a World Heritage Site may be proposed.

Social Importance of the Cultural Heritage Issue

The protection of heritage resources from potential project impacts is a straightforward matter
of planning, and of implementing practical measures of design and construction. The public value placed on heritage resources, however, is a subjective and culturally variable matter. It is therefore of interest to briefly consider the place of history and the past in Montenegrin society.

A concern for national history and cultural heritage, a common theme in all societies, is unusually strong in Montenegro and shows no sign of diminishing. Montenegrins, more than most, define their identity through a long and well-remembered past.

The Montenegrin sensitivity to history and tradition may come in part from being a small nation in an area of frequent imperial involvement, and violent invasion, and from being a Christian nation in an area with numerous adjacent Moslem populations. High levels of interest in history and archaeology are typical of countries in the process of 'nation building.' An additional factor particularly applicable to prehistoric relics is the strong archaeological research tradition. Because the discovery and study of sites and monuments is often a by-product of project preservation measures, the highway project has the - potential to create positive impacts on Montenegrin society.

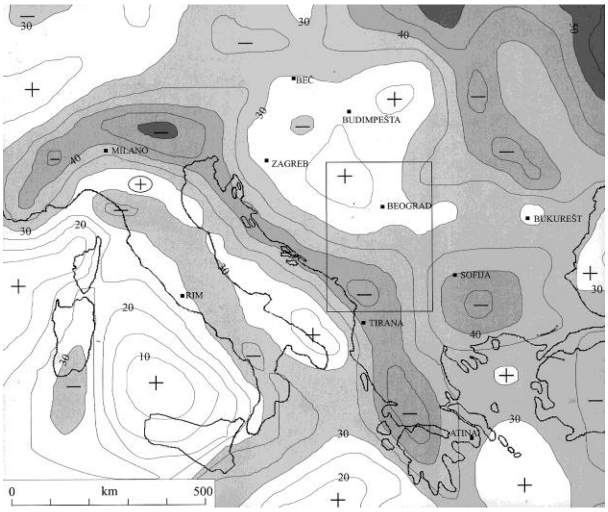
Appendix 9: Natural Risks

For the highway projects in Montenegro in general the natural risks are identified as earthquakes, erosion and landslides.

Gravity values and Seismology

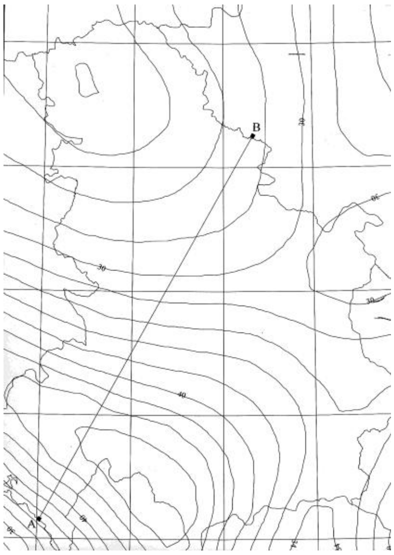
Montenegro has lowest gravity values in the region (approx. 110 mgal). The gravity minimum in Montenegro is result of great crust thickness in Dinarides. Anticlinoria and other geological uplifts, are marked by negative gravity anomalies. Hence, thickness of the crust is considerable in uplifted areas and reduced in depressed zones.

Increase of Bouguer values is toward northeast, with contours going parallel to Dinarides. From the other side, contours in the southern part of Serbia are in SW-NE direction, with a remarkable discontinuity along the line: Djakovica – Pristina – Dimitrovgrad. This discontinuity cuts the Dinaric complex in the area of the Albanian – Serbian border, where anomalies are perpendicular to Dinarides.



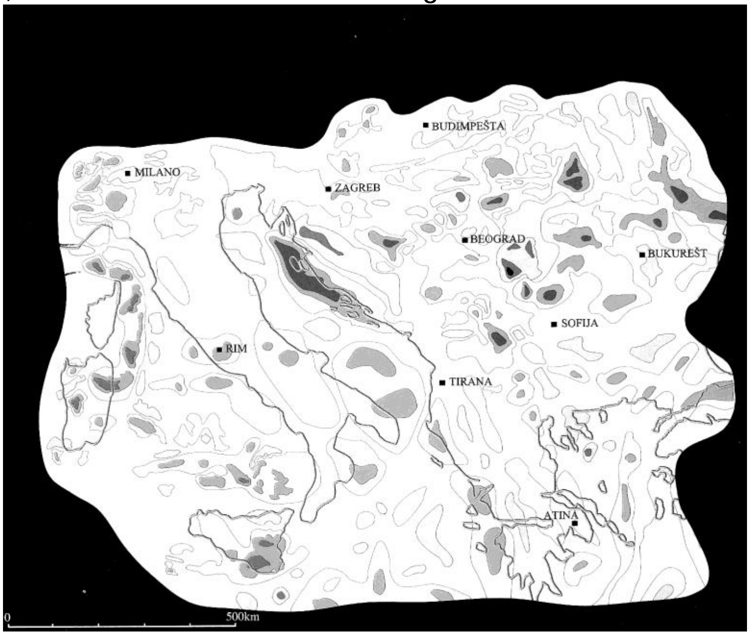
Bouguer gravity map of Serbia and Montenegro. The contour interval is 5 mgal (Geological Atlas of Serbia, 1997)

The map of Moho surface compiled on the basis of DSS (Deep Seismic Soundings) and calculations of the Crust's thickness according to three parameters: depth of Moho surface, Bouguer anomaly and altitude above the sea level. Shows maximum depth to Moho discontinuity is in Montenegro, 50 km north from Podgorica. Moho boundary gradually shallows to the northeast and in Pannonian basin amounts only about 20 km.



Map of Moho surface (Geological Atlas of Serbia, 1997)

Complex geological interpretation of geomagnetic and gravity data is shown in the figure below. According to shape and position of geophysical anomalies and to geological data, regions with ultramafic and acidic intrusives are distinguished such as the areas with unique lithological characteristics, as carbonate rocks in Montenegro.



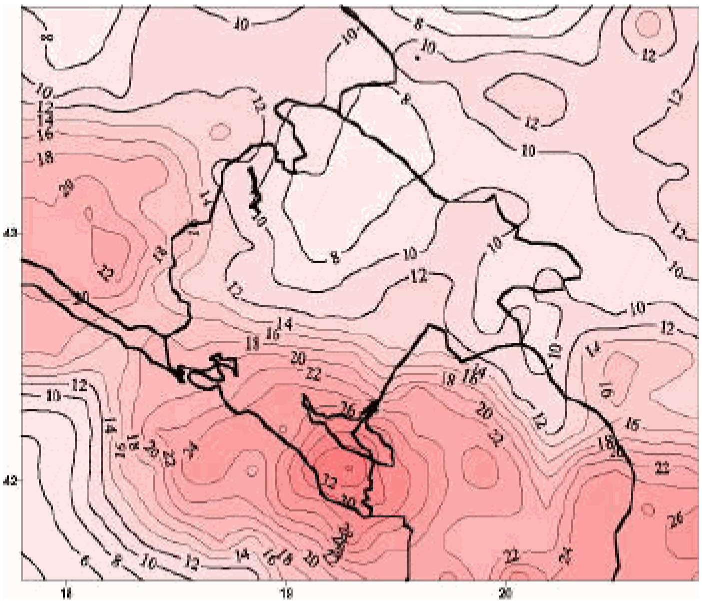
During the earthquake in 1979, liquefaction process was expressed at several localities of Adriatic coast in Montenegro and Skadar lake coast, causing intensive damages (destroying the “Fjord” hotel in Kotor, etc.). Generally, that area is defined as vulnerable to liquefaction.

At the territory of Balkans, the highest seismic activity is characteristic of Dinaridic seismogenous block (Montenegro and SW Serbia), with over 70% events. At the area of the block, disastrous earthquake in 1979 is famous of numerous victims and outstanding damages, initiating detailed complex geological and seismological investigations.

During the period 1983-1986, seismic regionalization, as well as detailed microzonation of all urban environments of the territory of Montenegro, was carried out. The strong earthquakes caused by intensive tectonic processes, predominantly occurring in the coastal part of the territory, produce destructive effects in the form of landslides, avalanches and soil liquefaction.

Seismic hazard of Montenegro for the return period of 200 years with maximum horizontal acceleration (expressed in % of g) and the probability of occurrence 70%)

Source: Seismological Observatory of Montenegro



Seismic activity at the Montenegro territory and neighbouring areas during XX century are distinguished by very large intensity. During this period at the Montenegro occurred several thousand strong and very strong earthquakes. Some of them were characterized as destructive ones.

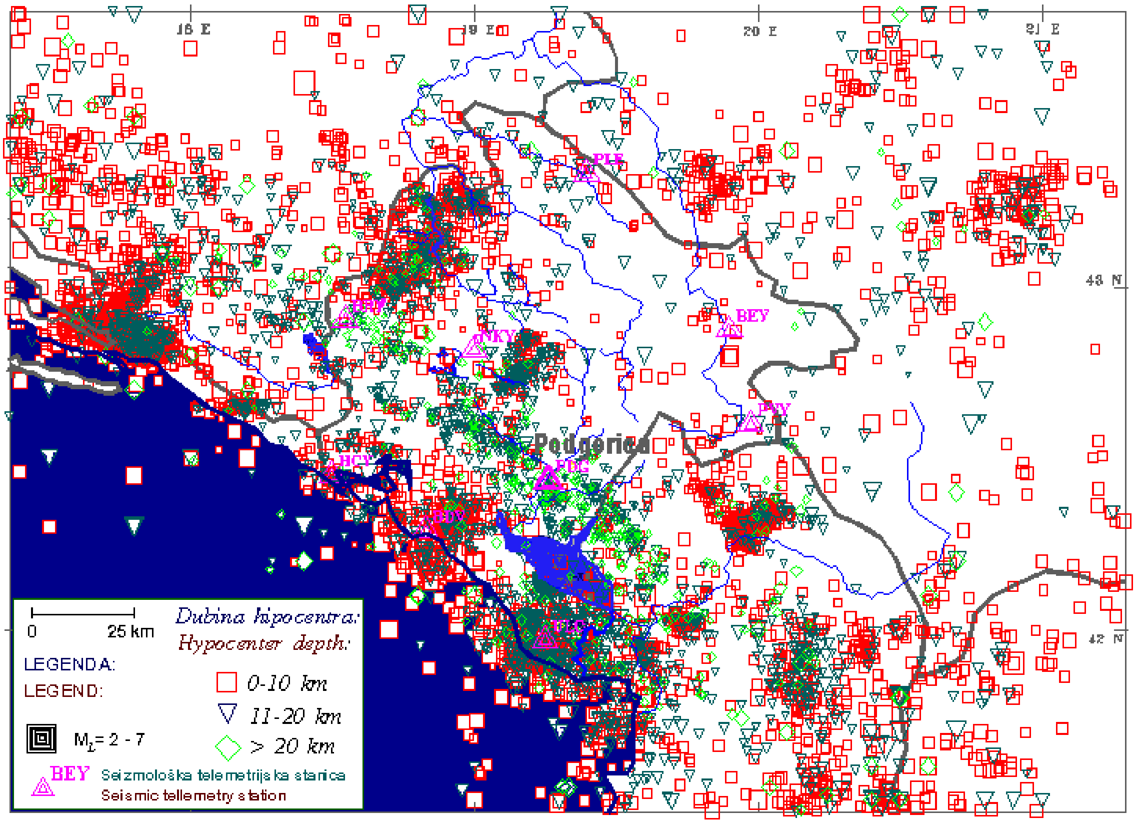
The earthquake of April 15, 1979, at 7:19 AM (local time), unfortunately belongs to the category of catastrophic. The magnitude of this earthquake was 7.0 Richter scale. The whole Montenegrin coastal area during this earthquake was shocked by the intensity of IX degree Mercaly scale. This earthquake took 101 lives in the

Montenegro and 35 in Albania. Beside that, it was destroyed very huge part of the Montenegro hotel capacity, and also a great number of apartment buildings. At the presented picture it is shown one of the recorded accelerograms at the hotel Olympic in Ulcinj (on the hard rock), with the maximum horizontal acceleration of 28 % of Earth's gravity (g).

On the map of epicentres, it is presented all stronger recorded earthquakes (over 2.5 magnitude) occurred on the area of Montenegro and its vicinity during XX century. It is possible to make a conclusion that, practically, complete coastal area posses much higher seismic hazard comparing inland part not only at the Montenegro territory, but much broader region.

On the picture, using different colours, it is expressed the third dimension of the hypocentral parameter (the depth), so it can be recognized some deep seismoactive structure - as it is large tectonic trench which is placed in the Dinarides direction - beginning from northern Albania, via Podgorica in Montenegro, then Danilovgrad and Bratogost at the western part of Montenegro, and further - to the west in the Herzegovina (Republika Srpska). On the epicentral map this tectonic trench can be noticed by position of relatively deep hypocenters (green rhombus and dark blue triangles).

Also, on the map it is possible to notice at the north - western part of the Montenegro territory, effects of a pretty large seismic induced activity in the region of the artificial lake created by the dam "Piva" which is 220 meters high. The main part of the seismic activity in this region is connected with the oscillation of hydrostatic pressure of the reservoir water at the limestone masses in the basement, during the charging and discharging of the lake.



The epicenteral map for earthquakes in the Montenegro region during XX century

Source: Seismological Observatory of Montenegro

Erosion and landslides

Erosion and landslides are prevailing, contemporary engineering-geological process in the mountainous and hilly areas of the modernized road. Foot and side erosions are frequent in the region and stipulate significant separation of slopes. At the exposures and artificial slopes they are intensively weathered and settle down. On gentle slopes of hills and watersheds, argillite clays quickly loses their structure and form alluvial layer due to the influence of undergoing physical and chemical weathering, as well as precipitation and quick changes in temperature.

The relief is uneven, sometimes hilly, mainly separated by ravines and erosions in the lower part. Steepness of slopes varies. Mainly the hill sides are subject to mechanical weathering. Due to disturbance of structural links many macro cracks with circulating infiltration waters can be found in this zone. There are sections with significantly weathered bedrocks in the zone.

There are a landslide sections along the highway route. Depending on the direction of forces causing landslides, which may vary depending on seasons, the landslide body moves with different speed both in plan and by depth. The foot of the slope moves more slowly as compared with the top causing hardly compatible expansion-compression zones in the landslide and cracks. On some places those cracks lay on already existing system of cracks, stratifications and make situation more complicated. Cracks spread nearby the deformed section usually serve as main ways of waters circulation in the body of the landslide. These waters are easily drained and influence stability of the slope and the landslide activity.

Erosion usually takes place at the bottom of narrow gullies and along ravines, where deposits are washed off by temporary streams and taken down to the lower parts of the relief. At the rest of the sections the surface is washed-off by run-off waters.

Appendix 10: Mitigation Measures for Mining/Quarry Activity

The following environmental requirements should be proposed concerning extraction activities: Firstly, from an environmental point of view it would be desirable to use resources already being exploited, as this would prevent proliferation of extraction sites and make control and re-instatement more manageable.

If it is necessary to open new gravel extraction sites, investigations must be conducted in order to identify possible fossil deposits at a distance from active river beds. Extraction within these areas should first ensure that all re-usable surface materials are stockpiled for subsequent restoration purposes. The boundary of the extraction area should be clearly defined and, on the river side, a reserve bank should be maintained. Extraction depths would depend on the characteristics of the site and the mode of operation. Extraction of materials would be permitted below the current water table on condition that fuel oil and lubricants from the machinery do not come into contact with the water i.e. at depths of about 1 metre. Should use be made of a dragline, excavation could be made to a greater depth below the water table.

When extraction is approved from gravel bars within the existing river banks on the inside margins of meander curves, no gravel should be removed from within two metres of the upper water level at the time of extraction in order to protect the currently active river channel. The depth of material removed should not fall below the surface water level at the time of extraction and the existing river grade should be maintained. In such areas, extraction should not take place during periods of anticipated high river flows which could cause flooding during operations.

When extraction is in areas with less sensitive, shallower river flows, it might be permitted to remove gravel to the level of the existing river bed. The existing valley grade would be maintained and the operational area should be protected by a low 1 to 2 metre wide gravel bank.

In case of new-opening carrier site, the following recommendations should be implemented whatever the extraction site chosen:

- Installation of scrubbers and filters to cleanse the dust in crushing plant.
- Access must be via existing track ways and agreed with owners of the land crossed.
- In areas of natural vegetation near the river bank, care should be taken not to disturb mature trees.
- No plant or machinery should be left unattended at the extraction site overnight to minimise the possible impact caused by high flood levels. The existing flood protection bank or natural levee must be maintained.
- A decantation basin must be installed at the outlet of the crushing installation in order to trap the sediments before discharge of washing water into the watercourses.
- Vehicle access into the active river channel should not be permitted in order to minimise disturbance to the habitat and possible pollution with fuel oils and lubricants. Where access to sites is only possible by crossing the river, temporary culverts should be installed to alleviate possible pollution hazards.

- Upon completion of extraction activities, the site should be carefully levelled to form a grade consistent with that of the existing active river channel.

Where gravel extraction can be replaced by massive rock, the same requirements as for borrow pits apply to quarry rehabilitation. It should be emphasized that such extraction requires above all proper landscaping to hide the quarry or to integrate it in the overall landscape.

During quarries works execution, the contractor shall ensure: preservation of trees during piling of materials; spreading of stripped material to facilitate water percolation and allow natural vegetation growth; re-establishment of previous natural drainage flows; improvement of site appearance. When the works shall be completed, and at own expense, the contractor shall restore the environment around the worksite to its original state. The supervisor shall provide the contractor with a report confirming the restoration before acceptance of the works.

Appendix 11: Scoping Checklist

1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)?				
No.	**Questions to be considered in Scoping**	**Yes /No ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant?**
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes		Yes.
1.2	Clearance of existing land, vegetation and buildings?	Yes		Yes
1.3	Creation of new land uses?	Yes		Yes
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes		No
1.5	Construction works?	Yes		Yes
1.6	Demolition works?	Yes		No
1.7	Temporary sites used for construction works or housing of construction workers?	Yes		No
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes		Yes
1.9	Underground works including mining or tunnelling?	Yes		Yes
1.10	Reclamation works?	Yes		
1.11	Dredging?	Yes		No
1.12	Coastal structures e.g. seawalls, piers?	No		No
1.13	Offshore structures?	No		No
1.14	Production and manufacturing processes?	No		No
1.15	Facilities for storage of goods or materials?	Yes		Yes
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes		Possibly
1.17	Facilities for long term housing of operational workers?	No		No
1.18	New road, rail or sea traffic during construction or operation?	Yes		Yes
1.19	New road, rail, air, waterbome or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes		Yes
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes		Yes
1.21	New or diverted transmission lines or pipelines?	Yes		No
1.22	Impoundment, damming, culverting, realignment or	Yes		Yes

	other changes to the hydrology of watercourses or aquifers?			
1.23	Stream crossings?	Yes		Yes
1.24	Abstraction or transfers of water from ground or surface waters?	No		No
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes		No
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes		Yes
1.27	Long term dismantling or decommissioning or restoration works?	Yes		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	Yes		
1.29	Influx of people to an area in either temporarily or permanently?	Yes		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?			

2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, <u>especially any resources which are non-renewable or in short supply?</u>				
No.	**Questions to be considered in Scoping**	**Yes /No ?**	**Which Characteristics of the Project Environment could be affected and how?**	**Is the effect likely to be significant? Why?**
2.1	Land especially undeveloped or agricultural land?	Yes		No
2.2	Water?	Yes		No
2.3	Minerals?			
2.4	Aggregates?	Yes		No
2.5	Forests and timber?	Yes		No
2.6	Energy including electricity and fuels?	Yes		Yes
2.7	Any other resources?			
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes		No
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)?	No		No
3.3	Will the project affect the welfare of people e.g. by changing living conditions?	Yes		No
3.4	Are there especially vulnerable groups of people who could be affected by the project e.g. hospital	Yes		No

	patients, the elderly?			
3.5	Any other causes?			
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes		Yes
4.2	Municipal waste (household and or commercial wastes)?	Yes		No
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes		No
4.4	Other industrial process wastes?			
4.5	Surplus product?			
4.6	Sewage sludge or other sludge from effluent treatment?	Yes		No
4.7	Construction or demolition wastes?	Yes		Yes
4.8	Redundant machinery or equipment?	Yes		No
4.9	Contaminated soils or other material?	Yes		No
4.10	Agricultural wastes?	No		No
4.11	Any other solid wastes?			
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes		Yes
5.2	Emissions from production processes?	Yes		Yes
5.3	Emissions from materials handling including storage or transport?	Yes		Yes
5.4	Emissions from construction activities including plant and equipment?	Yes		Yes
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes		Yes
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (e.g. slash material, construction debris)?			
5.8	Emissions from any other sources?			
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
No.	**Questions to be considered in Scoping**	**Yes /No/ ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant? Why?**
6.1	From operation of equipment (engines, crushers)?	Yes		Yes
6.2	From industrial or similar processes?	Yes		No
6.3	From construction or demolition?	Yes		Yes
6.4	From blasting or piling?	Yes		No

6.5	From construction or operational traffic?	Yes		Yes
6.6	From lighting or cooling systems?	Yes		Yes
6.7	From sources of electromagnetic radiation (effects on nearby sensitive equipment as well as people)?	No		No
6.8	From any other sources?			
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes		Yes
7.2	From discharge of sewage or other effluents (treated or untreated) to water or the land?	Yes		Yes
7.3	By deposing of pollutants emitted to air, land, water?	No		
7.4	From any other sources?			
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	Yes		Yes
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires, storage, handling, use or production of hazardous or toxic substances?	Yes		No
8.2	From events beyond normal environmental protection (failure of pollution control systems)?	Yes		No
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (floods, earthquakes,)?	Yes		No
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, social groups etc?	Yes		No
9.2	By resettlement of people or demolition of homes or communities or community facilities (schools, hospitals)?	Yes		No
9.3	Through in-migration of new residents or creation of new communities?	Yes		No
9.4	By placing increased demands on local facilities or services e.g. housing, education, health?	No		No
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes		Yes
9.6	Any other causes?			
10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment (more housing, new roads, , etc?)	Yes		Yes
10.2	Will the project lead to development of supporting	Yes		Yes

	facilities, ancillary development or development stimulated by the project which could have impact on the environment (roads, power supply, waste or waste water treatment,) housing development,?			
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	Yes		Yes
10.4	Will the project set a precedent for later developments?			
10.5	Will the project have cumulative effects due to proximity to other projects with similar effects?			

REPUBLIC OF MONTENEGRO

MINISTRY OF TRANSPORT, MARITIME AFFAIRS AND TELECOMMUNICATIONS

RIMSKI TRG 46 “VEKTRA BUILDING”
81000, PODGORICA, MONTENEGRO

CONTRACT NO. 01-3814/1 DATED 10 AUGUST 2007

FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

STRATEGIC ENVIRONMENTAL ASSESSMENT – OVERVIEW & GENERAL ISSUES

VOLUME III

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE
PODGORICA, AUGUST, 2008

TABLE OF CONTENTS

EXECUTIVE SUMMARY

According to the Environment Law of Montenegro "Official Gazette of the Republic of Montenegro, No 12/1996 (Article 19) permission for the execution of any project shall not be given prior to the provision of the approval of Environmental Impact Assessment (EIA).The Ministry is entitled to grant approvals to the EIA statements as for the projects referred to in Article 17 of this Law. Each development project/activity either planned or carried out by legal or physical entity, either local or foreign one, which is likely to result in pollution of the environment or to pose any risk for the environment, shall be subject to preparation of the EIA statement (Article 17).Prior to carrying out the project/activity as referred to in paragraph 1 herein, the investor shall carry out the procedure of environmental impact assessment.

The environmental impact assessment shall identify, describe and assess both direct and indirect effects on the environment, particularly and respectively regarding:(1) human beings, flora and fauna; (2) soil, water and sea, air, climate and landscape; (3) interaction between factors as of lines (1) and (2); (4) assets and cultural and historical heritage; and (5) economic and social surroundings; The investor shall bear the expenses for the elaboration of the environmental impact assessment statement. Types of the projects that are mandated with preparation EIA statement, the contents, methods for drawing up the EIA statement, selection of alternative solutions in terms of technology and chemicals, selection of location, criteria that must be fulfilled by professional organisations to be entitled for drawing up the EIA statements, the method of appraisal and verification, public participation and other issues pertaining to the EIA statement shall be enacted by the Government (Article 18)

Based on screening consultations with the competent authority (LB communication with Ministry of Maritime Affairs Transportation and Telecommunication), and considering that the full-scale SEA (Strategic Environmental Assessment) process can not be completed due to limited timeframe and the resources of the present Project, it was advised for the current feasibility stage to prepare the preliminary environmental report in the SEA format, within the agreed scope (reflected in a content of this Report). This preliminary Environmental Assessment report will:

- demonstrate the commitments of the project initiating agencies (Department of Roads, MoTMAT) to the environmental protection considerations under the EU and Montenegrin legislation;
- set up the level and range of environmental requirements (for the future investors, developers as well as design-consultants and the contractors), implementation of which can be roughly calculated at the (current) feasibility stage;
- provide professional basis for the inter-sectoral consultations under the SEA procedure;
- provide scoping assessment of the main environmental and social impacts including impact on sensitive areas and the land-use, and propose remedial opportunities;
- provide competent authority with the information (including scoping information) sufficient to come out with the general opinion on the suggested rout alternatives;

- provide good basis for starting public participation process in terms of issues identification, impact identification and scoping for the full-scale ESIA.

The description of the project and the main options of construction works can be summarised as follows:

Different types of construction works are planned for the construction of the road: ground works, new sections construction, widening and reconstruction of the existing sections, new pavement construction, construction of the retaining walls, drainage network, erosion/landslides protection and the river protection. The new bridges and tunnels will be constructed. Road infrastructure will be installed. In general, the brief guidance for management of construction activity and workforce can be presented as follows:

Soils:

- choose the best work period to limit risks of erosion—avoid rainy season
- create a specific stockpile for topsoil to be reused
- plan dialogue with local authorities for use of excess soil

Water:

- do not locate site installations or production plants in sensitive places (e.g. near drinking water intakes)
- provide a used motor oil recovery system
- avoid water accumulation points, casual water from empty containers, old tires, etc., which act as mosquito breeding areas, i.e. provide good temporary drainage of site
- provide sufficient settling for pollution from particles

Air, noise:

- during work execution, noise impacts can be limited by using quiet equipment,
- installing temporary barriers or screens, and by working during regular business hours
- limit dust with a sprinkler system
- be careful when setting off explosives that can cause vibration damage

Flora and fauna:

- limit clearing to surfaces absolutely necessary for the road project;
- control poaching and firewood collection by workers

Population, economic activities:

- maintain access during work execution;

  enclose the work site with fencing for safety (especially to keep children away from heavy machinery);
- plan specific itineraries for site machinery traffic;

- define traffic rules encouraging contractors to respect highway regulations

Risks:

- plan emergency procedures in case of accidents, or spills of pollutants
- define safety rules for work site personnel—dangerous materials handling, fires, etc.

1 INTRODUCTION

This preliminary Environmental Assessment has been prepared as part of the “Feasibility Study for two Highways in Montenegro" financed by the IBRD…

Montenegro’s road infrastructure extends for 6,848 km, out of which 884 km are primary roads and 964km are secondary roads. The total network also contains 312 bridges, 136 tunnels, and about 5000 km of local roads. There are currently around 100,000 registered vehicles in Montenegro out of which 89 percent are private passenger vehicles. The physical characteristics of most of the state roads (steep slopes, absence of shoulders, tight curves, low radii, relatively high pavement degradation) results in an average speed of less than 50 kilometres per hour, results in higher costs for road users, reducing Montenegro’s comparative advantage against other transit corridors, and inhibits economic development.

The Transport Directorate (TD) a line authority of the Ministry of Transport, Maritime Affairs and Telecommunications (highway), is the body in charge of managing, maintaining, and building all state roads (highways, primary and secondary roads). As the Implementing Agency in the Highway Sector, the TD procured the consultants to undertake a feasibility study on the two highways across Montenegro. The specific links to be included in the study are respectively, the Bar-Boljare (border with Republic of Serbia) highway route, length approximately 170 km and the Adriatic-Ionian highway route, length approximately 110 km. The highway route Bar-Boljare is mainly marked as route Numbers 4 in the Regional Balkans Transport Infrastructure Study, and is an integral part of the Regional Core Transport Network for South – East Europe, linking the road network in Montenegro to neighbouring countries. Currently average traffic volumes on the existing line between Bar and the border with Republic of Serbia are around 4,000-5,000 vehicles per day but with a strong seasonal peak in July and August of up 13,000 vehicles per day. The other route, Adriatic-Ionian highway will represent an entirely new alignment.

OVERVIEW OF THE RELEVANT EU AND THE MONTENEGRIN LEGISLATION

1.1 EU Legislation

On 31 May 2001 the European Parliament and on 5 June 2001 the European Council formally adopted the Directive 2001/42/EC "On the Assessment of the Effects of Certain plans and Programmes on the Environment", also known as a SEA (Strategic Environmental Assessment) Directive.

The purpose of the SEA-Directive is to ensure that environmental consequences of certain plans and programmes are identified and assessed during their preparation and before the adoption. The public and environmental authorities can give their opinion and all results are integrated and taken into account in the course of the planning procedure. After the adoption of the plan or programme the public is informed about the decision and the way in which it was made.

The key objectives of SEA include contributing to a high level of protection of the environment and the integration of environmental considerations into the preparation and adoption of plans and programmes with a view of sustainable development.

Key elements of SEA, in general, should include the following:

- an analysis of the likely significant effects on the environment of implementing the proposed policy, plan or programme (PPP);
- the identification, description and evaluation of alternatives;
- the provision of the following information:

– an outline of the PPP;

– the current state of the environment and its likely evolution;

– the environmental characteristics of the areas likely to be significantly affected;

– the environmental protection objectives relevant to the PPP;

– the likely significant impacts on the environment;

– the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment;

– an outline of the reasons for selecting the alternatives dealt with;

– a description of measures for monitoring the implementation; and

– a non-technical summary

- the draft PPP and the environmental report are to be made available to relevant authorities and the public (including relevant NGOs and the other concerned organizations).

The SEA is increasingly being applied to transport infrastructure plans. Good SEAs:

- prevent unnecessary environmental complications and delays at the project level (the level at which EIA is applied);
- consider environmentally friendly alternatives that are no longer feasible at the project level, and prevent expensive mitigation measures;
- reduce public resistance to transport infrastructure projects, and raise environmental awareness in the transport sector.

The European Commission, DG Energy and Transport has developed a number of Principles of SEA for Transport Infrastructure Plans, that SEA should follow:

- SEA should be applied, at the earliest stage, to all transport infrastructure plans that may have environmental consequences;
- the initiator of a proposed transport infrastructure plan should be responsible for the preparation of an SEA report;
- the SEA report should be reviewed by environmental authorities and other interested parties and by the public;
- the competent authority should take the SEA report into account in making decisions about the proposed transport infrastructure plan;
- consultation and participation are integral to the SEA process.

The steps of the SEA process (screening, scoping, impact assessment, review, integration into decision making, implementation and monitoring, consultation and participation) are similar to those of project-level environmental impact assessment, but have different volume and level of details.

In connection with any financing, International Finance Institutions (IFI-s) such as The World Bank (WB) Group, the European Bank for Reconstruction and Development (EBRD) and export credit agencies also require compliance with specified environmental and social policies during the term of any financing provided by them.

1.2 International Agreements and Conventions

The international agreements and conventions, of relevance to the Road Modernization Project, to which Montenegro is party, are listed below:

- Ramsar Convention on Wetlands of International Importance Especially as Wildfowl Habitat;
- UN (Rio) Convention on Biological Diversity;
- UN Framework Convention on Climate Change;
- Convention on Migratory Species;
- Paris Convention on the Protection of the World Cultural and Natural Heritage;
- European Convention on Protection of Archaeological Heritage;
- Convention for the Protection of the Architectural Heritage of Europe;
- Aarhus Convention on Access to Information, Public Participation in decision-Making and access to justice in Environmental Matters.

1.3 Montenegrin Legislation and the Administrative Framework

The existing and forthcoming environmental legislation and guidelines relevant to the Montenegro Feasibility Study for Two Highways Project are listed below.

Nature protection

- Environment Law ("Official register of the Republic of Montenegro" n°12/96)
- Law on Nature Protection ("Official Gazette of the Republic of Montenegro" Nos. 36/77, 39/77, 2/89, 29/89, 29/89, 48/91, 17/92, 27/94)
- Regulation on the protection of rare, endemic and endangered animal and plant ("Official Gazette of the Republic of Montenegro" n°30/68)
- Law on National Parks ("Official Gazette of the Republic of Montenegro" n°s 47/91, 17/92, 27/94)
- Law on Forests ("Official Gazette of the Republic of Montenegro" n°55/2000)
- Law on Hunting ("Official Register of the Republic of Montenegro" n°47/99)
- Law on Freshwater Fishery ("Official Gazette of the Socialist Republic of Montenegro" n° 39/76, 51/76, 34/88; "Official Gazette of the Republic of Montenegro" n°4/92)
- Regulation on Environmental Pollution Taxes ("Official Gazette of Republic of Montenegro" N°26/97, 9/2000)

Environmental Impact Assessment

- Environmental Impact Assessment Decree ("Official Gazette of Republic of Montenegro" N°14/97)
- Guidance on the content of EIA study ("Official Gazette of Republic of Montenegro" N°21/97)

Strategic Environmental Impact Assessment

- Strategic Environmental Impact Assessment Law ("Official Gazette of Republic of Montenegro" N°80/05)

Air Pollution

- Decree relating to method of measuring air pollution (Official Gazette of the Republic of Montenegro N°s 14/80)
- Air quality Standards Regulation (Official Gazette of the Republic of Montenegro N°4/82, 8/82)
- Law on Technical Control of Vehicles (1984)
- Decree relating to selection of measuring locations to establish level of air pollution (Official Gazette of the Republic of Montenegro N°6/86)
- Law on Air Protection (Official Gazette of the Republic of Montenegro Nos. 14/80, 16/80, 29/89, 39/89, 48/91, 17/92, 27/94)
- Regulation on Air Pollution Emission (Official Gazette of the Republic of Montenegro N°25/01)

Noise

- Noise Protection Act (Official Gazette of the Republic of Montenegro N°24/95, 42/00, 49/00)

Water

- Law on Water
- Decree on water categorization and classification (1996)
- Ordinance on determining and maintaining the protection zones around the drinking water sources and an ordinance on categorization of water streams and lakes

Waste

- Law on collecting and recycling of solid waste (“Official Gazette of Republic of Montenegro”, n° 20/81, 26/81, 2/89, 19/89, 39/89, 48/91, 17/92, 27/94)
- Regulation on the criteria for selection of a location and method of solid waste disposal (“Official Gazette of Republic of Montenegro”, n°56/2000)

Soil

- Law on Geological Investigations and Exploitation of Mineral Resources (1988)
- Law on Agricultural Land (“Official Gazette of Republic of Montenegro”, Nos. 15/92, 59/92)
- Law on Mining (“Official Gazette of Republic of Montenegro”, n°28/93)
- Law on Construction (“Official Gazette of Republic of Montenegro”, n° 55/00)
- “The Road Act”, published in Podgorica on 22nd June 2004 is a technical document discussing technical issues associated with the use, layout, maintenance, cleaning and signs for roads and does not seek to address environmental, health or safety issues.

Cultural Heritage

- Law on Protection of the Monuments of Culture (1991),
- Law on Museum Activity (1977, 1989),
- Law on Library Activity (1977, 1989),
- Law on Archives Activity (1991, 1994)
- Law on Revitalisation of Old Cities Damaged by the Earthquake on 15 April, 1979 (1984, 1986),
- Law on Monuments Revitalization Kotor (1991) and
- Law on Monuments, Memorial sites, Historic Events and Persons (1971, 1972, 1988)

In addition to the Ministry of Tourism and Environmental Protection, a variety of other ministries/departments in Montenegro also play a role in the approval/agreement process for the Road Modernization Project, including but not limited to:

1. Ministry of Maritime Affairs Transportation and Telecommunication;

2. Ministry of Culture, Sports and Media;
3. Ministry of Agriculture, Forestry and Water Management;
4. Ministry for Economic Development;
5. Ministry of Health, Labour and Social Welfare;
6. Hydrological and Metrological Service of Montenegro;
7. National Parks of Montenegro;
8. Centre for Ecotoxicological Research of Montenegro;
9. P.C. Republic Geological Institute of Montenegro;
10. Forestry Directorate.

Montenegro is divided into administrative units (municipalities). Relevant state bodies and institutions are located in Podgorica, the capital city. Local authorities` institutions perform the main administrative functions in each municipality including the local land-use issues and land allocation function – especially important in relation to the present project.

1.4 Consultation and Public Participation Process

Consultation with relevant authorities, agencies and all other stakeholders in the region or corridor is the key in identifying the scope and relevance of an SEA. More generally, public participation can contribute to widen the issues and the perspective from which a transport plan is being assessed. To be effective, participation requires the public to be presented with arguments which they can directly relate to.

In general, even in the EU, the reasons for limited attention to public participation at the strategic level of assessment are:

- the assumption that this may be almost impossible given the scale of the issue (i.e. Too complex to be understood, or not concrete enough to be presented to the general public), and/or the size of the population;
- the fear that this will be too expensive and time consuming.

In Montenegro, public participation usually takes place at the final stages of an EIA process. As stated in the law on EIA: "When the competent authority has the obligation to inform public in accordance with provisions of this Law such information shall be made public in at least one local or daily paper published in the territory that is going to be affected by the planned project (Article 29 -Public information methods). The competent authority shall inform the authorities and organisations concerned by means of delivering written notices by fax or electronic media.

Within 7 days from the receipt of the application for authorisation for the Study, the competent authority shall inform authorities and organisations and public concerned about the ways, period and venue for public access, submission of opinions and remarks/comments, as well as about time and venue of public debate on the Study. Public debate may not be held sooner than 20 days from the day when public and authorities and organisations and public concerned were informed. Public debate shall be organised and chaired by the competent authority. The developer and at least one person who participated in the Study elaboration shall participate in the public debate. (Article 20 - Public debate on the Study).

At the early stage Montenegrin agencies, who initiates new program (or project), usually limit themselves to consultations with the relevant authorities, ministries, maybe stakeholder organizations, – but not the general public - for the same reasons as mentioned above for the EU. However, large infrastructure developments require a procedure which involves the public even before a decision is taken on the opportunity or otherwise of considering such development.

As it was stated above, this report provides good basis for starting inter-sectoral consultations and public participation process in scoping, issues identification, detailed impact identification for the full-scale Environmental and Social Impact Assessment (ESIA).

Communication and public information on the Project have to be ensured during the design process, since public involvement is an integral part of ESIA. Activities to inform and involve the public should begin as early as possible. Communication with interested parties could be materialized through:

a) information disclosures (public dissemination of information materials and documents);

b) information gatherings (communication with residents and interest groups);

c) consultation (providing opportunities for interested persons to pose questions and for the project team to obtain opinions about project alternatives);

d) participation (dialogue between interested parties before key project decisions are made).

Consultation techniques could include information displays, newsletters, reports and leaflets, interview surveys, formal „public hearings" or less formal public meetings, discussions with specific groups or individuals, on-site consultations and inspection tours and rapid appraisal methods such as key informant interviews, focus group discussions, structured observation and informal surveys. Communication with public should continue also during the construction phase.

The first round of consultations on an inner-governmental level already took place within the period of preparation of this Report and partially is reflected in the content. The consultations have been conducted with the MoTMAT.

In regards of public participation - it is proposed to use fragments of this report as a basis for the public presentations as well as for preliminarily distributed handouts – in order to initiate comments and the information exchange process. In addition to the meetings with the NGOs which can be conducted in Podgorica, the integral part of the PP process are the meetings with the local representatives (NGOs, stakeholders, citizens' groups of interest) in the regions along the route.

2 DESCRIPTION OF THE PROJECT

This section of the Environmental Assessment describes the project content only briefly. The main project documents are presented in the Feasibility Study. If necessary this section can be extended based on extracts from the Economic and Technical Design chapters of the Feasibility Study.

2.1 Economic and Social Need for the Project

In general, the social-economic effect resulting from the proposed road construction project can provide overall improvement of living conditions and standards for the national population. The main benefits are increased quality of a major transport artery which will contribute to the national economy, and increased government revenue from transit taxes, which in turn could contribute to improved social services. The use of local labour in the construction phase will also provide an inflow of cash to local economies along the highway route.

2.2 Construction of new Highway and Modernization of Existing Sections

The proposed construction design is likely to be based on the Trans-European Motorway (TEM) standards. These standards refer to a highway which:

- is specially designed and built for motor traffic and does not serve properties bordering on it;
- is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip (central reserve) not intended for traffic or, exceptionally, by other means;
- does not cross at level with any road, railway or tramway track, or footpath;
- is marked with traffic signs;

In addition to that, the highway will:

- be provided with hard shoulders of adequate width, on which no other than emergency stopping is allowed;
- have a sufficient distance between the interchanges;
- be provided with its own police and maintenance services.

2.3 Infrastructure and Facilities

The collection and discharge of surface water (rain or snow melt) from the carriageway surface and from embankments and cuts will be done by means of the following devices: pavement drains, side channels and ditches; slope protection ditches, gutters, sumps. In order to catch the foul water leaving the highway and prevent it from polluting the watercourses, the following facilities and measures will/may be used: monolithic sedimentation reservoirs; natural catchment basins; biological purification; sorption filters.

Additionally, it is necessary to foresee the snow -cleaning during winter periods which should be the responsibility of the winter service for the road maintenance. Apart from manual cleaning of snow, some substances are often used for the cleaning such as salt or grit, which directly influence the soil beside the road and possible pollution and present a threat to draingae systems. That is why it is required to foresee a regular snow and the above mentioned substances cleaning from the road edges.

Infrastructure includes new bridges and existing bridges and tunnels, which should also be brought to the same safety level, if they have lower capacity than the provisions required for the highway. Bridges and tunnels are an integral part of the highway, the cross section of which on the bridge or in the tunnel should therefore remain the same.

It is required to install fencing along the whole length of the highway, for both safety and environmental protection reasons. The fencing, consisting usually of a tight metal mesh, should be installed at the edges of the highway property. The fence height should vary from a minimum of 1.50 m to a maximum of 2.50 m. Where the highway crosses the populated areas or splits the community the overpasses and underpasses will be constructed. Also where the highway crosses zones of big wild animal populations, suitably sized and shaped overpasses and underpasses for animals will be constructed.

The design has to make provision for setting of maintenance centres and related outlying posts, including stations for highway telecommunication system. The buildings for offices, machine workshops, vehicle shelters, salt supplies, etc., should be of modular type to permit enlargement at a later stage. They must be provided with suitably large paved yards to facilitate the manoeuvring by special vehicles.

Depending on their functional characteristics, highway facilities can be grouped in the following types:

- rest areas;
- service areas;
- toll facilities (if necessary);
- frontier check-points (if any).

Facilities shall be accessible from the highway only. Pedestrian access may be provided from the ordinary road network for use by tradesmen and service personnel.

Rest areas are separated physically from the highway carriageways and provide the user with an opportunity to halt in an atmosphere which affords a distinct change from highway driving. Each rest area must be provided with acceleration and deceleration lanes, road signs and markings.

Service areas will provide fuel, lubricants and mechanical assistance, rest, refreshment and toilet facilities, and overnight motel accommodation for users, plus shops and tourist services.

3 ENVIRONMENTAL BASELINE

3.1 General

The description of baseline conditions is one of the key steps which are generally required to meet the objectives of any Environmental Assessment. In a properly conducted EA, it is essential that both biophysical and socio-economic components of the environment be taken into account. The presented baseline conditions define the characteristics of the existing environment in Montenegro along the proposed highway route and partially shape projected future conditions, assuming no project is undertaken. They provide the basis from which general preliminary impact analysis are made.

The quality of the analysis of baseline conditions establishes the viability of the impact appraisal, and therefore of the study itself. This stage of the EA process is of prime importance. Hurrying this stage of the EA, or not coordinating with the various organizations affected by the project, may be counterproductive and add costs later. So the data presented below is very general review of the baseline conditions, conducted in a modest scale due to the limited timeframe and the resources of this Project, in order to create a broad picture allowing for initiating and starting the EA process. This picture will require more accurate studies and analysis at the subsequent stages of the Project, providing more detailed info to be taken into consideration for the feasibility and design.

3.2 Climatic Conditions

The climatic conditions are summarized in Appendix 1.

3.3 Geomorphology, soils and engineering-geological conditions

Geomorphology, soils and the engineering-geological conditions are summarized in Appendix 2.

3.4 Hydrogeology and Surface Water

The hydrogeology and the surface water conditions are summarized in Appendix 3.

3.5 Main Environmental Assets along the Route

The main environmental assets along the highway route are summarized in Appendix 4.

3.6 Air Quality and Noise Level

The air quality and noise level issues are summarized in Appendix 5.

3.7 General Conditions of the Existing Road

The general present conditions of the existing road are summarized in Appendix 6.

3.8 Socio-Economic Baseline

The socio economic baseline is summarized in Appendix 7.

3.9 Cultural Heritage and Archaeology

The cultural heritage and archaeology issues are summarized in Appendix 8.

3.10 Natural risks

The seismic activity, flooding, and soil weathering, erosion and landslides conditions are summarized in Appendix 9.

4 IDENTIFICATION OF THE MAIN IMPACT CATEGORIES, SOURCES AND THE RECEPTORS

4.1 Planning and Design Phase

- Socio-economic impact: The project will contribute indirectly to poverty alleviation by job creation for implementation of the civil works components in the short time and in creating in longer time employment opportunities for overall economic activities in the country. But in the same time loss of access to roadside businesses for many people, even entire settlements, means loss of the access to their livelihood, that should be compensated by business involvement and access to the rest and service areas along the highway.
- Natural Environment: The highway route will cross Skadar lake national park, which should be considered as a separate issue during detailed design and construction stage. Also the highway route will run along the Tara River bank, which should be also taken into consideration given the protected area of the Tara River. Besides the road construction/modernization project will have impact on landscapes, flora and fauna, possible land erosion and landslides which shall be prevented or minimized at both detailed design and the construction stages.
- Land-use: Where the existing road right-of-way is about 30 m wide, the widening operations mostly do not necessitate the purchase of agricultural lands, all the works being included in the initial right-of-way. This minimizes the widening impacts. But the new sections consider some agricultural and private land consumption which shall be compensated correspondingly, on a legal basis.
- Noise: The rehabilitation of pavement will allow a reduction of noise during operation. But the project will improve traffic flow, and increase number of vehicles on the road and so the global noise atmosphere should increase too. The impact of the project concerning noise is to be mitigated.
- Air Pollution: The road modernization project has both positive and negative effects:

– positive benefits of improved traffic flow lead to improved fuel efficiency and better engine performance, thereby reducing volume of vehicle emissions which otherwise results from idling traffic. Also new road is foreseen to by pass urban areas which should re-direct traffic flow from its centres and therefore reduce air pollution in the cities.

– negative impacts: improved road conditions increase volume of traffic bringing to increased volume of aerosol emissions, including led and other solid particles, and also to increase in emissions of gaseous pollutants like NOx and CO2.

4.2 Construction Phase

Materials Supply: The road modernization and construction works will require asphalt, stone, gravel, and sand and the sources of these materials, even though not directly related to the project, may be a cause for environmental concern. A significant amount of Air pollution is generated from the asphalt plants because these plants burn heavy oil, which may contain high sulphur. Besides this, a lot of toxic gases are being emitted in the asphalt plant. The quarries also create a significant amount of particulate emissions, which may create respiratory and health problems. Overexploitation of gravel and sand from rivers may threaten the structural stability of the river banks and change the hydrology and ecology of the river system. Compliance of the materials supply sources with environmental safety standards is therefore essential.

- *Materials Transport:* Transport of construction materials or demolition debris in open trucks, and during traffic hours, should be prohibited so as to minimize exposure to dust and fumes.
- *Noise and dust:* Noise and dust may be a concern at the construction site, for the construction workers, as well as people living and working in the surrounding areas, especially if construction activities are taking place in congested areas.
- *Traffic Disruptions and vehicular/pedestrian safety:* All road construction/modernization works will involve temporary disruptions and diversion of normal traffic, which may cause significant inconvenience in congested areas, and pose road safety risks if appropriate signs are not posted while doing the works on the highways and roads in remote areas. Limited access to roadside businesses and dwellings causes extra inconvenience and extra costs as a result of prolongation of the way to reach the needed area. Temporary relocation of bus pullouts during construction may lead to increased walking distances for pedestrians.
- *Disposal of construction wastes:* The milled asphalt and demolition wastes, if not removed from the site and disposed of properly, could cause pollution of the soil and water with toxic runoff and particulates while also posing an accident risk and impairing the aesthetic quality of the landscape. The materials should be transported and disposed of in accordance with safe environmental practices, or reused to the extent feasible.
- *Solid wastes and sediments in drains:* Roadside drains and ditches filled with solid waste are a serious health hazard, especially if these are used as receptacles for medical or toxic wastes and as defecation sites. Besides the risk of exposure to the waste itself, this has adverse effects also on the aesthetics and the drainage capacity in the relevant road sections. The runoff and leaching of drainage waters may be causing contamination of neighbouring irrigation and drinking water supplies. A number of such sites have been identified under the project, some constituting major dumping grounds requiring significant clean up efforts.
- *Water pollution:* Where construction activities are being carried out in the vicinity of watercourses, improper handling and storage of materials (concrete, asphalt, lubricants, fuels, solvents) may pose risk of water contamination.

The Short-term impacts are noise, dust and the disruption of traffic resulting from works execution; removal of waste materials, disturbances in drainage and temporary erosion.

Main direct negative impacts from road construction and modernization activities are linked with production and application of bituminous products; quarrying of stone and gravel. These impacts are often considered to be important and form a transitory hindrance for everybody near the road (because of diversions, movement of construction plant, noise, dust, etc.). However this will be limited to the construction period and can be reduced by the taking of simple precautions, which should be laid down in the specifications for the bidding contractors.

Site installation impact consist firstly of the physical area of the installation, which can cause the disappearance of several hectares of farmland. There is then the assortment of nuisances and pollution caused by the functioning of the installation:

- local nuisances (noise, disturbance to traffic) for the neighbouring population;
- sanitary problems related to the treatment and disposal of sewage;
- pollution of soil and surface water by lubricants and hydrocarbons, especially during maintenance of works plant and utility vehicles; the mechanical workshops, maintenance pits, fuel installations and depots are often severely polluted;
- social problems involved in the installation of workers in small communities. However, this effect is not necessarily detrimental as it is likely that such works will create temporary employment for local people.

Equipment maintenance and fuelling may cause contamination of soils and watercourses, including groundwater, if handling of lubricants, fuels, solvents, etc. is improper or careless. This is valid for all kind of equipment used and in all areas of road construction.

Preparatory works and earthwork: Tree felling, clearing and soil stripping are part of the preparatory works. Moving services (electricity, water...) is generally included. Preparatory works will be found mainly within all sections of the highway. Preparatory works can thus involve unjustified tree felling or excessive use of agricultural land. Instead of being recovered and stockpiled for re-use, topsoil is sometimes dumped with excess spoil. Moving service networks does not generally raise any problems, at least as regards overhead power lines. The case is different for underground networks such as potable water supply system. If no precautions are taken, a number of pipes risk breakages, causing accidental flow and supply being cut off for certain houses. Some of the cut materials will be reused in embankment but most of the surplus spoil will be disposed off. Selected sub-layer and fill materials will have to be supplied from borrow pits. Various disturbances such as land take erosion, change in flow conditions, pollution and nuisances (noise, dust and vibration) and changes in the landscape can be forecast for borrow and stockpile sites and during haulage of materials. The most serious of these nuisances is generally water pollution caused by the works. The initial topsoil stripping phase and especially haulage and dumping is the occasion for maximum movement of fine particles by rain, wind and movement of works plant. To the problem of suspended matter must obviously be added the risk of pollution (oils and fuel) by works plant. It is noted that although this chemical pollution is not very perceptible, it often causes more harm than physical pollution by matter in suspension. The most sensitive sites to these forms of pollution are obviously the watercourses crossed by the project. At these places, the conservation of the existing bridges largely contributes to eliminate the risks of pollution. These risks are potentially more serious for the small watercourses where the culverts must be replaced. Due to the concentration of heavy metal in roadsides zones, the rehabilitation works, especially the removal of shoulder and embankment material, are potentially dangerous for the adjacent ecosystems, especially for rivers and water bodies. Also, in the case of adjacent arable fields, the rehabilitation works should be undertaken with certain restrictions. Excavation of ditches whose side-slopes and sediments contain elevated levels of lead, cadmium and zinc may result in remobilization of contaminants due to erosion and flushing into watercourses or groundwater due to release at disposal site. Erosion of fine-grained sediments during excavation, depending on ditch flows and weather conditions, may be carried into watercourses of fish-bearing. Removal of roadside vegetation within right-of-way and excavation of new drainage works may expose fine-grained sediments to erosion and mobilization. It is necessary to mention a potential danger of damaging some archaeological locality, so during the earthwork stage, at the places where this may be expected the additional precautionary measures should be taken.

Civil engineering structures: Motorway overpasses, underpasses, bridges and culvert construction may result in following negative environmental impacts on natural habitat:

As for earthworks, the replacement of culverts can generate punctual pollution problems: suspended matter, oils, fuel. The pollution risks will be all the more acute since the flow is low (no dilution effect) and the initial water quality high. Basic concrete, which is used by bridge construction and during the reconstruction works, may result in enhanced cadmium leaching.

A consequence of structure works could be deposition of toxic concrete or concrete leachate into watercourses during on-site concrete pours. Work within wetted area of watercourse may negatively affect fish habitat. Work along stream bank may disturb riparian vegetation and soils that are integral to supporting aquatic habitat.

Pavement works: Paving of the road stretches can cause the air and water contamination from new asphalt batch plant. Although most asphalt mixing plants lie outside highly populated areas, their emissions represent a potential source of pollution to both the air and surrounding land areas. Sources of road base and road surfacing materials are most likely to comprise crushed quarried rock and crushed river boulders. Pebbles, gravels and agglomerate for road construction come from mountains quarry or from river-bed. Sand comes from river-bed or from crushing plant. Materials coming from river-beds are clean without clay and don't need additional washing for their using for road building process (to check with additional tests). Another impact is increased level of noise, dust and vibration created while works are carried out adjacent to residential dwellings and commercial enterprises during construction, which may create stress on local inhabitants and workers. For example, the noise level of a pneumatic drill at 15 metres is around 80 db that is annoying, that of a heavy truck at 15 m may reach 80 db causing hearing damage. Background noise starts to tire people at much lower levels.

4.3 Operation Phase

Road safety: Increased speed and volume of traffic also raises issues of road safety and the need to maintain speed limits and post appropriate signage. Currently, the lack of preventative and safety conscious maintenance interventions is contributing significantly (either directly or indirectly) to a very bad road safety environment.

- *Occupational safety:* Occupational safety in road maintenance programs during the operational phase is a significant concern. There appears to be a serious lack of safety advice and/or compliance enforcement by the responsible agencies, suggesting a need for fundamental change in the current road maintenance practices.
- *Solid waste:* Large scale dumping of sold wastes into road side drains is an institutional and community problem which is likely to continue in the long term unless these issues are addressed by the appropriate institutions, such as those responsible for solid waste collection and disposal, enforcement of environmental regulations, and the communities themselves.

The Pollution Impact is usually differentiated as accidental pollution and chronic pollution

- *Accidental Pollution* **-** is the pollution caused by spills resulting from accidents during transport, loading/unloading of goods or at the services, etc. The gravity of the consequences is variable: it depends on the nature and quantity of the spilt product, and also on the resource likely to be contaminated. Water streams and ponds are often seriously jeopardised. The stake is thus ecological and economic at once. Hydrocarbons are involved in the majority of cases. Their polluting power is considerable. They are not mixable with water and spread out on the surface. No terrain is really proof against it; their progress is only more or less rapid. Then the danger comes from toxic and corrosive matters. They are often soluble in water, which makes them irretrievable. Toxicity depends on their concentration in the environment.
- *Chronic Pollution* covers all pollution resulting from traffic, maintenance and others activities:

– waste resulting from the combustion of fuels: hydrocarbons, lead, etc..

– oil and coolant, leaking from trucks,

– metal waste resulting from the corrosion of vehicles,

– mineral oils and greases used for lubrication,

– discharge of effluents to watercourses.

Soil pollution is linked with atmosphere and water pollution. Road transport is by far the main mode of transportation, which generates this kind of pollution. Heavy metals PCBs, non-burnt hydrocarbons and dusts mainly cause this form of pollution. Pollutants settle on the leaves of plants or are absorbed by roots. Potential contamination of soils and watercourses as a result of improper disposal of liquid and solid wastes from construction activities should be a consequence of the road works.

5 ENVIRONMENTAL AND SOCIAL RISKS

5.1 General Assessment

5.1.1 Environmental risks

The environmental risks are usually related to the failure of mitigation measures. Environmental risk incorporates the risk to the environment as a whole, which is air, water, land, plants and animals, including direct or indirect impact on people. The failure of environmental mitigation can result in serious impacts such as erosion, lowered water tables, permanent loss of wildlife, community severance, increased road accidents, increased pollution.

The transportation of hazardous materials during both construction and operation, if an accident occurs, causes spill, resulting in polluted ground water, streams and drinking water, as well as contaminated soil.

Natural disasters can damage a road and its environment with the consideration of the additional hazards posed by rivers and landslide areas. Within the parameters of road safety, the possibility of landslides shall be examined. Unstable cuts above a road, or below, if the road collapses, can prove fatal risk to road users.

Roads can also be the vector for involuntary transport of diseases or parasites by vehicles, plants animals and people which can seriously affect the regional ecosystem.

For the proper environmental risk assessment the important component is the determination of environmental sensitivity of the receiving environment to a project risks and impacts, including sensitivity of human population.

The seismic activity, soil weathering, erosion and landslides conditions are summarized in Appendix 5: Natural Risks

5.1.2 Social Risks

As traffic flow increases, conflicts increase between the local activities and the efficiency and safety of traffic functions of the road. Further conflicts and safety concerns arise when road improvement to highway standards significantly reduces the accesses. The roadside activities may play an important part in the social and economic life of the community. Economic impacts could include loss of businesses and customers, induced need for capital investment, and high opportunity cost losses. Very understandably, changes which might lead to such impacts may be resisted, creating the category of social risk.

While by-pass roads can overcome some problems of conflict between road use and community welfare, they may create other problems. On the positive side, by-pass roads reduce the immediate impacts of traffic on the community, and local commercial activities sometimes flourish as a result. On the negative side, communities may fear a loss of businesses from the diversion of traffic, and some community activities may "migrate" to the new route, potentially changing existing land use patterns and possibly undermining the objective of greater control of access on the new route. By-passes, like other road projects, can also cause changes in vehicle flow on the secondary network, possibly creating nuisances if traffic should increase at some locations.

Road development often requires the acquisition of privately owned land. This land has to be acquired by the government from its current owners. While it is sometimes possible to negotiate a price for voluntary sale of a property, governments often have to use their rights to compulsory acquisition (expropriation) of properties for public projects. By its nature, expropriation causes economic loss and social and psychological disruption for the affected individuals and their families. Naturally, the greater the number of people involved, the greater the risk of disruption and loss. The economic impacts of expropriation may include the loss of houses or businesses, or the loss of business income, either temporary or permanent. The social and psychological impacts and associated costs are more complex, and they are often much more devastating. In some cases, property ownership or development rights are not clearly defined under the law. These should be identified as early as possible, since they can take many years to resolve.

5.1.3 Health and safety risks:

There are many features of a road and its surroundings which influence the risk of a road accident or the severity of accidents when they do occur. Analysis of accident data is essential in ensuring that remedial measures are well targeted and effective. This requires specialized skills and knowledge and should be used both to identify critical problems and to test the results of past safety efforts.

Construction of a road involves occupational health and safety risks to road workers, primarily in the areas of the storage and handling of dangerous materials, and in the operation of heavy machinery close to traffic, slopes, power lines, and watercourses. Some specific examples are:

- exposure to dust particles or toxic fumes from chemicals used in road works and materials testing;
- exposure to lead paint in maintenance of old steel structures;
- potential for collapse of trenches and scaffolding; and
- risk of accidents involving passing traffic.

The present socio-economic conditions along the route are summarized in Appendix 7

5.2 Risk Prevention and Mitigation Opportunities

The risk of failure of environmental mitigation measures is always a possibility which should be considered, but it shall be reduced to some extent through

- strengthening staff skills and training in environmental management;

  ensuring management support for environmental policies and action plans;

  monitoring environmental actions and responsibilities and making provision for remedial actions; and
- planning for remedial measures in case initial planned actions are not successful.

The highway route was selected specifically to avoid urban populated areas, areas with known geohazards or other features that may increase environmental or social risks during construction or operation. This process has already had the largest impact on minimizing the risk from unplanned events.

Yet failures are still possible. For example, soil erosion may still occur even after preventive measures have been included in the road construction program. This failure may be due to a lack of technical expertise or simply negligence. These risks need to be understood and anticipated, through the identification and repair of weaknesses in the environmental management plan.

Transport of hazardous materials needs to be regulated and monitored, with possible restrictions on routes and time of travel to avoid the most populated places and busiest times. The clear marking of vehicles as to the type of material carried also reduces the risk of major spill damage by facilitating effective clean up. The Transport Ddirectorate (TD) shall follow the existing (or develop) policies on hazardous goods movement, with specified transport restrictions, requirements on containers and labels, and special permits and police escorts for particularly hazardous materials.

Natural disaster mitigation has two aspects of interest to road managers:

i) It should take into account possible rare disaster events and incorporate steps to minimize their impacts. Firebreaks, fire access roads, avalanche control measures, and flood reduction measures such as floodways and spillways, are examples of design features commonly used to mitigate known problems which affect particular routes.

ii) It should involve the Transport Directorate to ensure that key road sections can be kept open or reopened as quickly as possible, and that traffic diversion can be implemented as needed. Simple recording of disaster response measures and responsibilities, and regular training and dissemination are important to the success of disaster mitigation.

Involuntary transport of diseases or parasites is generally managed by signs and check-points which restrict the transport of contaminated fruits or other plant materials and livestock in areas affected by specific plant or animal disease problems.

In regards of *social risk* prevention - disruptions to social and economic interactions that make for community vitality can be avoided if a road project follows a route far from any human settlement or if changes made to existing roads are minimal.

Where road construction requires removal of some local activities from the right-of-way, a common mitigation measure is to provide alternative space for these activities nearby. The effects of bypassing local businesses will be mitigated by providing service areas adjacent to the new routes and by encouraging local communities to make use of the new opportunities provided.

Impacts on roadside land users have been partially avoided by choosing route locations away from built-up areas and by restricting the extent of road works to avoid interference with existing activities. In some cases the adoption of a reduced-speed design, reduced right-of-way land requirements, or design changes (underground drainage, for instance) will allow to avoid impacts on properties and activities. As with prevention, mitigation of land acquisition impacts is achieved primarily by modifying the route or design of a road to minimize its effects on nearby properties and land uses. The design of alternative access to affected properties and the management of temporary works and traffic diversion will also reduce the magnitude of impacts on property and will improve living conditions.

Occupational health and safety risks of road works can be limited by clearly defining procedures for handling materials, conducting tests, paving, operating heavy equipment, and constructing trenches. The contractor's responsibilities to workers and the environment may be identified during pre-bid conferences, to ensure that potential bidders are aware of contract requirements and can submit proposals which adequately address the necessary tasks and their costs. This can minimize the likelihood of contractor defaults.

There is no doubt that accident prevention is more valuable than any mitigation or compensatory measure. Its effectiveness will depend on cooperation amongst, and actions taken by, the various groups which are directly and indirectly involved with the road project. Proper design of road safety features is a very effective way to prevent accidents.

5.3 Compensation Opportunities

Compensation should be considered if steps to reduce risks and impacts are not possible or sufficient. Compensation can be material (reconstruction of homes or natural habitats), financial (compensation for loss of property), or both. Compensatory measures for specific impact areas are discussed below.

"Social and commercial rehabilitation" may prove to be a precise term to describe the process of re-establishing lifestyles and livelihoods following resettlement, recognizing that this process involves more than just replacing lost property or assets. Such rehabilitation may require additional financial, technical, and organizational assistance, which is rarely provided for in legislation or administrative arrangements. The term “rehabilitation” is confusing when applied to road projects, since it is also used by transportation engineers and planners to describe construction works that bring a deteriorated road back to its original condition.

Legislated compensation procedures generally provide only for the owners of property and make no allowances for tenants, employees, or squatters. Additional arrangements must be defined to ensure that these affected groups are not substantially disadvantaged by land use changes, and that they are assisted in relocating and re-establishing their homes and sources of incomes.
For landowners, assistance provided under existing legal statutes—in addition to provi-
sions laid out in the environmental management plan—will be sufficient to generate appropriate compensatory action. However, for other persons without legal title to land,

such additional assistance will be the major means of compensation and mitigation of losses.

Resettlement and compensation is considered by the Project for those whose households, land or livelihood is directly affected by a project. Compensation will also be provided through the restructuring of property layout and access arrangements disturbed by road construction. More comprehensive compensation for loss of community amenity will be provided through providing alternative spaces and facilities. Service roads, accesses to the rest and service areas markets, are included in road project in order to provide for commercial or social activities that are important to community life.

Monetary compensation, based on previous experiences, poses a number of concerns in resettlement and rehabilitation programs. Most notable are the following:

Valuation of assets is usually significantly lower than present market value, especially since book (or tax) value of properties is commonly employed in such valuations. Even present market value can leave people less well off than before. If, for example, there are many resettled people seeking scarce land, prices may rise, and re-settlers may have to pay more than the previous market rate just to replace their former assets. In anticipation of the problems that may arise, the road planners should acquire a clear understanding of expropriation and valuation procedures, and ensure that negotiation and arbitration procedures are in place and operating effectively.

Property markets do not exist in a form which allows ready replacement of land and livelihoods. In densely populated areas it may be especially difficult to buy property with an agricultural, housing, or community environment similar to that associated with the property expropriated for road development.

Timing of payments can be critical. When properties are valued, but payment is delayed for several years, the ultimate monetary compensation may not reflect market rates at the time of payment. This consideration is especially important when inflation characterizes the national economy, and delayed payments may result in depreciated compensation. Thus, inflation should be taken into account.

The manner in which compensation is paid can be significant for the long-term improvement of living conditions of the recipients. People not used to money—or with insufficient resources to meet current expenses—will typically spend the compensation payment on other articles of consumption, thus becoming vulnerable to landlessness or homelessness. Therefore, in many instances it is useful to pay most of the compensation into a blocked bank account, from which the funds are released when the re-settler has identified a new home, business or land, and signed all relevant contracts. A small amount—up to 20 percent of the funds—can be paid in cash to the re-settler so that he or she can take care of other domestic needs.

Restoration or replacement of assets expropriated may be preferable to financial compensation; it may prove to be a better way to replace, in full, the source of the owners' livelihoods. However, these assets must be replaced at the new site before displacement and relocation occur. This may require considerable front-end investment. Near urban areas, for example, it may be desirable to incorporate commercial arcades at the highway service areas and other similar arrangements offering displaced tradesmen access to markets. Continuation of their economic activities would thus be ensured under safe conditions for both customers and vendors. Wherever possible, restoration or replacement should be provided at a minimum distance from the previous location.

The recovery of the costs of resettlement can sometimes be achieved through the use of toll systems. Since such direct system may not be available in this Project, however, the costs of resettlement may have to be incorporated into the Project's budget. There should be no reason why the displaced persons should have to bear the costs of their displacement. The specifications for land acquisition and resettlement in road projects are guided by the basic notion that the conditions of life, including income, must be restored at least to those levels that existed before the project was undertaken. These specifications must be written down in a resettlement and rehabilitation action plan (RAP).

In regards of health and safety compensation usually the individuals who have contracted a disease, been injured, or died as a result of contact with a road project cannot receive adequate compensation. Instead, compensation should benefit the entire community. For example, the provision or improvement of community health services could compensate for the increased risks associated with living on or near a road.

6 ENVIRONMENTAL MANAGEMENT SYSTEM

6.1 General Outline of the Environmental Management Plans

The EU approach to Environmental and Social Management includes the following key principles: preliminary assessment of environmental and social impact of the project, minimization of potential impact through design and other mitigation measures, monitoring and control of the implementation, auditing of performance. This section of the document highlights how these principles will be applied to the proposed project. It identifies how all the commitments made in the ESIA shall be translated into actions through the management and monitoring plans.

The road construction/modernization project shall deliver mutual benefits to communities and to the environment along the route. It will minimize potential negative impacts through identification and mitigation of impacts, compensate for damage to environment, land and property in a legal, transparent and ethical manner that respects the interests of those involved.

The Environmental Management Plan (EMP) is the most important output from the EA process. Variously referred to as the environmental action plan, environmental protection plan or the environmental construction plan, the EMP is the synthesis of all proposed mitigation and monitoring actions, set to a timeline with specific responsibility assigned and follow-up actions defined.

The Environmental Management System (EMS) for this particular project will consist from a series of Environment and Social Management Plans for each different issue area, will address issues related to the construction and operation phases of a project, and each of these plans shall include:

- a list of all project related activities and impacts, organized by development stage (planning, construction, and operation);
- a list of regulatory agencies and implementing organizations/companies involved and their responsibilities;
- specific remedial and monitoring measures presented for a) construction period activities and impacts, b) operational period activities and impacts;
- a clear reporting schedule, including discussion of what to submit, to whom, and when;
- cost estimates and sources of funding for both one-time costs and recurring expenses for the EMPs implementation.

The EMS will include the following environmental and social management plans:

– Community Safety Management Plan - outlines specific actions for the construction contractor to ensure safety of communities along the route;

– Community Liaison Management Plan - outlines specific actions for the construction contractor to ensure positive community relations;

- Worker Camp Management Plan - ensures effective management of worker camps with regards to community relations and other potential impacts of the camps (e.g. on natural resources, roads, etc);
- Infrastructure and Services Management Plan - sets out specific actions for the construction contractor, to minimize the disruption & negative impact associated with infrastructure, natural resources, households and community assets e.g. land, roads, irrigation, etc ;
- Employment and Training Management Plan - sets out specific actions for the construction contractor ensure opportunities for local employment are maximized and that there is a fair distribution of jobs. The Plan also aims to manage the skills development and training process to ensure local communities can benefit from this project in the longer term;
- Procurement and Supply Management Plan - sets out specific actions for the construction contractor to ensure opportunities for sourcing goods and services from local and national businesses is maximized;
- Transport Management Plan - sets out specific actions for construction contractor to properly manage traffic and its potential impacts, including safety and accidents;
- Resettlement Action Plan - sets out the principles, process and specific actions related to land acquisition and compensation;
- Cultural Heritage Management Plan - outlines strategy and actions to avoid and/ or minimize project impacts to archaeological and historic monument sites;
- Reinstatement Summary Plan - outlines the actions that contractor will take to implement the Reinstatement Specification (a contractual document) and achieve the reinstatement targets for erosion control and bio-restoration;
- Landscape Management Plan - sets out specific actions for construction contractor to undertake to mitigate and minimize visual landscape impacts;
- Pollution Prevention Management Plan - sets out specific actions for the contractor to ensure that polluting emissions and disturbance are be prevented or mitigated;
- Waste Management Plan - outlines specific actions for the construction contractor and for the maintenance operator to ensure that best practice waste management procedures are implemented on both construction and operation stages;
- Emergency Response Plan - sets out specific actions for construction contractor and the operator to ensure that incidents, including fire and those involving spillage of chemicals or oil, are properly managed during both construction and operation.

The EMS can be divided into two broad components, one dealing with the natural environment and the other with the social environment. The social component addresses resettlement and economic impacts, and is usually prepared as a stand-alone document. It is known as a resettlement action plan or a resettlement and rehabilitation action plan (RAP). It is advisable, unless such is not feasible for practical reasons, that the RAP be incorporated as a section into the Project EMS, since this would facilitate the integration of the biophysical and social environmental actions into one project-level action plan. The

EMS, including each particular plan, is the key document, but it needs to be supplemented by construction- and operation-period monitoring reports, which describe how mitigation measures have been implemented and how effective they are. The reports will be produced by the monitoring teams according to a prescribed format and will be submitted to the contract managers and to the regulatory agencies.

6.2 Mitigation Measures Related to Planning/Design Phase

6.2.1 Socio-economic aspect

In this report the socio-economic impact, as well as impact on land-use is considered as a priority. The main prevention, mitigation and compensation measures which are planned and designed to reduce that impact at the very early phase of the Project are described in Section 6: Environmental and Social Risks.

Measures Related to Cultural Heritage:

As far as these projects are concerned, it is proposed to previously conduct a systematic archaeological recognition of the area, i.e. the highway corridor, in order to draw attention to eventual existence of significant archaeological sites so that those are avoided during the design stage. If that is not possible, then the research should be done before the beginning of the preparatory works as set out in the 6.3.1 – Preparing the Construction Site.

If an important site is uncovered during road works, possible realignment of the road will be considered. In some unusual cases it is preferable to leave a cultural site buried beneath the road. This may involve raising the level of the road. Commonly-utilized mitigation measures include excavation, erosion control, restoration of structural elements and site mapping. Other measures that may be required on occasion are structural stabilization, soil and rock stabilization, control of groundwater levels, vegetative stabilization, control of flora and fauna, and site surveillance. The overview of cultural heritage issue, as well as proposed impact identification methodology and remedial measures are summarized in Appendix 8.

6.2.2 Natural Environment

Measures Related to Soils:

The likelihood of serious environmental impacts on soil as a result of the proposed road construction project will be reduced by

- Minimizing the area of ground clearance;
- avoiding (where possible) sensitive alignments, such as those which include steep hillsides;
- balancing filling and cutting requirements through route choice, so as to avoid the production of excess spoil material and reduce the need for borrow pits;
- avoiding previously contaminated sites;
- avoiding the creation of cut slopes and embankments which are of an angle greater than the natural angle of repose for the local soil type; and

- replanting disturbed areas immediately after disturbance has stopped, *not* after construction has been completed.

There is a wide range of techniques designed to reduce the risk of damaging the soil and to fit the project into its environment with minimal adverse effects. Simple techniques such as replanting will be effective in many situations, whereas more sophisticated techniques, such as retaining walls, are used only in the most difficult cases.

Replanting cleared areas and slopes is the most effective action to be taken in reducing erosion and stability problems. It should be undertaken as early as possible in the construction process, before erosion becomes too advanced; to be most effective, it should be done immediately after the disturbance takes place. Vegetation should be selected to serve a specific engineering function. In some cases, a short-lived engineering structure, such as a woven wattle fence, is installed, along with vegetation that can take over the function of the structure in time.

The mitigation measures for the soil protection from the negative impact at the construction phase are described further in this section.

Where it proves impossible to avoid negative impacts on the soil, compensatory measures that aim to make up for losses or damage are considered. Some examples are:

- transformation of quarries into lakes for recreation, aquaculture, or wildlife habitat;;
- terracing of nearby marginal farmland to make it more productive on the long term;
- conversion of borrow pits and spoil dump sites into roadside picnic areas and scenic lookouts;
- remediation of soils whose productive capacity has been reduced during the construction phase; for example, using a subsoiler to break up hardpan produced by compaction with heavy equipment; or

Measures Related to Flora and Fauna:

During the planning of the new sections of highway or changes in width or alignment, sensitive natural environments have to be identified early in the planning process so that alternate routes and designs could be considered (see Appendix 4: Environmental baseline). Wherever possible, road developments have been located more than one kilometre away from sensitive areas to avoid severe impacts on flora and fauna. Water crossings have been minimized, and buffer zones of undisturbed vegetation will be left between roads and watercourses.

Engineering road cross-section design can reduce the impact on the environment, for example, by using narrow widths, lower vertical alignments, smaller cuts and fills, flatter side slopes, and less clearing of existing vegetation.

Planting in road rights-of-way and adjacent areas can help to support local flora and fauna. In some cases, planting may provide additional habitats and migration routes for local animals, while also guarding against erosion. Border plant species may need to be chosen for resistance to wind or fire in some areas. Planting should be done wherever possible with native species, which are likely to require little maintenance and may prove beneficial in maintaining ecosystem integrity. In cases where non-native species are deemed essential, careful monitoring should be planned, to ensure that they do not compete too successfully with native species and spread uncontrollably.

Animal crossings can be used to assist the migration of animals. At important crossing points, animal tunnels or bridges have sometimes been used to reduce collision rates, especially for protected or endangered species. Tunnels are sometimes combined with culverts or other hydraulic structures. These measures are expensive and used only at a few locations where they are both justified (by the importance of the animal population and the crossing route) and affordable (relative to the cost of the project and the funds available).

Fencing or *plant barriers* can reduce the risk of collisions between animals and vehicles. In some cases, semi-permeable fencing is used, which excludes species that are more likely to be involved in collisions while letting less problematic species through. Fences may interfere with the migratory patterns of animals, or may simply shift the points where migratory patterns conflict with traffic patterns along the route. Fencing may also, in some cases, interfere in predator-prey relationships, allowing predators to gain significant advantage because prey escape routes are restricted.

Aquatic ecosystems are particularly sensitive to road development, and there are a number of ways in which the impacts can be lessened. Standing water can be bridged instead of filled. Stream re-channelling should be avoided as much as possible, but where it must be done, efforts should be made to recreate lost channel diversity. Careful attention should be paid to erosion control techniques near watercourses. Culverted crossings will be designed with the needs of migratory aquatic species in mind. Baffles might be installed to slow the flow enough to allow fish and others to swim against the current, and culvert bottoms should be set below the level of the stream bed. Pre-development streambed gradients should be maintained wherever possible.

Traffic control measures - reduction of the speed limit may reduce the rate of collisions between vehicles and animals, particularly at night and in areas of frequent animal crossings. Signs warnings of the presence of animals in places where animal corridors cross the road may also help to reduce collisions. Roadside reflectors may be used to scare animals away from the roadway when vehicles approach at night.

<u>Measures Related to Water Resources:</u>

Sensitivity to changes in water flows may be physical (effects on hydrology), biological (habitat of flora and fauna), and human (water for recreational, economic, and domestic uses). Wherever possible, sensitive areas have been avoided by the use of alternative routes, and where this is not feasible, priority will been given to route alternatives which interfere the least with valued environmental components (VEC). Mitigation measures that might be considered unfeasible under normal circumstances may be justified for use in sensitive areas.

Measures used to avoid severe impacts on local hydrological environment include:

- avoiding alignments which are susceptible to erosion, such as those crossing steep slopes;
- minimizing the number of water crossings wherever possible;
- using only "clean" fill materials around watercourses, such as quarried rock containing
  no fine soil; and
- leaving buffer zones of undisturbed vegetation (width increased in proportion to slope) between road sites and bodies of water.

The mitigation measures will include:

Flow speed control - water speed reduction measures can substantially reduce potential impacts. Examples include grasses, riprap, and other devices in water channels, as well as dispersal structures in main drains.

Settling basins – can be used to remove silt, pollutants, and debris from road runoff water before it is discharged to adjacent streams or rivers. They are most appropriate where the downstream environment is particularly sensitive or where the levels of silt or pollutants are particularly high. Ongoing maintenance may be required where large amounts of silt are deposited.

Infiltration ditches - can be used to reduce overland flow by encouraging the movement of runoff down through the soil profile. The volume of flow in downstream drainage structures is reduced, the flow of pollutants is localized, and groundwater is recharged.

Oxidating macrophytes (wetland treatment facilities) - such as cattails in temperate climates, can be used to remove some pollutants naturally from settling basins.

Water collection, control, and treatment - this expensive option for polluted runoff from pavements and slopes will be applied in particularly sensitive areas.

<u>Measures Related to Landscape:</u>

The regional landscape design principles should provide guidance in resolving major issues relating to alignment, landscaping maintenance, and the provision of user services.

Alignment characteristics shall be selected to best fit the route into the landscape.

Vertical and horizontal alignment should follow the natural relief as closely as possible within technical constraints such as slopes and radius of curvature;

- Curves can accentuate views, while ensuring adequate safety for passing. Coming into close proximity with a natural feature of special interest, such as a rock face, is often better than avoiding it;
- Slopes on either side of the road can be varied to match the site's natural topography;
- Bridges, viaducts, and tunnels can be used across steep terrain rather than high cuts and embankments, to preserve the landscape's visual and physical continuity. Computer landscape illustration may help the Transport Directorate to visualize the completed road project within the landscape;
- Drivers can enjoy the view of a bridge. They are often beautiful structures. Views from the road can be revealed, composed, or reinforced by road layout and design but should also take road speed into account.

Landscaping proposed for the route should

- – fit in with local vegetation (trees, shrubs, avenue trees, hedges);
- – make use of vegetation to harmonize with or improve the existing landscape;
- – be representative of the road's category and function;
- – respect views and not be planted systematically just to fill in space;
- – take advantage of natural openings in the existing vegetation;
- – frame and underscore the various landscape units crossed;
- – suit and underscore the various engineering structures;
- – ensure user safety by using the landscape to signal changes in the route, for example, by decreasing the space between avenue trees before entering a curve or village; and
- – pay attention to the aesthetics of engineering structures by selecting materials that adopt local colours and textures and which give the structure a simple shape.
- – use natural stone for support walls and viaducts whenever possible rather than pure concrete since stone is dominant in Montenegrin architecture tradition.

Maintenance of roadside vegetation, slopes, and structures can greatly affect visual appearance and can be enhanced by involving maintenance workers in the planning and management of the roadside environment. Plant indigenous wildflowers and grasses for a low maintenance ("no mow") roadside.

User services made available to motorists along the roadway will help ensure the success of a road project and help avoid concerns such as littering or vehicles making indiscriminate stops along the roadway. They also contribute to road safety by allowing drivers to rest or check vehicles and loads during a trip. Examples include rest areas, scenic lookouts, and shoulder pull-off areas.

6.2.3 Noise

Noise problem in general have been reduced by moving the road alignment away from noise-sensitive urban areas using bypass roads. Choosing alignments which minimize steep slopes and sharp corners, especially at sensitive locations, will also prevent noise problems.

National standards may specify one noise level not to be exceeded for all types of zones or, more realistically, different noise levels for different zones, such as industrial, urban, residential, or rural areas. Lower limits are sometimes specified for nocturnal noise. Details of road noise standards are usually available from national transportation agencies. If no national standards exist, objectives can still be established for various types of road projects. Indicative standards used in Western Europe might be not to exceed a Leq (8 a.m. -6 p.m.) of 65 dB(A) for residences in urban areas, and 60 dB(A) for rural areas. It is important, when considering international standards, to take into account the differences in noise criteria, measurement methods, and applicability to various types of projects. It should be noted that noise standards are only applicable for a defined measurement method which specifies the location of measurement devices and the duration of measurement. Indeed, one obstacle to consistent compliance with standards is the fact that noise measurement is dependent on so many variables, such as weather and the type, position, and number of sensors. Unless the values of the variables are clearly defined and strictly adhered to, compliance with standards may not be especially meaningful.

The following mitigation measures can be implemented during the design of the highway:

Surface design and maintenance – the application of a bituminous surface layer over worn concrete roadways is effective in reducing frictional noise. The use of open-graded asphalt and the avoidance of surface dressings may also be effective in reducing frictional noise in sensitive areas. Some jurisdictions are experimenting with asphalt made using discarded tires, which appears to reduce frictional noise as well. Generally, smooth, well-maintained surfaces such as freshly laid asphalt without grooves and cracks will keep noise to a minimum.

Road geometry - road design should avoid steep grades and sharp corners to reduce noise resulting from acceleration, braking, gear changes, and the use of engine brakes by heavy trucks at critical locations.

Noise barriers are among the most common mitigation measures used. They are most effective if they break the line of sight between the noise source and the receptors being protected, and if they are thick enough to absorb or reflect the noise received. The types of noise barriers most commonly employed consist of earth mounds or walls of wood, metal, or concrete which form a solid obstacle between the road and roadside communities. Noise mounds require considerable areas of roadside land; for narrow alignments, bridges, and roads on embankments, wall-type barriers may be the only viable option. Two or more barrier types are often combined to maximize effectiveness. Plantations of trees and shrubs, for instance, contribute little to actual noise reduction, but they do confer a psychological benefit in reducing the perceived nuisance of traffic noise, and they are often used to 'soften' the visual appearance of mounds and walls. A successful mitigation plan will often incorporate several of the measures. A busy road passing by a high-rise building, for example, may require specialized surfacing, a barrier or screen to reduce traffic noise at lower levels, and facade insulation for the upper floors.

Compensation. The purchase of roadside properties by governments may, in many cases, be more viable than the implementation of extensive measures to protect only a limited number of people. Monetary compensation for noise impacts is currently offered only in a small number of countries and cases and is not advisable due to affected population's "change of mind" syndrome.

6.2.4 Air Pollution

Impacts of motor vehicle air pollution along the highway are partially prevented by routing traffic away from populated areas and reducing traffic congestion. Bypass roads actually keep long-distance traffic out of settlements, preserving the commercial and social integrity of thoroughfares while still allowing access to the highway. As a general rule, avoiding densely populated sites means fewer potential impacts and reduced need for traffic management measures.

Specific design improvements to limit motor vehicle air pollution impacts will include:

- selecting road alignments which avoid passing close to housing, schools, and work places;
- providing sufficient capacity to avoid traffic congestion, even with projected increases in traffic flow;
- taking account of prevailing wind direction when sitting roads and road features, including refuelling stations, near population centres;
- avoiding steep grades and sharp curves which would promote deceleration, accelera tion and shifting wherever possible;
- planting tall, leafy, and dense vegetation between roads and settlements to filter pollutants.

National and regional strategic and regulatory measures related to air pollution may form part of an environmental action plan or an air quality strategy for the country. They can have some influence on the baseline conditions at the project level, and so are relevant to the main national highway project. Measures could include policies, regulations, charges, and enforcement programs covering:

– vehicle emissions standards as well as inspection and maintenance requirements;

– retirement or retrofitting of high-consumption and high-polluting vehicles;

– fuel technology and quality;

– pricing of motor vehicle purchase and use;

– management of demand for motor vehicle travel;

– management of traffic efficiency; and
– investment in better mass (inter-city) transport, such as buses and mini-buses/vans.

Where impacts are inevitable, compensation measures are considered. These will include:

- provision of local access roads where access to main arteries has been restricted for the purpose of promoting traffic efficiency and safety;
- replacement of land expropriated for bypass roads, interchanges, and route widening;
- provision of replacement market space for roadside vendors for whom access has been restricted in order to facilitate more efficient traffic flow;
- provision of farmland improvements or more economic space for farmers whose crop options have been restricted, or whose soil has been contaminated, by increased traffic volume and consequent emissions;
- supply of funds to be used in additional cleaning and maintenance of buildings and monuments; or
- improvement of local health care facilities which will aid in treatment of pollution-related ailments.

6.3 Mitigation Measures Related to the Construction Phase

The application of environmentally sound (correct) construction and operations management practices can often significantly reduce and sometimes eliminate the direct impacts of road projects on environment. The short term impacts from noise, dust, vibration, and traffic congestion during the execution of road work shall be minimized under the project by specifying in all project contract documents the responsibility of contractors to undertake appropriate work site mitigation actions as part of the management of work sites.

Impact avoidance, mitigation, and compensation options for the construction phase are divided into four stages: a) preparing the construction site; b) supplying materials; c) managing the construction activity; and d) restoring the site after completion of the road work.

6.3.1 Preparing the Construction Site

Many potential impacts may be avoided by taking preventive measures when setting up a work site. Careful sitting of borrow pits, stockpiling areas, work depots, and work camps can avoid sensitive areas, reduce air and noise pollution, minimize visual intrusion, and help to prevent local traffic congestion. Confining the handling and use of hazardous materials at the construction site can go a long way in reducing the risks of accidental spills.

Measures related to the works installations:
Project contract specifications shall stipulate that the siting, construction and environmental restoration of facilities for the housing of construction personnel, the storage of equipment and vehicles, labour camps and similar facilities must be conducted to the satisfaction of the developer, competent authority and the local communities.

The works installations must be equipped with the following facilities to reduce pollution: a septic tank for the sanitary installations; surface coating to render impermeable the truck and site plant parking areas; the hydrocarbon storage areas and the filling station (runoff water from these areas will run into impervious ditches and discharge into a storm water tank with an oil separator before discharge into the natural environment), installation of grease interceptors in the inspection pits and mechanical workshops.

Proper storage for harmful or toxic chemicals (paints, lubricants, explosives) has to be planned by the contractor. The greases and hydrocarbons collected in the storm water tanks/oil separators must be incinerated under environmentally satisfactory conditions.

If possible, the works installations should not be sited nearer than 500 m to a built-up area in order to limit nuisances in the nearby area. Hiring of local workers should nevertheless be preferred to workers from outside the region. The contractor shall propose to the supervisor the location of work site installations and detail proposed measures to reduce impacts on the environment of these sites and the people living in the immediate vicinity, as regards both the surface area used (clearing, bush and tree removal, drainage, trash dumping) and underground impacts (disruption or pollution of the water table).

Measures related to the preparatory works:

All accesses required by the works will be entered in an overall plan showing the precise area of provisional rights-of-way, the amount of the indemnity for temporary use of the land and the obligation to restore the latter (generally for renewed use as farmland).

Tree felling plans will be drawn to prevent abuse in scrub clearing and felling operations with penalties laid down for the unplanned felling. All useable timber shall be retained for firewood or construction purposes. The other vegetation will be burnt only under careful control in order not to damage the forest edge.

During the soil stripping phase, topsoil must be kept for future re-use for erosion control and landscaping purposes. Topsoil must not be stockpiled to a depth of more than 2 metres or it will lose its biological qualities. It must under no circumstances be mixed with spoil. Its soil value must be maintained by sowing with legumes to enrich its nitrogen content and protect the stockpiles from erosion.

The overall plans mentioned above will show the precise routing of underground pipes and will thus limit damage caused during the movement of service networks.

Possible archaeological work to save any interesting remains will be carried out during these preparatory works.

6.3.2 Supplying Materials

Contractors will be required to use or buy material from existing asphalt plants, stone quarries and borrow pits operating with valid environmental and other permits and licenses. Appropriate provisions to this effect will be made in the contract documents.

Measures related to the Mining/Quarry Activities:

Contracts shall specify that only licensed quarrying operations are to be used for material sources. If licensed quarries are not available the contractors may be made responsible for setting up their dedicated crusher plants at approved quarry sites. Selections of quarries for the purposes of the Project will require the approval of the environmental authority.

The crushed stones required for the road layers may either come from massive rock quarries or river gravel extractions. In case of new opening of quarry site, on an environmental standpoint it is desirable to avoid river gravel extraction due to the high associated environmental impacts (increased sedimentation and turbidity which affects aquatic flora and fauna, destruction of valuable riparian vegetation, erosion processes). Montenegro is rich with rocks and stones with significant number of rock quarries which should be used rather than gravel material carried by the rivers, which should have less impact on the environment than river gravel extraction. The environmental requirements proposed concerning extraction activities – see Appendix 10.

Measures related to the Asphalt Plants:

Contract provisions shall require that asphalt and hot-mix plants will be located at least 500 metres away from the nearest sensitive receptor (e.g., school, hospital or protected area) and subject to licensing and approval of the environmental authority, and that operators are required to install emission controls in accordance with the local environmental regulations.

In case of no-compliance of the local plants with the emission limits – the contractor will be required to provide (import) the asphalt plant(s) of advanced technologies, in accordance with the EU standards. The optimal places for the batch are remote from houses and they should be located on the areas where the groundwater is well protected (deep depositions of clay). To avoid disturbance (noise, dust) with inhabitants, the mixing plant has to be at least at 300 m distance from the settlement areas. Although most asphalt mixing plants lie outside highly populated areas, their emissions represent a potential source of pollution to both the air and surrounding land areas. All asphalt mixing plants are required to obtain environmental certification in order to operate. Emissions testing are required for certification.

The mixing plants will be fitted with filters, chimneys, equipped with particle traps and will be supplied with furnace oils in order to reduce the air pollution. It is important to: ensure that asphalt is not deliberately or accidentally deposited into watercourses. Special specifications have to be applied for the location and the conditions of storage of hazardous materials.

Measures related to the Borrow Pits:

Contracts will ensure enforceable provisions stating that:

a) Only existing borrow areas approved by the environmental authority will be used for the project ;
b) Pits management, (including restoration if it will follow the completion of certain works) shall be in full compliance with all applicable environmental standards and specifications;
c) The excavation and restoration of borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the environmental authority or

the construction Supervision Consultant (SC), acting on behalf of the road owner, will be required before final acceptance and payment under the terms of contracts;

d) Borrow pit areas will be graded to ensure drainage and visual uniformity or to create permanent tanks/dams;

e) Topsoil from the opening of borrow pits will be saved and reused to re-vegetate the pits to the satisfaction of the SC. Additional borrow pits, if necessary, will not be opened without the restoration of those areas no longer in use, and without the approval of the environmental authority.

For excavation of ditches, excavation of new drainage works, source of aggregates, the mitigation measures are the following:

- excavation and removal of soils and disposal of them in a location approved by the legislative documents of the Montenegrin Ministry of Tourism and Environmental Protection; in any cases these areas can not be located closer than 100 m from water courses;
- use of erosion control measures such as re-vegetation of disturbed soils, tarps, etc., to prevent erosion of ditch side-slopes and soils stock piles; also the principles characterized in the part of heavy metal pollution part should be considered.

For the construction of new culverts, some streams have sufficiently high flows in the rain season to require the creation of diversionary channels. In such cases, the channels will have to be carefully prepared before use and suitably compacted to minimise the effects of sediment transfer. For reducing the effects of erosion the maximum of the works have to be done during dry season.

Measures related to the Materials Transport:

Truck operators will be required to cover or wet truck loads, haul materials at off peak traffic hours, and use alternative routes to minimize traffic congestion. The contractor will be required to prepare and submit to the works supervisor a traffic management plan showing routes and times to be used for materials delivery off and on site.

The contractor will be required to foresee the obligation of washing the vehicle tires that are used in the earthworks and that are driven in the public traffic roads. This may be solved by the construction of a pool filled with water built on a passage place from the construction site to the traffic road, taking into account that the water from the pool must not be contaminated with substances such as engine oil, fuel or similar.

6.3.3 Managing the Construction Activity

The engineering consultant responsible for supervision of the works will ensure that all the mitigation and compensatory measures planned in the project are performed. He will also handle the relations between the different categories of users and residents in the project implementation area to take into account their problems during the works.

All the measures described in this section will form part of the Technical Specifications for the Contractor. In particular, the Contractor will justify his working methods for reducing the detrimental effects of the works for the environment.

Measures related to Noise:

Construction noise problems can be minimized by using well-maintained and "silenced" equipment, operating within existing noise control regulations and limiting work hours near residential areas. Prior to commencement of the work, the contractor will be required to submit the following:

- a method statement describing the type of plant to be used and the noise control methods proposed;
- a work program indicating the sound power level and location for each activity, manufacturers' literature establishing the sound power level of plant, and calculations of maximum levels at specified locations as may be required by the relevant authorities.

Hours or working will be subject to the relevant authorities' agreement. This should normally exclude night-time working in sensitive locations (e.g. close to housing or hospitals). Construction contractors will be required to limit activities to daylight working hours and use equipment with noise mufflers.

The contractor will take all reasonable measures to control vibration so as to comply with any regulatory requirements, to protect receptors from nuisance or discomfort and to protect buildings from damage.

Measures Related to Dust:

Construction site and materials storage sites will be watered as appropriate to bring down dust.

The contractor will take all reasonable measures to avoid creating a dust nuisance and to prevent emissions of smoke of fumes from plant or stored materials (e.g. fuel oils). During dry season, the contractor will be watering the road section under works near the settlement areas. The use of covered trucks for material transportation has to be an obligation.

In the past, waste oil was used as a cheap dust suppression material until road managers realized that runoff contaminated with waste oil affects the quality of local potable surface and ground water, water supplies and reduces the health of local livestock. Rehabilitation costs are extremely high and often unsatisfactory. Waste oils should not be used for dust suppression.

Measures Related to Waste:

Prior site investigations will be carried out on any areas which are known or likely to contain contaminated materials. The excavation, handling and disposal of those materials will have to be carried out in compliance with the best practices, regulatory controls and agreements with relevant authorities.

All reasonable opportunities will be sought for the recycling of waste arising from the project - existing material will be re-used to form the sub-base layer in the case of this rehabilitation works project (Recycling Pavement Process).

All other waste will have to be handled and transported in a safe and environmentally responsible manner. Waste contractors will be licensed or will otherwise be able to demonstrate an adequate degree of competence in complying with this requirement, with appropriate provisions in their contract documents to carry out visual inspections for toxic materials before handling, segregate waste fractions as necessary, use appropriate safety measures while handling and transporting the wastes, and disposal at authorized dump sites with approval of the local authorities. Sites or facilities used for the disposal of waste from the project will be licensed or otherwise approved for that purpose (especially for contaminated material); will have an acceptable record of health, safety and environmental performance; will have to be designed specifically for their intended waste disposal purpose.

Measures Related to Water Pollution:

Pollution from chemical products can be limited by following the recommended procedures for containing and confining their use (e.g. bitumen production) and by not using them during extreme meteorological events such as high winds or rainstorms. Contractors will be required to properly organize and cover material storage areas; isolate concrete, asphalt and other works from any watercourse by using sealed formwork; isolate wash down areas of concrete and asphalt trucks and other equipment from watercourse by selecting areas for washing that are not free draining directly or indirectly into any watercourse. Contractors will further ensure proper handling of lubricants, fuel, and solvents by secured storage; ensure proper loading of fuel and maintenance of equipment; collect all waste and dispose to permitted waste recovery facility.

Measures Related to Erosion:

Measures to prevent erosion are of major importance during the work phase, and can include:

- planting on cleared areas and slopes immediately after equipment belonging to a specific site has been moved, and reusing stripped topsoil;
- temporarily covering the soil with mulch or fast-growing vegetation;
- intercepting and slowing water runoff; and
- protecting slopes by using reshaping techniques, rock fill, and other methods.

Measures Related to the Civil Engineering Structures:

The bridges detailed design should integrate parameters to prevent flooding during closing of the channels during works period. The general mitigation measures used in the bridge rehabilitation/construction and culvert lengthening have following aspects:

ensure that concrete work is isolated from watercourse;

- ensure that concrete trucks and other equipment used to handle concrete are washed down in an area that is isolated from the watercourse so as not to allow toxic leachate to enter fish bearing streams;
- construct in stream foundation works in the dry season so as to avoid the need for earth cofferdams; or use steel caisson type cofferdams instead of earth cofferdams so as to minimize risk of introducing sediments into a fish-bearing watercourse;

- use clear span bridge structures wherever possible to eliminate need for in stream construction work.

During the bridge deck paving it is not allowed to deposit of toxic asphalt substances into watercourses. During the bridge painting deposition of toxic paint substances into watercourse from sand-blasting and painting operations should be avoided.

Work along stream bank may disturb riparian vegetation and soils that are integral to supporting aquatic habitat, following mitigation principles should be considered:

– minimizing footprints of disturbance area;

– carrying out compensatory riparian vegetation planting in adjacent riparian areas that may be suitable for enhancement;

– controlling sediment runoff into fish-bearing watercourses by employing best management practices for erosion and sediment control.

Measures Related to Traffic Disruptions and Vehicular/Pedestrian Safety:

Traffic control for both construction vehicles and diverted traffic should minimize impacts across the entire affected area. Contractors will prepare a traffic management plan with appropriate measures to redirect traffic.

Measures Related to Incident Issues:

The contractor has to prepare an emergency plan in case of incidents related to spillage of chemicals during the work period.

6.3.4 Restoration of the Site after Completion of the Road Work.

Serious attention must also be paid to rehabilitation of the site. On completion of the work, the contractor shall do everything necessary to restore the sites to their original state. The surface coating must be removed and stripped topsoil (stockpiled outside the site area) must be recovered and spread over the works installations area. No stockpile of materials, remains of vehicles or buildings should remain on the site. Everything must be removed for use at other sites or taken to a tip. The site will be redeveloped as farmland according to the initial land use. The supervisor shall draw up a report confirming the restoration before acceptance of the works.

Site rehabilitation requires a well-designed planting program utilizing native vegetation where possible, with follow-up maintenance over several years and repairs as required.
Quarries and large borrow sites can be landscaped and developed for a variety of natural, economic, or recreational uses. Work site facilities, such as wells, water storage, sewer systems, and buildings, are sometimes converted for local use upon completion of a project.

Borrow Pits Restoration:

After completion of borrow operations, it will be necessary to re-grade the pit area by remodelling steep slopes. Spoil materials could be used for this operation. These materials will be suitably compacted in order to prevent soil loss by erosion. The next steps would be to re-spread the topsoil stored for this purpose, scarify it and conduct re-vegetalisation of the working area. It is reminded that natural re-vegetalisation on bare ground is very slow. Satisfactory completion of replanting will have to be carefully monitored.

Moreover, all working areas on bare ground will generally induce increased runoff. The site surface must be carefully drained to reduce this impact. Strict attention to peripheral drainage at all working areas will help to alleviate this problem. Settlement traps must be installed as necessary to concentrate runoff and keep dispersal of sediments in watercourses to a minimum. Special attention must therefore be paid to all activities related to the construction of cross drainage structures. Sediment traps are one of the main design features to prevent sedimentation from occurring downstream of culverts during earth works. Where flows are expected to be small, this can be in the form of a shallow sediment trap to slow down the flow of water and allow the finer materials to settle out. The device could be completed by the plantation of thick grass mat barriers at the outlet of the sediment trap. But the main preventive measure for fighting erosion, runoff and sedimentation at these points is to schedule construction activities during the dry season.

Spoil materials not reused in road embankment will serve in priority for borrow pit rehabilitation. The filling of borrow pits will serve both landscaping and safety purposes. Leaving deep pits with vertical walls in which people might fall will be avoided. All spoil materials which cannot be reused for rehabilitation purpose will be dumped in waste pits. Waste pits are usually sited along the road in low points not developed for agriculture. The impacts associated of these sites are the same as those of borrow pits (erosion, runoff, sedimentation, landscape damage, etc.). The same rehabilitation principles should therefore be applied: slopes 1/2, suitably compacted, re-spreading of top soil (≅ 15 cm) and re-vegetalisation. If correctly rehabilitated, these waste pits could become pleasant resting areas for travellers using the road.

6.4 Mitigation Measures Related to Operation Phase

6.4.1 General Provisions

Perhaps the most important mitigation measure related to operation phase is to ensure that maintenance measures, included in the road design, operate effectively. Protection of the biophysical environment can be assisted by regular drain clearing, upkeep of vegetation on slopes and exposed surfaces, maintenance of flow speed reduction devices in drains, removal of waste materials arising from road works, and avoiding the use of herbicides and other toxic or polluting substances.
Impacts on the community and social environment during maintenance activity can be mitigated through well-designed traffic management plans, the use of quiet equipment, operating during daily periods of high ambient noise, and focusing attention on improvements in the quality of signs, guardrails and other features which contribute to safety and local accessibility.

Environmental "hot-spots" or problem locations, such as easily-eroded sites or notoriously unstable slopes (identified during the VEC identification step and/or during the execution of works) shall be monitored properly during the operation/maintenance phase.

Experts in roadside vegetation, traffic management, and transportation safety should monitor maintenance activities to ensure that work practices meet environmental objectives. Understanding the functions and techniques of roadside planting, signs, and guardrails is important for their proper functioning. Training road crews in these issues can help them considerably in correctly executing and managing maintenance works.

Environmental requirements left as statements in an EA will rarely be implemented, unless local regulations specifically identify EAs as legally binding documents. Implementation of environmental requirements can be ensured by either attaching the EA report as a legal condition to all contract documents or by preparing a set of environmental clauses to be placed directly into the contract documentation.

6.4.2 Road safety

The design of the road modernization to the EU highway standards can contribute automatically to a significant improvement of safety level. However, the project envisages two separate components of road safety during the operation phase:

The first one is a proactive approach to the maintenance contracts, whereby each section of road that is included in a contract will be subjected to a Safety Audit and measures to maintain and improve the safety conditions of the highway.

As another component it is advisable that the road safety councils shall be established to evaluate and recommend the adoption of road safety policies such as:

- mandatory use of seat belts;
- compulsory driver training and testing;
- prohibition and punishment of driving while impaired by drugs or alcohol;
- traffic safety education for children; and
- testing and inspection of all vehicles according to EU vehicle safety standards;
- restricting access for NMV (non-motorized vehicles);

Road councils, with the help of their member agencies and ministries, are also obligated to develop national or regional road safety plans, which might include:

- ensuring that post-accident emergency assistance and medical care are available to all accident victims;

  developing an accurate accident data recording system;
- conducting research and regularly monitoring the state of road safety;
- determining the need for further road improvements (based on accident data); and
- encouraging research and development of new, safety-oriented road technologies.

6.4.3 Occupational safety

For the first phase of a proposed Road Safety Action Plan the consultants will propose to Government the introduction of a road workers protection policy to adopt. The keynote provision of the protection policy will be that on highway having a certain traffic count, when taken over a 12 hour period, no person will work either alone or without the requisite set of protective signs, cones, and protective barriers. This will be in addition to approved reflective clothing. This policy will apply to all road workers regardless whether they are public sector workers or contractors staff. This will also require the contractors to comply.

The result of this policy will be that the road department will supply the requisite protective equipment and clothing.

The second level of operational road safety will be a policy of 'advocacy' whereby, for all first time Routine Maintenance Contractors it is intended to provide (within the provisions of the contract) for a standard set of warning signs and barriers for securing a safe working site in the carriageway. The number and design of signs will be to a standard design commensurate to the class and design speed of the road and in accordance with accepted EU standards.

This initial set of signs and a set of reflective clothing for a set number of workers will become the property of the contractor at the end of the contract.

The contractor will however be responsible for replacing any signs that are lost or broken during the tenure of his contract, and will not receive payments for works where the correct and approved signing and protection of workers is not undertaken.

6.4.4 Solid waste

Although solid waste collection and disposal is the responsibility of the local governments, it may be in the long term interest of the Transport Directorate to initiate a dialogue with the appropriate government agencies on this issue. As inadequate drainage affects the roads and interferes with their maintenance, may prohibit waste dumping, initiate a system of fines to discourage it, and carry out public awareness campaigns to point out how the practice is detrimental to public health as well as instrumental in deteriorating the condition of the roads.

The options for the improvement of waste and litter management could be:

- adoption of waste minimization procedures in purchasing and facilities management (e.g. use of recycled and durable products, improved handling of materials, pavement recycling);
- introduction of recycling procedures and targets for materials giving rise to major waste streams (e.g. metals, paper, plastics), adoption of specific measures for the handling and disposal of potentially hazardous or environmentally damaging wastes (e.g. oils, battery acids, contaminated spoil, solvents). The use of recycling technology for pavement operation also can be a mitigation measure for reducing the volume of waste linked to the routine maintenance of the highway.

6.5 Environmental Monitoring – Methods and Means

6.5.1 Monitoring and Evaluation

Implementation of mitigation measures is often the weakest link in the environmental management process and requires special attention from managers. The detailed ESIA study for the Highway Project will identify plans for works supervision, future environmental monitoring, and evaluation studies. This assures continuity between design and construction and helps ensure full implementation of the each environmental management plan (EMP) within the Environmental Management System (EMS). It should involve skilful and responsible staff in both environment (biophysical, social) and roads, including those concerned with work supervision during the construction phase. Responsibility for undertaking monitoring, as well as the reporting procedure, will be specified in the EMP section of the environmental impact statement.

6.5.2 Compliance Monitoring

During construction, all mitigation measures designed to reduce the impact of the construction activities should be monitored and enforced by the environmental monitoring authorities. This requires:

- defining the proposed mitigation and compensatory measures;
- specifying who is responsible for the monitoring activity;
- including implementation of mitigation measures in contract specifications;
- making environmental competence one of the selection criteria for contractors;
- briefing, educating, and training contractors in environmental protection methods.

Compliance monitoring should not be confined to the road right-of-way, but should cover all sites affected by the project, including borrow pits, quarries, disposal sites, waterway diversions, materials treatment areas, access roads, and work camps. After the construction phase, environmental monitoring must be continued. Some mitigation measures, such as drainage systems and erosion-preventive plantings, require regular maintenance for correct operation, and monitoring is necessary to ensure their continued effectiveness.

6.5.3 Effects Monitoring (Evaluation)

After mitigation measures are implemented, effects monitoring or evaluation can test the validity of hypotheses formulated in the environmental impact study; they can also de termine if the mitigation measures have achieved their expected results. In most countries, such evaluation is not regulated by laws and is therefore often neglected.

Social and financial assistance to affected communities and individuals may also fail to address all problems fully; follow-up monitoring is generally required for a number of years.

Evaluation is necessary not only for this particular project, but also to advance methodology, assist in designing future studies in Montenegro, and— through lessons learned—contribute to the relevance and cost-effectiveness of environmental protection measures. Governmental support is weak in this area, but it is necessary for successful evaluation of road projects. Responsibility for corrective action to be taken in the event of mitigation failure should be defined clearly.

7 ENVIRONMENTAL ANALYSIS OF THE PROJECT ALTERNATIVES

The analysis of alternative solutions is an essential component of EA. In order to define what type of project or, alternatively, what solution is most appropriate to relieve the particular road problem, a clear description of the need for the project is necessary (see Section 3 of this Report). Once this has been achieved, a set of viable alternative solutions can be defined. Having more than one alternative solution is not absolutely necessary, but it is highly recommended in order to avoid serious omissions and concerns about project viability.

In describing the project and its alternatives, four key characteristics of each proposed alternative should be determined before a comparative analysis can be undertaken. This refers to alternative solutions or alternative options, as opposed to alternative designs assessed during the later stages of the feasibility study process. The five characteristics are:

- spatial requirements (for a 2x7.5m wide pavement, the right-of-way (ROW) typically varies between 30 and 50 metres, or 3 to 5 hectares per kilometre of road.);
- natural resources (including productive land) consumption;
- impact on valued environmental components (VAC);
- human resources benefits and costs (such as resettlement versus better access to market); and
- waste production during the construction and operation/maintenance periods.

Prior to selecting a preferred alternative solution, a preliminary consultation should be held in conjunction with the VEC identification activity. The focus should be on introducing the project, outlining possible impacts, indicating the planning timetable, and specifying the stakeholder input. At the later stage the consultations should bring together all stakeholders, including the relevant regulatory agency (competent authority).

7.1 Consideration of the Alternatives

The sustainable road EAs involve the consideration of two types of alternatives (unless special restrictive conditions exist). These are usually referred to as *alternative solutions* to the transportation problem (discussed in Section 3) and *alternative designs* for a selected project. Alternative designs usually involve options regarding alignment, routing, construction methods, materials used, landscaping, and so forth, while the basic project concept remains constant. Frequently, two to three alternatives are chosen, and within these there may be several other alternative treatments for specific features, for example, options for traversing a wetland or mangrove forest. These may also be considered as separate alternatives. Designs which prevent or avoid negative impacts often require changes to the location of the road or of the off-site activities associated with construction. The VEC consultation activity can help to identify alternatives that are practical and sustainable and that are supported by the various affected interest groups.

7.2 Methods for comparing the effects of various project alternatives.

A number of structured evaluation and comparison methods have been developed for analyzing and presenting environmental data. The most frequently used is a matrix in which socio-economic and biophysical environmental effects are represented either numerically or visually, using graphic indicators (such as dots or bars, as in a histogram) which vary in size according to the magnitude of the impact. A common way of distinguishing the effects of alternatives is to apply a scaling-weighting and aggregation approach. This involves assigning numerical values to the expected impact on each VEC and combining them all in a single overall measure of impact for each alternative.

Not all VECs have equal importance - numerical weights are assigned based on informed opinion. The greater the total per alternative, the more serious is the impact. For the *numerical weights method* the ranking exercise is usually completed by a group of people representing all stakeholders (possibly the members of the workshop team which identified the VECs). These people vote first on the relative importance of each VEC and then on the relative importance of the factors affected within each VEC. From this, a single numerical value per alternative can be derived. There are a number of drawbacks to this approach, including over-simplification and excessive value judgment, but nevertheless outputs should be valid, provided they are applied with care (there should be at least two public information sessions with stakeholders along the route).

Another method for comparing the effects of various project alternatives is the value function method, which is described below. In practice, there is no technical solution which weights and ranks "correctly" the wide range of issues that need to be addressed. The final outcomes of analyses of alternatives are usually strongly influenced by political and community-based consultative processes; however, these tend to focus on a few main concerns to the exclusion of others. Presentation systems should recognize this and provide information to decision-makers and affected groups, rather than seek to define solutions. For *the value function method* of analysis of alternatives the environment is classified into four types: human environment, community life, natural environment, and cultural environment. As shown below for example, three to five impact categories are listed for each environmental type, totalling sixteen in all:

Human Environment:	1) Noise 2) Vibration 3) Air quality 4) Water quality 5) Sunshine
Community Life:	6) Community life 7) Spatial separation (including from livelihood), 8) TV/Radio obstruction
Natural Environment:	9) Geospheric 10) Hydrospheric 11) Atmospheric 12) Fauna 13) Flora
Cultural Environment:	14) Landscape 15) Cultural heritage 16) Recreation

The environmental assessment of routing alternatives takes the following five steps:

– The analysis begins by estimating the values of sixteen impact categories for each route alternative. For example, the noise level is estimated in dB(A), the air pollution in ppm, and the spatial separation in kilometres of a given route alternative;

- The estimated values for the respective impact categories are then converted to non-dimensional environmental quality values that fall in the range from 0 to -1;
- The converted non-dimensional quality value of every impact category is then multiplied by the assigned weight that indicates the significance of the impact category relative to the others;
- The weighted environmental quality values of sixteen impact categories are then totalled to obtain a comprehensive environmental quality value for each route alternative;
- The route alternative of the largest comprehensive environmental quality value is judged the least environmentally hazardous.

The value function is used to convert the estimated values of an impact category to non-dimensional values. The weights for the respective impact categories can be determined by informed judgment, on the basis of the surveyed opinions from road planners, local inhabitants, and relevant experts.

7.3 General Analysis of Alternatives and Preliminary Conclusions

Analysis of alternatives of the highway project at current stage involves comparing impacts that are not easily quantified, not measured against the same criteria, and that vary in time, space, and validity.

TECHNICAL MEMORANDUM NO. 10A

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE BAR – BOLJARE HIGHWAY (APPENDICES)

Appendix 1: Climate Conditions

Apart from geographic latitude and sea level, the climate in Montenegro is also determined by presence of large water areas (the Adriatic Sea, Skadar Lake), deep indentation by the sea into the coastline (Bay of Kotor), moderately high mountain hinterland near the coastline (Orjen, Lovcen and Rumija Mountains), Field of Ulcinj in the hindermost south-eastern part and by Durmitor, Bjelasica and Prokletije mountain massifs.

Southern part of Montenegro and Zetsko-Bjelopavlicka Valley are located in the Mediterranean climate region (long, hot and dry summers and relatively mild and rainy winters). Towns which are located in valleys like Podgorica and Danilovgrad, have lower temperatures in January than coastal towns situated at relatively same geographic latitude, while the temperature during the summer is somewhat higher. The warmest summers in our country are in the Zeta Plain, because of high serenity during the summer, which makes a land and air very warm. Podgorica is a town with highest mean monthly temperatures during the summer and with largest average number of tropical days. The lowest mean annual temperature is in Zabljak (Tara River basin).

Large karst valleys have more severe climate, whose bottoms are deep under the surrounding mountain peaks and which are 40 to 80 km far from the Adriatic. Karst valleys that are very close to the Adriatic (about 20km) but are separated from the sea by relatively high mountains also have severe climate. During the winter, a cold air is subsided in these valleys, going down the nearby mountains. During the summer, however, the bottoms of the Karst valleys get very warm, leading to increase of annual temperature fluctuation. During the winter, mainly in anticyclonic situations, low-level temperature inversions may occur in these Karst valleys.

Map of stations of Hydrological and Metrological service of Montenegro

Central and Northern part of Montenegro has certain characteristics of mountain climate, with apparent influence of the Mediterranean Sea, which is reflected in precipitation

regime and in higher mean temperature of the coldest month. In the ultimate north of Montenegro, the climate is continental, which is, apart from large daily and annual temperature variations, characterized by small annual quantity of precipitation, which is equitably distributed per month. In mountainous areas in the north of the Republic, summer is relatively cold and humid, and winter is long and severe, with frequent frosts and low temperatures, which rapidly decrease by the height.

The biggest mean annual value of the cloudiness is in the mountainous areas, about 55-66% in average, and then it decreases towards the seaside being 45-35% in average. The lowest cloudiness of the year is in July and in August, and the highest is in December. The lowest oscillation of the cloudiness is in the mountainous areas, while it is much bigger at the seaside. Duration of the sunshine is in opposite proportion to the cloudiness. At the seaside, duration of the insolation is 2750 hours in average, while in mountainous areas far from the seaside, average values are 1550-1900 hours. In all areas, July and August have 4 to 5 times longer insolation than winter months.

The rainiest area in Europe is mountainous area above the Kotor Bay (Krivosije). In that area annual precipitation is 4600 mm, i.e. at the steep slopes of the Orjen in the place of Crkvice (940m) average annual precipitation is 5000 mm, which is European maximum precipitation, and in the peak years it is almost 7000 l/m2, especially with precipitation of the orographic character. Central and northern parts of the Republic were hit with floods during last century (e.g. 1963 and 1979). That area, where there is upper watercourse of the Tara and the Lim, is characterized with especially big medium annual quantity of precipitation of about 1600-2000 mm per year. Years with biggest floods in these areas are 1963 and 1979, and then, the end of 1999 and first half of 2000.

Beside orographic effect, cyclone of Genoa has a very strong influence on the climate in Montenegro, which original area is suburb of the bay of Genoa and Siberian anticyclone, with the centre in north-east Russia. Under their influence, high grades of atmospheric pressure and temperatures are established in the whole Balkans, and especially in the territory of Montenegro. When the cyclone of Genoa is active, it doesn't stay for long, precipitation is intensive and they don't last many days. Precipitation of long duration happens when there is a strong high-altitude SW streaming within a cyclone above the Western Europe. In the whole Adriatic, there is the air depression during winter season. It is, actually, a series of depressions, moving from the west to the south-east and east and they cover southern areas. These depressions cause maximum precipitation in winter at the seaside. Areas with modified Mediterranean pluviographic regime of precipitation have mainly autumn and winter precipitation with its maximum in late autumn, from October to December, while summer is dry.

In south-west areas of Montenegro, there are about 10% of annual quantities of precipitation in summer-time. In so-called south-Adriatic pluviometric regime of precipitation, difference between the rainiest and the driest month is about 11,5%. The rainiest month is November and the driest is July. High mountains, beside quite big quantities of precipitation, also have more days with precipitation, than it is the case with the surrounding valleys and plains. In mountainous areas it's snowing more in spring than in autumn, because autumn is quite warmer than spring. Predominant winds are consequence of the general disposition of the atmospheric pressure in different months.
Regarding barometric depression at the Adriatic and in the east Mediterranean and high atmospheric pressure in the east and north-east Balkans, in winter months there are dominating winds from north-east square. Characteristic winds are bora and sirocco. Bora is cascading wind of north and of north-east direction. It is the most frequent and strongest

in cold half of the year, in winter, and it is present along all the eastern coast of the Adriatic. It blows when there is area of high air pressure north of the Dinaric Alps, and a cyclone is in the western part of the Mediterranean or the Adriatic Sea. At such horizontal grade of the air pressure, cold air from higher latitude passes over the Dinaric Alps and it swoops down the coast by high speed, thus causing fall of the temperature and of humidity, except in the case of the cyclonic or dark bora, when the weather is cloudy and rainy. One of the main characteristics of bora is its huge strength and motion. Its speed is between 16 and 33 m/s. It's the strongest in the coastal parts, where the mountains vertically dominate it (the coast) and where on the mountainous cliffs there are gorges where the air streaming lines are gathered. Strength of bora decreases very quickly towards open sea, so that it doesn't make breakers. South wind or sirocco, blows in bigger part of the Mediterranean with less or bigger differences in physical characteristics and direction.

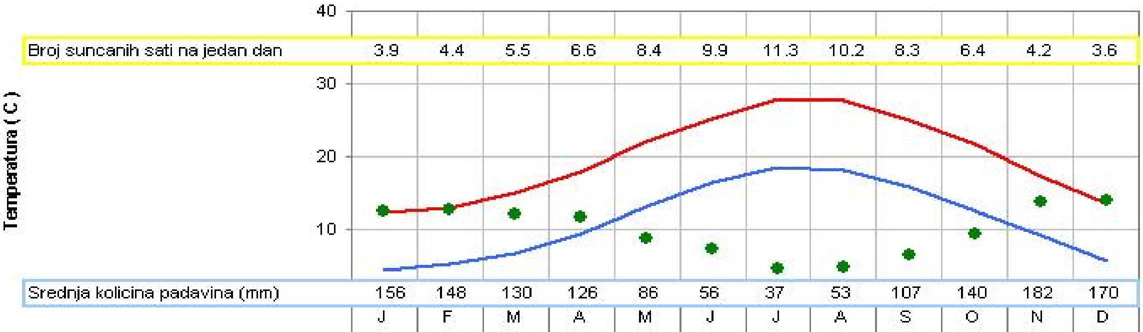
It starts blowing when the cyclone moves across the Mediterranean or the Adriatic Sea, and when there is high pressure above North Africa. It blows in front part of the cyclone from south to south-east direction. Due to such circulation, it often includes dry and warm air from North Africa, which contains significant quantities of dust. When in the south stream it comes to the coast, that air, due to the orographic effect, causes cloudy and rainy weather there, as well as on the slopes of the coastal mountains. Biggest number of the precipitation which falls in these areas in colder part of the year is caused by this streaming. Biggest quantity of precipitation in Europe – in Crkvice, can be explained by its influence. When the air originating from the North Africa comes together with sirocco, there are coloured rains falling from time to time – of yellowish or reddish colour. Since it's often very strong and since it covers big surface of the sea, sirocco causes breakers, from the open sea towards the coast. Strength and frequency of sirocco increase from the north to the south part of the seaside. Last decade of 20th century was warmer regarding many years measuring (from 1949 up to now).

The warmest year in the territory of Montenegro was 2003. Reason for heat waves was strong field of high pressure above Western Europe within clear ridge of high pressure in high-altitude circulation of large scales. Heated air from the south reinforced the strength and keeping of the heat wave. Almost the whole radiation of the sun was directed to the heating, because both vegetation and soil were dry. Such 'a blocking elevation', which is kept for several days, is not rarity for Europe in summer-time. The highest recent maximum temperature was measured in Podgorica in August 2003, which was 42C, and there was continuous period of 100 tropical days then (days with maximum temperature higher than or as of 30C).

Some average annual characteristics such as average max and min temperatures per month, average rainy days and number of sunny hours in a day are given for five locations along N-S highway route in the tables bellow.

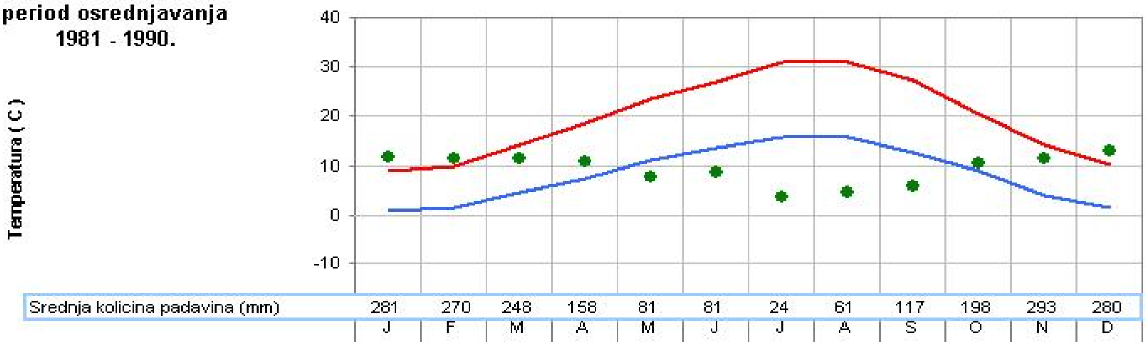
Source: Hydrological and Metrological service of Montenegro

Bar



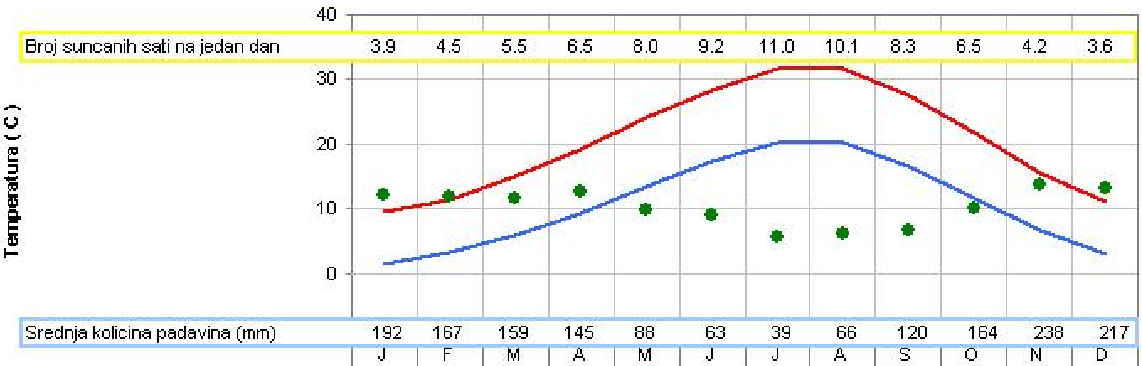
	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	3.9	4.4	5.5	6.6	8.4	9.9	11.3	10.2	8.3	6.4	4.2	3.6
Srednja kolicina padavina (mm)	156	148	130	126	86	56	37	53	107	140	182	170
Srednja Tmax (C)	12.3	13.0	15.0	18.0	22.1	25.3	27.8	27.7	25.1	21.6	17.2	13.6
Srednja Tmin (C)	4.3	5.1	6.8	9.3	13.1	16.4	18.4	18.2	15.8	12.5	9.1	5.7
Srednji broj dana sa padavinama >=0.1mm	12.5	12.7	12.1	11.6	8.7	7.4	4.5	4.8	6.5	9.5	13.7	13.9

Virpazar
period osrednjavanja
1981 - 1990.



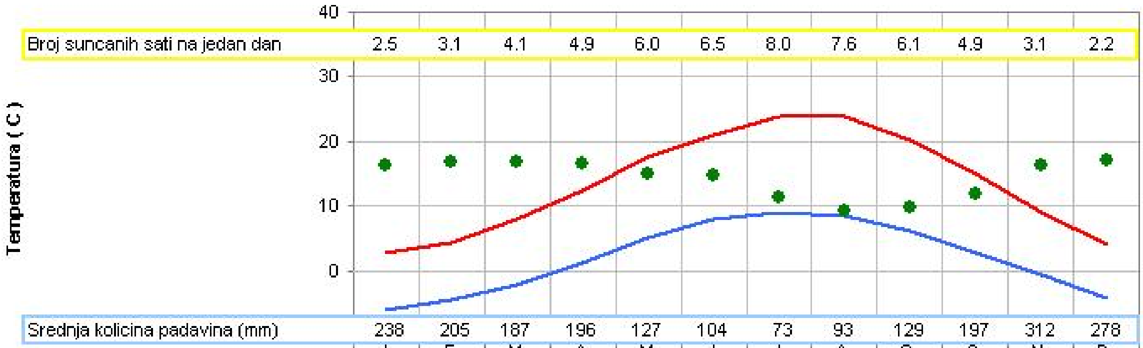
	J	F	M	A	M	J	J	A	S	O	N	D
Srednja kolicina padavina (mm)	281	270	248	158	81	81	24	61	117	198	293	280
Srednja Tmax (C)	8.9	9.9	14.2	18.6	23.5	26.9	31.1	31.1	27.2	20.4	14.1	10.2
Srednja Tmin (C)	1.0	1.3	4.5	7.3	11.0	13.6	15.8	15.7	12.7	8.8	3.9	1.6
Srednji broj dana sa padavinama >=0.1mm	11.8	11.5	11.5	10.8	7.8	8.5	3.5	4.5	5.8	10.5	11.3	13.0

Podgorica



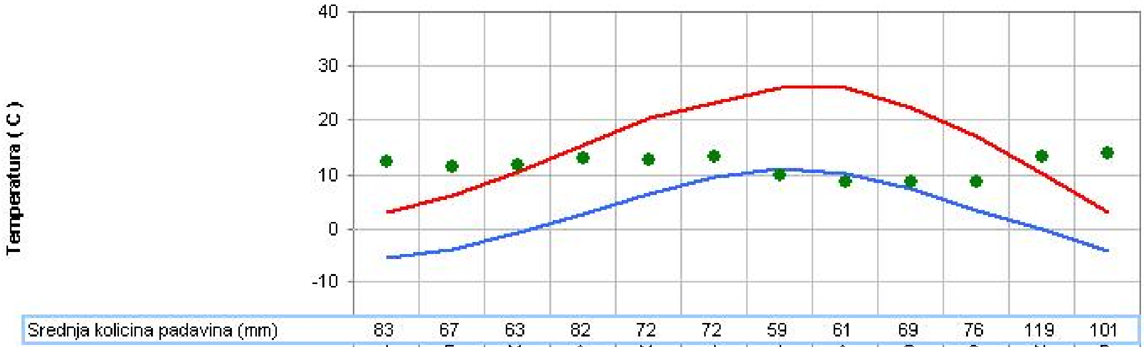
	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	3.9	4.5	5.5	6.5	8.0	9.2	11.0	10.1	8.3	6.5	4.2	3.6
Srednja kolicina padavina (mm)	192	167	159	145	88	63	39	66	120	164	238	217
Srednja Tmax (C)	9.5	11.3	14.9	19.1	24.2	28.2	31.7	31.6	27.4	21.7	15.4	11.0
Srednja Tmin (C)	1.4	3.2	5.8	9.1	13.5	17.3	20.3	20.2	16.5	11.6	6.8	2.9
Srednji broj dana sa padavinama >=0.1mm	12.2	11.9	11.6	12.5	9.8	8.9	5.7	6.0	6.8	10.1	13.8	13.1

Kolasin



	J	F	M	A	M	J	J	A	S	O	N	D
Broj suncanih sati na jedan dan	2.5	3.1	4.1	4.9	6.0	6.5	8.0	7.6	6.1	4.9	3.1	2.2
Srednja kolicina padavina (mm)	238	205	187	196	127	104	73	93	129	197	312	278
Srednja Tmax (C)	2.7	4.2	8.0	12.5	17.7	21.0	23.8	23.9	20.2	15.1	9.0	4.0
Srednja Tmin (C)	-6.1	-4.5	-2.1	1.2	5.0	7.9	9.0	8.4	6.2	2.7	-0.6	-4.3
Srednji broj dana sa padavinama >=0.1mm	16.3	16.7	16.8	16.6	15.0	14.8	11.4	9.3	9.8	11.8	16.4	17.1

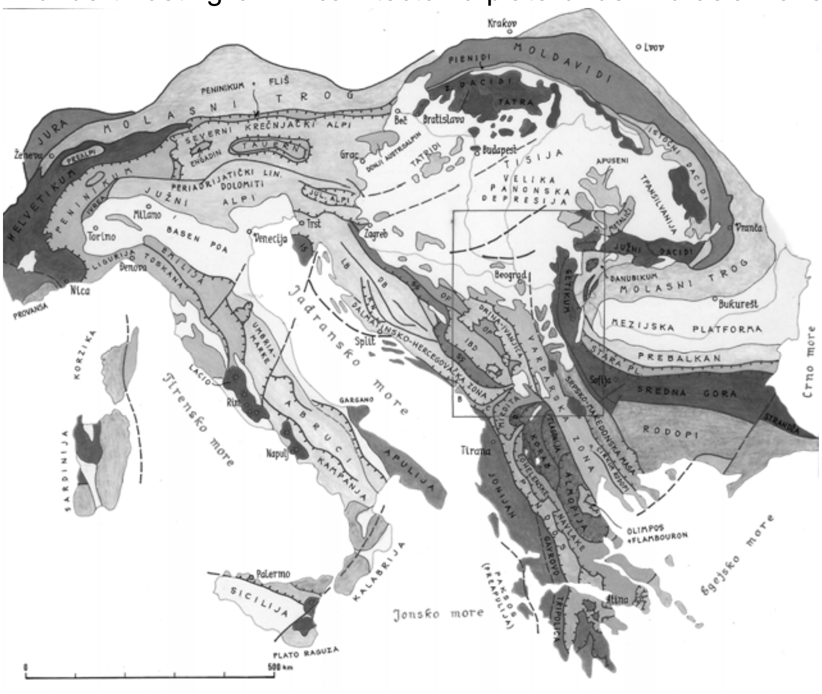
Berane



	J	F	M	A	M	J	J	A	S	O	N	D
Srednja kolicina padavina (mm)	83	67	63	82	72	72	59	61	69	76	119	101
Srednja Tmax (C)	2.9	6.1	10.5	15.3	20.3	23.1	26.0	26.1	22.4	17.0	10.3	3.1
Srednja Tmin (C)	-5.8	-3.9	-0.8	2.7	6.4	9.5	10.9	10.3	7.5	3.3	0.0	-4.2
Srednji broj dana sa padavinama >=0.1mm	12.4	11.4	11.6	12.9	12.7	13.3	9.8	8.7	8.6	8.5	13.3	13.9

Appendix 2: Geomorphology, Soils, Engineering-Geological Characteristics

Geological structure of the territory of Montenegro is result of influence of several factors, first of all: 1. sedimentation and geodynamics within this part of Mediterranean geosyncline; 2. underthrusting of African tectonic plate under Eurasian one; 3. intensive neotectonic



movements; 4. forming of very expressed exogenous relief.

Geological map of Montenegro with adjacent regions (Geological Atlas of Serbia, 1997)

That is why the project area is characterized not only by different lithostratigraphic content and complex tectonic structure, but also by unique geomorphologic, engineering-geological, hydrogeological and seismotectonic conditions.

At the northern Mediterranean, the lateral strain from the contact zone between African and Eurasian plate are transferred through the Adriatic micro-plate to the Dinarides – in the NE direction (Glavatovic, 2004). Strain concentration within lithosphere of Dinarides is performed by complex process of the segments moving through the Adriatic micro-plate (bellow the sediment complex, covering silicate and basalt rocks and the rest of lithosphere, in the direction of subducting Apennine plate – to the Tyrrhenian Sea).

Strong lateral stresses are also produced by thick sediment complex of Adriatic plate (up to the level of Triassic clastite), which is resistant to the horizontal deformation in the Adriatic region, simultaneously generating strong tectonic processes in the outer and inner Dinarides. As a result, horst and graben structures are formed, as well as mountain massifs, tectonic depressions, trenches, nappes and faults (normal, reverse and transform). System of normal and reverse fault structures are predominantly oriented parallel to Dinarides. These faults are mostly with regional dimensions, with dipping angle toward land 20-50 degrees. Transcurent faults are mostly generated perpendicularly to the previous ones, with small dimensions and steep slope of the fault plane.

Dinarides

Montenegro belongs to the Dinarides mountain chain where Paleozoic crystalline schist and Middle- and Upper Triassic limestone are distinguished. The main part of Montenegro and is made of limestone. Limestone formations are covered by diabase-chert ones. The formation is characterized by greater or smaller overtroughs of magmatic rocks and ultramaphites. Referring to the structure, the following two areas are distinguished: area of the Earth’s crust compression (wide coastal belt in Montenegro, with numerous napes) and the area of the Earth’s crust opening (the rest part, with numerous horsts and trenches, as well as confining neotectonic faults).

In the Dinarides the predominant topographic type is karst in terrains of carbonate rocks . Karst forms in exposed limestones are particularly well developed in Montenegro. Prokletije, Durmitor and other highest mountains have preserved relics of a glacial topography; cirques, troughs, moraines, formed during the Pleistocene. Snow and frost actions have produced periglacial topographic features: polygonal ground, felsenmeers (rock seas), solifluction teracettes, lobes, etc. above timberline on the mountains. The Dinarides consist predominantly of crushed and karstified Mesozoic limestones. This world famous karst region greatly differs in hydrogeology and geomorphology from the neighbouring regions. Groundwater flows through system of karst channels and fractures discharging by strong resurgence.

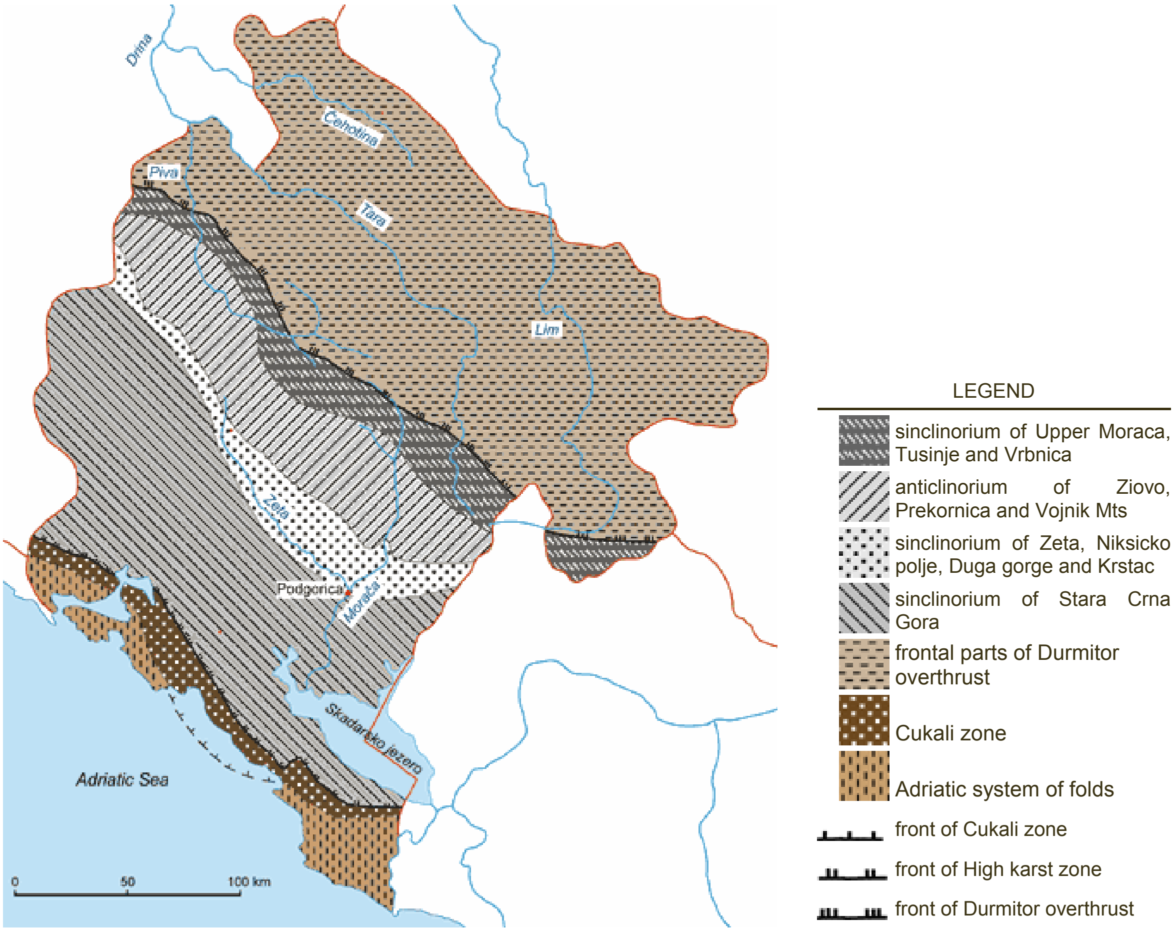
Karst of Montenegro

Over two-thirds of the territory of Montenegro belongs to the karst of south-eastern Dinarides.The karst in Montenegro differs along the territory, by its distribution and position, its position in relation to the non-karstic terrain and the Adriatic sea, and by its occurrences (various forms and dimensions) and processes. This comes as a consequence of diverse sedimentation conditions, as well as different geologic evolution of individual parts of the Dinaric geosyncline (both in space and time). A segment of the Dinaric geosyncline which forms the terrain of Montenegro, is predominantly (on two thirds of the territory) built up of limestone and dolomite sediments (from Devonian; to the nowadays). Since the end of Devonian period (ending phase of Caledonian orogeny), it has been uplifted and lowered by numerous phases of Hercynian and Alpine orogeny. Due to epeirogenic and orogenic movements in different geological times, since the end of the Devonian period to the final uplifting of Dinaric geosyncline, when present territory of Montenegro (end of Middle Miocene) has been formed, some parts of the geosyncline bottom have been, more or less, uplifted and lowered.

This caused favourable conditions for sedimentation of different products, among which were dominant those who have formed limestones and dolomites of great thickness and distribution. It is easily noticeable that the epeirogenic and orogenic movements have been advancing from north-east to south-west. During those movements, there were relatively quiet periods when small islands existed, protruding above the sea level as islands. The climate was also variable, but mostly favourable for the development of karstification. Simultaneously with these movements, particularly during the Laramidian orogeny (Upper Cretaceous - Lower Paleogene), the folding, faulting, overthrusting and even movements which caused creating of nappes occurred. As a result, the rock porosity

increased favouring the karstification process and forming today's karst - a geological product of very complex and enigmatic occurrences and processes.
With the aim to present the most important properties of the Montenegrin karst, its complexity as well as the characteristic differences of individual parts of the territory, karst zoning was carried out. The most logical way to do this was to identify the karstic properties of the individual geotectonic units of Dinarides, which built up the territory of Montenegro. Therefore, the properties of the Durmitor Overthrust, the High-Karst Zone, the Pindus-Cukali Zone (in the territory of Montenegro Budva-Bar Zone) and the Adriatic-Ionian fold System (in the territory of Montenegro Adriatic fold System) are presented.

We have deliberately kept the oldest, the most common and the most often cited names for geotectonic units of Dinarides. Parts of the Dinaric geosyncline, which formed rocks in general and by this the karst in the territory of Montenegro, had different and specific geologic evolutions. Subsequently, on the terrains of cited geotectonic units, specific karsts with present properties and appearance developed. With development of the karstification processes the karst differences of the geotectonic units became smaller. This characteristic is notable in the karst of Montenegro.



Geotectonic division of Montenegro.

Karst of the Durmitor nappe, although spacious (over 5.000 km^2) and several kilometres thick, with large aquifers, is divided into several regions among which are significant karst of northern and north-western Montenegro, karst of Bjelasica and karst of north-eastern Montenegro. Due to the presence of Late Palaeozoic and Lower Triassic clayey-marly-sandy beds, Middle Triassic eruptive rocks and Middle and Upper Jurassic diabase-chert formation rocks, karst in these regions does not represent a unique entity. Karst of these regions has the characteristic of holokarst. The limestones and dolomites of these regions are the oldest ones and they have been exposed to karstification for the longest period, even since the Upper Jurassic. The karstified limestones and dolomites of this geotectonic unit, although mutually separated, build up the largest and the highest mountain massifs in Montenegro.

Although there are canyons deeper then 1000 m, the karstification of limestone and dolomites of this geotectonic unit proceeds and descends deeper then fluvial erosion. Karst of this geotectonic unit is characterized by fluvial erosion (deep canyons), glacier erosion and lacustrine erosion. As a result, karst of this geotectonic unit, besides characteristics common to holokarst, has properties of high-mountain, fluvial, glacial and contact karst.

In the territory of Montenegro, the High-Karst Zone has the greatest extent. The terrain of this geotectonic unit is mainly built up of Mesozoic (Triassic, Jurassic and Cretaceous) limestones and dolomites of several kilometres of thickness. This thickness is even larger, due to the reverse faulting and overthrusting and thus repeating of carbonate series. The karst of this region is characterised by all surface occurrences and all processes characteristic for holokarst such as: karst plain; polje; uvala; sinkhole; dry, hanging, blind and karstified valley; lapies; canyon; shaft; cave; resurgence; vrulja; estavelle and so on. Within the karst of this geotectonic unit exist syncline regions build up of impermeable flycsh beds.

The layers of Durmitor flycsh of the uppermost north-eastern parts of this geotectonic unit have various hydrogeological features and functions. In the terrains built up of clayey-marly-sandy beds and at lower elevations, such as the valley of Vrbnica and Gornja Moraca, the layers of Durmitor flycsh are impermeable and represent a total barrier. In the terrains built up of varied, more or less marly limestones, comprising narrow zone and located at the height of over 1.000 m, as in the case of south-western slopes of the Durmitor massif, they represent a water permeable media. It is interesting to mention that the deepest cave (897 m) in the territory of Montenegro explored by speleologists is located in these rocks. The middle belt of High-Karst Zone in the territory of Montenegro is built up of Upper Cretaceous-Paleogene flysch beds. The distribution, position and impermeability cause this flycsh to have a function of elevated and lateral barrier. The karstification of limestones and dolomites in this area is below the base level of erosion, below the sea level and is deeper then 1.000 m. The High-Karst Zone has all the prominent characteristics of: fluvial erosion (deep canyons of Komarnica and Moraca rivers with their tributaries), glacial erosion (on the high mountains), lacustrine, sea and combined erosion. The spacious Zeta depression with the largest lake on the Balkan Peninsula - Skadar Lake, is situated In the High-Karst Zone. Parts of the bottom of this lake represents a cryptodepression. Sublacustrine springs (vruljas) exist in the Lake, with bottoms at depth of over 80 m below water level which is about 6,5 m above sea level. In the Zeta Plain loess deposits are found.

Along the internal belt of Bokokotorska Bay, from Morinj, across Risan, Perast and Orahovac to Kotor, the High-Karst Zone is in direct contact with the sea. In these terrains are located the largest vrulja on the Adriatic coast, called Sopot, and the greatest estavelle horizon - Gurdic-Skurda. The vast differences in water-yielding capacity of the constant and periodic karst springs point out to the strong karstification of High-Karst Zone limestones and dolomites. The difference between minimal and maximal water yielding capacity is over 350 m3.

Karst of the Pindus-Cukali zone, in the territory of Montenegro Budva-Bar Zone, is characterised by contact and contact-fluvial relatively low karst. Notable within this zone is frequent alteration of karstified limestones and dolomites with terrains built up of sedimentary and volcanic rocks. The seepage aquifers and the seepage karst aquifers in the karstic terrains of this zone, outside of the sea influence, are few and of small depth. Their dynamic reserves are small, providing hardly 5 l/s during the drought periods. The seepage karst aquifers of this geotectonic unit are, in several places, in immediate contact with the sea. These are low and shallow aquifers with brackish water. In this karstic area, water-rich aquifers with dynamic reserves do not exist.

The reason for this is a small distribution of cavernous limestones. In this region there are cavernous limestones with static reserve which give by pumping, during the drought period of the year, over 50 l/s of water (Opacica).

Karst of the Adriatic-Ionican fold System (in the territory of Montenegro-Adriatic fold System) is represented by karst with anticline structures, four of them situated in the hinterland of Ulcinj and separated by synclinal structures built up of flycsh deposits. These folds, which strike from Albania and across the hinterland of Ulcinj toward north-west, sink under the sea at the north-western margin of the Bar plain. Only one of them, the anticline structure of Grbalj and Lustica, appears again in south-eastern marginal part of Mrcevo plain trending to Dubrovnik. Karst of the Adriatic anticline structures in the hinterland of Ulcinj and external folds of the Bokokotorska Bay are characterized by the occurrences of exposed, coastal karst. This karst is low but with deep slope below the sea level. The karst aquifers in this region are, during the whole year or for shorter periods, under the influence of the sea water which has a high concentration of Cl ions.

Generally, waters of the karst terrain of Montenegro are clean, as the karstic water can be, except in the regions under the influence of the municipal, industrial and other waste waters. Karstic waters, not considering the influence of the sea water, belong to the magnesium-calcium- chloride-hydrocarbonate type of water.

Appendix 3: Hydrogeology and Surface Water

Adriatic Sea drainage basin

Area of the Adriatic Sea drainage basin in Montenegro covers about 6560 km^2. Moraca River, with its tributaries Zeta and Cijevna, Crnojevica River and Orahovstica River drain to the Adriatic Sea. These three rivers pour into the Skadar Lake and from that point on flow towards the Adriatic Sea through the Bojana River.

Moraca

In its upper and middle part of the flow, Moraca River is highly mountain river. Its length is 113,4 km, and area of the river basin to the Hydrological Station (H.S.) Podgorica is 2628 km^2. Currently, there are three measuring profiles at the Moraca River: Pernica, Zlatica and Podgorica, including one limnigraph station at the right tributary Mrtvica. Measuring at the above stations has been constantly performed for more than 20 years, and at the Podgorica station, measuring has started from 1948. Cijevna is a left tributary of Moraca, with the length of 64,7 km and river basin area of 383 km2 to the H.S. Trgaj, where measuring was performed from 1949 to 1989.

Source: Hydrological and Metrological service of Montenegro

Zeta

The most important tributary of the Moraca River is Zeta. Its length is 85 km, and river basin area to the H.S. Danilovgrad is 1216 km^2. Measuring places are Duklov most and Danilovgrad, and measuring activities have been preformed at the above locations from 1955 or 1948 respectively.

Skadar Lake

Skadar Lake covers less than 400 km^2 with minimum water level and up to 525 km^2 with maximum water level registered. The Lake is primarily filled by Moraca River, including Crnojevica River and Orahovstica as well as Kiri River in Albania. The Lake is drained by the Bojana River.

Black Sea drainage basin

Area of the Black Sea drainage basin in Montenegro is somewhat larger than the area of the Adriatic Sea drainage basin, covering about 7260 km^2. From this part on, the Ibar

River drains through the Zapadna Morava River, while Lim, Cehotina, Piva and Tara River with its tributary Komarnica drain through the Drina River.

Lim

Source: Hydrological and Metrological service of Montenegro

Lim River is the most important Montenegrin River from the hydrographic point of view. It flows out of the Lake Plav, although Vruja and Grncar rivers make a part of its source, which by confluence make Ljuca River that flows into the Lake Plav. Before the town of Andrijevica, Lim River receives Murino River and Zlorecica as its left tributaries, and Djuricka River, Rzenicka, Velicka and Komaraca as its right tributaries. From the town of Andrijevica to the town of Berane, Lim River receives Krastica, Trebicka, Sevarinska River from the left and Bistrica River from the right. From the town of Berane to the town of Bijelo Polje, Lim River receives Brzava and Ljuboviđa as its left tributaries, Dapsicka and Ljesnica as its right tributaries. From Bijelo Polje to Dobrakovo, it receives Bjelopoljska Ljesnica from the left and Bjelopoljska Bistrica from the right. Area of the Lim River basin to Dobrakovo is 2880 km^2. Its length is 234,2 km. Observations and measuring are currently performed at the stations: Plav, Andrijevica, Zaton, Berane, Bijelo Polje and Dobrakovo. With regard to the above hydrological station, the Hyd-met Institute has been keeping a long set of data (about 50 years). As regards its tributaries, the observations have been performed at Grncar-Gusinje, Zlorecica-Andrijevica and Ljuboviđa-Ravenna Rijeka.

Tara

Tara River emerges from the Maglic Kariman peaks (about 2400 mnm). From the source to the Drcka river mouth, right basin of the Tara River is more developed than the left one. Major tributaries are Opasanica and Drcka, Pcinja, Plasnica, Stitarica, Ravnjak and Ljutica spring. From the right side, the River Tara receives Skrbusa, Svinjaca, Jezerstica, Rudnjaca, Bjelojevicka and Selacka rivers. Area of the Tara River basin up to the Hydrological Station Scepan Polje is 2040 km^2. The length of the river is 148,4 km.

Measuring places along the Tara River are Crna Poljana, Trebaljevo, Bistrica and Djurđevica Tara.

Piva

The Piva River has created a basin at the high massif of Montenegrin mountains. This river bears several names along its flow. Its source part underneath the South-Western slopes of the Durmitor Mountain up to the town of Savnik is called Bukovica. It joins Bijela in Savnik and continues further under the name Pridvorica until it reaches the confluence of Gornja Komarnica into the Pridvorica. The river continues further downwards under the name Komarnica all the way to relocated Monastery of Piva, where it receives the tributary Sinjaci and is named Piva. The river flows to the Scepan Polje, where it meets Tara and creates Drina River. Area of the Piva River basin is estimated to be about 1784 km^2 up to Scepan Polje. Upper Komarnica springs from Durmitor and flows through a 600 m deep and about 40 km long canyon. Along the Komarnica flow, karst phenomena are being created, with insufficiently explored underground flows, overflowings from basin to basin and numerous springs. Measuring stations of the River are Bukovica Savnik, Komarnica Duzi and Komarnica Lonci.

Ibar

The Ibar River originates from the north-eastern slopes of the Hajla mountain at the hill 1760 mnm. Main tributaries are Zupanica, Limnicka River, Ibarac, Grahovska, Bukovacka, Balticka and Backa. The Ibar River basin is fan-shaped with quite developed hydrography and high possibilities for a fast creation of flood waves. Area of the Ibar River basin up to the H.S. Bac is 413,6 km^2., and its length is 273,8 km.

Cehotina

The Cehotina River originates from the Stozer mountain. It is the second largest tributary of Drina after the Lim River. It is composed of Koraci and Brezovski streams. Tributaries of the Cehotina River are Koricka, Maocnica, Vezisnica and Voloder. Area of the Cehotina River basin to the H.S. Gradac is 809,8 km^2. Its length is 128,5 km. Hydrological stations at the Cehotina River are Cirovici (became operational in 1978), Pljevlja (1948) and Gradac (1963). Measuring and observation of the water level are also performed at its tributary Maocnica (series 1985-2002.)

Underground water

Growing quantities of contaminated water and other harmful substances of settlements, industry and mining activity cause degradation of water potential of the territory of the whole country. Among groundwater resources, the most vulnerable to contamination are shallow aquifers with inter-granular porosity. As an example, we can present contamination of major part of groundwater from Cemovsko polje, southern from Podgorica (particularly close to aluminium plant). This aquifer is famous of huge reserves, high water quality and yield of wells (200 l/s).

The other aquifer significant from the standpoint of public water supply – karst aquifer is open for external contamination, but because of absence of population in mountainous watersheds (hence, without potential contaminants) is mainly protected. One of the problems is a fact that potential sources in Montenegro are not legally protected, and so – they are vulnerable to contamination and degradation or reserved for other purposes. Unfortunately, lack of care of the society related to groundwater resources, as a strategic raw material of the first order) will have harmful consequences in the future, when two opposite occurrences will be more expressed than now – growing demands for new amounts of high-quality drinking water and more and more vulnerable (reduced) available water resources.

Appendix 4: Main Environmental Assets along the Route.

This overview describes the most important environmental assets along the highway route, based on a review of existing data sources. Some of this information was developed as publicly available papers/books from which data is extracted.

The evaluation of baseline environmental conditions was undertaken through the verification of areas considered of key environmental significance along the highway route. In the review of literature the following areas have been scoped in the ecological aspect:

- Bar Municipality
- Podgorica Municipality
- Kolasin Municipality
- Andrijevica Municipality
- Berane Municipality
- Bijelo Polje Municipality

Bar Municipality

Relief forms have divided this area into Adriatic, lake and mountain region. Adriatic region is characterized by mild climate, which is a modified Mediterranean climate, especially distinctive in Bar valley region. Effects of heat from the Adriatic penetrate through the river Bojana; therefore the climate is mild in the coastal area of the Lake Skadar and especially in Crmnicko polje. Cliff tops on mountain ranges and higher mountains Sutorman, Rumija and Lisinj have characteristics of mountain Mediterranean climate. They serve as a rampart defending from cold and dry north and northeastern wind penetrations along the coastal area

The range of Lake Skadar has characteristics of the Adriatic climate with strong effects of continental climate and with substantial temperature oscillations since the height effect is stronger on promontories towards the lake than on slopes towards the sea.

Coastal zone

Bar is situated in the south-eastern part of Montenegro at the latitude 42 degrees north and at the longitude 19 degrees east using the area of 505km^2

Bar's municipality has have 83 settlements and 47.768 inhabitants. It is divided into 12 local communities. Bar is famous for its multi-nationalities. Its wealth consists of 25 nationalities which are settled in this area. The number of inhabitants increased from 1948 to 2003. more than 100% -from 21.000 to 47.768 in 2003.
Bar represents modern city that each day is expanding. As port city will amaze you with clean and done green spaces. There are many tourist attractions in its surrounding, like

Old town Bar, fortress of Haj Nehaj whose ruins from 15th century, King Nikola's castle represent historic and cultural monuments of the city, Olive tree old over 2000 years, large number of monasteries and churches for the visitors wishing this way of tourism, a handful of festivals and cultural manifestations: International TV festival, Gatherings under old olive tree and so forth.

Olive cultivation may be a quality indicator of the Mediterranean climate effect and this is the best indicator of this climate in the Adriatic area. This climate is characterized by long and dry summers and mild and rainy winters due to heat effects of the Adriatic Sea. Pretty high average winter temperatures in Bar (9,1oC) indicate that there is no true winter here.

The temperature seldom falls bellow zero, that is, there are only a few days during winter with seldom snowfalls and frost. Spring comes early and due to this some fruit blossom in February already (almond). Summers are very warm and dry with the average temperature of 22,6^{o}C, with long periods of heat that reflects in vegetation which dries up or scorches. Autumn is usually long and pleasant in Bar and it is significantly warmer than spring – temperatures are fairly higher in autumn for 3 to 4oC. In the last hundred years Bar had a maximum measured temperature of 37,7^{o}C on July 26, 1987 and minimum temperature of -7,2oC back in January 1963. The sea was the warmest on August 20, 1982 in 2pm – 28,6oC, and the lowest sea temperature was measured twice- on February 18, 1983 and on February 24, 2000 – it was 9,3oC.

Winds characteristic for the Adriatic are cold northeast wind (bora) and moist wind that blows from south named Jugo or Sirocco, as well as Pulenat, Maestral (Maistral), Burin, Danik (Daily wind) and Nocnik (Night wind). Bura (northeast wind) is the most frequent and at the same time the strongest wind. It occurs during wintertime and it blows from the high mountain towards the sea bringing the chillness. On the open sea this wind reaches the strength of a storm and it also creates short and low sea waves, up to 2,5m. Jugo or Sirocco blows in the south and southeastern parts of the Adriatic, from the sea to the shore. It blows horizontally with the medium temperature of 3 Bofor. Jugo churns sea surface and produces waves that reach the height of up to 6m.

At the end of spring and during summer, when the weather is warm and bright, there is a wind blowing from the sea, during the day, named Maestral. It is a cool summer breeze and the most important wind in the area. It only unsettles the sea surface. Pulenat is a moist west wind which is rather frequent during springtime. Levant is a warm south-eastern wind that brings moist air, and Lebic blows from southwest, from the African coast – this wind is called "libeccio" in Italy and this means that it blows "from Libya". Burin blows during the night, from the shore to the sea, from northeast and east. Due to uneven heating and cooling of the seaside and bare limestone mountains there is an alternation between Danik and Nocnik (daily and night wind). Danik blows during daytime from the seaside to the mountains and Nocnik blows from the mountain to the lowlands, mostly during summer period. Nevera is a stormy wind on the sea, without constant direction, it is a passing and very strong wind.

Agriculture is very developed in the area of the municipality of Bar. It is very rich and well known in producing southern fruit.

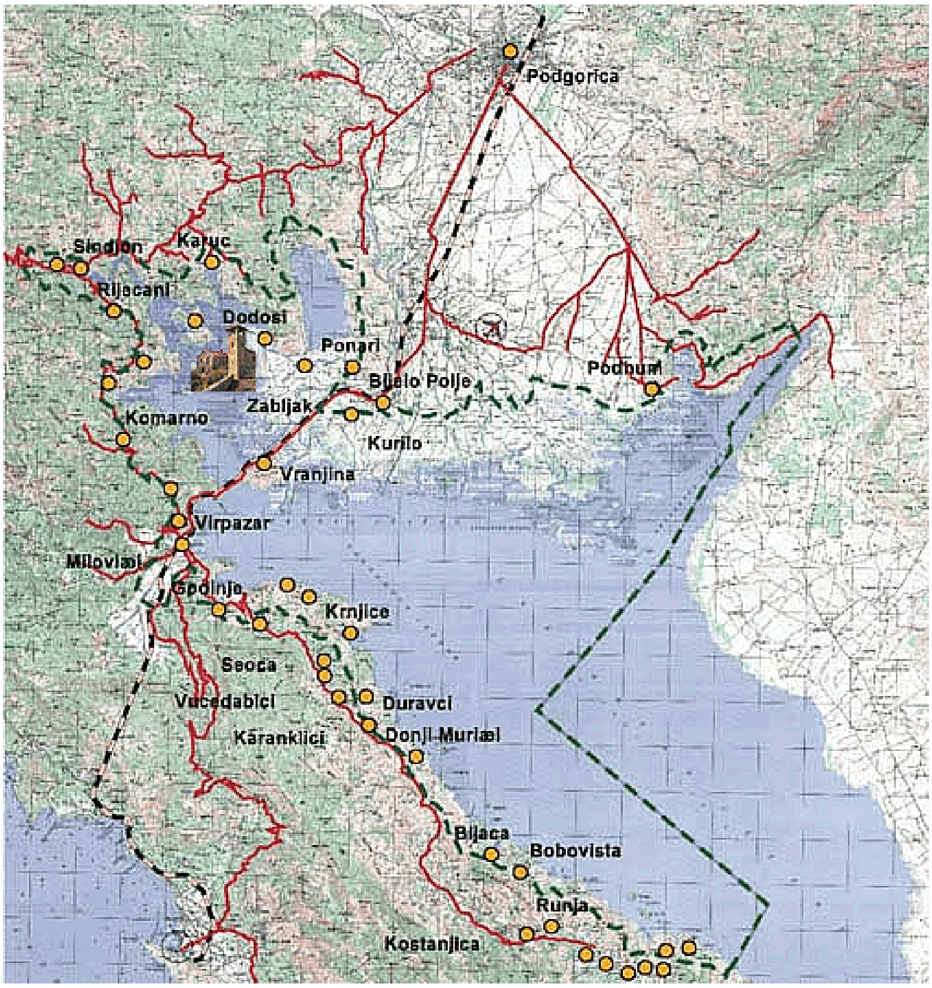
Skadar Lake National Park

Lake is located in Zeta – Skadar valley and is surrounded by mountains and 7 km far from Adriatic Sea. Two Thirds of Lake of Skadar is in Montenegro and rest one third is in Albania. Depending of level of water space of Lake varies from 530 to 370 km^2 it is considered 44 km long and 14 km wide. Coast line is very cut especially in north – west side. Low valley of north part of Lake is often flooded. Lake of Skadar is the largest lake at Balkan Peninsula one of the last fresh water spaces and largest national park in Montenegro and the most famous for its diversity of flora and fauna. Lake itself is unusual for mutual vicinity of different living areas and their chain of feeding.

There is a large number of birds' kinds. It is stated that 270 kinds of birds inhabit this Lake. Around 90% of birds are migratory and are of international importance. During season of migrating, white little egret, white spoonbill and various kinds of ducks pass over this region. Cormorant nest in north swamps and represent one of three most important colonies in the world (ITR, Ecological Research Study on Peat exploration, 2001). Rare and endangered kind of curly pelican nest at floating peat islands in north end of the Lake. There are 50 species of fish living in the Lake and 3 snake like. The most important from economic point of view are ukljeva and carp.

World of plants of this park is very important and is different from the regions where there are often floods, little stone islands and steep mountain cliffs. There are three rare and protected plants and trees and large number (30 +) of rare plants in park.

In region of Lake of Skadar there are 20 monasteries, churches, villages, fortresses and sacred monuments. This lake is witness of Montenegrin history from 11th century up to now. Around Lake itself there are 18 important historic monuments. of International recognition:



History of human kind around Lake of Skadar dates back to times of early manhood for its health and dispensable resources. Earliest written documents from this region are from 11th century or period of creating the first Montenegrin dynasty. Turning of Roman Catholics into Orthodox Church many monasteries and churches, in the beginning of 1400 AD built around the lake. In 1478 Turks occupied Zabljak and region of lake and ruled over it until 1878, when Montenegro was liberated from Turkish rule. During Turkish occupation Montenegro was ruled by Cetinje Metropolitans and it survived this period. Some strongholds were used by Italians during WWII.

Bird watching, fishing, hunting, renting and ride in boat, swimming and sunbathing are main recreational activities around the Lake.

National Park Skadar lake was founded in 1968 for keeping and protection of wonderful surrounding of the Lake and its shore. Plan of development for his park was made in 1997.

Park is easily accessible from direction of Podgorica and Bar by highway Podgorica – Petrovac or by rain from Bar or Podgorica through central part via Virpazar. To other regions inside park you can come in own car or taxi. Travellers' agents in Podgorica offer one day trips to Lake including boat ride at Lake and lunch at far fishermen village.

As national park it is special for its emphasized limnology characteristics and the biggest crypto depression on the Balkan Peninsula and one of the biggest in Europe. It is very interesting that the surface and depth of the lake vary depending from the quantity of precipitation. In rainy months the level of the lake grows to 2.5 to 3 meters This particularity lasts for 5-6 months per year. It belongs to a group of counter flow lakes with large number of tributaries providing the lake with fresh water and the only bayou is river Bojana which flows into Adriatic Sea.

Virpazar

Microclimate of Virpazar, Crmnica and of the lake is different than the climate in Bar. With the occurrence of the southwestern current the area of Bar is exposed to air humidity, and condensation in the atmosphere appears during the transition of this current over orographic barrier (a mountain). Precipitations occur on the mountain tops and the air, free of humidity and water, continues its voyage, comes down to the Virpazar area and causes the fan effect. Such conditions cause abrupt melting of snow. One meter thick snow cover can be melted within a couple of hours. In such situations it comes to floods since there are no river systems in Virpazar.

Local winds on the Skadar Lake used to condition lives of local people, thus it is not unusual that their tradition and folklore attach a great importance to those winds. People who used to live around Skadar Lake knew even 15 winds which had impacts on lake sailing, fishing or trade, and those are: danik, nocnik, sjeverika, murlan, bojanac, rumijas, orahovina, upor or smuta, vijorac, sijavica (prijepor), sjevernjak, hercegovac, silok, grbin and juznjak.

Podgorica Municipality

Podgorica is located in central Montenegro, in northern part of Zeta plain. The entire area in which is intersected with rivers, and the city itself is located only 15 km north of Lake Skadar. Moraca and Ribnica rivers flow through the city, while Zeta, Cijevna, Sitnica, Mareza rivers flow in the vicinity of the city. One of the main features of the city is richness in bodies of water.

The city itself, in contrast to most of Montenegro, is lying on predominantly flat area of northern Zeta plain. Only exceptions are hills that overlook the city. These are mostly steep hills that rise abruptly from the surface, and thus are not suitable for urbanisation.

They rather limit the city's expansion, especially to the north, shaping the city's development.

Podgorica has typical Mediterranean climate, with hot and dry summers, and mild winters. Snow is almost unknown phenomena in Podgorica. It has a mean annual rainfall of 1544 mm, and median daily temperature of 16,4°C. It has around 135 days with temperature higher than 25°C per annum. Podgorica is particularly known for extremely hot summers, as temperatures over 40° C are a common occurrence in July and August. Absolute maximum recorded in Podgorica is 44.8 °C, on 16th August 2007.
The municipality of Podgorica accounts for 10.4% of Montenegro's territory and 27.3% of its population. Besides being an administrative centre of Montenegro, Podgorica is also its

economic, cultural and educational focal point. There are around 170,000 people in Podgorica municipality, which includes the small towns of Tuzi and Golubovci, and around 140,000 people in the city itself. This is the official data from 2003 census, while estimates go up to 200,000.

Moraca Canyon

Departing from Podgorica, one of the major country road follows the canyon of the Moraca River and than continues further towards the North Montenegro and further on to Serbia and Belgrade. It is the most monumental limestone canyon in Montenegro. The countryside is initially soft and almost hilly with strange red-streaked rocks but then becomes gradually harsher, with mountains dominating the winding road which cuts through them, with long tunnels and borders on a deep gorge, creating a real master piece of nature. The scenery presents a continuous inspiration to Montenegrin artists, especially painters.

The Moraca Canyon runs 45 kilometres through the Municipality of Kolasin. The most interesting part of the canyon are the famous Platije, which are 37 km south from Kolasin, and its depth at certain places is over 1,000 metres. For centuries, the Moraca River has been the route to penetrate the Northern region and the Moraca Monastery was its gateway. The sanctuary appears without warning, almost as an oasis. The high canyon cliffs seclude various flora and fauna species, and the clear and pure waters of the Moraca River are rich with the most beautiful samples of trout and huchen, and therefore renowned for sports fishing. The canyon has a significant cultural historical treasure too as the most beautiful monastery of Montenegro

The new highway alignment is supposed to ascend from current road alignment before entering the gorge part of the canyon.

Kolasin Municipality

The Municipality of Kolasin is situated in the central part of the continental part of Montenegro. It stretches over an area of 897 m2 kilometres of the upper and middle courses of the Tara and Maraca Rivers. The basins of these two rivers make two natural unities, equal by size and spatially close by and yet different. The Crkvina saddle, situated between Maraca and Kolasin monasteries, is the watershed of the two basins. On its southern side, waters flow towards the Adriatic Sea, and on its northeast side, the waters flow through the Tara, Drina, Sava and the Danube Rivers, reaching the Black Sea. The curiosity is that the waters split on the roof of a building on this saddle and flow into two different basins.

The region of Kolasin is surrounded with cliffs and mountain peaks of Sinjavina, Javorje, Semolj, Kapa Moracka, Maganik, Stavnje, Ostrvica, Komovi, Kljuc, and Bjelasica Mounts, which makes it a true mountainous region rich in all the beauties and challenges offered by high mountains and a particularly diversified relief. Breathtaking canyons, glacial lakes like those in fairytales, mountain peaks exceeding 2000 meters, numerous springs, thick woods, spacious pastures, limestone plateaus – make this treasure of landscapes infinitely abundant, unforgettable and exciting always in a new way.

The relief should be added to above as the constant and expressed factor. The area of the Kolasin Municipality is featured by major changes in altitude at small distances. The very town of Kolasin is at 954 meters above sea level; only five or so percent of territory is at a height below 500, and 24 percent below 1000 meters above sea level. The eastern part of the Kolasin region has specific climatic conditions, where Bjelasica Mount dominates, rich with water and thick woods. Due to the relative openness over the Crkvina saddle and the Moraca valley, the winds from the Mediterranean region penetrate, which increases the precipitation. However, because the terrain is so rough and with deep river canyons and thick woods, there are many microclimatic conditions resulting in various climatic changes.

Average annual temperature is 7.3 ^{o}C. January is the coldest month with average temperature of -1.9 ^{o}C, the warmest is July with 16 ^{o}C. Autumns, with average temperature is only 6.5 oC. This is explained by the influence from the sea and that also applies to somewhat faster temperature transition from winter to summer than from summer to winter.

The highest temperature in Kolasin of 36 ^{o}C was recorded on August 29, 1956 and the lowest of -29.8 ^{o}C on January 13, 1985. During the year the town has 127.2 frosty days on the average and it sometimes happens that, in the middle of June, the temperature drops -3 oC. In the mountainous part of the Municipality, the number of frosty days goes over 150 days a year. The lowest parts lying, around the Tara and Moraca Rivers are featured by the biggest number of warm days with maximum temperatures of 25 oC. Considering the air temperature range, the conclusion is that the heating season in Kolasin lasts 249 days, i.e. the need to heat homes and working premises lasts from September 17 until May 24.

Average annual insolation period in the Kolasin region is 1830 hours. Its average precipitation during the year is 2106.2 millilitres. December is the rainiest month with 310.4 and July is the driest month with 72.3 millimetres. The higher the altitude, the higher is the precipitation. The precipitation in the south –western part of the Municipality can reach the values exceeding 2700 millilitres

It snows for 52 days on average and, on the higher grounds of Bjelasica Mt., over 60 days a year, mostly in January and February. In Kolasin proper, ground is covered with snow that can be measured for 82.8 days a year on average with big annual variations of as 108 days. In 1981, 141 days were recorded with snow and, in 1951, only 33 days. The regions 1500 meters above sea level can be covered with snow for over 120 days. For over one hundred days, the snow cover is minimum 30cm. The most frequent wind blows from the north with the maximum squalls of some 25.8 meters per second. Considerable winds also blow the west and southwest, sometimes more seldom from the southeast and west and most seldom from the east.

The north wind is the predominantly winter wind and it resembles the seaward north-eastern wind. It brings low temperatures and often snow, thereby creating big snow drifts. Strong winds sweep through Kolasin only 10.2 days a year. In the recent years even less. On average, only two days a year are with the winds, the speed of which is above code number eight on the Beaufort scale, i.e. above 19 meters per second.

Today, the Kolasin Municipality has more than 12000 inhabitants and over one third of them, around 4500, live in Kolasin itself. On average there are 13 inhabitants per km^{2}.The people of this region lived poverty and privation in the past because of the overpopulation of villages and the natural type of farming. This situation resulted in mass emigration, first to Serbia and, from the beginning of the 20th century, increasingly to other countries, especially the United States. With the construction of roads and other infrastructural facilities, particularly in the period after the Second World War, condition developed for better use of the natural resources of this, for tourism, very attractive region. That was the opportunity for better and richer life of the local population.

The nature of this region put the architects and builders before great challenges to follow in with esthetical and engineering excellence of recent times. It took a lot of courage, know – how and skills for some projects to be finished. This is, first of all, related to the bridges. The bridges and viaduct on Belgrade – Bar railroad command admiration because of their beauty and remarkable construction undertakings. Of all the bridges along Belgrade – Bar railroad in the territory of the Kolasin municipality, the ones over the Tara River stand out: The Mala Rijeka viaduct is a viaduct is the tallest railway viaduct in the world. It is 498, 8 m long and rises 200 m above the Mala Rijeka (meaning literally Little river). It is also the longest bridge on the Belgrade - Bar railway. Where .36, 000 m³ of concrete and 100,000 tons of steel were built into the bridge. The largest of four pillars, upon which the bridge lies, has a base bigger than a tennis court.

Biogradska Gora National park

Even thou the proposed alignment of new highway is not passing through it, it is worth mentioning this national park with which Kolasin Municipality is connected, in the most beautiful way, with its nearest neighbours, the municipalities of Andrijevica, Berane, Bijelo Polje and Mojkovac, which spreads over 5400 hectares, occupying the central part of Bjelasica Mountain, between the Tara and Lim Rivers.

With its surroundings, this is a very important ‘‘climatic, hydro-geological and ecological node of Montenegro and the Balkans‘‘. One of the three last preserved primeval forests in Europe is in the park with trees old as much as 400 years and over 45 meters high, with the perimeters up to 150 cm. Biogradska Gora was statutory declared to be the National Park in 1952 but this area had been put under protection much earlier.

Three levels of protection have been established for Biogradska Gora. The first zone includes the primeval forest reserve, which stretches on some 1600 hectares. There all the activities that could disrupt the spontaneous life of the nature are prohibited. This zone is used for scientific research and some educational and cultural activities as well as for tourist and recreational activities. The second zone is under strict land, water, plant and animal life, and landscape environmental protection, but grazing is permitted provided the pasture vegetation is preserved. Damaged and diseased trees are allowed to be cut and there is a wide range of recreational activities that are allowed. The third, contact zone is dedicated to various forms of tourism, health food production, hunting, fishing, bee keeping, and harvesting of medicinal herbs. The experts claim that the area of the National Park Biogradska Gora contains all the vegetation of the Earth‘s northern hemisphere, where over 2000 species and subspecies of higher plants have been registered in the Park so far, of which every fifth is endemic to the Balkan region

The richness of plant life creates adequate conditions for survival of animal life. Deer, wolfs, foxes, martens(golden and white), otters, weasels, rabbits, squirrels and bears are all the original inhabitants of Biogradska Gora. The newcomers are deer and hinds and its passing guests are wild boars. In this area, the bird life includes about 150 species among them being: imperial eagle, hawk, rough-legged hawk, cock of the wood, deaf duck, calendar bowers (crested, yellow, blue…), sittine, woodpecker, finch, gold-finch and cinclidae. Out of 350 species of insects specially protected are : forest ant, hart's tongue, rhinoceros beetle, and butterflies swallowtail and Apollo. In the rivers and lakes there are many species of trout-stream, golden, Californian, etc. Those in the lakes are autochthonous and, therefore, specially protected, just like the relict Triterus montenegrinus.

Tara River

The part of the Municipality of Kolasin, in the Tara River basin, is on a higher average altitude above sea level and has a number of smaller valley expansions, such as Kolasinska terrace, Lipovska Valley, Trebaljevo, the Donja (i.e. Lower) and Gornja (i.e. Upper) Tara Rivers and valleys with a number of its tributaries.

Tara River is quiet and placid but, at the times of heavy rains and sudden melting of snow, it can become a raging torrent. The Tara River originates from two smaller rivers, the Verusa and the Opasnica. Near Matesevo, the Tara takes in the Drcka, the Skrbusa, then Pjescanica, and Pcinja before Kolasin , after that Svinjaca Plasnica and Bukovica. After than, it continues to flow across the territory of the neighbouring municipality of Mojkovac until it finally meets the Piva River and flows further on as the Drina River.

The Tara River, 144 km long, is the longest river in Montenegro. But its 82 km long and 1,300 m deep canyon is an extraordinary natural attraction which cuts between the mountains Sinjajevina and Durmitor on one side and Ljubisnja and Zlatni Bor on the other, and is the world's second deepest after the Colorado River canyon. The Tara River Canyon is a jewel of nature, placed on UNESCO's world heritage list in 1980 and has been protected as part of a network of international biosphere preserves. Tara is of fluvial origin. At this location the canyon was formed by a combination of the rushing waters of the river together with the tectonic forces making the mountains rise. With a variety of plant and animal species, its magnificence lies in its numerous contrasts.

Around the river, the vegetation is very dense: black pine, eastern hornbeam, black ash, elm, linden, and in higher areas, above rocks, one can see cork oaks, hornbeams, maples, beeches. In the areas more than 1000m high, fir and spruce forests can be found. The Canyon holds one of the last primary forests of black pine in Europe. "Crna poda" is the most valuable black pine forest with unusually high trees. Some trees are almost 50m high and 400 years old.

The Tara flows slowly, unhurriedly, in its rocky bed, free to unwind in a succession of bights and curves. It embraces little wooded islands and brushes the thick forests that cover its banks. Tara is limpid, exuberant, full of life, far from the dull, altered, shabby look that rivers have. Its waters are clear as crystal; the pebbles on the bottom are clean and smooth; there is no suspension, no algal carpet. Instead of being terrifying, the high cliffs are reassuring and charm the visitor with dozens of enchanted waterfalls, almost as if the mountains themselves were just moss-covered sponges. A multitude of fry moves quickly in the low water and several natrices hunt after them zigzagging among the pebbles.

Nowadays, the Tara canyon gathers all those who like adventures and exuberating contact with nature. Water attractions from the world's famous amusement parks are just a bad simulation of the real excitements that are unavoidable while rafting along the Tara River and over its 50 rapids. Besides nature's beauty, rafting and canoeing almost along the whole course will add to the excitement. The raft is made of logs and it is rowed by brave and skilled people who used to transport timber in the lower course of the river in this way.

Andrijevica Municipality

Andrijevica is based in the north-east part of Montenegro, situated in the Upper Polimlje (Lim river valley) on the left bank of the river Lim. It covers the space of 340 km^2 with about 6 600 inhabitants, out of which some 1000 live in city of Andrijevica, and others in rural areas. By its position, Andrijevica resembles a terrace, build above this beautiful river. It is situated between two mountainous rivers – Zlorecica and Kestica. Near it, there are the mountains Komovi and Visitor, as well as Lake of Bukumir – 1440 m above the sea level,

It is characterised by old and undeveloped communal and social infrastructure. The main resources except almost untouched nature are forests covering 13.912 ha. Arable land covers some 5.971 ha and 7.692 ha are covered with pasture. Parallel there are resources of construction stone, minerals and river sand and gravel.

Lim River

Lim River is the major tributary of Drina with a trans-boundary sub-catchments of 3,160 km². It has its source in eastern Montenegro (Prokletije Mountains at the Albanian border) and flows through the towns Andrijevica, Berane, Bijelo Polje and Priboj. Its source under the name of *Vrmosa* is only few kilometres away from the source of the Tara River, but the two rivers go in opposite directions.

Vrmosa flows to the east, and after only few kilometres it crosses over to Albania passing through Prokletije Mountains, it re-enters Montenegro under the name of *Grncar*. Receiving stream Vruje from the right at Gusinje, it continues as *Ljuca* for a few more kilometres where it empties into the Lake Plav, creating small delta. It flows out of the lake to the north, next to the mountain Visitor, under the name Lim for the remaining 197 km. It continues generally to the north through cities of Andrijevica, Berane, Bijelo Polje, entering Serbia between villages of Dobrakovo and Gostun.

The Lim is subject to serious exploitation of riparian vegetation and sand/gravel excavation and is impounded by several dams
Fertile valley of the river is called Polimlje (Lim valley). It represents area around composite river valley, made of several gorges and depressions. It is important agricultural region, especially for cultivating fruits and stockbreeding. It is also important route for the both road and railways from Serbia to Montenegro and Adriatic coast, most notably, Belgrade-Bar railway. Industry is not much developed (smaller industrial centres are Berane, Bijelo Polje and Prijepolje). Most use of the river has Serbian electricity production, with power station Potpec being constructed and several more stations on the Lim's major tributary, the Uvac.

Despite the potentials, the entire area the Lim flows through is undeveloped and for decades highly depopulating.

Berane Municipality

This town covers the space of 647 km^2 with about 40 000 inhabitants out of which some 13 000 lives in the city and others spread in 27 communities. Berane is the centre of the whole upper Polimlje (Lim valley). There are several important cultural and historical monuments in this region, such as: a medieval town Bihor, which was the headquarters of the tribal state (having the same name), situated at the confluence of the rivers Lim and Ljesnica and Budimlje, which was built on the remnants of the former roman settlement. Among cultural monuments, there are famous monuments Sudikova and Djurdjevi Stupovi, and from recent period – the monument on Jasikovac (a stone book containing 1 000 letters). There are favourable conditions for fruit growing and agriculture, in this region Out of total territory, some 91% is arable land (62 ha). Beside that, there is the coal mine and the factory for animal skin processing in Berane.

Climate is mild continental with temperature reaching 37oC during summer and -30oC during winter. Early spring matching calendar is favourable for early agriculture having vegetation period lasting 250 days a year. Winters are long and cold. Due to climate condition, landscape and nature, this area is rich with surface waters, which are 98% drained by Lim river.

Similar to Andrijevica it is one of the poorest municipalities of Montenegro. The industrial production is very small due to the collapse of country economy in the past decade. The fact that during second half of 20th century many families have moved to urban centres due to industrialisation the agriculture production is low as well. The latest developments are mainly in the segments of small scale trade and tourism. In total there is only 3000 employed

Bijelo Polje Municipality

The pleasant valley of the river Lim with its tributary rivers Bistrica, Ljubovidja and Ljesnica has always been attractive for people to settle and live in it. The traces of life in Illyrian, Greek and Roman period can be noticed there, up to the modern times. The region of Bijelo Polje coves the space of 924 square kilometres with about 57 000 inhabitants. Thanks to the railway Belgrade – Bar and developed road network, Bijelo Polje has a very favourable geographic position. Among cultural and historical monuments, the church of St Petar is of a special importance. The famous Miroslav`s gospel was written for its needs in the twelfth century – one of the most famous Cyrillic written works. In the vicinity of Bijelo Polje, there is the factory for mineral water processing “Bijela Rada” and the factory for wool processing – Bijelo Polje.

Appendix 5: Air Quality and Noise Level

Air Quality

In accordance with the Montenegrin regulations, a permanent quality control of air on the territory of Montenegro is being measured and reported. Such control is aimed at determining conditions and changes in water balance and qualitative composition of water. i.e. determining a class of bounty in surface waters and control and evaluation of the level of air pollution in lower layer of atmosphere. Evaluation of the water and air quality is made in accordance with legal regulations. Methodology of work has been fully standardized in all phases of sampling, analysis and data processing.

In addition to the national environmental monitoring program, the Centre for Ecotoxicological Research of Montenegro participates in implementation of international programs: Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air pollutants in Europe (EMEP) and Mediterranean Pollution Monitoring and Research Program (MEDPOL). Analytical data on environmental situation are published under Annual Reports, which are appropriately filed and sent to the competent Ministry and other interested parties. The outcomes are occasionally published at expert local and international gatherings.

A limited number of measurements of air quality have historically been collected within Montenegro, in the few locations along the highway route: at Bar, Podgorica, and Berane. Such measurements of air quality are available in the annual reports.

Municipality	Location	Coordinates		Altitude	Type of station
Bar	Dom zdravlja	420 93'	190 10'	4	urban, traffic
Podgorica	CETI	420 26'32''	190 18'99''	45	urban, traffic
Podgorica	D.Gorica	420 39'71''	190 16'19''	45	urban, traffic
Podgorica	Srpska	420 26'34''	190 17'07''	35	Industrial traffic
Podgorica	Konik	420 26'12''	190 12'48;;	45	urban, industrial
Berane	Trafostanica	420 50'	190 52'	700	traffic

Source: Centre for Ecotoxicological Research of Montenegro

The majority of the proposed new sections lies in predominantly rural areas, where it is expected that air quality would be very good owing to the current relatively limited scale of industry and road traffic in Montenegro.

The Annual average values of restrain concentrations of pollutants from annual report for 2006 relevant to the highway route are shown in the tables bellow.

Annual average values of restrain concentrations of basic pollutants in 2006

Station	C_{av}.SO2	C_{max}.SO2	C 95 SO2	C_{av}.NOx	C_{max}.NOx	C 95 NOx	C_{av}.O3	Cmax.O3	C 95 O3
	µg/m3								
Bar	2.64	14.46	2.27	3.33	15.08	2.97	57.78	**138.83***	54.03
Podgorica - CETI	2.53	31.32	2.07	6.82	65.55	5.73	53.46	**139.94***	49.28
Podgorica - D.Gorica	3.12	14.56	2.69	3.73	11.04	3.43	55.01	**129.95***	51.71
Podgorica -Konik	7.12	73.47	5.31	3.62	36.65	2.86	57.92	**144.43***	54.40
Podgorica - Srpska	4.66	38.97	3.78	4.20	17.25	3.81	53.54	**166.60***	49.10
Berane	2.25	14.45	1.85	2.98	62.43	2.15	56.98	**160.27***	53.32
LIMIT VALUE	110			150**			125		

Station	C_{av}. smoke/soot	C_{max}. smoke/soot	C 95 smoke/soot	C_{av}. suspended particles	C_{max}. suspended particles	C_{av}. settling maters	C_{max}. settling maters
	µg/m3					mg/m2dan	
Bar	12.97	**60.49***	11.55	88.72	**184.24***	138.58	275.45
Podgorica - CETI	24.34	**71.35***	22.62	85.79	**120.50***	148.32	303.02
Podgorica - D.Gorica	17.04	**126.37***	14.95	66.38	108.77	152.59	**428.87***

Podgorica -Konik	21.33	**124.42***	19.32	**198.39***	**452.25***	333.59	**842.38***
Podgorica - Srpska	22.86	**133.45***	18.22	**200.80***	**380.40***	**352.07***	**1172.50***
Berane	16.02	**87.35***	13.91	102.94	**187.27***	136.66	**373.03***
LIMIT VALUE	60			110		350	

Annual average values of restrain concentrations of specific pollutants in 2006

Station	C_{av}.H2S	C_{max}.H2S	C 95 H2S	C_{av}.NH3	C_{max}.NH3	C 95 NH3	C_{av}.H2CO	C_{max}.H2CO	C 95 H2CO
	µg/m3								
Bar	0.23	1.31	0.19	1.83	12.53	1.41	1.13	5.00	0.97
Podgorica - CETI	0.35	4.25	0.26	2.83	14.24	2.44	1.46	8.50	1.14
Podgorica - D.Gorica	0.72	1.90	0.32	3.63	30.45	2.46	0.53	2.50	0.45
Podgorica -Konik	1.13	1.55	0.36	5.49	40.60	3.23	1.02	7.00	0.73
Podgorica - Srpska	0.48	2.50	0.35	2.68	23.10	1.87	1.39	8.65	0.96
Berane	0.37	2.90	0.26	1.51	6.65	1.30	0.28	2.00	0.20
LIMIT VALUE	8			200			12		

Source: Centre for Ecotoxicological Research of Montenegro

Baseline data indicates that levels of measured pollutants are mainly within limit values. The air quality along the highway route except urban areas is currently very good. These findings are unsurprising given the current extent of industrial activity and road transport currently within Montenegro. Contribution to the measured concentrations of target gases is likely to arise from domestic burning of wood and other fossil fuels, road transport, and limited industry.

Based on the given results it can be concluded that the air quality is on the satisfactory level. Suspended particles represent major problem in more less all urban areas in Montenegro. High concentrations of polycyclic aromatic hydrocarbons (PAH) are mainly result of exhaust gases from vehicles which are not up to standard as well as due to the quality of fuel.

The following conclusions can be drown up:

1. Restrain concentrations of global parameters (SO2 and NOx) are below national limit values (<110μg/m3) however sometimes exciding EU values (50 μg/m3). Increase in the number of vehicles and low quality of fuel results with high values of PAH and suspended particles especially in the urban areas.
2. Increased smoke/soot values are recorded during winter which can be explained by traditional usage of coal and wood as a major heating material.
3. Almost in all urban areas Cmax.O3 is recorded higher than limit values, which is direct consequence of UV radiation combined with soot coming from vehicle exhaust pipes.

Noise level

Similar to air quality monitoring Centre for Ecotoxicological Research of Montenegro is performing noise level measurement. This exercise is performed on the locations such as main squares in urban areas, medical facilities surroundings and national parks. The limit values of L_{eq} for different areas are shown in the table below:

Type of Area	L_{eq}		
	Unit	**Day**	**Night**
Recreation and resting area, hospitals, cultural and historical sites, parks	dB(A)	50	40
Tourist areas, small size settlements, camps and schools	dB(A)	50	45
Residential area	dB(A)	55	45
Business-residential area, trade-residential area, playgrounds	dB(A)	60	50
City centres, entrepreneurship, trade and administrative areas, areas along highways, main roads and city traffic lanes	dB(A)	65	55
Industrial zones, warehouse zones, service areas and non residential areas	dB(A)	Applied values of bordering zones	

Source: Centre for Ecotoxicological Research of Montenegro

The results from the monitoring from 2004, 2005 and 2006 shows that noise levels are over the set limits in the most of the locations with incising trend. The biggest exceeding difference is recorded in Podgorica, mainly due to the fact that distance from the traffic and subject area (hospital, park school) is very small. The noise level in the national parks is recorded higher than expected mainly due to the natural effects (birds, wind etc).

Thee main constrain is the fact that zones in the urban areas are not well defined (distinction between residential and industrial area is sometimes hard to distinguish) and therefore applying above table is not simple.

Appendix 6: General Conditions of the Existing Road

The existing road is used by mixed traffic. All types of vehicles from modern and speediest cars to 38 ton trailer trucks. Sometimes, a horse and cart is using this road. The variation of observed speed is from 15 km/h to 160 km/h (exceptionally on the flat sections near Podgorica). The pedestrian, the cows pass trough the road and very often, the cows slept on the road. Drivers are undisciplined, ignored all horizontal and vertical signs.

In Podgorica suburb, on the both side of the road there are the trade of fruits and local fruits. This process disturbs traffic and is source of many accidents. Usually the settlements are implanted on the both side and close to existing road. Typical small rural town is compound of one line of houses with a yard. Any attempt to wider the existing road to highway standards will results in destruction of half of settlement located on one side of the road. In this case the social cost of the construction of highway will be very high.

The visual assessment shows:

- Many features such as culvert wing walls, aprons, and headwalls are in the bad condition. Bridge parapets are sometimes partially broken away.
- There is the need to fix all drainage structures, culverts, pipes, both brickwork and concrete.
- The profiles of original roadside ditches are completely changed as they have become silted up over long periods or have become the receptacle for waste and garbage. The problem with solid waste dumping is particularly severe because of (i) highway drainage channels being directly used, in a targeted and purposeful manner, as waste disposal sites; (ii) Highway drainage channels picking up waste products indirectly by interconnection to supplementary drainage systems from adjoining lands and properties outside the ROW;
- Road safety conditions at most places are very poor. Cambers of road on bends have become damaged by the effects of heavy vehicles. Untreated pothole and patching repairs, particularly on bends where tire traction and adhesion is critical, pose risk of skidding and loss of control. There is also a lack of hazard warning boards, bollards, or any form of physical barrier on sites that clearly have experienced vehicles going over embankments through hedges and running into walls and roadside banks.
- On the whole length of existing road water provided from the pavement is going directly to the land without any process of cleaning of hydrocarbon products.
- The crossing of the settlements and built-up areas are especially dangerous regarding to drivers' and pedestrians' safety, due to the narrowness of the carriageway and several sharp bends.

Appendix 7: Socio-Economic Baseline

Many socio-economic problems along the route under consideration are directly attributable to the poor economic conditions in Montenegrin rural areas or in some way connected to them. Despite the foreign investment boom (mainly Montenegrin real-estate in the seaside area) economic conditions are reflected in the collapse of agriculture and industry, the lack of opportunities for well-paid, regular employment and the pressures on livelihoods that eventually affects the environment. It is also widely understood that poor economic conditions impose a constraint on sources and levels of investment in necessary infrastructure, services and economic sectors. The need for economic growth is of course a national issue, but the problem needs to be addressed in all sectors and geographical areas. This suggests strongly that value for money or potential to generate sustainable economic growth should be ranked highly as evaluation criteria for investments in transport infrastructure. This also accords with national policies and the priorities of international assistance projects which concentrate on poverty reduction.

Quality of life theme underlies issues relating to poor standards of services (e.g. drinking water, electrical supply, sewage disposal) and threats to human health from poor environmental conditions. Poor standards of waste disposal (both domestic waste and sewage) are one of the most pervasive and most persistent problems along the rout. Poor environmental conditions represent a very real threat to human health. Industrial pollution is widespread, domestic water supplies are regularly polluted with untreated sewage and river water quality is unrecorded but almost certainly very poor. Impacts on human health should therefore be also accorded a high priority as an evaluation criterion to judge any development interventions.

Infrastructure along the route is generally in a very poor state, ineffective or inoperable. Transport infrastructure is in a poor condition, with roads that are severely degraded and pot-holed. Energy is a major problem with communities receiving an infrequent supply of electricity, or no electricity at all. This results in a high reliance on coal and wood, which is cut and gathered by the communities themselves. Telecommunication and telephone lines are in very poor condition or non-existent. The infrastructure for mobile phones is available and reliable. Water supply is a problem in costal area during summer tourist season with some communities receiving running water for a few hours a day, or no piped water at all. Sanitation services are almost non-existent, and when they do exist, they are often ineffective.

Agricultural infrastructure was built for small-scale farming and is unsuited for current market competition. Rural roads and irrigations systems are not adjusted to the new land tenure structures. Nowadays, the Montenegrin rural agricultural sector is at subsistence level; it is producing food for self-consumption with a small surplus sold in markets and at roadside stalls. The small size of land parcels is sufficient for personal consumption but not large enough to provide a living from the land It is obvious that economic hardship is the underlying cause of low birth rates and high levels of out migration from rural to urban areas. Forecasts of future population growth are negative, but it may not result in reduced population and development pressure in the areas adjacent to the main transport artery. The various survey data do not reveal any great sub-regional variations in socio-economic conditions along the route. In common with most of Montenegro, economic conditions are hard and for households access to livelihood as well as to the main road is their greatest priority. For some of them today the highway itself represents the livelihood where they are involved in different legal and illegal businesses including trade and wide range of services.

The Bar-Boljare highway runs through the territory of 6 municipalities: Bar, Podgorica, Kolasin, Andrijevica, Berane and Bijelo Polje.

The highway runs through predominantly rural terrain with agriculture activities beyond the existing extent of the cities, except some minor cases where it passes through some of the outermost suburbs. Although not urban in character the highway is directly related to the economic and demographic development of the cities. In the same time highway has a considerably wide area of influence on rural regions through which it passes. Most of them have predominantly rural populations and limited industrial development.

Land ownership and the use of land is an important part of the social economy along the highway rout, as well as Montenegro as whole. The majority of the population in the communities along the rout relies on the land for subsistence, and it provides an integral part of their income if not the majority in many cases. The land is used for three main productive activities: crops/fruit/vegetable cultivation, livestock raising/grazing, timber harvesting and wood cutting. In general people use state land for pasture and for timber harvesting and woodcutting, and own the land they use for crop/fruit/vegetable cultivation. State land is used under a lease agreement or sometimes without formal permission. The average amount of land owned or used per household is almost one hectare. This includes: backyard gardens, summer plots (not attached to the house, largest piece of land owned by any one household – mainly used for vegetables), small vegetable plots (close to the house), collectively owned farm land (far from the house), privately-owned farm land (very small percentage). In general, vegetables are the most widespread type of crops cultivated, followed by herbs and fruit. However, the municipalities differ significantly in terms of what crops/fruit/vegetable are cultivated, based mainly on climatic and geographic conditions along the route. The land of the present road and, to great extent, the land needed for the widening belongs to the Montenegrin state territories. But for some of the new bypasses and alternative routs there is a need of expropriation and/or buying-out and compensation procedure.

At current preliminary environmental assessment stage, it is only possible to answer the general scoping questions on whether the project results in social changes, for example, in demography, traditional lifestyles, employment etc., which are indicated in the Scoping Check-list (see Appendix 11). The preliminary analysis of the possible socio-economic risks and impacts is also presented in the Section 6 of this report.

At the later stage, for the full-scale environmental and social impact assessment (ESIA), a socio-economic survey will/shall be undertaken in all the “highway affected communities” within the zone of influence of construction and operation (2-5 or more km - to be determined on the basis of previous or EU experience). The data will/shall be collected in a format that could be easily transferred to a database and GIS for later analysis using SPSS (standard specialist software), and mapping of attitudes and impacts to cover the following main topics:

- population and demographics
- labour and livelihoods
- infrastructure, resources and services
- culture, local administration, decision making and planning
- attitudes and perceptions.

Appendix 8: Cultural Heritage and Archaeology

Montenegro, a country of contrasts - of mild Mediterranean and a severe mountainous climate, fruitful plains and river valleys, and high and arid mountains - on its rather small surface area of 13.812 km^2, inherits cultural heritage originating from the time of creation of the first human communities until present. Privileged to be situated on the boundary of two large civilisations - eastern and western and three great religions - Orthodox, Catholic and Islamic, numerous known and unknown builders, painters and carvers, masters of sophisticated crafts, writers, transcribes and typographers, were leaving here the masterpieces of their hands and their spirit, sublimated nowadays into a wealthy cultural heritage.

Responsible for cultural heritage and archaeology is Republic Institute for Protection of Cultural Monuments with mission to work on finding, studying, collecting and conservation of cultural monuments and natural rarities of Montenegro. Versatile businesses on conservation of monuments and natural heritage lead to separation of these activities and establishment of Institute for Nature Protection. Internal organisation of the Institute has been implemented through work of organisational units (centre, departments and ateliers). Business on investigation, collecting, keeping and treatment of documentation is carried out by the Centre for Research and Documentation, whereas the activities of design, inspection and implementation of the works on the terrain take place through the Department for Protection of Civil Engineering Heritage.

All endeavours of the Republic of Montenegro to define its own concept of cultural policy during ultimate decades of 20th century did not give expected results. Montenegro did not have, neither has it today, a strategic document of that kind. Until ten years ago, Montenegro did not have relevant institutions either, that is Ministry of Culture, whose task would have been to conceive a strategy or programme and action plan for the cultural development of the country. Therefore, cultural policy was dealing with daily issues, in an uncontrolled manner and without transparency, in both, decision-making process and distribution of financial resources.

The new National Report on Cultural Policy points out inevitability of replacing present, mainly outdated, legal regulation with a new one, which would be adjusted according to the international standards and rules of the Council of Europe, European Union and World Trade Organization. Concerning the fact that numerous legislation are indirectly related to the culture, it is clearly visible from the report that the national cultural programmes, both short-term and long-term, must supervene strategic documents of the Government and that it is required by them (economic development strategy, urban plan, national program for higher education, financial and fiscal policy, etc).

In the field of protection and valorisation of the cultural heritage applicable Laws are the following: Law on Protection of Cultural Monuments (1991), Law on Museum Activity (1977 and 1989), Law on Library Activity (1977 and 1989), Law on Archive Activity (1991 and 1994), Law on Reconstruction and Revitalisation of Old Cities Damaged by the Earthquake on 15 April, 1979 (1984 and 1986), Law on Renewal of Monuments Holdings of Kotor (1991), and Law on Monuments, Memorial sites, Historic Events and Persons (1971, 1972 and 1988).

Protection of Cultural Monuments

Historic monuments are remaining structures that owing to aesthetic qualities, association with significant events or people, or through great age alone represent a significant and irreplaceable historic resource. Monuments, in addition to being of interest for art historical study, may also be highly visible and well known, symbolising the importance of past events and possibly historic persons to the general public. The value of an important historic monument is closely attached to its specific location and setting, and to the surrounding landscape. Unlike archaeological sites, it is very rare that an historic monument can be moved or altered without substantial loss of its scholarly and public value. Avoidance and direct protection are almost always preferred for historic monuments

The conditions for proper, modern and, according to international principles, standardised way of protection of monuments heritage in Montenegro were created only after the Second World War. Protection of cultural heritage was put on a solid legal basis and its care was given to Institute for Protection and Scientific Research of Cultural Monuments and Natural Rarities, Central Registry of Protected Cultural Monuments was introduced, and it contained all basic data about protected monuments.

In the basic plans and programs, long term or annual ones, the main program orientation of activities of the protection of cultural monuments is based on two elements - administrative norms and documentation. Protected cultural monuments in Montenegro are classified in three categories:

- I - Monuments of Special Importance;
- II- Monuments of High Importance;
- III – Important Monuments.

Local authorities should have an important role in protection of cultural monuments; since protected monuments are geographically situated in territories under the jurisdiction of local authorities. Previous experience shows that local authorities relies upon republic institutions (Institutes) when it comes to the protection of cultural monuments, and therefore their role is inadequate to the real needs. That is very important for those local authorities, which are supervising protected urban zones and historical sites.

However, based on the Law on Local Self-government from 2003, municipalities are obliged to provide necessary conditions and take care for protection of cultural monuments and memorial sites of local importance. Based on the Law on Protection of Cultural Monuments from 1991, in terms of protection of cultural heritage, municipalities are obliged to take care, maintain and use, and protect monuments from damaging impact of nature and men activities, to make them publicly available, bear the costs of regular maintenance of cultural monuments.

At the same time, with adoption of town planning, municipalities are obliged to obtain opinion from the Republic Institute for Protection of Cultural Monuments by reason of protection and preservation of urban or historical character or environmental ensemble of old towns and settlements. It is also stipulated by the Law that for carrying out construction works, which might cause changes on the cultural monuments, a prior licence from the Republic Institute must be obtained.

Protection of Natural Property

In the period after the Second World War protection of nature in Montenegro was carrying out in several phases, through which it was raised an awareness that effective protection could not be carried out only by legal protection of plant and animal species, but whole areas needed to be protected, such as those that were designated as natural parks in 1952 (Lovcen, Biogradska Gora and Durmitor). The protection of natural property became even more important after designation of Montenegro as Ecological State by the Parliament in 1991. Today, these issues are regulated in certain parts by: the Law on Protection of Nature, Law on National Parks, Law on Freshwater Fishing, Law on Maritime Assets; Hunting Law, Law on Town Planning, etc.

Montenegro has also a public enterprise called National Parks of Montenegro, which is responsible for four national parks: Biogradska gora, Durmitor, Skadar Lake and Lovcen.

Protection of nature is under the competence of the Ministry of Culture, although with forming of the Ministry for Protection of Environment (now it is a sector in the Ministry of Town Planning) during ‘90s, large part of responsibilities was delegated to this Ministry. Unfavourable situation in human resources in institutions dealing with the protection of nature, as well as scarce financial resources allocated for this area, significantly influence efficiency of implementation of plans, programs and protection measures.

There is a significant number of NGOs involved in nature protection activities in Montenegro on local, regional, republic and international level.

Republic Institute for Protection of Nature, National Parks and Natural History Museum in Podgorica own relatively good and modern equipment necessary for the process of inventorying, preparation and storage of natural and other materials. The role of the State in development of activities of nature protection is reflected in attempts to find adequate ways of financing, which, having in mind continuous economic difficulties, remains to be an unsolvable problem, especially when it comes to national parks.

Local authorities should have more important role in the protection of nature, since protected natural objects are located inside the territories of one or more municipalities. The more active role signifies that local authorities, with more responsibility and determination through its secretariats for town planning and construction inspections, should provide legal implementation and respect of adopted planned documents.

In the period of founding the activities related to the protection, up to the disintegration of the former Yugoslavia, Republic Institute for Protection of Nature and institutions for nature preservation had relatively intensive international cooperation. Cooperation was made through the Yugoslav Commission for Cooperation with UNESCO on the occasion of inclusion the National Park Durmitor, canyon of river Tara, and Kotor and Risan Bay on the list of international and worldwide important objects for the protection of natural and cultural heritage, as well as with inclusion of Skadar lake on Ramsar List (Ramsar bureau). Cooperation is also established with EUROPAEC federation, World Commission for Protected Areas, World Organization for Protection of Nature and other organisations and ecological associations.

Archaeology

Interest for archaeology in Montenegro began in the second half of the 19th century, when according to the decision of Prince Nikola I Petrovic Njegos, had started the archaeological researches of important Roman city of Duklja (Doclea) near Podgorica.

The Centre for Archaeological research was formed on the republic level with the aim to replace previous practice of disorganised, scattered and partial approach in performing archaeological research to more organised and planned one. Although it operates according to the Law on Museums, Law on Protection of Cultural Monuments, and Code of Conditions and Ways of Performing Archaeological Excavation and Research, the Centre discharged from its authority a part of work of museum character (collecting, preserving, and exhibiting the archaeological material). It would be necessary to bring a regulation, which would regulate and prevent numerous problems and misunderstanding in overlapping of competencies of the Centre and municipal museums containing archaeological collections and performing archaeological researches.

Archaeological resources consist of surface and near-surface artefacts and related materials in a spatial and stratigraphic context, which constitute a scientific record of the past cultures that created them. Where no contemporary written records of a culture exist, archaeological remains may constitute the only extant record of that culture. Without necessary knowledge and planning, ground-disturbing projects such as the proposed highway have the potential to damage archaeological sites and artefacts, thereby diminishing scientific and cultural resources that are a part of the cultural patrimony. Archaeological sites are considered to be an important and irreplaceable aspect of Montenegrin's cultural patrimony. Although heritage management principles always favour protection of archaeological sites by avoidance, such sites can often be rescued by scientific excavation, in which case a ground disturbing project may go forward with limited adverse impact to the resource.

The nearest known archaeological site to the foreseen corridor is Doclea, located in the vicinity of Podgorica town. Doclea is the most significant and the largest urban centre created in the period of Roman domination in Montenegro. The town was founded in the first decade of the 1st century AD. It is situated on the plateau elevating on the very mouth of the River Zeta into the Moraca.

Archaeological investigations of Doclea were initiated by the end of the 19th century and were continued from 1954 to 1964 and again in 1998. The highway corridor runs along Doclea and it covers a part of the place named Vranjske njive where the so called western necropolis of this antique city is located. Recently, probing excavations have been conducted.

Also the Bar-Boljare highway corridor runs along the Monastery Djurdjevi Stupovi, situated near the Municipality of Berane. The fact requires adequate caution. The same can be said for a place called Dolac, where the traces of the Roman military camp - castrum were discovered long ago, then a place called Lušci where the prehistoric tumulues were found as well as for many other locations in the Lim River valley that have not been dicovered yet but are presumed to exist.

The archaeological resource list should be used by project engineering staff to create corridor re-routes, avoiding potential impacts to the largest and most obvious known sites. Avoidance of monuments is a key consideration in route selection.

Potential project impacts, methodology, remedial measures

Potential project impacts to archaeological sites and monuments differ substantially. For archaeological sites the concern is direct physical impact on fragile subsurface resources from earthmoving equipment and heavy vehicle transit. For monuments the immediate concerns are accidental vehicle impacts, damage to the surrounding landscape setting, destabilisation and impact from continuous heavy vehicle passage or use of high explosives.

Monuments are also prone to secondary impacts such as those caused by temporary or permanent increases in population, sometimes referred to as induced development. Such impacts may include unauthorised and inappropriate occupation of monuments, robbing of monuments for building materials, and degrading of the monuments' surroundings from a variety of unplanned uses. Archaeological resources are less prone to such impacts because of their underground location.

In addition to the difference in impact types just noted, there is another important difference between archaeological sites and monuments.

- Archaeological sites are most often underground and are therefore difficult to identify. Further, those surface indications of archaeological sites that do exist are not always a reliable measure of the extent or importance of subsurface resources. Avoidance of archaeological remains that are discernible from the surface, large burial mounds for example, is good practice but does not ensure that less obvious subsurface remains will not be adversely affected
- Historic monuments are by definition above ground and are therefore easy to identify in project planning studies Their evaluation is also more straight-forward because subsurface investigation is seldom required. Visibility and accessibility make monuments protection studies less elaborate and less time-consuming. Ease of access is also a cause for the most common impacts noted above, requiring preservation solutions that operate to protect against impacts that result from continuous and long-term public access

Also, in the case of archaeological sites, there are further potential impacts associated with late finds. This is because any baseline data cannot include previously unreported subsurface sites. In this latter case of unreported finds, the historical context is particularly important for defining the types of impacts that might be expected. It thus provides a general background on events of scientific and public significance of each of the periods.

The fact that the planned highway corridors mainly pass through the river valleys, as well as through the fields and hills, actually going the same directions which were, in previous times starting from the old age, used as the basic communication, implies a logical expectation to find archaeological sites from different times and of different character.
Thus, apart from the already mentioned *Potential project impacts, methodology, remedial measures* by which “the monuments should be identified through published literature sources supplemented by the unpublished but validated field survey data”, it is necessary to emphasise that there are potential sites that can be identified only on the basis of the systematic recognition of the appropriate area. The methodology of recognising that is

being used in these cases as well as the results gained by the recognising, will provide necessary answers to almost all the questions related to the further protection of the sites, together with the proposed measures for protection or systematic excavations. If required due to significance of a site there will be a proposal for alignment relocation.

The highway E-75 can exemplify the systematic recognition in the area of Serbia. There on the corridor line 192 archaeological sites were found, out of which 25 were examined because they were discovered on the road alignment. A similar situation happened in Slovenia, where through the methodology of recognition 100 archaeological sites were discovered.

Out of these reasons, the need for conducting systematic archaeological recognitions of the highway corridor should be especially emphasised. All the relevant institutions from Montenegro starting from the Republic and Regional Centres for Protection of Cultural Monuments, Montenegrin Archaeological Centre to all the local museums which are located at the area where this corridor passes through, should participate. This is one of the primary conditions to reduce or even to avoid eventual misunderstandings or additional expenses which could appear, due to discovery of an archaeological site during the construction work.

The monuments shall be identified through published literature sources supplemented by unpublished but validated field survey data. Literature review process and consultation with various experts shall confirm that the proposed route alternatives are the best option in terms of limiting possible impacts on monuments. Moreover, the route can be further investigated in the course of project. Additional investigation will include recording of precise monument locations, further technical description and study of selected monuments, local inquiry and record searches regarding selected monuments.

Individual monuments typically have protection zones of 50m in radius while protection zones of monastery complexes and castles vary from 150m to 250m in radius, which also ensures protection of the adjacent natural landscapes and the visual setting (view shed) of the protected monument. Protection and landscape zones of monuments are specific for each feature and can be accurately indicated once a final option of the route is defined. It should be noted that some monuments may have unidentified archaeological resources associated with them that could require protection as well. In exceptional cases, if it proves impossible for an alignment to avoid a cultural site of value, salvage excavation should be undertaken. Relocating artefacts or ruins from a site is a last alternative and can be expensive.

Commonly-utilized mitigation measures include excavation, erosion control, restoration of structural elements, rerouting of traffic, and site mapping. Other measures that may be required on occasion are structural stabilization, soil and rock stabilization, control of groundwater levels, vegetative stabilization, control of flora and fauna, and site surveillance. A site management plan will be required. It should identify conservation actions required and, where necessary, provide guidance on other measures such as salvage or relocation. It should establish monitoring and evaluation procedures and a schedule of operations and budget. Particularly important is the inclusion in the plan of specific contract clauses to define responsibilities of companies and workers who discover new sites or artefacts, or who damage known sites. These chance find procedures, all too often, are given inadequate attention. At the very least, they should identify the authorities to whom the company or individual should report, the format for such reporting, the waiting period required before work can be resumed, and measures for interim care of the found items.

Dialogue between the road department and the ministry in charge of cultural heritage needs to be frequent and continuous to avoid situations which either damage the cultural site or delay the road project. In some countries, road projects have been delayed for years because of a lack of procedures governing cultural sites, or lack of funding for the protection, study, or restoration of these sites. In practice, a cooperative relationship between road builders and archaeological specialists is essential. If cultural heritage requirements are too rigid, some site discoveries may be hidden or destroyed to avoid compliance. If, however, road workers fail to allow for heritage sites, substantial delays and cost increases can occur.

All this suggests that if the mitigation plan is to be effective, in most countries it will have to include proposals for strengthening the legal framework and the institutional capacities for the on-going management of the cultural heritage in question. Thus, when the legislation is being examined in order to identify relevant information pertaining to the sites in question, an assessment of the effectiveness of that legislation and of supportive institutional capacity should also be conducted.

Examples of compensatory actions may be

- tourist development of the site where heritage elements are conserved and showcased,
  and
- classification of the site as protected under appropriate legislation. For sites of international quality, UNESCO listing as a World Heritage Site may be proposed.

Social Importance of the Cultural Heritage Issue

The protection of heritage resources from potential project impacts is a straightforward matter of planning, and of implementing practical measures of design and construction. The public value placed on heritage resources, however, is a subjective and culturally variable matter. It is therefore of interest to briefly consider the place of history and the past in Montenegrin society.

A concern for national history and cultural heritage, a common theme in all societies, is unusually strong in Montenegro and shows no sign of diminishing. Montenegrins, more than most, define their identity through a long and well-remembered past.

The Montenegrin sensitivity to history and tradition may come in part from being a small nation in an area of frequent imperial involvement, and violent invasion, and from being a Christian nation in an area with numerous adjacent Moslem populations. High levels of interest in history and archaeology are typical of countries in the process of 'nation building.' An additional factor particularly applicable to prehistoric relics is the strong archaeological research tradition. Because the discovery and study of sites and monuments is often a by-product of project preservation measures, the highway project has the - potential to create positive impacts on Montenegrin society.

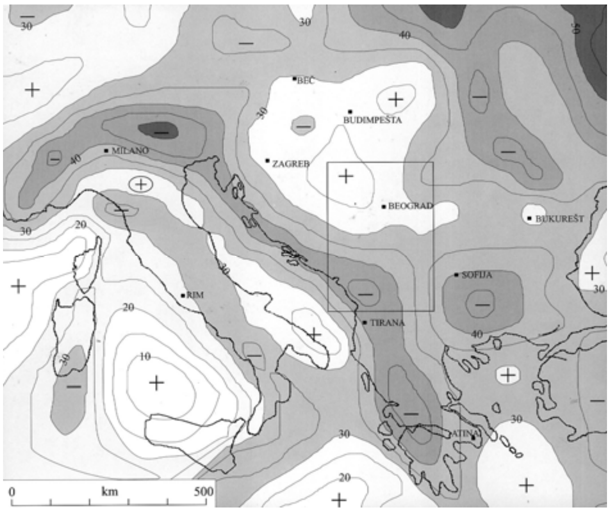
Appendix 9: Natural Risks

For the highway projects in Montenegro in general the natural risks are identified as earthquakes, erosion and landslides.

Gravity values and Seismology

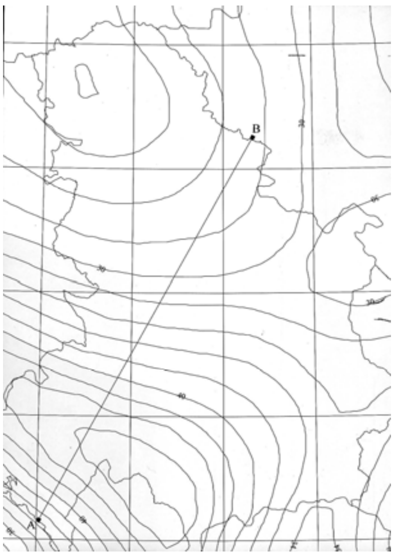
Montenegro has lowest gravity values in the region (approx. 110 mgal). The gravity minimum in Montenegro is result of great crust thickness in Dinarides. Anticlinoria and other geological uplifts, are marked by negative gravity anomalies. Hence, thickness of the crust is considerable in uplifted areas and reduced in depressed zones.

Increase of Bouguer values is toward northeast, with contours going parallel to Dinarides. From the other side, contours in the southern part of Serbia are in SW-NE direction, with a remarkable discontinuity along the line: Djakovica – Pristina – Dimitrovgrad. This discontinuity cuts the Dinaric complex in the area of the Albanian – Serbian border, where anomalies are perpendicular to Dinarides.



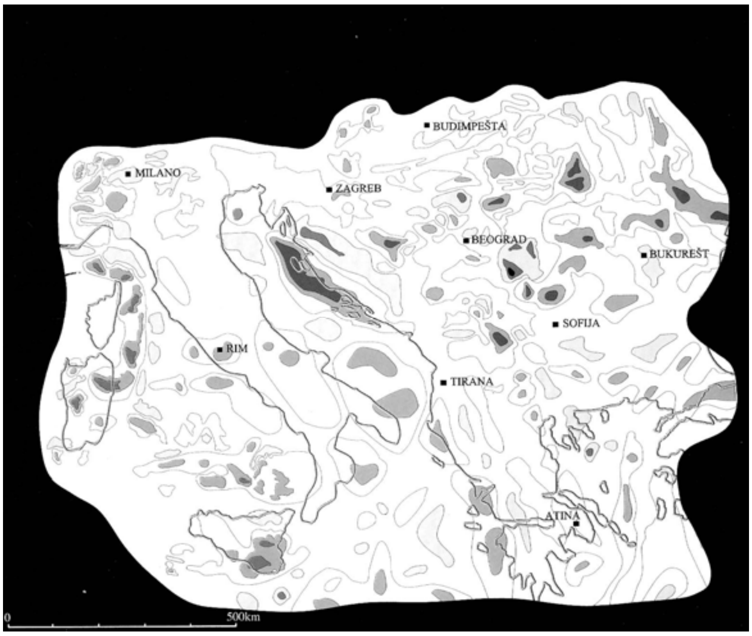
Bouguer gravity map of Serbia and Montenegro. The contour interval is 5 mgal (Geological Atlas of Serbia, 1997)

The map of Moho surface compiled on the basis of DSS (Deep Seismic Soundings) and calculations of the Crust's thickness according to three parameters: depth of Moho surface, Bouguer anomaly and altitude above the sea level. Shows maximum depth to Moho discontinuity is in Montenegro, 50 km north from Podgorica. Moho boundary gradually shallows to the northeast and in Pannonian basin amounts only about 20 km.



Map of Moho surface (Geological Atlas of Serbia, 1997)

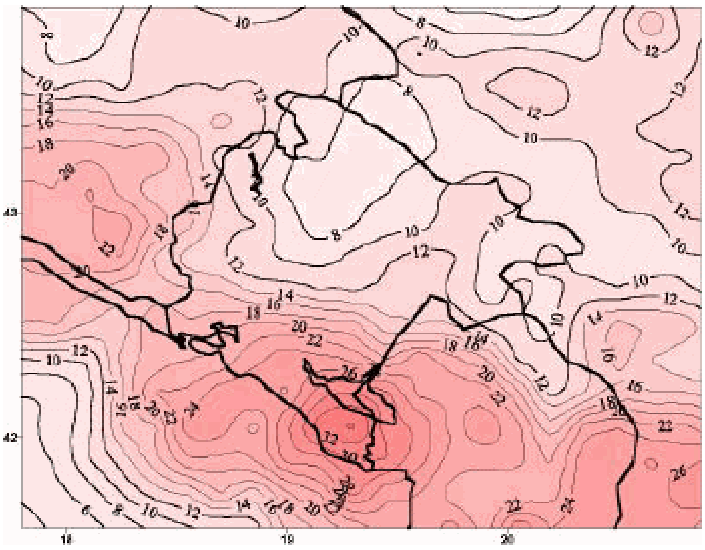
Complex geological interpretation of geomagnetic and gravity data is shown in the figure bellow. According to shape and position of geophysical anomalies and to geological data, regions with ultramafic and acidic intrusives are distinguished such as the areas with unique lithological characteristics, as carbonate rocks in Montenegro.



During the earthquake in 1979, liquefaction process was expressed at several localities of Adriatic coast in Montenegro and Skadar lake coast, causing intensive damages (destroying the “Fjord” hotel in Kotor, etc.). Generally, that area is defined as vulnerable to liquefaction.

At the territory of Balkans, the highest seismic activity is characteristic of Dinaridic seismogenous block (Montenegro and SW Serbia), with over 70% events. At the area of the block, disastrous earthquake in 1979 is famous of numerous victims and outstanding damages, initiating detailed complex geological and seismological investigations.

During the period 1983-1986, seismic regionalization, as well as detailed microzonation of all urban environments of the territory of Montenegro, was carried out. The strong earthquakes caused by intensive tectonic processes, predominantly occurring in the coastal part of the territory, produce destructive effects in the form of landslides, avalanches and soil liquefaction.



Seismic hazard of Montenegro for the return period of 200 years with maximum horizontal acceleration (expressed in % of g) and the probability of occurrence 70%)

Source: Seismological Observatory of Montenegro

Seismic activity at the Montenegro territory and neighbouring areas during XX century are distinguished by very large intensity. During this period at the

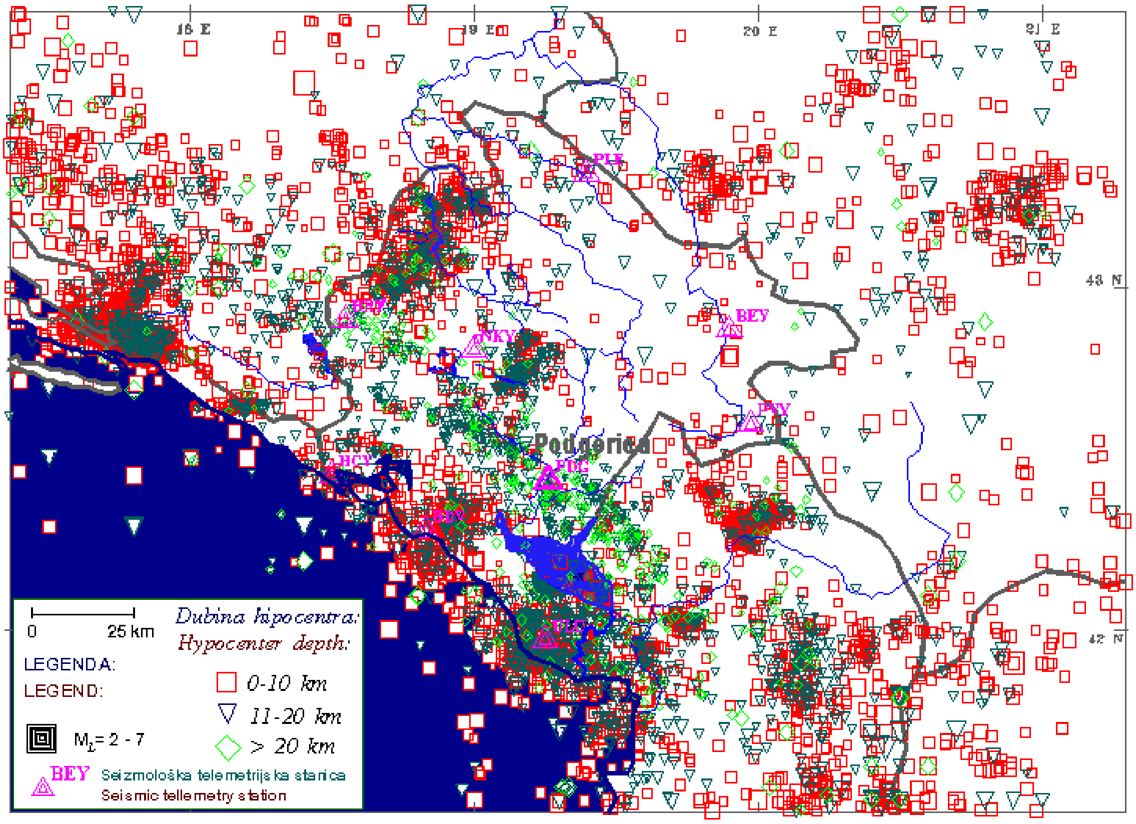
Montenegro occurred several thousand strong and very strong earthquakes. Some of them were characterized as destructive ones.

The earthquake of April 15, 1979, at 7:19 AM (local time), unfortunately belongs to the category of catastrophic. The magnitude of this earthquake was 7.0 Richter scale. The whole Montenegrin coastal area during this earthquake was shocked by the intensity of IX degree Mercaly scale. This earthquake took 101 lives in the Montenegro and 35 in Albania. Beside that, it was destroyed very huge part of the Montenegro hotel capacity, and also a great number of apartment buildings.

On the map of epicentres, it is presented all stronger recorded earthquakes (over 2.5 magnitude) occurred on the area of Montenegro and its vicinity during XX century. It is possible to make a conclusion that, practically, complete coastal area posses much higher seismic hazard comparing inland part not only at the Montenegro territory, but much broader region.

On the picture, using different colours, it is expressed the third dimension of the hypocentral parameter (the depth), so it can be recognized some deep seismoactive structure - as it is large tectonic trench which is placed in the Dinarides direction - beginning from northern Albania, via Podgorica in Montenegro, then Danilovgrad and Bratogost at the western part of Montenegro, and further - to the west in the Herzegovina (Republika Srpska). On the epicentral map this tectonic trench can be noticed by position of relatively deep hypocenters (green rhombs and dark blue triangles).

Also, on the map it is possible to notice at the north - western part of the Montenegro territory, effects of a pretty large seismic induced activity in the region of the artificial lake created by the dam "Piva" which is 220 meters high. The main part of the seismic activity in this region is connected with the oscillation of hydrostatic pressure of the reservoir water at the limestone masses in the basement, during the charging and discharging of the lake.



The epicenteral map for earthquakes in the Montenegro region during XX century

Source: Seismological Observatory of Montenegro

Erosion and landslides

Erosion and landslides are prevailing, contemporary engineering-geological process in the mountainous and hilly areas of the modernized road. Foot and side erosions are frequent in the region and stipulate significant separation of slopes. At the exposures and artificial slopes they are intensively weathered and settle down. On gentle slopes of hills and watersheds, argillite clays quickly loses their structure and form alluvial layer due to the influence of undergoing physical and chemical weathering, as well as precipitation and quick changes in temperature.

The relief is uneven, sometimes hilly, mainly separated by ravines and erosions in the lower part. Steepness of slopes varies. Mainly the hill sides are subject to mechanical weathering. Due to disturbance of structural links many macro cracks with circulating infiltration waters can be found in this zone. There are sections with significantly weathered bedrocks in the zone.

There are a landslide sections along the highway route. Depending on the direction of forces causing landslides, which may vary depending on seasons, the landslide body moves with different speed both in plan and by depth. The foot of the slope moves more slowly as compared with the top causing hardly compatible expansion-compression zones in the landslide and cracks. On some places those cracks lay on already existing system of cracks, stratifications and make situation more complicated. Cracks spread nearby the deformed section usually serve as main ways of waters circulation in the body of the landslide. These waters are easily drained and influence stability of the slope and the landslide activity.

Erosion usually takes place at the bottom of narrow gullies and along ravines, where deposits are washed off by temporary streams and taken down to the lower parts of the relief. At the rest of the sections the surface is washed-off by run-off waters.

Appendix 10: Mitigation Measures for Mining/Quarry Activity

The following environmental requirements should be proposed concerning extraction activities: Firstly, from an environmental point of view it would be desirable to use resources already being exploited, as this would prevent proliferation of extraction sites and make control and re-instatement more manageable.

If it is necessary to open new gravel extraction sites, investigations must be conducted in order to identify possible fossil deposits at a distance from active river beds. Extraction within these areas should first ensure that all re-usable surface materials are stockpiled for subsequent restoration purposes. The boundary of the extraction area should be clearly defined and, on the river side, a reserve bank should be maintained. Extraction depths would depend on the characteristics of the site and the mode of operation. Extraction of materials would be permitted below the current water table on condition that fuel oil and lubricants from the machinery do not come into contact with the water i.e. at depths of about 1 metre. Should use be made of a dragline, excavation could be made to a greater depth below the water table.

When extraction is approved from gravel bars within the existing river banks on the inside margins of meander curves, no gravel should be removed from within two metres of the upper water level at the time of extraction in order to protect the currently active river channel. The depth of material removed should not fall below the surface water level at the time of extraction and the existing river grade should be maintained. In such areas, extraction should not take place during periods of anticipated high river flows which could cause flooding during operations.

When extraction is in areas with less sensitive, shallower river flows, it might be permitted to remove gravel to the level of the existing river bed. The existing valley grade would be maintained and the operational area should be protected by a low 1 to 2 metre wide gravel bank.

In case of new-opening carrier site, the following recommendations should be implemented whatever the extraction site chosen:

- Installation of scrubbers and filters to cleanse the dust in crushing plant.
- Access must be via existing track ways and agreed with owners of the land crossed.
- In areas of natural vegetation near the river bank, care should be taken not to disturb mature trees.
- No plant or machinery should be left unattended at the extraction site overnight to minimise the possible impact caused by high flood levels. The existing flood protection bank or natural levee must be maintained.
- A decantation basin must be installed at the outlet of the crushing installation in order to trap the sediments before discharge of washing water into the watercourses.
- Vehicle access into the active river channel should not be permitted in order to minimise disturbance to the habitat and possible pollution with fuel oils and lubricants. Where access to sites is only possible by crossing the river, temporary culverts should be installed to alleviate possible pollution hazards.

- Upon completion of extraction activities, the site should be carefully levelled to form a grade consistent with that of the existing active river channel.

Where gravel extraction can be replaced by massive rock, the same requirements as for borrow pits apply to quarry rehabilitation. It should be emphasized that such extraction requires above all proper landscaping to hide the quarry or to integrate it in the overall landscape.

During quarries works execution, the contractor shall ensure: preservation of trees during piling of materials; spreading of stripped material to facilitate water percolation and allow natural vegetation growth; re-establishment of previous natural drainage flows; improvement of site appearance. When the works shall be completed, and at own expense, the contractor shall restore the environment around the worksite to its original state. The supervisor shall provide the contractor with a report confirming the restoration before acceptance of the works.

Appendix 11: Scoping Checklist

1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)?				
No.	**Questions to be considered in Scoping**	**Yes /No ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant?**
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes		Yes.
1.2	Clearance of existing land, vegetation and buildings?	Yes		Yes
1.3	Creation of new land uses?	Yes		Yes
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes		No
1.5	Construction works?	Yes		Yes
1.6	Demolition works?	Yes		No
1.7	Temporary sites used for construction works or housing of construction workers?	Yes		No
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes		Yes
1.9	Underground works including mining or tunnelling?	Yes		Yes
1.10	Reclamation works?	Yes		
1.11	Dredging?	Yes		No
1.12	Coastal structures eg seawalls, piers?	No		No
1.13	Offshore structures?	No		No
1.14	Production and manufacturing processes?	No		No
1.15	Facilities for storage of goods or materials?	Yes		Yes
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes		Possibly
1.17	Facilities for long term housing of operational workers?	No		No
1.18	New road, rail or sea traffic during construction or operation?	Yes		Yes
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes		Yes
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes		Yes
1.21	New or diverted transmission lines or pipelines?	Yes		No
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	Yes		Yes
1.23	Stream crossings?	Yes		Yes
1.24	Abstraction or transfers of water from ground or	No		No

	surface waters?			
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes		No
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes		Yes
1.27	Long term dismantling or decommissioning or restoration works?	Yes		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	Yes		
1.29	Influx of people to an area in either temporarily or permanently?	Yes		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?			

2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?

No.	Questions to be considered in Scoping	Yes /No ?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.1	Land especially undeveloped or agricultural land?	Yes		No
2.2	Water?	Yes		No
2.3	Minerals?			
2.4	Aggregates?	Yes		No
2.5	Forests and timber?	Yes		No
2.6	Energy including electricity and fuels?	Yes		Yes
2.7	Any other resources?			

3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?

3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes		No
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?	No		No
3.3	Will the project affect the welfare of people eg by changing living conditions?	Yes		No
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital	Yes		No

	patients, the elderly?			
3.5	Any other causes?			

4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes		Yes
4.2	Municipal waste (household and or commercial wastes)?	Yes		No
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes		No
4.4	Other industrial process wastes?			
4.5	Surplus product?			
4.6	Sewage sludge or other sludges from effluent treatment?	Yes		No
4.7	Construction or demolition wastes?	Yes		Yes
4.8	Redundant machinery or equipment?	Yes		No
4.9	Contaminated soils or other material?	Yes		No
4.10	Agricultural wastes?	No		No
4.11	Any other solid wastes?			

5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes		Yes
5.2	Emissions from production processes?	Yes		Yes
5.3	Emissions from materials handling including storage or transport?	Yes		Yes
5.4	Emissions from construction activities including plant and equipment?	Yes		Yes
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes		Yes
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (eg slash material, construction debris)?			
5.8	Emissions from any other sources?			

6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?

No.	Questions to be considered in Scoping	Yes /No/ ?	Which Characteristics of the Environment could be affected and how?	Is the effect likely to be significant? Why?
6.1	From operation of equipment (engines, crushers)?	Yes		Yes
6.2	From industrial or similar processes?	Yes		No
6.3	From construction or demolition?	Yes		Yes
6.4	From blasting or piling?	Yes		No
6.5	From construction or operational traffic?	Yes		Yes
6.6	From lighting or cooling systems?	Yes		Yes
6.7	From sources of electromagnetic radiation (effects on nearby sensitive equipment as well as people)?	No		No
6.8	From any other sources?			

7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes		Yes
7.2	From discharge of sewage or other effluents (treated or untreated) to water or the land?	Yes		Yes
7.3	By deposing of pollutants emitted to air, land, water?	No		
7.4	From any other sources?			
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	Yes		Yes

8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires, storage, handling, use or production of hazardous or toxic substances?	Yes		No
8.2	From events beyond normal environmental protection (failure of pollution control systems)?	Yes		No
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (floods, earthquakes,)?	Yes		No

9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, social groups	Yes		No

	etc?			
9.2	By resettlement of people or demolition of homes or communities or community facilities (schools, hospitals)?	Yes		No
9.3	Through in-migration of new residents or creation of new communities?	Yes		No
9.4	By placing increased demands on local facilities or services eg housing, education, health?	No		No
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes		Yes
9.6	Any other causes?			

10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment (more housing, new roads, , etc?)	Yes		Yes
10.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment (roads, power supply, waste or waste water treatment,) housing development,?	Yes		Yes
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	Yes		Yes
10.4	Will the project set a precedent for later developments?			
10.5	Will the project have cumulative effects due to proximity to other projects with similar effects?			

TECHNICAL MEMORANDUM NO 10B

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE ADRIATIC-IONIAN HIGHWAY (APPENDICES)

Appendix 1: Climate Conditions

Apart from geographic latitude and sea level, the climate in Montenegro is also determined by presence of large water areas (the Adriatic Sea, Skadar Lake), deep indentation by the sea into the coastline (Bay of Kotor), moderately high mountain hinterland near the coastline (Orjen, Lovcen and Rumija Mountains), Field of Ulcinj in the hindermost south-eastern part and by Durmitor, Bjelasica and Prokletije mountain massifs.

Southern part of Montenegro and Zetsko-Bjelopavlicka Valley are located in the Mediterranean climate region (long, hot and dry summers and relatively mild and rainy winters). Towns which are located in valleys like Podgorica and Danilovgrad, have lower temperatures in January than coastal towns situated at relatively same geographic latitude, while the temperature during the summer is somewhat higher. The warmest summers in our country are in the Zeta Plain, because of high serenity during the summer, which makes a land and air very warm. Podgorica is a town with highest mean monthly temperatures during the summer and with largest average number of tropical days. The lowest mean annual temperature is in Zabljak (Tara River basin).

Large karst valleys have more severe climate, whose bottoms are deep under the surrounding mountain peaks and which are 40 to 80 km far from the Adriatic. Karst valleys that are very close to the Adriatic (about 20km) but are separated from the sea by relatively high mountains also have severe climate. During the winter, a cold air is subsided in these valleys, going down the nearby mountains. During the summer, however, the bottoms of the Karst valleys get very warm, leading to increase of annual temperature fluctuation. During the winter, mainly in anticyclonic situations, low-level temperature inversions may occur in these Karst valleys.

Map of stations of Hydrological and Metrological service of Montenegro

Central and Northern part of Montenegro has certain characteristics of mountain climate, with apparent influence of the Mediterranean Sea, which is reflected in precipitation

regime and in higher mean temperature of the coldest month. In the ultimate north of Montenegro, the climate is continental, which is, apart from large daily and annual temperature variations, characterized by small annual quantity of precipitation, which is equitably distributed per month. In mountainous areas in the north of the Republic, summer is relatively cold and humid, and winter is long and severe, with frequent frosts and low temperatures, which rapidly decrease by the height.

The biggest mean annual value of the cloudiness is in the mountainous areas, about 55-66% in average, and then it decreases towards the seaside being 45-35% in average. The lowest cloudiness of the year is in July and in August, and the highest is in December. The lowest oscillation of the cloudiness is in the mountainous areas, while it is much bigger at the seaside. Duration of the sunshine is in opposite proportion to the cloudiness. At the seaside, duration of the insolation is 2750 hours in average, while in mountainous areas far from the seaside, average values are 1550-1900 hours. In all areas, July and August have 4 to 5 times longer insolation than winter months.

The rainiest area in Europe is mountainous area above the Kotor Bay (Krivosije). In that area annual precipitation is 4600 mm, i.e. at the steep slopes of the Orjen in the place of Crkvice (940m) average annual precipitation is 5000 mm, which is European maximum precipitation, and in the peak years it is almost 7000 l/m2, especially with precipitation of the orographic character. Central and northern parts of the Republic were hit with floods during last century (e.g. 1963 and 1979). That area, where there is upper watercourse of the Tara and the Lim, is characterized with especially big medium annual quantity of precipitation of about 1600-2000 mm per year. Years with biggest floods in these areas are 1963 and 1979, and then, the end of 1999 and first half of 2000.

Beside orographic effect, cyclone of Genoa has a very strong influence on the climate in Montenegro, which original area is suburb of the bay of Genoa and Siberian anticyclone, with the centre in north-east Russia. Under their influence, high grades of atmospheric pressure and temperatures are established in the whole Balkans, and especially in the territory of Montenegro. When the cyclone of Genoa is active, it doesn’t stay for long, precipitation is intensive and they don’t last many days. Precipitation of long duration happens when there is a strong high-altitude SW streaming within a cyclone above the Western Europe. In the whole Adriatic, there is the air depression during winter season. It is, actually, a series of depressions, moving from the west to the south-east and east and they cover southern areas. These depressions cause maximum precipitation in winter at the seaside. Areas with modified Mediterranean pluviographic regime of precipitation have mainly autumn and winter precipitation with its maximum in late autumn, from October to December, while summer is dry.

In south-west areas of Montenegro, there are about 10% of annual quantities of precipitation in summer-time. In so-called south-Adriatic pluviometric regime of precipitation, difference between the rainiest and the driest month is about 11,5%. The rainiest month is November and the driest is July. High mountains, beside quite big quantities of precipitation, also have more days with precipitation, than it is the case with the surrounding valleys and plains. In mountainous areas it’s snowing more in spring than in autumn, because autumn is quite warmer than spring. Predominant winds are consequence of the general disposition of the atmospheric pressure in different months.
Regarding barometric depression at the Adriatic and in the east Mediterranean and high atmospheric pressure in the east and north-east Balkans, in winter months there are dominating winds from north-east square. Characteristic winds are bora and sirocco. Bora is cascading wind of north and of north-east direction. It is the most frequent and strongest

in cold half of the year, in winter, and it is present along all the eastern coast of the Adriatic. It blows when there is area of high air pressure north of the Dinaric Alps, and a cyclone is in the western part of the Mediterranean or the Adriatic Sea. At such horizontal grade of the air pressure, cold air from higher latitude passes over the Dinaric Alps and it swoops down the coast by high speed, thus causing fall of the temperature and of humidity, except in the case of the cyclonic or dark bora, when the weather is cloudy and rainy. One of the main characteristics of bora is its huge strength and motion. Its speed is between 16 and 33 m/s. It's the strongest in the coastal parts, where the mountains vertically dominate it (the coast) and where on the mountainous cliffs there are gorges where the air streaming lines are gathered. Strength of bora decreases very quickly towards open sea, so that it doesn't make breakers. South wind or sirocco, blows in bigger part of the Mediterranean with less or bigger differences in physical characteristics and direction.

It starts blowing when the cyclone moves across the Mediterranean or the Adriatic Sea, and when there is high pressure above North Africa. It blows in front part of the cyclone from south to south-east direction. Due to such circulation, it often includes dry and warm air from North Africa, which contains significant quantities of dust. When in the south stream it comes to the coast, that air, due to the orographic effect, causes cloudy and rainy weather there, as well as on the slopes of the coastal mountains. Biggest number of the precipitation which falls in these areas in colder part of the year is caused by this streaming. Biggest quantity of precipitation in Europe – in Crkvice, can be explained by its influence. When the air originating from the North Africa comes together with sirocco, there are coloured rains falling from time to time – of yellowish or reddish colour. Since it's often very strong and since it covers big surface of the sea, sirocco causes breakers, from the open sea towards the coast. Strength and frequency of sirocco increase from the north to the south part of the seaside. Last decade of 20th century was warmer regarding many years measuring (from 1949 up to now).

The warmest year in the territory of Montenegro was 2003. Reason for heat waves was strong field of high pressure above Western Europe within clear ridge of high pressure in high-altitude circulation of large scales. Heated air from the south reinforced the strength and keeping of the heat wave. Almost the whole radiation of the sun was directed to the heating, because both vegetation and soil were dry. Such 'a blocking elevation', which is kept for several days, is not rarity for Europe in summer-time. The highest recent maximum temperature was measured in Podgorica in August 2003, which was 42C, and there was continuous period of 100 tropical days then (days with maximum temperature higher than or as of 30C).

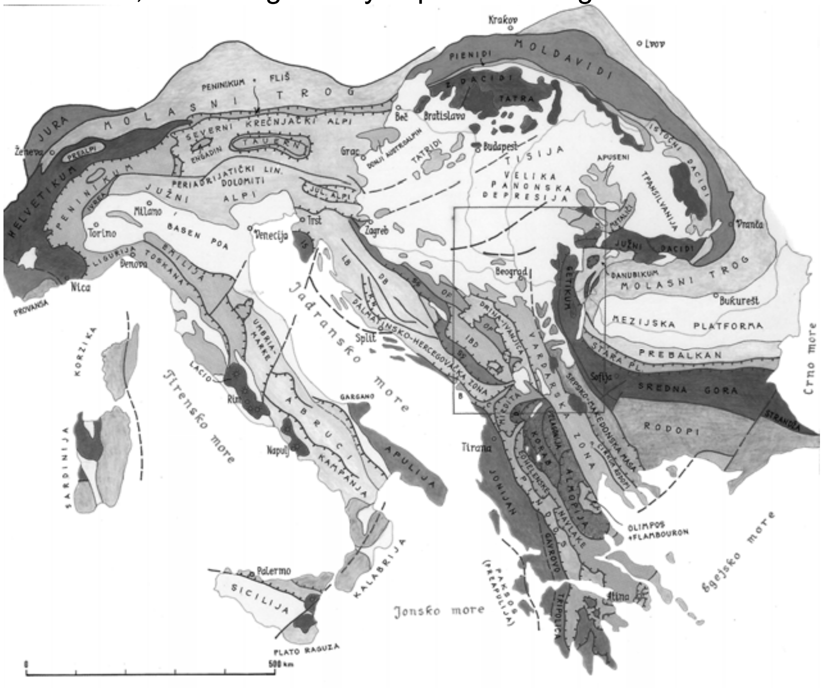
Some characteristics such as max and min temperatures, RR and snow measured are given for three locations along Adriatic-Ionian highway route in the table below.

Station	Tmax (^oC)	Tmin (^oC)	RR24-max (mm)	Snow(cm)
Grahovo	37.2	-26.8	390.4	170
Cetinje	38.9	-22.8	428.3	205
Danilovgrad	42.8	-14.6	250	53

Source: Hydrological and Metrological service of Montenegro

Appendix 2: Geomorphology, Soils, Engineering-Geological Characteristics

Geological structure of the territory of Montenegro is result of influence of several factors, first of all: 1. sedimentation and geodynamics within this part of Mediterranean geosyncline; 2. underthrusting of African tectonic plate under Eurasian one; 3. intensive neotectonic movements; 4. forming of very expressed exogenous relief.



Geological map of Montenegro with adjacent regions (Geological Atlas of Serbia, 1997)

That is why the project area is characterized not only by different lithostratigraphic content and complex tectonic structure, but also by unique geomorphologic, engineering-geological, hydro geological and seismotectonic conditions.

At the northern Mediterranean, the lateral strain from the contact zone between African and Eurasian plate are transferred through the Adriatic micro-plate to the Dinarides – in the NE direction (Glavatovic, 2004). Strain concentration within lithosphere of Dinarides is performed by complex process of the segments moving through the Adriatic micro-plate (below the sediment complex, covering silicate and basalt rocks and the rest of lithosphere, in the direction of subducting Apennine plate – to the Tyrrhenian Sea).

Strong lateral stresses are also produced by thick sediment complex of Adriatic plate (up to the level of Triassic clastite), which is resistant to the horizontal deformation in the Adriatic region, simultaneously generating strong tectonic processes in the outer and inner Dinarides. As a result, horst and graben structures are formed, as well as mountain massifs, tectonic depressions, trenches, nappes and faults (normal, reverse and transform). System of normal and reverse fault structures are predominantly oriented parallel to Dinarides. These faults are mostly with regional dimensions, with dipping angle toward land 20-50 degrees. Transcurent faults are mostly generated perpendicularly to the previous ones, with small dimensions and steep slope of the fault plane.

Dinarides

Montenegro belongs to the Dinarides mountain chain where Palaeozoic crystalline schist and Middle- and Upper Triassic limestone are distinguished. The main part of Montenegro and is made of limestone. Limestone formations are covered by diabase-chert ones. The formation is characterized by greater or smaller overtroughs of magmatic rocks and ultramaphites. Referring to the structure, the following two areas are distinguished: area of the Earth's crust compression (wide coastal belt in Montenegro, with numerous napes) and the area of the Earth's crust opening (the rest part, with numerous horsts and trenches, as well as confining neotectonic faults).

In the Dinarides the predominant topographic type is karst in terrains of carbonate rocks . Karst forms in exposed limestones are particularly well developed in Montenegro. Prokletije, Durmitor and other highest mountains have preserved relics of a glacial topography; cirques, troughs, moraines, formed during the Pleistocene. Snow and frost actions have produced periglacial topographic features: polygonal ground, felsenmeers (rock seas), solifluction teracettes, lobes, etc. above timberline on the mountains. The Dinarides consist predominantly of crushed and karstified Mesozoic limestones. This world famous karst region greatly differs in hydrogeology and geomorphology from the neighbouring regions. Groundwater flows through system of karst channels and fractures discharging by strong resurgence.

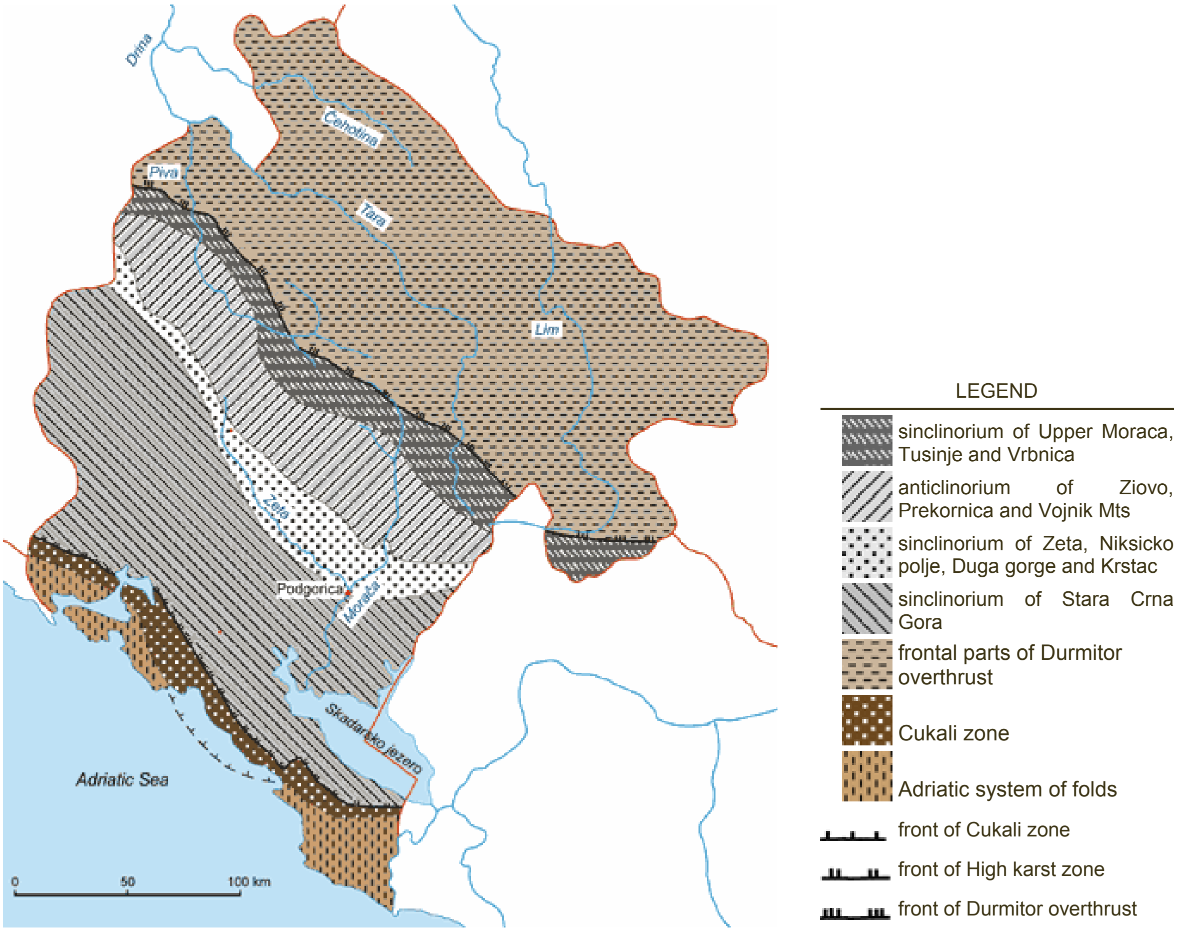
Karst of Montenegro

Over two-thirds of the territory of Montenegro belongs to the karst of south-eastern Dinarides. The karst in Montenegro differs along the territory, by its distribution and position, its position in relation to the non-karstic terrain and the Adriatic sea, and by its occurrences (various forms and dimensions) and processes. This comes as a consequence of diverse sedimentation conditions, as well as different geologic evolution of individual parts of the Dinaric geosyncline (both in space and time). A segment of the Dinaric geosyncline which forms the terrain of Montenegro, is predominantly (on two thirds of the territory) built up of limestone and dolomite sediments (from Devonian; to the nowadays). Since the end of Devonian period (ending phase of Caledonian orogeny), it has been uplifted and lowered by numerous phases of Hercynian and Alpine orogeny. Due to epeirogenic and orogenic movements in different geological times, since the end of the Devonian period to the final uplifting of Dinaric geosyncline, when present territory of Montenegro (end of Middle Miocene) has been formed, some parts of the geosyncline bottom have been, more or less, uplifted and lowered.

This caused favourable conditions for sedimentation of different products, among which were dominant those who have formed limestones and dolomites of great thickness and distribution. It is easily noticeable that the epeirogenic and orogenic movements have been advancing from north-east to south-west. During those movements, there were relatively quiet periods when small islands existed, protruding above the sea level as islands. The climate was also variable, but mostly favourable for the development of karstification. Simultaneously with these movements, particularly during the Laramidian orogeny (Upper Cretaceous - Lower Palaeogene), the folding, faulting, overthrusting and even movements which caused creating of nappes occurred. As a result, the rock porosity increased favouring the karstification process and forming today's karst - a geological product of very complex and enigmatic occurrences and processes.
With the aim to present the most important properties of the Montenegrin karst, its complexity as well as the characteristic differences of individual parts of the territory, karst zoning was carried out. The most logical way to do this was to identify the karstic properties of the individual geotectonic units of Dinarides, which built up the territory of

Montenegro. Therefore, the properties of the Durmitor Overthrust, the High-Karst Zone, the Pindus-Cukali Zone (in the territory of Montenegro Budva-Bar Zone) and the Adriatic-Ionian fold System (in the territory of Montenegro Adriatic fold System) are presented.

We have deliberately kept the oldest, the most common and the most often cited names for geotectonic units of Dinarides. Parts of the Dinaric geosyncline, which formed rocks in general and by this the karst in the territory of Montenegro, had different and specific geologic evolutions. Subsequently, on the terrains of cited geotectonic units, specific karsts with present properties and appearance developed. With development of the karstification processes the karst differences of the geotectonic units became smaller. This characteristic is notable in the karst of Montenegro.



Geotectonic division of Montenegro.

Karst of the Durmitor nappe, although spacious (over 5.000 km^2) and several kilometres thick, with large aquifers, is divided into several regions among which are significant karst of northern and north-western Montenegro, karst of Bjelasica and karst of north-eastern Montenegro. Due to the presence of Late Palaeozoic and Lower Triassic clayey-marl-

sandy beds, Middle Triassic eruptive rocks and Middle and Upper Jurassic diabase-chert formation rocks, karst in these regions does not represent a unique entity. Karst of these regions has the characteristic of holokarst. The limestones and dolomites of these regions are the oldest ones and they have been exposed to karstification for the longest period, even since the Upper Jurassic. The karstified limestones and dolomites of this geotectonic unit, although mutually separated, build up the largest and the highest mountain massifs in Montenegro.

Although there are canyons deeper then 1000 m, the karstification of limestone and dolomites of this geotectonic unit proceeds and descends deeper then fluvial erosion. Karst of this geotectonic unit is characterized by fluvial erosion (deep canyons), glacier erosion and lacustrine erosion. As a result, karst of this geotectonic unit, besides characteristics common to holokarst, has properties of high-mountain, fluvial, glacial and contact karst.

In the territory of Montenegro, the High-Karst Zone has the greatest extent. The terrain of this geotectonic unit is mainly built up of Mesozoic (Triassic, Jurassic and Cretaceous) limestones and dolomites of several kilometres of thickness. This thickness is even larger, due to the reverse faulting and overthrusting and thus repeating of carbonate series. The karst of this region is characterised by all surface occurrences and all processes characteristic for holokarst such as: karst plain; polje; uvala; sinkhole; dry, hanging, blind and karstified valley; lapies; canyon; shaft; cave; resurgence; vrulja; estavelle and so on. Within the karst of this geotectonic unit exist syncline regions build up of impermeable flycsh beds.

The layers of Durmitor flycsh of the uppermost north-eastern parts of this geotectonic unit have various hydrogeological features and functions. In the terrains built up of clayey-marl-sandy beds and at lower elevations, such as the valley of Vrbnica and Gornja Moraca, the layers of Durmitor flycsh are impermeable and represent a total barrier. In the terrains built up of varied, more or less marly limestones, comprising narrow zone and located at the height of over 1.000 m, as in the case of south-western slopes of the Durmitor massif, they represent a water permeable media. It is interesting to mention that the deepest cave (897 m) in the territory of Montenegro explored by speleologists is located in these rocks. The middle belt of High-Karst Zone in the territory of Montenegro is built up of Upper Cretaceous-Palaeogene flysch beds. The distribution, position and impermeability cause this flycsh to have a function of elevated and lateral barrier. The karstification of limestones and dolomites in this area is below the base level of erosion, below the sea level and is deeper then 1.000 m. The High-Karst Zone has all the prominent characteristics of: fluvial erosion (deep canyons of Komarnica and Moraca rivers with their tributaries), glacial erosion (on the high mountains), lacustrine, sea and combined erosion. The spacious Zeta depression with the largest lake on the Balkan Peninsula - Skadar Lake, is situated In the High-Karst Zone. Parts of the bottom of this lake represents a cryptodepression. Sublacustrine springs (vruljas) exist in the Lake, with bottoms at depth of over 80 m below water level which is about 6,5 m above sea level. In the Zeta Plain loess deposits are found.

Along the internal belt of Bokokotorska Bay, from Morinj, across Risan, Perast and Orahovac to Kotor, the High-Karst Zone is in direct contact with the sea. In these terrains are located the largest vrulja on the Adriatic coast, called Sopot, and the greatest estavelle horizon - Gurdic-Skurda. The vast differences in water-yielding capacity of the constant and periodic karst springs point out to the strong karstification of High-Karst Zone limestones and dolomites. The difference between minimal and maximal water yielding capacity is over 350 m3.

Karst of the Pindus-Cukali zone, in the territory of Montenegro Budva-Bar Zone, is characterised by contact and contact-fluvial relatively low karst. Notable within this zone is frequent alteration of karstified limestones and dolomites with terrains built up of sedimentary and volcanic rocks. The seepage aquifers and the seepage karst aquifers in the karstic terrains of this zone, outside of the sea influence, are few and of small depth. Their dynamic reserves are small, providing hardly 5 l/s during the drought periods. The seepage karst aquifers of this geotectonic unit are, in several places, in immediate contact with the sea. These are low and shallow aquifers with brackish water. In this karstic area, water-rich aquifers with dynamic reserves do not exist.

The reason for this is a small distribution of cavernous limestones. In this region there are cavernous limestones with static reserve which give by pumping, during the drought period of the year, over 50 l/s of water (Opacica).

Karst of the Adriatic-Ionican fold System (in the territory of Montenegro-Adriatic fold System) is represented by karst with anticline structures, four of them situated in the hinterland of Ulcinj and separated by synclinal structures built up of flycsh deposits. These folds, which strike from Albania and across the hinterland of Ulcinj toward north-west, sink under the sea at the north-western margin of the Bar plain. Only one of them, the anticline structure of Grbalj and Lustica, appears again in south-eastern marginal part of Mrcevo plain trending to Dubrovnik. Karst of the Adriatic anticline structures in the hinterland of Ulcinj and external folds of the Bokokotorska Bay are characterized by the occurrences of exposed, coastal karst. This karst is low but with deep slope below the sea level. The karst aquifers in this region are, during the whole year or for shorter periods, under the influence of the sea water which has a high concentration of Cl ions.

Generally, waters of the karst terrain of Montenegro are clean, as the karstic water can be, except in the regions under the influence of the municipal, industrial and other waste waters. Karstic waters, not considering the influence of the sea water, belong to the magnesium-calcium- chloride-hydro carbonate type of water.

Appendix 3: Hydrogeology and Surface Water

Adriatic Sea drainage basin

Area of the Adriatic Sea drainage basin in Montenegro covers about 6560 km^2. Moraca River, with its tributaries Zeta and Cijevna, Crnojevica River and Orahovstica River drain to the Adriatic Sea. These three rivers pour into the Skadar Lake and from that point on flow towards the Adriatic Sea through the Bojana River.

Source: Hydrological and Metrological service of Montenegro

Moraca

In its upper and middle part of the flow, Moraca River is highly mountain river. Its length is 113,4 km, and area of the river basin to the Hydrological Station (H.S.) Podgorica is 2628 km^2. Currently, there are three measuring profiles at the Moraca River: Pernica, Zlatica and Podgorica, including one limnigraph station at the right tributary Mrtvica. Measuring at the above stations has been constantly performed for more than 20 years, and at the Podgorica station, measuring has started from 1948. Cijevna is a left tributary of Moraca, with the length of 64,7 km and river basin area of 383 km2 to the H.S. Trgaj, where measuring was performed from 1949 to 1989.

Zeta

The most important tributary of the Moraca River is Zeta. Its length is 85 km, and river basin area to the H.S. Danilovgrad is 1216 km^2. Measuring places are Duklov most and Danilovgrad, and measuring activities have been preformed at the above locations from 1955 or 1948 respectively.

Skadar Lake

Skadar Lake covers less than 400 km^2 with minimum water level and up to 525 km^2 with maximum water level registered. The Lake is primarily filled by Moraca River, including Crnojevica River and Orahovstica as well as Kiri River in Albania. The Lake is drained by the Bojana River.

Black Sea drainage basin

Area of the Black Sea drainage basin in Montenegro is somewhat larger than the area of the Adriatic Sea drainage basin, covering about 7260 km^2. From this part on, the Ibar

River drains through the Zapadna Morava River, while Lim, Cehotina, Piva and Tara River with its tributary Komarnica drain through the Drina River.

Lim

Source: Hydrological and Metrological service of Montenegro

Lim River is the most important Montenegrin River from the hydrographic point of view. It flows out of the Lake Plav, although Vruja and Grncar rivers make a part of its source, which by confluence make Ljuca River that flows into the Lake Plav. Before the town of Andrijevica, Lim River receives Murino River and Zlorecica as its left tributaries, and Djuricka River, Rzenicka, Velicka and Komaraca as its right tributaries. From the town of Andrijevica to the town of Berane, Lim River receives Krastica, Trebicka, Sevarinska River from the left and Bistrica River from the right. From the town of Berane to the town of Bijelo Polje, Lim River receives Brzava and Ljuboviđa as its left tributaries, Dapsicka and Ljesnica as its right tributaries. From Bijelo Polje to Dobrakovo, it receives Bjelopoljska Ljesnica from the left and Bjelopoljska Bistrica from the right. Area of the Lim River basin to Dobrakovo is 2880 km^2. Its length is 234,2 km. Observations and measuring are currently performed at the stations: Plav, Andrijevica, Zaton, Berane, Bijelo Polje and Dobrakovo. With regard to the above hydrological station, the Hyd-met Institute has been keeping a long set of data (about 50 years). As regards its tributaries, the observations have been performed at Grncar-Gusinje, Zlorecica-Andrijevica and Ljubovida-Ravna Rijeka.

Tara

Tara River emerges from the Maglic Kariman peaks (about 2400 mnm). From the source to the Drcka river mouth, right basin of the Tara River is more developed than the left one. Major tributaries are Opasanica and Drcka, Pcinja, Plasnica, Stitarica, Ravnjak and Ljutica spring. From the right side, the River Tara receives Skrbusa, Svinjaca, Jezerstica, Rudnjaca, Bjelojevicka and Selacka rivers. Area of the Tara River basin up to the Hydrological Station Scepan Polje is 2040 km^2. The length of the river is 148,4 km. Measuring places along the Tara River are Crna Poljana, Trebaljevo, Bistrica and Djurđevica Tara.

Piva

The Piva River has created a basin at the high massif of Montenegrin mountains. This river bears several names along its flow. Its source part underneath the South-Western slopes of the Durmitor Mountain up to the town of Savnik is called Bukovica. It joins Bijela in Savnik and continues further under the name Pridvorica until it reaches the confluence of Gornja Komarnica into the Pridvorica. The river continues further downwards under the name Komarnica all the way to relocated Monastery of Piva, where it receives the tributary Sinjaci and is named Piva. The river flows to the Scepan Polje, where it meets Tara and creates Drina River. Area of the Piva River basin is estimated to be about 1784 km^2 up to Scepan Polje. Upper Komarnica springs from Durmitor and flows through a 600 m deep and about 40 km long canyon. Along the Komarnica flow, karst phenomena are being created, with insufficiently explored underground flows, overflowings from basin to basin and numerous springs. Measuring stations of the River are Bukovica Savnik, Komarnica Duzi and Komarnica Lonci.

Ibar

The Ibar River originates from the north-eastern slopes of the Hajla mountain at the hill 1760 mnm. Main tributaries are Zupanica, Limnicka River, Ibarac, Grahovska, Bukovacka, Balticka and Backa. The Ibar River basin is fan-shaped with quite developed hydrography and high possibilities for a fast creation of flood waves. Area of the Ibar River basin up to the H.S. Bac is 413,6 km^2., and its length is 273,8 km.

Cehotina

The Cehotina River originates from the Stozer mountain. It is the second largest tributary of Drina after the Lim River. It is composed of Koraci and Brezovski streams. Tributaries of the Cehotina River are Koricka, Maocnica, Vezisnica and Voloder. Area of the Cehotina River basin to the H.S. Gradac is 809,8 km^2. Its length is 128,5 km. Hydrological stations at the Cehotina River are Cirovici (became operational in 1978), Pljevlja (1948) and Gradac (1963). Measuring and observation of the water level are also performed at its tributary Maocnica (series 1985-2002.)

Underground water

Growing quantities of contaminated water and other harmful substances of settlements, industry and mining activity cause degradation of water potential of the territory of the whole country. Among groundwater resources, the most vulnerable to contamination are shallow aquifers with inter-granular porosity. As an example, we can present contamination of major part of groundwater from Cemovsko polje, southern from Podgorica (particularly close to aluminium plant). This aquifer is famous of huge reserves, high water quality and yield of wells (200 l/s).

The other aquifer significant from the standpoint of public water supply – karst aquifer is open for external contamination, but because of absence of population in mountainous watersheds (hence, without potential contaminants) is mainly protected. One of the problems is a fact that potential sources in Montenegro are not legally protected, and so – they are vulnerable to contamination and degradation or reserved for other purposes. Unfortunately, lack of care of the society related to groundwater resources, as a strategic raw material of the first order) will have harmful consequences in the future, when two opposite occurrences will be more expressed than now – growing demands for new amounts of high-quality drinking water and more and more vulnerable (reduced) available water resources.

Appendix 4: Main Environmental Assets along the Route

This overview describes the most important environmental assets along the highway route, based on a review of existing data sources. Some of this information was developed as publicly available papers/books from which data is extracted.

The evaluation of baseline environmental conditions was undertaken through the verification of areas considered of key environmental significance along the highway route. In the review of literature the following areas have been scoped in the ecological aspect:

- Podgorica Municipality
- Danilovgrad Municipality
- Cetinje Municipality
- Niksic Municipality

Podgorica Municipality

Podgorica is located in central Montenegro, in northern part of Zeta plain. The entire area in which is intersected with rivers, and the city itself is located only 15 km north of Lake Skadar. Moraca and Ribnica rivers flow through the city, while Zeta, Cijevna, Sitnica, Mareza rivers flow in the vicinity of the city. One of the main features of the city is richness in bodies of water.

The city itself, in contrast to most of Montenegro, is lying on predominantly flat area of northern Zeta plain. Only exceptions are hills that overlook the city. These are mostly steep hills that rise abruptly from the surface, and thus are not suitable for urbanisation. They rather limit the city's expansion, especially to the north, shaping the city's development.

Podgorica has typical Mediterranean climate, with hot and dry summers, and mild winters. Snow is almost unknown phenomena in Podgorica. It has a mean annual rainfall of 1544 mm, and median daily temperature of 16,4°C. It has around 135 days with temperature higher than 25°C per annum. Podgorica is particularly known for extremely hot summers, as temperatures over 40° C are a common occurrence in July and August. Absolute maximum recorded in Podgorica is 44.8 °C, on 16th August 2007.

The municipality of Podgorica accounts for 10.4% of Montenegro's territory and 27.3% of its population. Besides being an administrative centre of Montenegro, Podgorica is also its economic, cultural and educational focal point. There are around 170,000 people in Podgorica municipality, which includes the small towns of Tuzi and Golubovci, and around 140,000 people in the city itself. This is the official data from 2003 census, while some estimates go up to 200,000.

Danilovgrad Municipality

The new highway route is only tangent Danilovgrad municipality from the south.

Danilovgrad was founded in 1869. Together with Spuz and part of Katunska valley it makes Danilovgrad municipality.

Situated in the central part of Montenegro it is connected by rail and roads with Podgorica and Niksic. It is 25 km away from the main airport in Podgorica, 75 km remote from the cost by rail and about 120 km from the winter centres such as Zabljak, and Kolasin. This municipality covers 501 km^2. It has population of about 16.600 citizens out of which some 4,000 are based in the Danilovgrad city. Mediterranean climate and high average temperatures make this region highly suitable for recreation and vacation.

Natural characteristics can be mainly described as plain (known as Bjelopavlici plain) situated, between high mountains Garac /1436 m/ on the south-west and Maganik /2139m/ on the north-west, and between spring of the river Zeta which is under Palencia /700m/ on the north-east up to Velje Brdo /283 m/ on the far soth-est. Many springs and rivers run through the valley - Susica and Graeanica as right and Brestiea, Ljutotuk, Morava and Suvi Do as left branches of the river Zeta. The river Zeta runs through Bjelopavlici plain and its clear water, beaches and plants which grow around are a real beauty.

Zeta starts near Niksic, under the Planinica hill flows eastwards for 86 km until it confluxes into Moraca River, as its most significant tributary, just north of Podgorica. The name "Zeta" derives from an early root meaning "harvest" or "grain".

Zeta river valley has historically been densely populated, as fertile lowlands are rare in mountainous Montenegro.

The area around Zeta-Bjelopavlici Plain have similar temperature characteristics as the Coast area due to the stronger influence and large water surface of Lake Skadar.

This part of Montenegro has the highest July temperatures, partly as a result of a low altitude, low cloudiness, small quantity of precipitation in summer and partly bare lime rocks by the borders of the valley, which are strongly heated in the summer. It is characterized by slightly modified Mediterranean type of annual precipitation movement, featured by maximum precipitation in late autumn and at the beginning of winter, and by the obvious minimum in summer months.

The basic geological substratum consists of: crystal slate, marls, sandy soils, limestone, dolomites, flisch, with the small participation of eruptive rocks. On this substratum different types of soil have been developed, particularly terra-rossa, black gray or gray brown soils and there was a considerable participation of anthropogenized alluvial-delluvial soils of different depths and skeleton soils on fluvial-glacier gravel. In this plain area in neogen, there were lakes which deposited their sediments, so that these valleys are the most fertile parts of Montenegro. One part of valley consists of fluvial- glacier okonglomerated sand and pebbles,so it is not fit for the cultures,but only for spring grazing and grapevine. Confusingly, the other significant plain in Montenegro, Zeta plain has been named after

Zeta river, although Zeta river itself does not flow through it. The Bjelopavlici plain provided a corridor for road and rail connection between two biggest Montenegrin cities, Podgorica and Niksic

Cetinje Municipality

Cetinje is expanded on 910 km2 which is 6,6 % of total expanse of Montenegro. (13,812 km2). City itself is expanded on about 5 km^2 with average height above sea level of 671 m. Based on the census from 2003 Cetinje has 18,482 inhabitants. This is 2,98 % of total population in Montenegro. In the city live, according to this census, 8,879 men and 9,603 women. 90 % of the populations are Montenegrins. It is on the main road Podgorica-Cetinje-Budva, which makes it open to the inside of Montenegro and Montenegrin coast. Cetinje is 29 km far from the airport in Podgorica, 49 km far from the airport in Tivat and 67 km far from the port in Bar.

Cetinje field was formed in The east Karst-continental bottom of the mountain Lovcen, whose highest peaks are Stirovnik (1749 m) and Jezerski vrh (1660 m) where is situated mausoleum of Petar II Petrovic Njegos. From all sides, defoliated limestone slopes close view.

Cetinje has middling continental climate, with dry and warm summers with temperature of approximately 20oC and mild and wet winters with temperature of approximately 2,1oC. Average temperature on the yearly basis is about 11oC, with year amplitude of 20,1oC. Cetinje is well known by plentiful precipitations during spring and autumn, and it is one of the rainiest towns in Europe with about 4,000 mm of water sediment on the yearly basis. Even beside enormous precipitations, Cetinje field and its surrounding do not have water flows on the surface and it has rare water sources. This is the consequence of Karst configuration and geologic structure.

Niksic Municipality

The Municipality of Niksic is situated in the central and west area of Montenegro on the 2.065 km², with its 15 % share of the territory makes it the largest municipality in Montenegro. Niksic is situated at the 630m height above the sea level.

The citizens of Niksic make 12% of the whole population of the Montenegro. Geographical, economical, as well as historical position of the town, apart from the natural increase in the population, contributes to the constant growth of the number of people living there. There are about 90.000 citizens living there.

The climate of Niksic is from the Mediterranean to mountainous and continental, with the average temperature in January is 1,3ºC, and in July is 21,1ºC. The average value of the relative humidity is 68,6%. There are 2.245 hours of sunshine in per year. The summers are hot with little rainfall and the winters are rainy. The largest rainfalls are in November and December. It is snowing for about 19 days, and is preserved for about 29 days per year in Niksic field, but at the mountains and in the surroundings of the town, it is preserved even to six months per year. The dominant winds are the north (24,4%) and the south (21,7%).

Within Herceg Novi municipality on the border with the Municipality of Niksic, and in the vicinity of the foreseen corridor, a new national park Orjen (defined also within Montenegrin Physical Plan) is proposed and it should be taken into account when planning motorway section approaching western border.

Appendix 5: Air Quality and Noise Level

Air Quality

In accordance with the Montenegrin regulation a permanent quality control of air on the territory of Montenegro is being measured and reported. Such control is aimed at determining conditions and changes in water balance and qualitative composition of water. i.e. determining a class of bonity in surface waters and control and evaluation of the level of air pollution in lower layer of atmosphere. Evaluation of the water and air quality is made in accordance with legal regulations. Methodology of work has been fully standardized in all phases of sampling, analysis and data processing.

In addition to the national environmental monitoring program, the Centre for Ecotoxicological Research of Montenegro participates in implementation of international programs: Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air pollutants in Europe (EMEP) and Mediterranean Pollution Monitoring and Research Program (MEDPOL). Analytical data on environmental situation are published under Annual Reports, which are appropriately filed and sent to the competent Ministry and other interested parties. The outcomes are occasionally published at expert local and international gatherings.

A limited number of measurements of air quality have historically been collected within Montenegro, in the few locations along the highway route: at Podgorica, and Niksic. Such measurements of air quality are available in the annual reports.

Municipality	Location	Coordinates		Altitude	Type of station
Podgorica	CETI	42_0 26’32’’	19_0 18’99’’	45	urban, traffic
Podgorica	D.Gorica	42_0 39’71’’	19_0 16’19’’	45	urban, traffic
Podgorica	Srpska	42_0 26’34’’	19_0 17’07’’	35	Industrial traffic
Podgorica	Konik	42_0 26’12’’	19_0 12’48;;	45	urban, industrial
Niksic	Municipality	42_0 46’	18_0 56’	600	urban, traffic

Source: Centre for Ecotoxicological Research of Montenegro

The majority of the proposed new sections lies in predominantly rural areas, where it is expected that air quality would be very good owing to the current relatively limited scale of industry and road traffic in Montenegro.

The Annual average values of restrain concentrations of pollutants from annual report for 2006 relevant to the highway route are shown in the tables below.

Annual average values of restrain concentrations of basic pollutants in 2006

Station	C_{av}.SO2	C_{max}.SO2	C 95 SO2	C_{av}.NOx	C_{max}.NOx	C 95 NOx	C_{av}.O3	Cmax.O3	C 95 O3
	μg/m3								
Podgorica - CETI	2.53	31.32	2.07	6.82	65.55	5.73	53.46	**139.94***	49.28
Podgorica - D.Gorica	3.12	14.56	2.69	3.73	11.04	3.43	55.01	**129.95***	51.71
Podgorica -Konik	7.12	73.47	5.31	3.62	36.65	2.86	57.92	**144.43***	54.40
Podgorica -Srpska	4.66	38.97	3.78	4.20	17.25	3.81	53.54	**166.60***	49.10
Niksic	3.33	31.43	2.41	3.94	16.42	3.51	53.80	121.62	50.17
LIMIT VALUE	110			150**			125		

Station	C_{av}. smoke/soot	C_{max}. smoke/soot	C 95 smoke/soot	C_{av}. suspended particles	C_{max}. suspended particles	C_{av}. settling maters	C_{max}. settling maters
	μg/m3					mg/m2dan	
Podgorica - CETI	24.34	**71.35***	22.62	85.79	**120.50***	148.32	303.02
Podgorica - D.Gorica	17.04	**126.37***	14.95	66.38	108.77	152.59	**428.87***
Podgorica -Konik	21.33	**124.42***	19.32	**198.39***	**452.25***	333.59	**842.38***
Podgorica -Srpska	22.86	**133.45***	18.22	**200.80***	**380.40***	**352.07***	**1172.50***
Niksic	21.27	**91.44***	18.60	85.87	**116.96***	252.36	**811.02***
LIMIT VALUE	60			110		350	

Annual average values of restrain concentrations of specific pollutants in 2006

Station	C_{av}.H2S	C_{max}.H2S	C 95 H2S	C_{av}.NH3	C_{max}.NH3	C 95 NH3	C_{av}.H2CO	C_{max}.H2CO	C 95 H2CO
	μg/m3								
Podgorica - CETI	0.35	4.25	0.26	2.83	14.24	2.44	1.46	8.50	1.14
Podgorica - D.Gorica	0.72	1.90	0.32	3.63	30.45	2.46	0.53	2.50	0.45
Podgorica -Konik	1.13	1.55	0.36	5.49	40.60	3.23	1.02	7.00	0.73
Podgorica -Srpska	0.48	2.50	0.35	2.68	23.10	1.87	1.39	8.65	0.96
Niksic	0.19	0.85	0.16	2.05	6.67	1.73	0.34	6.00	0.12
LIMIT VALUE	8			200			12		

Source: Centre for Ecotoxicological Research of Montenegro

Baseline data indicates that levels of measured pollutants are mainly within limit values. The air quality along the highway route except urban areas is currently very good. These findings are unsurprising given the current extent of industrial activity and road transport currently within Montenegro. Contribution to the measured concentrations of target gases is likely to arise from domestic burning of wood and other fossil fuels, road transport, and limited industry.

Based on the given results it can be concluded that the air quality is on the satisfactory level. Suspended particles represent major problem in more less all urban areas in Montenegro. High concentrations of polycyclic aromatic hydrocarbons (PAH) are mainly result of exhaust gases from vehicles which are not up to standard as well as due to the quality of fuel.

The following conclusions can be drown up:

1. Restrain concentrations of global parameters (SO_2 and NO_x) are below national limit values (<110μg/m3) however sometimes exciding EU values (50 $\mu g/m^3$). Increase in the number of vehicles and low quality of fuel results with high values of PAH and suspended particles especially in the urban areas.
2. Increased smoke/soot values are recorded during winter which can be explained by traditional usage of coal and wood as a major heating material.
3. Almost in all urban areas Cmax.O3 is recorded higher than limit values, which is direct consequence of UV radiation combined with soot coming from vehicle exhaust pipes.

Noise level

Similar to air quality monitoring Centre for Ecotoxicological Research of Montenegro is performing noise level measurement. This exercise is performed on the locations such as main squares in urban areas, medical facilities surroundings and national parks. The limit values of L_{eq} for different areas are shown in the table below:

Type of Area	L_{eq}		
	Unit	Day	Night
Recreation and resting area, hospitals, cultural and historical sites, parks	dB(A)	50	40
Tourist areas, small size settlements, camps and schools	dB(A)	50	45
Residential area	dB(A)	55	45
Business-residential area, trade-residential area, playgrounds	dB(A)	60	50
City centres, entrepreneurship, trade and administrative areas, areas along highways, main roads and city traffic lanes	dB(A)	65	55
Industrial zones, warehouse zones, service areas and non residential areas	dB(A)	Applied values of bordering zones	

Source: Centre for Ecotoxicological Research of Montenegro

The results from the monitoring from 2004, 2005 and 2006 shows that noise levels are over the set limits in the most of the locations with incising trend. The biggest exceeding difference is recorded in Podgorica, mainly due to the fact that distance from the traffic and subject area (hospital, park school) is very small. The noise level in the national parks is recorded higher than expected mainly due to the natural effects (birds, wind etc)

Thee main constrain is the fact that zones in the urban areas are not well defined (distinction between residential and industrial area is sometimes hard to distinguish) and therefore applying above table is not simple.

Appendix 6: General Conditions of the Existing Road

In general, the baseline ecological conditions of the road vary from satisfactory to very poor. The technical design assessment shows a contradiction between a requirement of ToRs and reality of the presented situation on the site. The technical parameters of existing road are below these of highway standards. Generally a pavement width is 8 m to 9 m. The pavement and also the shoulders are in poor condition. The total length of the road is about 200 km. Only few kilometres have a dual two-lane carriageway without emergency lanes. The rest is single two-lane carriageway. The pavement, base and sub base appear generally in poor condition.

The existing road is used by mixed traffic. All types of vehicles from modern cars to 38 tonne trailer trucks. Sometimes horse drawn carts are using this road. The variation of observed speed is from 15 km/h to 160 km/h (exceptionally, on the flat sections near Podgorica). The pedestrian, the cows pass through the road and very often, the cows slept on the road. Drivers are undisciplined, ignored all horizontal and vertical signs.

In Podgorica suburb, on the both side of the road there are the trade of fruits and local fruits. This process disturbs traffic and is source of many accidents. Usually the settlements are implanted on the both side and close to existing road. Typical small rural town is compound of one line of houses with a yard. Any attempt to wider the existing road to highway standards will results in destruction of half of settlement located on one side of the road. In this case the social cost of the construction of highway will be very high.

The visual assessment shows:

- Many features such as culvert wing walls, aprons, and headwalls are in the bad condition. Bridge parapets are sometimes partially broken away.
- There is the need to fix all drainage structures, culverts, pipes, both brickwork and concrete.
- The profiles of original roadside ditches are completely changed as they have become silted up over long periods or have become the receptacle for waste and garbage. The problem with solid waste dumping is particularly severe because of (i) highway drainage channels being directly used, in a targeted and purposeful manner, as waste disposal sites; (ii) Highway drainage channels picking up waste products indirectly by interconnection to supplementary drainage systems from adjoining lands and properties outside the ROW;
- Road safety conditions at most places are very poor. Cambers of road on bends have become damaged by the effects of heavy vehicles. Untreated pothole and patching repairs, particularly on bends where tire traction and adhesion is critical, pose risk of skidding and loss of control. There is also a lack of hazard warning boards, bollards, or any form of physical barrier on sites that clearly have experienced vehicles going over embankments through hedges and running into walls and roadside banks.
- On the whole length of existing road water provided from the pavement is going directly to the land without any process of cleaning of hydrocarbon products.

- The crossing of the settlements and built-up areas are especially dangerous regarding to drivers' and pedestrians' safety, due to the narrowness of the carriageway and several sharp bends.

Appendix 7: Socio-Economic Baseline

Many socio-economic problems along the route under consideration are directly attributable to the poor economic conditions in Montenegrin rural areas or in some way connected to them. Desperate the foreign investment boom (mainly Montenegrin real-estate in the seaside area) economic conditions are reflected in the collapse of agriculture and industry, the lack of opportunities for well-paid, regular employment and the pressures on livelihoods that eventually affects the environment. It is also widely understood that poor economic conditions impose a constraint on sources and levels of investment in necessary infrastructure, services and economic sectors. The need for economic growth is of course a national issue, but the problem is so endemic that it needs to be addressed in all sectors and geographical areas. This suggests strongly that value for money or potential to generate sustainable economic growth should be ranked highly as evaluation criteria for investments in transport infrastructure. This also accords with national policies and the priorities of international assistance projects which concentrate on poverty reduction.

Quality of life theme underlies issues relating to poor standards of services (e.g. drinking water, electrical supply, sewage disposal) and threats to human health from poor environmental conditions. Poor standards of waste disposal (both domestic waste and sewage) are one of the most pervasive and most persistent problems along the route. Poor environmental conditions represent a very real threat to human health. Industrial pollution is widespread, domestic water supplies are regularly polluted with untreated sewage and river water quality is unrecorded but almost certainly very poor. Impacts on human health should therefore be also accorded a high priority as an evaluation criterion to judge any development interventions.

Infrastructure along the route is generally in a very poor state, ineffective or inoperable. Transport infrastructure is in a poor condition, with roads that are severely degraded and pot-holed. Energy is a major problem with communities receiving an infrequent supply of electricity, or no electricity at all. This results in a high reliance on coal and wood, which is cut and gathered by the communities themselves. Telecommunication and telephone lines are in very poor condition or non-existent The infrastructure for mobile phones is available and reliable. Water supply is a problem in coastal area during summer tourist season with some communities receiving running water for a few hours a day, or no piped water at all. Sanitation services are almost non-existent, and when they do exist, they are often ineffective.

Agricultural infrastructure was built for small-scale farming and is unsuited for current market competition. Rural roads and irrigations systems are not adjusted to the new land tenure structures. Nowadays, the Montenegrin rural agricultural sector is at subsistence level; it is producing food for self-consumption with a small surplus sold in markets and at roadside stalls. The small size of land parcels is sufficient for personal consumption but not large enough to provide a living from the land.

It is obvious that economic hardship is the underlying cause of low birth rates and high levels of out migration from rural to urban areas. Forecasts of future population growth are negative, but it may not result in reduced population and development pressure in the areas adjacent to the main transport artery. The various survey data do not reveal any great sub-regional variations in socio-economic conditions along the route. In common with most of Montenegro, economic conditions are hard and for households access to livelihood as well as to the main road is their greatest priority. For some of them today the highway itself represents the livelihood where they are involved in different legal and illegal businesses including trade and wide range of services.

The Adriatic-Ionian highway runs through the territory of 4 municipalities: Podgorica, Danilovgrad, Cetinje, and Niksic.

The proposed highway runs through predominantly rural terrain with agriculture activities beyond the existing extent of the cities, except some minor cases where it passes through some of the outermost suburbs (Podgorica and Grahovo). Although not urban in character the highway is directly related to the economic and demographic development of the cities. In the same time highway has a considerably wide area of influence on rural regions through which it passes. Most of them have predominantly rural populations and limited industrial development.

Land ownership and the use of land is an important part of the social economy along the highway route, as well as Montenegro as whole. The majority of the population in the communities along the route relies on the land for subsistence, and it provides an integral part of their income if not the majority in many cases. The land is used for three main productive activities: crops/fruit/vegetable cultivation, livestock raising/grazing, timber harvesting and wood cutting. In general people use state land for pasture and for timber harvesting and woodcutting, and own the land they use for crop/fruit/vegetable cultivation. State land is used under a lease agreement or sometimes without formal permission. This includes: backyard gardens, summer plots (not attached to the house, largest piece of land owned by any one household – mainly used for vegetables), small vegetable plots (close to the house), collectively owned farm land (far from the house), privately-owned farm land. In general, vegetables are the most widespread type of crops cultivated, followed by herbs and fruit. However, the municipalities differ significantly in terms of what crops/fruit/vegetable are cultivated, based mainly on climatic and geographic conditions along the route. The land of the present road and, to great extent, the land needed for the widening belongs to the Montenegrin state territories. But for some of the new bypasses and alternative routes there is a need of expropriation and/or buying-out and compensation procedure.

At current preliminary or strategic environmental assessment stage, it is only possible to answer the general scoping questions on whether the project results in social changes, for example, in demography, traditional lifestyles, employment etc., which are indicated in the Scoping Check-list (see Appendix 11). The preliminary analysis of the possible socio-economic risks and impacts is also presented in the Section 6 of this report.

At the later stage, for the full-scale environmental and social impact assessment (ESIA), a socio-economic survey will/shall be undertaken in all the “highway affected communities” within the zone of influence of construction and operation (2-5 or more km - to be determined on the basis of previous or EU experience). The data will/shall be collected in a format that could be easily transferred to a database and GIS for later analysis using SPSS (standard specialist software), and mapping of attitudes and impacts to cover the following main topics:

- population and demographics
- labour and livelihoods
- infrastructure, resources and services

- culture, local administration, decision making and planning
- attitudes and perceptions.

Appendix 8: Cultural Heritage and Archaeology

Montenegro, a country of contrasts - of mild Mediterranean and a severe mountainous climate, fruitful plains and river valleys, and high and arid mountains - on its rather small surface area of 13.812 km^2, inherits cultural heritage originating from the time of creation of the first human communities until present. Privileged to be situated on the boundary of two large civilisations - eastern and western and three great religions - Orthodox, Catholic and Islamic, numerous known and unknown builders, painters and carvers, masters of sophisticated crafts, writers, transcribes and typographers, were leaving here the masterpieces of their hands and their spirit, sublimated nowadays into a wealthy cultural heritage.

Responsible for cultural heritage and archaeology is Republic Institute for Protection of Cultural Monuments with mission to work on finding, studying, collecting and conservation of cultural monuments and natural rarities of Montenegro. Versatile businesses on conservation of monuments and natural heritage lead to separation of these activities and establishment of Institute for Nature Protection. Internal organisation of the Institute has been implemented through work of organisational units (centre, departments and ateliers). Business on investigation, collecting, keeping and treatment of documentation is carried out by the Centre for Research and Documentation, whereas the activities of design, inspection and implementation of the works on the terrain take place through the Department for Protection of Civil Engineering Heritage.

All endeavours of the Republic of Montenegro to define its own concept of cultural policy during ultimate decades of 20th century did not give expected results. Montenegro did not have, neither has it today, a strategic document of that kind. Until ten years ago, Montenegro did not have relevant institutions either, that is Ministry of Culture, whose task would have been to conceive a strategy or programme and action plan for the cultural development of the country. Therefore, cultural policy was dealing with daily issues, in an uncontrolled manner and without transparency, in both, decision-making process and distribution of financial resources.

The new National Report on Cultural Policy points out inevitability of replacing present, mainly outdated, legal regulation with a new one, which would be adjusted according to the international standards and rules of the Council of Europe, European Union and World Trade Organization. Concerning the fact that numerous legislation are indirectly related to the culture, it is clearly visible from the report that the national cultural programmes, both short-term and long-term, must supervene strategic documents of the Government and that it is required by them (economic development strategy, urban plan, national program for higher education, financial and fiscal policy, etc).

In the field of protection and valorisation of the cultural heritage applicable Laws are the following: Law on Protection of Cultural Monuments (1991), Law on Museum Activity (1977 and 1989), Law on Library Activity (1977 and 1989), Law on Archive Activity (1991 and 1994), Law on Reconstruction and Revitalisation of Old Cities Damaged by the Earthquake on 15 April, 1979 (1984 and 1986), Law on Renewal of Monuments Holdings of Kotor (1991), and Law on Monuments, Memorial sites, Historic Events and Persons (1971, 1972 and 1988).

Protection of Cultural Monuments

Historic monuments are remaining structures that owing to aesthetic qualities, association with significant events or people, or through great age alone represent a significant and irreplaceable historic resource. Monuments, in addition to being of interest for art historical study, may also be highly visible and well known, symbolising the importance of past events and possibly historic persons to the general public. The value of an important historic monument is closely attached to its specific location and setting, and to the surrounding landscape. Unlike archaeological sites, it is very rare that an historic monument can be moved or altered without substantial loss of its scholarly and public value. Avoidance and direct protection are almost always preferred for historic monuments

The conditions for proper, modern and, according to international principles, standardised way of protection of monuments heritage in Montenegro were created only after the Second World War. Protection of cultural heritage was put on a solid legal basis and its care was given to Institute for Protection and Scientific Research of Cultural Monuments and Natural Rarities, Central Registry of Protected Cultural Monuments was introduced, and it contained all basic data about protected monuments.

In the basic plans and programs, long term or annual ones, the main program orientation of activities of the protection of cultural monuments is based on two elements - administrative norms and documentation. Protected cultural monuments in Montenegro are classified in three categories:

- I - Monuments of Special Importance;
- II- Monuments of High Importance;
- III – Important Monuments.

Local authorities should have an important role in protection of cultural monuments; since protected monuments are geographically situated in territories under the jurisdiction of local authorities. Previous experience shows that local authorities relies upon republic institutions (Institutes) when it comes to the protection of cultural monuments, and therefore their role is inadequate to the real needs. That is very important for those local authorities, which are supervising protected urban zones and historical sites.

However, based on the Law on Local Self-government from 2003, municipalities are obliged to provide necessary conditions and take care for protection of cultural monuments and memorial sites of local importance. Based on the Law on Protection of Cultural Monuments from 1991, in terms of protection of cultural heritage, municipalities are obliged to take care, maintain and use, and protect monuments from damaging impact of nature and men activities, to make them publicly available, bear the costs of regular maintenance of cultural monuments.

At the same time, with adoption of town planning, municipalities are obliged to obtain opinion from the Republic Institute for Protection of Cultural Monuments by reason of protection and preservation of urban or historical character or environmental ensemble of old towns and settlements. It is also stipulated by the Law that for carrying out construction works, which might cause changes on the cultural monuments, a prior licence from the Republic Institute must be obtained.

Protection of Natural Property

In the period after the Second World War protection of nature in Montenegro was carrying out in several phases, through which it was raised an awareness that effective protection could not be carried out only by legal protection of plant and animal species, but whole areas needed to be protected, such as those that were designated as natural parks in 1952 (Lovcen, Biogradska Gora and Durmitor). The protection of natural property became even more important after designation of Montenegro as Ecological State by the Parliament in 1991. Today, these issues are regulated in certain parts by: the Law on Protection of Nature, Law on National Parks, Law on Freshwater Fishing, Law on Maritime Assets; Hunting Law, Law on Town Planning, etc.

Montenegro has also a public enterprise called National Parks of Montenegro, which is responsible for four national parks: Biogradska Gora, Durmitor, Skadar Lake and Lovcen.

Protection of nature is under the competence of the Ministry of Culture, although with forming of the Ministry for Protection of Environment (now it is a sector in the Ministry of Town Planning) during '90s, large part of responsibilities was delegated to this Ministry. Unfavourable situation in human resources in institutions dealing with the protection of nature, as well as scarce financial resources allocated for this area, significantly influence efficiency of implementation of plans, programs and protection measures.

There is a significant number of NGOs involved in nature protection activities in Montenegro on local, regional, republic and international level.

Republic Institute for Protection of Nature, National Parks and Natural History Museum in Podgorica own relatively good and modern equipment necessary for the process of inventorying, preparation and storage of natural and other materials. The role of the State in development of activities of nature protection is reflected in attempts to find adequate ways of financing, which, having in mind continuous economic difficulties, remains to be an unsolvable problem, especially when it comes to national parks.

Local authorities should have more important role in the protection of nature, since protected natural objects are located inside the territories of one or more municipalities. The more active role signifies that local authorities, with more responsibility and determination through its secretariats for town planning and construction inspections, should provide legal implementation and respect of adopted planned documents.

In the period of founding the activities related to the protection, up to the disintegration of the former Yugoslavia, Republic Institute for Protection of Nature and institutions for nature preservation had relatively intensive international cooperation. Cooperation was made through the Yugoslav Commission for Cooperation with UNESCO on the occasion of inclusion the National Park Durmitor, canyon of river Tara, and Kotor and Risan Bay on the list of international and worldwide important objects for the protection of natural and cultural heritage, as well as with inclusion of Skadar lake on Ramsar List (Ramsar bureau). Cooperation is also established with EUROPAEC federation, World Commission for Protected Areas, World Organization for Protection of Nature and other organisations and ecological associations.

Archaeology

Interest for archaeology in Montenegro began in the second half of the 19th century, when according to the decision of Prince Nikola I Petrovic Njegos, had started the archaeological researches of important Roman city of Duklja (Doclea) near Podgorica.

The Centre for Archaeological research was formed on the republic level with the aim to replace previous practice of disorganised, scattered and partial approach in performing archaeological research to more organised and planned one. Although it operates according to the Law on Museums, Law on Protection of Cultural Monuments, and Code of Conditions and Ways of Performing Archaeological Excavation and Research, the Centre discharged from its authority a part of work of museum character (collecting, preserving, and exhibiting the archaeological material). It would be necessary to bring a regulation, which would regulate and prevent numerous problems and misunderstanding in overlapping of competencies of the Centre and municipal museums containing archaeological collections and performing archaeological researches.

Archaeological resources consist of surface and near-surface artefacts and related materials in a spatial and stratigraphic context, which constitute a scientific record of the past cultures that created them. Where no contemporary written records of a culture exist, archaeological remains may constitute the only extant record of that culture. Without necessary knowledge and planning, ground-disturbing projects such as the proposed highway have the potential to damage archaeological sites and artefacts, thereby diminishing scientific and cultural resources that are a part of the cultural patrimony. Archaeological sites are considered to be an important and irreplaceable aspect of Montenegrin's cultural patrimony. Although heritage management principles always favour protection of archaeological sites by avoidance, such sites can often be rescued by scientific excavation, in which case a ground disturbing project may go forward with limited adverse impact to the resource.

The nearest archaeological site, where the corridor connects with the corridor Bar-Boljare (Podgorica by-pass) is Doclea in the vicinity of Podgorica town. Doclea is the most significant and the largest urban centre created in period of Roman domination in Montenegro. The town was founded in the first decade of the 1st century AD. It is situated on the plateau elevating on the very mouth of the River Zeta into the Moraca.

Archaeological investigations of Doclea were initiated by the end of the 19th century and were continued from 1954 to 1964 and again in 1998.

The by-pass around Podgorica runs along Doclea and it covers a part of the place called Vranjske njive where the so called western necropolis of this antique town is located. Recently, the probing excavations have been conducted.

The archaeological resource list should be used by project engineering staff to create corridor re-routes, avoiding potential impacts to the largest and most obvious known sites. Avoidance of monuments is a key consideration in route selection.

Potential project impacts, methodology, remedial measures

Potential project impacts to archaeological sites and monuments differ substantially. For archaeological sites the concern is direct physical impact on fragile subsurface resources from earthmoving equipment and heavy vehicle transit. For monuments the immediate concerns are accidental vehicle impacts, damage to the surrounding landscape setting, destabilisation and impact from continuous heavy vehicle passage or use of high explosives.

Monuments are also prone to secondary impacts such as those caused by temporary or permanent increases in population, sometimes referred to as induced development. Such impacts may include unauthorised and inappropriate occupation of monuments, robbing of monuments for building materials, and degrading of the monuments' surroundings from a variety of unplanned uses. Archaeological resources are less prone to such impacts because of their underground location.

In addition to the difference in impact types just noted, there is another important difference between archaeological sites and monuments.

- Archaeological sites are most often underground and are therefore difficult to identify. Further, those surface indications of archaeological sites that do exist are not always a reliable measure of the extent or importance of subsurface resources. Avoidance of archaeological remains that are discernible from the surface, large burial mounds for example, is good practice but does not ensure that less obvious subsurface remains will not be adversely affected;
- Historic monuments are by definition above ground and are therefore easy to identify in project planning studies Their evaluation is also more straight-forward because subsurface investigation is seldom required. Visibility and accessibility make monuments protection studies less elaborate and less time-consuming. Ease of access is also a cause for the most common impacts noted above, requiring preservation solutions that operate to protect against impacts that result from continuous and long-term public access.

Also, in the case of archaeological sites, there are further potential impacts associated with late finds. This is because any baseline data cannot include previously unreported subsurface sites. In this latter case of unreported finds, the historical context is particularly important for defining the types of impacts that might be expected.

The fact that the planned highway corridors mainly pass through the river valleys, as well as through the fields and hills, actually going the same directions which were, in previous times starting from the old age, used as the basic communication, implies a logical expectation to find archaeological sites from different times and of different character. Thus, apart from the already mentioned *Potential project impacts, methodology, remedial measures* by which “the monuments should be identified through published literature sources supplemented by the unpublished but validated field survey data”, it is necessary to emphasise that there are potential sites that can be identified only on the basis of the systematic recognition of the appropriate area. The methodology of recognising that is being used in these cases as well as the results gained by the recognising, will provide necessary answers to almost all the questions related to the further protection of the sites, together with the proposed measures for protection or systematic excavations. If required due to significance of a site there will be a proposal for alignment relocation.

The highway E-75 can exemplify the systematic recognition in the area of Serbia. There on the corridor line 192 archaeological sites were found, out of which 25 were examined because they were discovered on the road alignment. A similar situation happened in

Slovenia, where through the methodology of recognition 100 archaeological sites were discovered.

Out of these reasons, the need for conducting systematic archaeological recognitions of the highway corridor should be especially emphasised. All the relevant institutions from Montenegro starting from the Republic and Regional Centres for Protection of Cultural Monuments, Montenegrin Archaeological Centre to all the local museums which are located at the area where this corridor passes through, should participate. This is one of the primary conditions to reduce or even to avoid eventual misunderstandings or additional expenses which could appear, due to discovery of an archaeological site during the construction work.

A historic context consists of culture-historical information needed to understand the significance of a particular archaeological site or monument and to predict what types of sites might be present in a previously un-investigated zone. The historic context developed below is a period-by-period series of brief vignettes of Montenegrin prehistory and history. It thus provides a general background on events of scientific and public significance of each of the periods.

The monuments shall be identified through published literature sources supplemented by unpublished but validated field survey data. Literature review process and consultation with various experts shall confirm that the proposed route alternatives are the best option in terms of limiting possible impacts on monuments. Moreover, the route can be further investigated in the course of project. Additional investigation will include recording of precise monument locations, further technical description and study of selected monuments, local inquiry and record searches regarding selected monuments.

Individual monuments typically have protection zones of 50m in radius while protection zones of monastery complexes and castles vary from 150m to 250m in radius, which also ensures protection of the adjacent natural landscapes and the visual setting (view shed) of the protected monument. Protection and landscape zones of monuments are specific for each feature and can be accurately indicated once a final option of the route is defined. It should be noted that some monuments may have unidentified archaeological resources associated with them that could require protection as well. In exceptional cases, if it proves impossible for an alignment to avoid a cultural site of value, salvage excavation should be undertaken. Relocating artefacts or ruins from a site is a last alternative and can be expensive.

Commonly-utilized mitigation measures include excavation, erosion control, restoration of structural elements, rerouting of traffic, and site mapping. Other measures that may be required on occasion are structural stabilization, soil and rock stabilization, control of groundwater levels, vegetative stabilization, control of flora and fauna, and site surveillance. A site management plan will be required. It should identify conservation actions required and, where necessary, provide guidance on other measures such as salvage or relocation. It should establish monitoring and evaluation procedures and a schedule of operations and budget. Particularly important is the inclusion in the plan of specific contract clauses to define responsibilities of companies and workers who discover new sites or artefacts, or who damage known sites. These chance find procedures, all too often, are given inadequate attention. At the very least, they should identify the authorities to whom the company or individual should report, the format for such reporting, the waiting period required before work can be resumed, and measures for interim care of the found items.

Dialogue between the road department and the ministry in charge of cultural heritage needs to be frequent and continuous to avoid situations which either damage the cultural site or delay the road project. In some countries, road projects have been delayed for years because of a lack of procedures governing cultural sites, or lack of funding for the protection, study, or restoration of these sites. In practice, a cooperative relationship between road builders and archaeological specialists is essential. If cultural heritage requirements are too rigid, some site discoveries may be hidden or destroyed to avoid compliance. If, however, road workers fail to allow for heritage sites, substantial delays and cost increases can occur.

All this suggests that if the mitigation plan is to be effective, in most countries it will have to include proposals for strengthening the legal framework and the institutional capacities for the on-going management of the cultural heritage in question. Thus, when the legislation is being examined in order to identify relevant information pertaining to the sites in question, an assessment of the effectiveness of that legislation and of supportive institutional capacity should also be conducted.

Examples of compensatory actions may be:

- tourist development of the site where heritage elements are conserved and showcased; and
- classification of the site as protected under appropriate legislation. For sites of international quality, UNESCO listing as a World Heritage Site may be proposed.

Social Importance of the Cultural Heritage Issue

The protection of heritage resources from potential project impacts is a straightforward matter of planning, and of implementing practical measures of design and construction. The public value placed on heritage resources, however, is a subjective and culturally variable matter. It is therefore of interest to briefly consider the place of history and the past in Montenegrin society.

A concern for national history and cultural heritage, a common theme in all societies, is unusually strong in Montenegro and shows no sign of diminishing. Montenegrins, more than most, define their identity through a long and well-remembered past.

The Montenegrin sensitivity to history and tradition may come in part from being a small nation in an area of frequent imperial involvement, and violent invasion, and from being a Christian nation in an area with numerous adjacent Moslem populations. High levels of interest in history and archaeology are typical of countries in the process of 'nation building.' An additional factor particularly applicable to prehistoric relics is the strong archaeological research tradition. Because the discovery and study of sites and monuments is often a by-product of project preservation measures, the highway project has the - potential to create positive impacts on Montenegrin society.

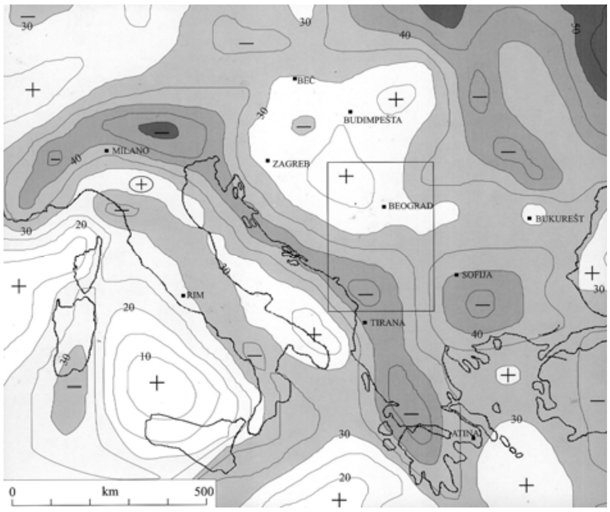
Appendix 9: Natural Risks

For the highway projects in Montenegro in general the natural risks are identified as earthquakes, erosion and landslides.

Gravity values and Seismology

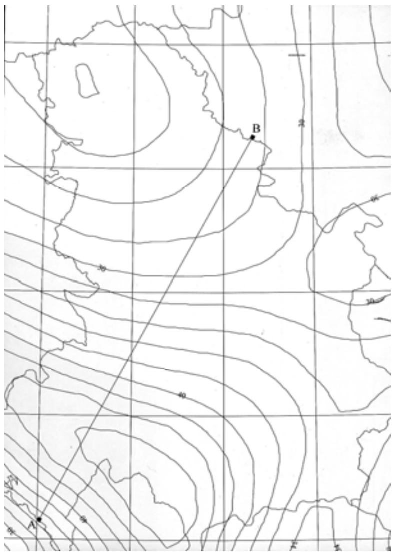
Montenegro has lowest gravity values in the region (approx. 110 mgal). The gravity minimum in Montenegro is result of great crust thickness in Dinarides. Anticlinoria and other geological uplifts, are marked by negative gravity anomalies. Hence, thickness of the crust is considerable in uplifted areas and reduced in depressed zones.

Increase of Bouguer values is toward northeast, with contours going parallel to Dinarides. From the other side, contours in the southern part of Serbia are in SW-NE direction, with a remarkable discontinuity along the line: Djakovica – Pristina – Dimitrovgrad. This discontinuity cuts the Dinaric complex in the area of the Albanian – Serbian border, where anomalies are perpendicular to Dinarides.



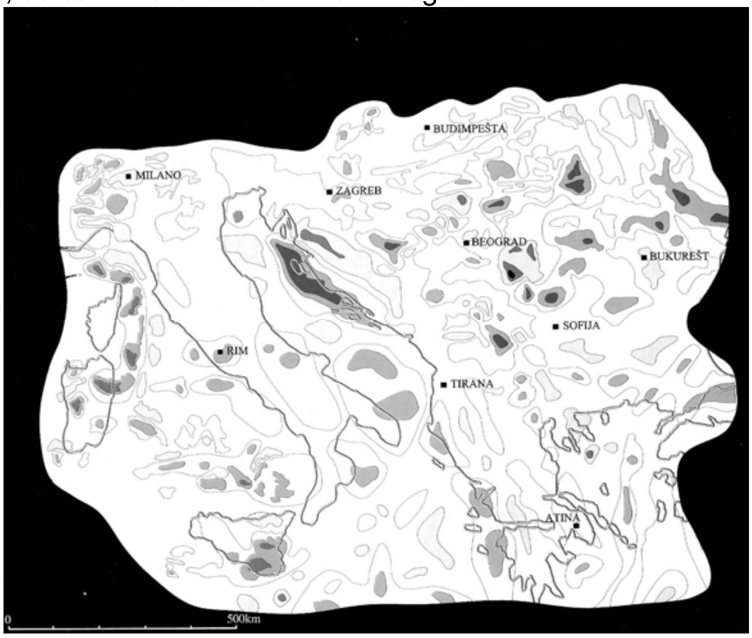
Bouguer gravity map of Serbia and Montenegro. The contour interval is 5 mgal (Geological Atlas of Serbia, 1997)

The map of Moho surface compiled on the basis of DSS (Deep Seismic Soundings) and calculations of the Crust's thickness according to three parameters: depth of Moho surface, Bouguer anomaly and altitude above the sea level. Shows maximum depth to Moho discontinuity is in Montenegro, 50 km north from Podgorica. Moho boundary gradually shallows to the northeast and in Pannonian basin amounts only about 20 km.



Map of Moho surface (Geological Atlas of Serbia, 1997)

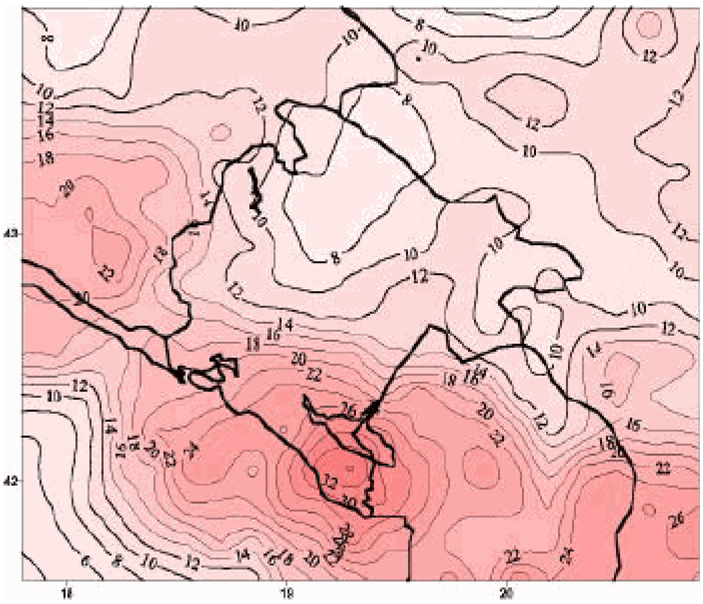
Complex geological interpretation of geomagnetic and gravity data is shown in the figure below. According to shape and position of geophysical anomalies and to geological data, regions with ultramafic and acidic intrusives are distinguished such as the areas with unique lithological characteristics, as carbonate rocks in Montenegro.



During the earthquake in 1979, liquefaction process was expressed at several localities of Adriatic coast in Montenegro and Skadar lake coast, causing intensive damages (destroying the "Fjord" hotel in Kotor, etc.). Generally, that area is defined as vulnerable to liquefaction.

At the territory of Balkans, the highest seismic activity is characteristic of Dinaridic seismogenous block (Montenegro and SW Serbia), with over 70% events. At the area of the block, disastrous earthquake in 1979 is famous of numerous victims and outstanding damages, initiating detailed complex geological and seismological investigations.

During the period 1983-1986, seismic regionalization, as well as detailed microzonation of all urban environments of the territory of Montenegro, was carried out. The strong earthquakes caused by intensive tectonic processes, predominantly occurring in the coastal part of the territory, produce destructive effects in the form of landslides, avalanches and soil liquefaction.



Seismic hazard of Montenegro for the return period of 200 years with maximum horizontal acceleration (expressed in % of g) and the probability of occurrence 70%)

Source: Seismological Observatory of Montenegro

Seismic activity at the Montenegro territory and neighbouring areas during XX century are distinguished by very large intensity. During this period at the Montenegro occurred several thousand strong and very strong earthquakes. Some of them were characterized as destructive ones.

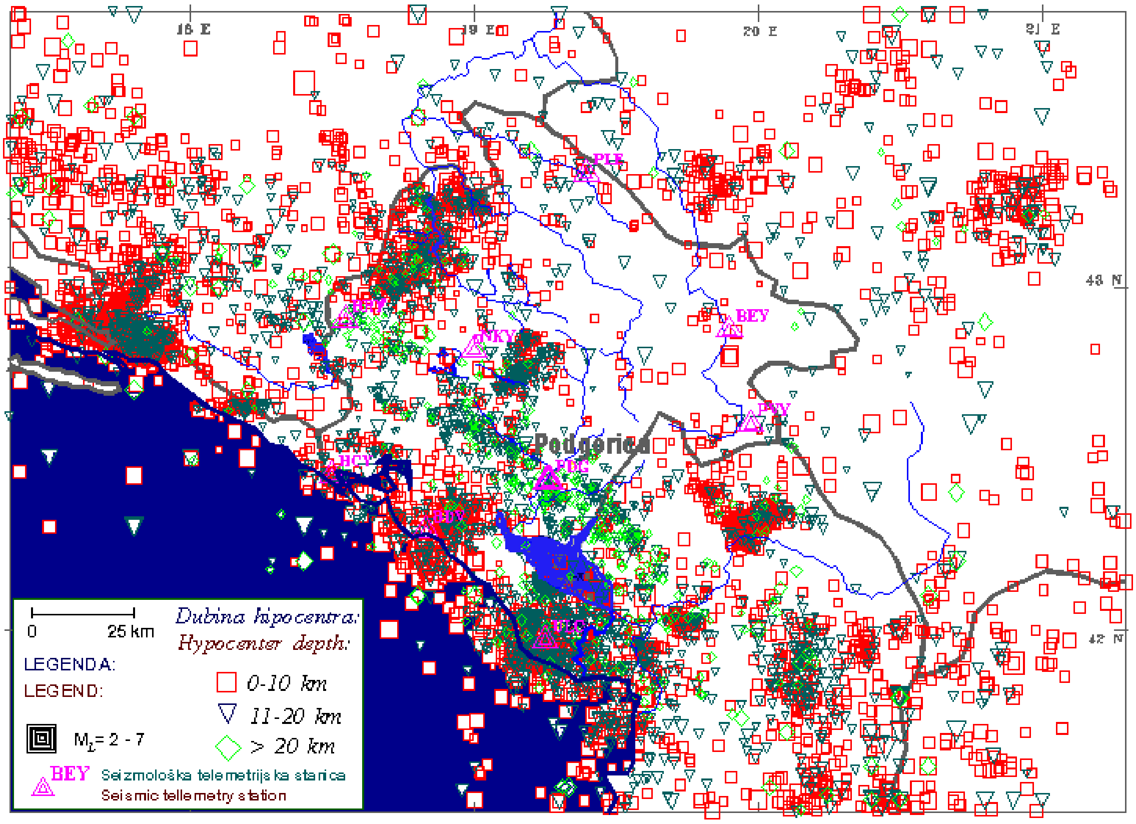
The earthquake of April 15, 1979, at 7:19 AM (local time), unfortunately belongs to the category of catastrophic. The magnitude of this earthquake was 7.0 Richter scale. The whole Montenegrin coastal area during this earthquake was shocked by the intensity of IX degree Mercaly scale. This earthquake took 101 lives in the

Montenegro and 35 in Albania. Beside that, it was destroyed very huge part of the Montenegro hotel capacity, and also a great number of apartment buildings. At the presented picture it is shown one of the recorded accelerograms at the hotel Olympic in Ulcinj (on the hard rock), with the maximum horizontal acceleration of 28 % of Earth's gravity (g).

On the map of epicentres, it is presented all stronger recorded earthquakes (over 2.5 magnitude) occurred on the area of Montenegro and its vicinity during XX century. It is possible to make a conclusion that, practically, complete coastal area posses much higher seismic hazard comparing inland part not only at the Montenegro territory, but much broader region.

On the picture, using different colours, it is expressed the third dimension of the hypocentral parameter (the depth), so it can be recognized some deep seismoactive structure - as it is large tectonic trench which is placed in the Dinarides direction - beginning from northern Albania, via Podgorica in Montenegro, then Danilovgrad and Bratogost at the western part of Montenegro, and further - to the west in the Herzegovina (Republika Srpska). On the epicentral map this tectonic trench can be noticed by position of relatively deep hypocenters (green rhombus and dark blue triangles).

Also, on the map it is possible to notice at the north - western part of the Montenegro territory, effects of a pretty large seismic induced activity in the region of the artificial lake created by the dam "Piva" which is 220 meters high. The main part of the seismic activity in this region is connected with the oscillation of hydrostatic pressure of the reservoir water at the limestone masses in the basement, during the charging and discharging of the lake.



The epicenteral map for earthquakes in the Montenegro region during XX century

Source: Seismological Observatory of Montenegro

Erosion and landslides

Erosion and landslides are prevailing, contemporary engineering-geological process in the mountainous and hilly areas of the modernized road. Foot and side erosions are frequent in the region and stipulate significant separation of slopes. At the exposures and artificial slopes they are intensively weathered and settle down. On gentle slopes of hills and watersheds, argillite clays quickly loses their structure and form alluvial layer due to the influence of undergoing physical and chemical weathering, as well as precipitation and quick changes in temperature.

The relief is uneven, sometimes hilly, mainly separated by ravines and erosions in the lower part. Steepness of slopes varies. Mainly the hill sides are subject to mechanical weathering. Due to disturbance of structural links many macro cracks with circulating infiltration waters can be found in this zone. There are sections with significantly weathered bedrocks in the zone.

There are a landslide sections along the highway route. Depending on the direction of forces causing landslides, which may vary depending on seasons, the landslide body moves with different speed both in plan and by depth. The foot of the slope moves more slowly as compared with the top causing hardly compatible expansion-compression zones in the landslide and cracks. On some places those cracks lay on already existing system of cracks, stratifications and make situation more complicated. Cracks spread nearby the deformed section usually serve as main ways of waters circulation in the body of the landslide. These waters are easily drained and influence stability of the slope and the landslide activity.

Erosion usually takes place at the bottom of narrow gullies and along ravines, where deposits are washed off by temporary streams and taken down to the lower parts of the relief. At the rest of the sections the surface is washed-off by run-off waters.

Appendix 10: Mitigation Measures for Mining/Quarry Activity

The following environmental requirements should be proposed concerning extraction activities: Firstly, from an environmental point of view it would be desirable to use resources already being exploited, as this would prevent proliferation of extraction sites and make control and re-instatement more manageable.

If it is necessary to open new gravel extraction sites, investigations must be conducted in order to identify possible fossil deposits at a distance from active river beds. Extraction within these areas should first ensure that all re-usable surface materials are stockpiled for subsequent restoration purposes. The boundary of the extraction area should be clearly defined and, on the river side, a reserve bank should be maintained. Extraction depths would depend on the characteristics of the site and the mode of operation. Extraction of materials would be permitted below the current water table on condition that fuel oil and lubricants from the machinery do not come into contact with the water i.e. at depths of about 1 metre. Should use be made of a dragline, excavation could be made to a greater depth below the water table.

When extraction is approved from gravel bars within the existing river banks on the inside margins of meander curves, no gravel should be removed from within two metres of the upper water level at the time of extraction in order to protect the currently active river channel. The depth of material removed should not fall below the surface water level at the time of extraction and the existing river grade should be maintained. In such areas, extraction should not take place during periods of anticipated high river flows which could cause flooding during operations.

When extraction is in areas with less sensitive, shallower river flows, it might be permitted to remove gravel to the level of the existing river bed. The existing valley grade would be maintained and the operational area should be protected by a low 1 to 2 metre wide gravel bank.

In case of new-opening carrier site, the following recommendations should be implemented whatever the extraction site chosen:

- Installation of scrubbers and filters to cleanse the dust in crushing plant.
- Access must be via existing track ways and agreed with owners of the land crossed.
- In areas of natural vegetation near the river bank, care should be taken not to disturb mature trees.
- No plant or machinery should be left unattended at the extraction site overnight to minimise the possible impact caused by high flood levels. The existing flood protection bank or natural levee must be maintained.
- A decantation basin must be installed at the outlet of the crushing installation in order to trap the sediments before discharge of washing water into the watercourses.
- Vehicle access into the active river channel should not be permitted in order to minimise disturbance to the habitat and possible pollution with fuel oils and lubricants. Where access to sites is only possible by crossing the river, temporary culverts should be installed to alleviate possible pollution hazards.

- Upon completion of extraction activities, the site should be carefully levelled to form a grade consistent with that of the existing active river channel.

Where gravel extraction can be replaced by massive rock, the same requirements as for borrow pits apply to quarry rehabilitation. It should be emphasized that such extraction requires above all proper landscaping to hide the quarry or to integrate it in the overall landscape.

During quarries works execution, the contractor shall ensure: preservation of trees during piling of materials; spreading of stripped material to facilitate water percolation and allow natural vegetation growth; re-establishment of previous natural drainage flows; improvement of site appearance. When the works shall be completed, and at own expense, the contractor shall restore the environment around the worksite to its original state. The supervisor shall provide the contractor with a report confirming the restoration before acceptance of the works.

Appendix 11: Scoping Checklist

1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)?				
No.	**Questions to be considered in Scoping**	**Yes /No ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant?**
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes		Yes.
1.2	Clearance of existing land, vegetation and buildings?	Yes		Yes
1.3	Creation of new land uses?	Yes		Yes
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes		No
1.5	Construction works?	Yes		Yes
1.6	Demolition works?	Yes		No
1.7	Temporary sites used for construction works or housing of construction workers?	Yes		No
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes		Yes
1.9	Underground works including mining or tunnelling?	Yes		Yes
1.10	Reclamation works?	Yes		
1.11	Dredging?	Yes		No
1.12	Coastal structures e.g. seawalls, piers?	No		No
1.13	Offshore structures?	No		No
1.14	Production and manufacturing processes?	No		No
1.15	Facilities for storage of goods or materials?	Yes		Yes
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes		Possibly
1.17	Facilities for long term housing of operational workers?	No		No
1.18	New road, rail or sea traffic during construction or operation?	Yes		Yes
1.19	New road, rail, air, waterbome or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes		Yes
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes		Yes
1.21	New or diverted transmission lines or pipelines?	Yes		No
1.22	Impoundment, damming, culverting, realignment or	Yes		Yes

	other changes to the hydrology of watercourses or aquifers?			
1.23	Stream crossings?	Yes		Yes
1.24	Abstraction or transfers of water from ground or surface waters?	No		No
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes		No
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes		Yes
1.27	Long term dismantling or decommissioning or restoration works?	Yes		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	Yes		
1.29	Influx of people to an area in either temporarily or permanently?	Yes		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?			

2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, <u>especially any resources which are non-renewable or in short supply?</u>

No.	Questions to be considered in Scoping	Yes /No ?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.1	Land especially undeveloped or agricultural land?	Yes		No
2.2	Water?	Yes		No
2.3	Minerals?			
2.4	Aggregates?	Yes		No
2.5	Forests and timber?	Yes		No
2.6	Energy including electricity and fuels?	Yes		Yes
2.7	Any other resources?			
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes		No
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)?	No		No
3.3	Will the project affect the welfare of people e.g. by changing living conditions?	Yes		No
3.4	Are there especially vulnerable groups of people who could be affected by the project e.g. hospital	Yes		No

	patients, the elderly?			
3.5	Any other causes?			
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes		Yes
4.2	Municipal waste (household and or commercial wastes)?	Yes		No
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes		No
4.4	Other industrial process wastes?			
4.5	Surplus product?			
4.6	Sewage sludge or other sludge from effluent treatment?	Yes		No
4.7	Construction or demolition wastes?	Yes		Yes
4.8	Redundant machinery or equipment?	Yes		No
4.9	Contaminated soils or other material?	Yes		No
4.10	Agricultural wastes?	No		No
4.11	Any other solid wastes?			
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes		Yes
5.2	Emissions from production processes?	Yes		Yes
5.3	Emissions from materials handling including storage or transport?	Yes		Yes
5.4	Emissions from construction activities including plant and equipment?	Yes		Yes
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes		Yes
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (e.g. slash material, construction debris)?			
5.8	Emissions from any other sources?			
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
No.	**Questions to be considered in Scoping**	**Yes /No/ ?**	**Which Characteristics of the Environment could be affected and how?**	**Is the effect likely to be significant? Why?**
6.1	From operation of equipment (engines, crushers)?	Yes		Yes
6.2	From industrial or similar processes?	Yes		No
6.3	From construction or demolition?	Yes		Yes
6.4	From blasting or piling?	Yes		No

6.5	From construction or operational traffic?	Yes		Yes
6.6	From lighting or cooling systems?	Yes		Yes
6.7	From sources of electromagnetic radiation (effects on nearby sensitive equipment as well as people)?	No		No
6.8	From any other sources?			
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes		Yes
7.2	From discharge of sewage or other effluents (treated or untreated) to water or the land?	Yes		Yes
7.3	By deposing of pollutants emitted to air, land, water?	No		
7.4	From any other sources?			
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	Yes		Yes
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires, storage, handling, use or production of hazardous or toxic substances?	Yes		No
8.2	From events beyond normal environmental protection (failure of pollution control systems)?	Yes		No
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (floods, earthquakes,)?	Yes		No
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, social groups etc?	Yes		No
9.2	By resettlement of people or demolition of homes or communities or community facilities (schools, hospitals)?	Yes		No
9.3	Through in-migration of new residents or creation of new communities?	Yes		No
9.4	By placing increased demands on local facilities or services e.g. housing, education, health?	No		No
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes		Yes
9.6	Any other causes?			
10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment (more housing, new roads, , etc?)	Yes		Yes
10.2	Will the project lead to development of supporting	Yes		Yes

	facilities, ancillary development or development stimulated by the project which could have impact on the environment (roads, power supply, waste or waste water treatment,) housing development,?			
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	Yes		Yes
10.4	Will the project set a precedent for later developments?			
10.5	Will the project have cumulative effects due to proximity to other projects with similar effects?			

REPUBLIC OF MONTENEGRO
MINISTRY OF TRANSPORT, MARITIME AFFAIRS AND TELECOMMUNICATIONS
RIMSKI TRG 46 “VEKTRA BUILDING”
81000, PODGORICA, MONTENEGRO

CONTRACT NO. 01-3814/1 DATED 10 AUGUST 2007

FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

TECHNICAL MEMORANDA

VOLUME IV

BOOK 1

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE

PODGORICA, AUGUST, 2008

11A.	ADRIATIC-IONIAN MOTORWAY PROJECT: ANALYSIS CONDITIONS OF THE EXISTING HIGHWAY, ANNEX TO TM11, ROAD CAPACITIES	20.12.2007.
12.	ROAD ACCIDENT REDUCTION BENEFITS	20.12.2007.
13.	GENERAL TRAFFIC FORECAST	20.12.2007.
13A.	GENERAL TRAFFIC FORECAST – REVISION	22.02.2008.
14.	DRAFT REPORT TRAFFIC SURVEYS	20.12.2007.
15.	MOTORWAY BAR – BOLJARE: ANALYSIS OF THE SERBIAN DESIGN STANDARDS FOR THE BEOGRAD-SOUTH ADRIATIC MOTORWAY	20.12.2007.
16.	INFORMATION FOR THE FURTHER INPUT TO HDM-4 ANALYSIS	20.12.2007.
17.	MOTORWAY BAR – BOLJARE SECTION SMOKOVAC – UVAC, ANALYSIS OF THE DESIGN PREPARED BY THE FACULTY OF CIVIL ENGINEERING OF PODGORICA	22.02.2008.
18.	ROAD SAFETY INSPECTION (RSI): BAR-BARSKI MOST ***AVAILABLE ONLY IN MONTENEGRIAN***	22.02.2008.

TECHNICAL MEMORANDUM NO. 1

MOTORWAY BAR – TANKI RT – PODGORICA
ANALYSIS OF THE DESIGN PARAMETERS

CONTENTS

1 Road Standards

The analyzed design was prepared by the Gradjevinski Fakultet Podgorica and PUT – Engineering Podgorica from 1998 to 2000. This design was prepared as a "Trans-Evropske Magistrale TEM". However, the parameters used in the 1998 - 2000 period should now be updated so as to correspond to the latest TEM Standards and Recommended Practice, issued in 2002. (*by TEM Project Central Office, 3rd Edition, February 2002. sections 3.1 & 3.2)*

On left side of the table below there are all geometrical parameters given in the existing design report. In the right column are our comments, i.e., the comparison with TEM.

Table 1

Type	Item		Proposed value	Louis Berger Comments
General	Design Speed		100km / h	**For the Design Speed 100 km / h the following values have be used:**
	Stopping Distance		175m	too large - should be 150m
	Absolute min. Sight distance for Overtaking		320m	must be 400m
	Desirable min. Sight distance for Overtaking		none	should be 600m
Cross Section	Width of	traffic lanes	3.5m	acceptable but recommended is 3.75m
		climbing lanes	3.0m	must be 3.5m
		emergency lanes	2.5m	too large - should be 2.25m
		left edge marking line	0.35m	too large – should be 0.25m
		right edge marking line	0.20m	must be 0.25m
		central reserve	4.0 (3.0)m	both values are correct
		Shoulders	1.0m	must be 3.0m including edge marking line 0.25m, emergency lane 2.25m and gutter 0.5m
		gutters	0.75m	
		verge	none	should be 0.5m
Longitudinal Profile	Minimum horizontal radii		450m	correct
	Minimum vertical radii (convex)		10,000	correct for two ways carriageway should be only 6,000m for one way carriageway
	Minimum vertical radii (concave)		7,000	correct
	Maximum longitudinal grade		5% in the text **but 6.6% on design**	max. value must be 5%
Slip Roads	Minimum horizontal radii		30m	must be 40m
	Width of one way ramp		7.0m	correct
	Width of two ways ramp		10.7m	too large - should be 10m

It is suggested that the existing design could be revised according to the parameters given in the right hand column of Table 1 so as to correspond with current TEM Standards.

2 Choice of road type

According to the U.S. Highway Capacity Manual – HCM (*Federal Highway Administration, 2000*) definitions are given for motorways (called Freeways in the U.S.A) and Expressways. Given in table 2 below.

Table 2

Type	Definition
Motorways (EU) / **Freeways** (USA)	• **Divided highways with full control of access**; • Two or more lanes for the exclusive use of traffic in each direction with Emergency Lane (EL); • Opposing directions of flow are continuously separated by a raised barrier, an at-grade median, or a continuous raised median; • It provides uninterrupted flow; • **All interchanges must be grade-separated**; • Direct access to/from adjacent properties not permitted; and, • Facilities: to include Rest and Service Areas.
Expressways	• **Divided highways** with two or more lanes for the exclusive use of traffic in each direction; • Opposing directions of flow are continuously separated by a raised barrier, or an at-grade median, or a continuous raised median; • **The intersections could be grade-separated, or at-grade controlled by traffic lights;** • Direct access to and from adjacent properties is not permitted; and, • Facilities: to include Rest Areas.

In our view, the existing (1998-2000) designs appear to be for tolled motorways. However (as in the TOR) we are proposing to analyze the possibilities for Expressways as a lower cost solution, when justified by the traffic flows.

3 Choice of construction strategy

The consultant will analyze four scenarios of construction strategy depending on projected traffic forecasts for each section. The table below presents the solutions for two stages of construction.

Table 3

Strategy		Advantages	Disadvantages
Cross Section	**Interchanges**		
One carriageway - width 14.5m including: • 2 x 3.75m traffic lanes in both directions; • 2 x 3.0m shoulders including: ➢ 0.25m edge marking line; ➢ 2.25m emergency lane; ➢ 0.5m gutter. • 2 x 0.5m verges.	At grade	• Less cost; • Possible control access.	• **Solution would cause higher accident rates**; • One shoulder and verge shall be replaced by a central reserve on the next stage; • All Interchanges shall be constructed like grade separated.
One carriageway - width 14.5m including: • 2 x 3.75m traffic lanes in both directions; • 2 x 3.0m shoulders including: ➢ 0.25m edge marking line; ➢ 2.25m emergency lane; ➢ 0.5m gutter. • 2 x 0.5m verges.	Grade separated	• More safety; • Possible control access.	• More costly; • This solution does not improve all safety problems; • On second stage, some slip roads must be adapted to the 2nd carriageway • One shoulder and verge shall be replaced by a central reserve on the next stage.

Two carriageways – full motorway including: • 2 x 3.75m traffic lanes in both directions; • 2 x 3.0m shoulders including: ➢ 0.25m edge marking line; ➢ 2.25m emergency lane; ➢ 0.5m gutter. • 2 x 0.5m verges; • Central reserve 4.0m.	At grade	• Possible control access.	• More costly; • This solution does not improve all safety conditions – but is corresponding to the Expressway; • All Interchanges shall be constructed as if grade separated.
Two carriageways – full motorway including: • 2 x 3.75m traffic lanes in both directions; • 2 x 3.0m shoulders including: ➢ 0.25m edge marking line; ➢ 2.25m emergency lane; ➢ 0.5m gutter. • 2 x 0.5m verges; • Central reserve 4.0m.	Grade separated	• Full control access.	• **Highly costly;** • **Maximum safety**

TECHNICAL MEMORANDUM NO. 1b

MOTORWAY BAR – BOLJARE
ANALYSIS OF THE DESIGN PARAMETERS

CONTENTS

1 Road Standards

The Consultant analyzed designs prepared by the different design Offices between 1998-2006.

The table below assembles all used standards (section by section) and compares them with the TEM Standards and Recommended Practice, issued in 2002. (*by TEM Project Central Office, 3rd Edition, February 2002. sections 3.1 & 3.2)*

On left side of the table below, all geometrical parameters given in the existing design report are shown. In the right column are our comments, i.e., the comparison with TEM.

Table

Type	Item		Sections			TEM STANDARDS
			Bar - Podgorica	Podgorica - Matesevo	Andrejevica - Boljare	
General	Design Speed [km / h]		100	100	100	**For the Design Speed 100 km / h the following values are recommended by TEM[1]:**
	Stopping Distance		175m	unknown	unknown	should be 150m
	Absolute min. Sight distance for Overtaking		320m	unknown	unknown	must be 400m
	Desirable min. Sight distance for Overtaking		none	unknown	unknown	should be 600m
Cross Section	Width of	traffic lanes	3.5m	3.5m	3.5m	recommended is 3.75m
		climbing lanes	3.0m	3.0m	3.0m	must be 3.5m
		emergency lanes	2.5m	2.5m	2.5m	should be 2.25m
		left edge marking line	0.35m	0.35m	0.35m	should be 0.25m
		right edge marking line	0.20m	0.20m	0.20m	must be 0.25m
		central reserve	4.0 (3.0)m	4.0m	4.0 (3.0)m	both values are correct
		Shoulders	1.0m	1.5m	1.0m	must be 3.0m including edge marking line 0.25m, emergency lane 2.25m and gutter 0.5m
		gutters	0.75m	1.0m	0.75m	
		verge	none	0.75m	unknown	should be 0.5m
Plan	Minimum horizontal radii		450m	600m	450m	450m
Longitudinal Profile	Minimum radii (convex)		10,000	10,000	unknown	correct for 2 - way carriageway should be only 6,000m for 1 - way carriageway
	Minimum radii (concave)		7,000	6,700	unknown	Vertical acceleration must be no more than $0.25 m/s^2$
	Maximum longitudinal grade		6.6%	4% - 5%	7%	max. value must be 5%
Slip Roads	Minimum horizontal radii		30m	unknown	unknown	must be 40m
	Width of one way ramp		7.0m	unknown	unknown	correct
	Width of two ways ramp		10.7m	unknown	unknown	should be 10m

[1] TEM Chapter 3.1 & 3.2

2 Summary

The Consultant strongly recommends application of current TEM Standards for the new designs. At the same time, the already existing design should be improved to TEM Standards, which would naturally be followed through the main design stage.

The TEM Standards are used in most countries of Central Europe and Balkans for the design of new motorways. Although there are no European corridors currently nominated in Montenegro, thus situation could change in the foreseeable future.

TECHNICAL MEMORANDUM No. 1c

MOTORWAY BAR – BOLJARE
ANALYSIS OF THE DESIGN PARAMETERS

CONTENTS

1 Introduction

This current version (1-c) of the previous Technical Memorandum (1-b) has been extensively revised as result of various discussions with the Client, and specifically in relation to the need to explain in a more general way the essential purpose of road standards, and why the Consultant recommends that the TEM 2002 standards for motorways should be adopted in Montenegro as the basis for design of the Bar-Boljare highway project. It should however be emphasized that the adoption of TEM 2002 standards as a future basis for motorway or expressway design and planning, does not mean that in every road project and for every single section the geometric and other design standards must be adhered to rigidly and automatically[1]. Indeed, TEM 2002 itself recognizes that flexibility in the application of standards is often necessary in practice. The TEM 2002 provides two sets of guidelines, as:

- Standards (S) and,
- Recommended Practice (RP)

The essential and basic purpose of the TEM standards and recommended practices is to enable road users in Europe to experience a safe and comfortable journey. Like the US Highway Capacity Manual (HCM) TEM standards are linked to *levels of service* (LOS) which means that in practice, standards may vary depending on actual and forecast traffic volumes in different regions. The primary role of the standards is to ensure that planning and design of an international motorway should provide for adequate traffic flow at minimum operating costs (both user costs and road agency costs) – while ensuring harmonized driving conditions for users, and proper levels of service, with safety, sufficient speed, and comfort for vehicle occupants over medium and long distances.

Within the development of the UNECE (United nations Economic Commission for Europe) TEM project, the nations of Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Italy, Lithuania, Poland, Slovakia, and Turkey are all participating fully, while at present both Serbia and Montenegro have 'observer' status.

[1] We would further note that although (referring to English usage) the word 'standard' can imply a "rule" the word also has the meaning of 'normal' or 'prevailing opinion' or 'customary' or 'benchmark'. This is noted only to again underline the fact that the standards are actually the 'ideals' or 'best practice' and in actual detailed designs some may require modification depending on the circumstances.

2 Current Road Standards

The Consultant analyzed designs prepared by the different design Offices between 1998-2006. The table below assembles all used standards (section by section) and compares them with the TEM Standards and Recommended Practice, issued in 2002.[2]

The TEM Standards & Recommended Practice report (3rd Edition 2002) is a compilation of a number of national road standards, elaborated in the 1990s with the primary objective to establish common motorway standards for the whole of Europe. TEM assembled the results of long European practice in road safety and improvement of drivers comfort.

These standards were elaborated under technical guidance provided by the countries participating in the Trans-European North-South Motorway Project (TEM) and were adopted by the Steering Committee of the Project. They are based on the original TEM Standards of January 1981 and on their first revision of July 1992. This second revision was accomplished by the working group made up of the representatives of most of the TEM countries. In the course of this revision the Consolidated text of the European Agreement on Main International Traffic Arteries (AGR) as revised by Amendments 1 to 7, the 1997 update of the Highway Capacity Manual (US Transportation Research Board Special Report 209) and the present state of European standardization (CEN/TC's 226 and 227) were (*inter alia*) taken into account.

The role of these standards is to ensure that the planning and design of the TEM motorway provide for the adequate traffic flow at minimum operating cost, while ensuring harmonized conditions for motorway users, proper level of service, safety, speed and driver comfort over medium and long distances.

Specific provisions were formulated in accordance with the following sub paragraphs:-

a) Essential and uniform throughout the whole length of the TEM. Countries would make every effort within reason to comply with these standards as a minimum (S);

b) Recommended practice (RP);

c) Although their primary application will be to the Trans-European North-South Motorway, these standards are at disposal to other United Nations countries which find them beneficial for the formulation or updating of their national standards.

General Characteristics of TEM are the following:

The TEM is classified as „motorway"

These standards, therefore, refer to a highway which (S):

1) is specially designed and built for motor traffic and does not serve properties bordering on it;

2) is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip (central reserve) not intended for traffic or, exceptionally, by other means;

3) does not cross at level with any road, railway or tramway track, or footpath; and

[2] by TEM Project Central Office, 3rd Edition, February 2002 (United Nations Economic Commission for Europe, UNECE)

4) is specially sign-posted as a motorway.

In addition to that, TEM highway shall:

(a) be provided with hard shoulders of adequate width, on which no other than emergency stopping is allowed (S);

(b) have a sufficient distance between the interchanges (RP); and,

(c) be provided with its own police and maintenance services (RP).

The TEM is a very flexible tool for motorway design. Below and on the next page you could read some principal rules from TEM. Numbers on the left side correspond to the TEM paragraphs.

1.2.1.1 In relation to the forecast traffic demand, each section of the TEM should at all times in its design lifetime function within the pre-established level of service "' (cf- Chapter 2) (RP)

1.2.1.2 This can be achieved basically in two ways:

(a) by immediately constructing the motorway with the general characteristics as defined in Section 1-1 and with a capacity such as to guarantee the pre-established level of service (RP). In this case each carriageway - being one-way - will have, among other characteristics, a minimum of two traffic lanes;

(b) by providing for an initial construction stage and for subsequent expansion stages in line with the expected growth in traffic demand, in such a way that the level of service offered to the user never falls below the pre-established level. The initial construction stage should guarantee the pre-established level of service for the traffic volumes forecast in the first 10 years of motorway operations.

1.2.1.3 Sections built in accordance with paragraph 1.2.1.2 (a) must be designed in conformity with these standards and must at all times correspond to the definition of the TEM as given in Section 1.1 (S).

1.2.1.4 Sections built in accordance with paragraph 1 (b) above are considered as provisional, and hence may not always and completely correspond to the TEM definition as given in Section 1.1

1.2.2.1 Construction in successive stages (phased construction) should be carried out in such a way that each stage is in harmony with the subsequent one, thereby reducing to a minimum any adjustment works (RP). 1.2.2.4 In the initial construction stage, the section shall have certain characteristics which are considered as important and proper to the definition itself:

(a) full control of access (S);

(b) hard shoulders or, in exceptional cases, lay-bys spaced at appropriate intervals (S);

(c) climbing lanes in cases where the conditions described in Chapter 2 occur (S);

(d) complete side fencing of the motorway (RP);

(e) horizontal and vertical motorway-type road signs and markings (S);

(f) service facilities provided in proportion to the volume of traffic (RP);

(g) suitable services to guarantee maintenance of the motorway, its structures and facilities (S); and

(h) cross fall corresponding to the future full profile of the motorway (S).

1.2.2.5 It should be noted that complete control of access can be maintained by means of the following:

(a) grade separation with interchanges;

(b) grade separation without interchanges;

(c) deviation of intersecting roads.

1.2.2.9.2Reduced cross section could be applied for the design speed of 80 km/h for possible use in difficult terrain.

1.2.2.9.3 This reduced cross section would show a minimum width of the central reserve of 3.00 m where no hard obstacles are present, and 3.50 m where isolated hard obstacles occur on the central reserve.

2.2.2.5.1 Lateral obstacles can result in vehicle slowdown for psychological reasons, and thus bring about a reduction in the level of service.

2.2.2.5.2 This phenomenon can be overcome by leaving at least 3.00 m of the shoulder free of any obstacles- Where safety fences are necessary, these should be located outside the shoulders (RP).

3.1.1.1 The design speed is the speed which determines the layout of a new road, both in plan and in cross section, being the maximum safe speed for which the road is designed (S).

3.1.1.2 Possible design and construction in successive stages will have no influence upon the selection of the final design speed, but may influence the determination of the most restrictive geometric characteristics adopted in the first stage.

3.1.1.3 The motorway should have similar geometric characteristics over sufficiently long sections (RP).

3.1.1.4 Possible variations in the geometric characteristics should occur only at points acceptable to the user (for example, in passing from urban to extra-urban zones, or where the morphology of the terrain crossed undergoes change) (RP).

3.1.1.5 If this is not possible, the variation in the geometric characteristics should occur gradually (RP).

3.1.1.6 Horizontal and vertical alignment should be such that the user notices no unjustified breaks in continuity, and is given timely warning of the critical points along the route, especially in the vicinity of interchanges, so that he can execute the necessary manoeuvres (RP)).

3.1.1.7 In order to achieve a smooth alignment, it is suggested to observe the following recommendations (RP):

(a) avoid the use of very long straights;

(b) try to maintain conformity, where possible, between the horizontal and vertical alignments;

(c) insert, between two horizontal circular curves, connecting curves of variable radius (transition curves).

3.1.2.1 In general, the design speed along the whole length of the TEM is 120 km/h (S).

3.1.2.2 It is, however, possible to adopt a lower design speed on particular sections with difficult topography. Design speeds of 100 km/h or even 80 km/h will thus be acceptable where justified by economic and technical considerations (RP).

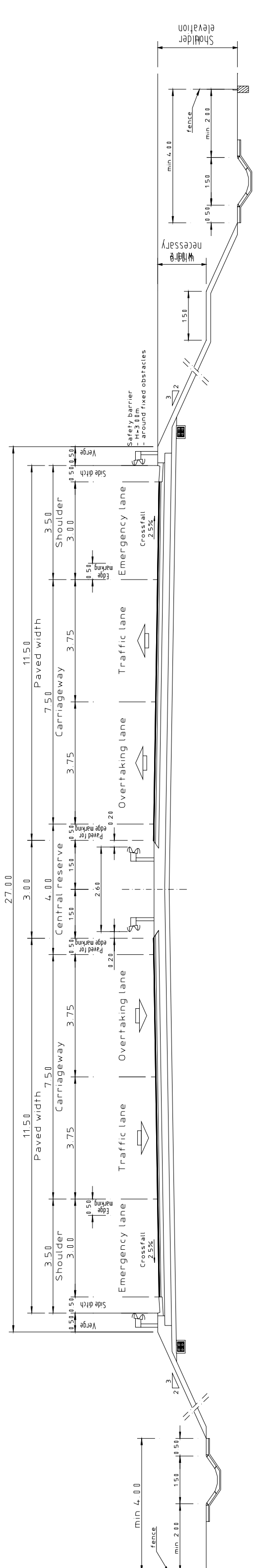
3.1.3.1 No reduction at all in the design speed of the motorway should be allowed at interchanges and tunnels (RP).

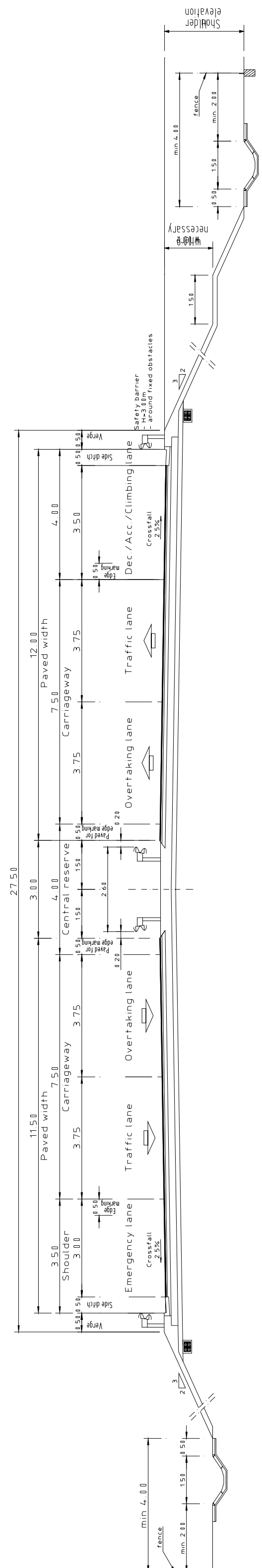
3.1.2.2 Only in cases where this might be justifiable by technical and economic reasons, will it be possible to adopt lower design speed within tunnels- A reduction of no more than 25% would be accepted, and in no case may the speed drop below 80 km/h (S).

On left side of the table on the next page, geometrical parameters given in the existing design report are shown. In the right column are our comments, i.e., the comparison with TEM.

Type	Item		Sections			TEM STANDARDS
			Bar - Podgorica	Podgorica - Matosevo	Andrejevica - Boljare	
General	Design Speed [km / h]		100	100	100	**For Design Speed 100 km/h the following values are recommended by TEM:**
	Stopping Distance		175m	unknown	unknown	should be 150m
	Absolute min. Sight distance for Overtaking		320m	unknown	unknown	must be 400m
	Desirable min. Sight distance for Overtaking		none	unknown	unknown	should be 600m
Cross Section	Width of	traffic lanes	3.5m	3.5m	3.5m	recommended is 3.75m ***According to the chapter 1.2.2.9.2 of TEM it could be reduced to 3.5m***
		climbing lanes	3.0m	3.0m	3.0m	must be 3.5m ***TEM stipulates this value because in the future a motorway should be widened to three lanes***.
		emergency lanes	2.5m	2.5m	2.5m	should be 2.25m ***See sketches on the next page.***
		left edge marking line	0.35m	0.35m	0.35m	should be 0.25m
		right edge marking line	0.20m	0.20m	0.20m	must be 0.25m
		central reserve	4.0 (3.0)m	4.0m	4.0 (3.0)m	both values are correct
		Shoulders	1.0m	1.5m	1.0m	must be 3.0m including edge marking line 0.25m, emergency lane 2.25m and gutter 0.5m
		gutters	0.75m	1.0m	0.75m	
		verge	none	0.75m	unknown	should be 0.5m
Plan	Minimum horizontal radii		450m	600m	450m	450m
Longitudinal Profile	Minimum radii (convex)		10,000	10,000	unknown	correct for 2 - way carriageway should be only 6,000m for 1 - way carriageway
	Minimum radii (concave)		7,000	6,700	unknown	Vertical acceleration must be no more than 0.25m/s2
	Maximum longitudinal grade		6.6%	4% - 5%	7%	max. value must be 5% If the design speed is 80km/h the max. value can be 6%
Slip Roads	Minimum horizontal radii		30m	unknown	unknown	must be 40m
	Width of one way ramp		7.0m	unknown	unknown	correct
	Width of two ways ramp		10.7m	unknown	unknown	should be 10m

Sketches on the next page show typical motorway cross section according to TEM for design speed 100km/h. On the first sketch there are two lanes and an emergency lane and on the second two lanes with additional lane (acceleration or deceleration or climbing).


Shoulder elevation
Verge
Side ditch
Shoulder
Emergency lane
Traffic lane
Overtaking lane
Carriageway
Paved width
Central reserve
27.00
11.50
3.50
3.00
7.50
3.75
4.00
Crossfall 2.5%


Shoulder elevation
Verge
Side ditch
Dec./Acc./Climbing lane
Traffic lane
Overtaking lane
Carriageway
Paved width
Central reserve
Shoulder
Emergency lane
27.50
12.00
11.50
4.00
3.50
3.00
7.50
3.75
Crossfall 2.5%

3 Summary

The Consultant recommends application of current TEM Standards for the new designs.

At the same time, the already existing design should be improved to TEM Standards, which would naturally be followed through the main design stage.

After checking the existing designs for the motorway Bar – Boljare it seems that designs do not need to be changed for motorway horizontal alignments. Only some curve radii of slip roads should be increased from 30m to 40m. Vertical alignments of so called “Variant 1” are corresponding to the TEM standards.

The TEM gives to designers a possibility (as with former Yugoslavian Standards) to divide a motorway on different sections according to terrain configuration. Each section could have different design speed from 100km/h to 80km/h. This flexibility permits reduced design parameters where needed with the objective to minimize the cost of investment.

At present the TEM Standards are used in most countries of Central Europe and Balkans for the design of new motorways. For example the Corridor TEN Vc (Trans-European Network) from Hungary to Ploce via Sarajevo, and also TEN VIIc from Budapest to Istanbul were designed using TEM standards.

Although there are no European corridors currently nominated in Montenegro, this situation could easily change in the foreseeable future.

The complete report on the TEM standards (a PDF document) can be obtained from the Consultants upon request, along with other UNECE/TEM reports of relevance.

TECHNICAL MEMORANDUM NO. 2

POPULATION FORECASTS BY MUNICIPALITY

CONTENTS

1 Population forecasts by municipality

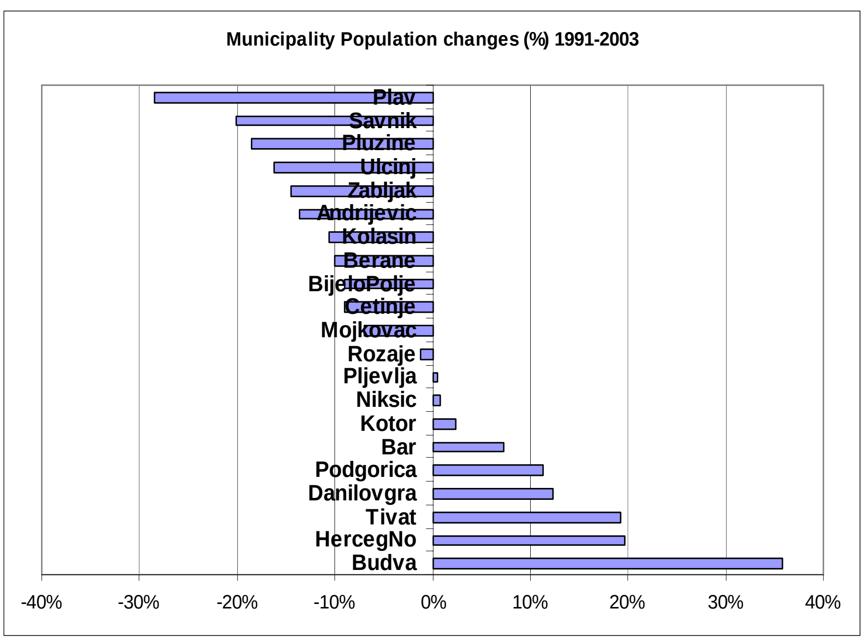
In the traffic studies, the municipalities (and boundaries) are utilized as traffic zones for the purpose of the origin-destination (O-D) base-year matrix, and hence the modeled traffic volumes on the corridor roads in the future. Predictions for the traffic O-D matrices in future years will be based principally on population and other municipality level data such as incomes and car ownership levels, etc. Data for population by municipality and changes over the period 1948–2003 were obtained from MONSTAT. Summary data for each census in the period since 1948 are shown in the table below.

Table 1: Population data, 1948-2003

Census year	Population	Average annual growth (%)
1948	377,189	
1953	419,873	2.17%
1961	471,894	1.47%
1971	529,604	1.16%
1981	584,310	0.99%
1991	615,035	0.51%
2003	620,145	0.07%

Although the total population has remained relatively stable since 1991, growing overall only by a small number, during the 1980s and 1990s there were significant population changes within the municipalities, as shown in the chart below.

Figure 1



As shown in the chart above, from 1991 to 2003 Budva, HercegNovi, Tivat, Danilovgrad, and Podgorica all grew by more than 10 percent; Kolasin, Andrijevica, Zabljak, Ulcinj, Pluzine, Savnik and Plav, all declined in population by more than 10 percent.

The diagram-map below plots population gainers (green cells) and losers (red) and shows that the trend in the period 1991-2003 was loss of population in nine municipalities in the northern half of the country, and significant increases in six municipalities in the south, in particular along the Adriatic coast, and in or near Podgorica.

Figure 2: Diagram-map of population gains and losses 1991-2003

	Pluzine 19%		Pljevlja			
		Zabljak 14%		**BijeloPolje 9%**		
		Savnik 20%	**Mojkovac 7%**			Rozaje
			Kolasin 11%		**Berane 10%**	
					Andrijevica 14%	
	Niksic					**Plav 29%**
		Danilovgrad 12% +				
Kotor			**Podgorica 11% +**			
Herceg Novi 20% +		**Cetinje 9%**				
	Tivat 19% +					
		Budva 36% +		**Bar 7% +**	**Ulcinj 16%**	

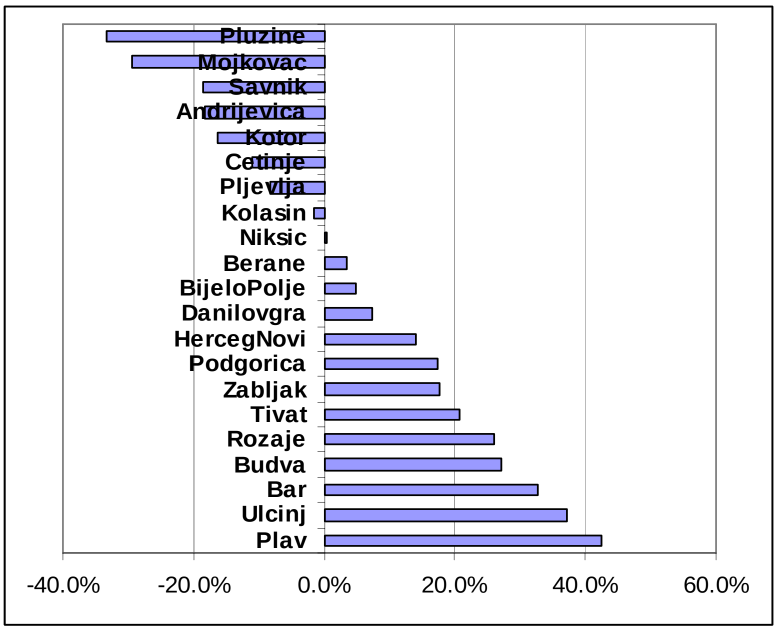
Notes:

The red municipalities (names underlined) lost 25,395 and the green zones gained 33,462 in population (net change = 8,067) in the period, and the countrywide net change in population was plus 5,110. In the white cells (Niksic, Kotor, Rozaje, Pljevlja) net population changes 1991-2003 were much smaller, less than 2 percent.

2 Official population growth forecasts

The Government 'Physical Plan' document of 2004 (Table 16) makes forecasts by municipality for the year 2021. In contrast to the very slow growth of the 1991-2003 intercensal period (see Table 1) the Plan assumes that from 2003 to 2021 the overall annual growth rate will increase to an average 0.55 percent. However, the Plan also forecasts that trends in individual municipalities will vary (with gainers and losers) in a rather similar way as in 1991-2003. The Physical Plan forecast trends for municipalities are shown in the chart below.

Figure 3: Physical Plan forecast population trends 2003-2021



The table below gives the Physical Plan forecast population totals by municipality, for year 2021.

Table 2: Populations in year 2021

Andrijevica	4,720
Bar	53,170
Berane	36,310
BijeloPolje	52,750
Budva	20,210
Danilovgrad	17,750
Zabljak	4,950
Kolasin	9,800
Kotor	19,180
Mojkovac	7,100
Niksic	75,530
Plav	19,680
Pluzine	2,850
Pljevlja	32,880
Podgorica	198,710
Rozaje	28,590
Tivat	16,440
Ulcinj	27,850
HercegNovi	37,670
Cetinje	16,450
Savnik	2,400
Montenegro	684,990

3 Zonal forecasts for Study purposes

The Physical Plan forecasts and trends up to year 2021 are adopted in this study for the future zonal population estimates. The study estimates are made in five year intervals from year 2007 which is used as the 'base year' for traffic forecasting purposes. However, after year 2022 overall annual growth for the country is assumed to slow slightly - from the Plan forecast of 0.55% up to 2021 - to 0.35% per year. It is also assumed that, after 2022, the municipality totals will grow in unison. The country-wide totals for the zonal forecast years from 2007 to 2037 are given below, and the following table – Table4 - shows the forecast totals by municipality or traffic zone.

Table 3: Country population 2007-2037

2007	632,860
2012	650,070
2017	668,830
2022	689,180
2027	701,300
2032	713,660
2037	726,260

Table 4: Zonal population forecasts 2007 - 2037

Bar	42,640	46,140	49,920	54,010	54,960	55,930	56,920
Berane	35,340	35,680	36,030	36,380	37,020	37,670	38,330
BijeloPolje	50,820	51,500	52,190	52,890	53,820	54,770	55,740
Budva	16,780	17,930	19,160	20,480	20,840	21,210	21,580
Danilovgrad	16,790	17,130	17,470	17,820	18,130	18,450	18,780
Zabljak	4,360	4,560	4,770	5,000	5,090	5,180	5,270
Kolasin	9,920	9,870	9,830	9,790	9,960	10,140	10,320
Kotor	22,050	20,980	19,960	18,990	19,320	19,660	20,010
Mojkovac	9,310	8,450	7,670	6,960	7,080	7,200	7,330
Niksic	75,340	75,410	75,470	75,540	76,870	78,220	79,600
Plav	14,940	16,480	18,190	20,070	20,420	20,780	21,150
Pluzine	3,900	3,490	3,120	2,790	2,840	2,890	2,940
Pljevlja	35,130	34,310	33,510	32,720	33,300	33,890	34,490
Podgorica	175,300	183,330	191,720	200,500	204,030	207,630	211,290
Rozaje	23,890	25,470	27,160	28,960	29,470	29,990	30,520
Tivat	14,210	14,970	15,770	16,610	16,900	17,200	17,500
Ulcinj	21,770	23,770	25,960	28,340	28,840	29,350	29,870
HercegNovi	34,010	35,280	36,590	37,950	38,620	39,300	39,990
Cetinje	18,010	17,440	16,880	16,340	16,630	16,920	17,220
Savnik	2,820	2,660	2,510	2,370	2,410	2,450	2,490
Country totals	632,860	650,080	668,820	689,180	701,300	713,660	726,260

TECHNICAL MEMORANDUM NO. 3

TRAFFIC ANALYSIS AND FORECASTS

CONTENTS

1 Historical Data on Traffic in Montenegro

Traffic counting along the main and regional network of Montenegro is conducted by the Crnagoraput AD Company. By 2001 the traffic counting was conducted with automatic counters, while one-day manual "pilot" counting have been conducted once a year in October. After 2001, following the damage of automatic counters due to bad maintenance, the traffic counting was continued on the basis of one-day "pilot" counting. For the purpose of analysis, available are data by sections calculated on AADT for 2000, 2001, 2002, 2005 and 2006. Traffic counting was also conducted in 2007 and data processing is ongoing, so these data can also be used for the purpose of analysis.

2 Strategic Plan for Road Infrastructure Maintenance and Development

Within the preparation of a Feasibility Study for the Ministry of Maritime Affairs and Transport, the BCEOM-COWI consultants prepared the "Strategic plan for maintenance and development of road infrastructure" in 2002-2003, in which the overall network of main and regional roads in Montenegro was included (see chapters 3 and 4). Interviews and traffic counting were conducted at 12 RSI stations, base-year transport model was defined and forecasts by time horizons by 2025 were created. There were three growth scenarios: optimistic, pessimistic and most likely. All analysis was conducted at the level of municipalities and trip matrices have been made for 35 zones (21 inside and 14 outside zones). Since alignments of proposed new highways were not defined at the time, the prognosis options of network development by 2025 were not evaluated assuming existence of new highways. Thus, the recommendations of this "Strategic Plan" concerned only maintenance and reconstruction of sections of the existing road network.

3 Traffic Database Updating

3.1 Traffic Counting

The traffic counting took place over 7 days including days when RSI interviews of vehicle drivers were conducted. The counting was conducted at 16 RSI stations along the corridors of future highways mostly at the same places where Crnagoraput Company conducts "pilot" counting every year, so it is possible to make data control and compare.

The counting was conducted every day in the period from 7.00 to 19.00h (12 hours). Only on those days when the RSI interview was also conducted at the same RSI station, the traffic counting was conducted in the period from 00.00 to 24.00 at that station (24 hours). This was necessary for the later expansion of data and obtaining the total AADT (Average Annual Daily Traffic) at each RSI station.

3.2 RSI Interviews of Vehicle Drivers (O-D Survey)

RSI Interviews were conducted at 16 selected locations over one day period from 7.00 to 19.00h. For the easier control, RSI stations were arranged into three groups so the survey took place over three days (one day for each group of stations). RSI interviews took place over three days (Wednesday trough Friday). Detailed explanation of survey datasheet and methodology are given in "Terms of Reference for Survey Conducting".

From this survey data, data on Origin and Destination of interviewed drivers are obtained, so as on the purpose of his/her trip. The sample proportion of interviewed drivers in comparison to counted vehicles at the station was 20/25%.

3.3 RSI Interviews of Vehicle Drivers (Stated Preference Survey)

This survey took place at the same stations where O-D survey were conducted, only the sample proportion for this survey was 4-5% from the total number of vehicles at the station, i.e. around 20% of interviewed drivers in the O-D Survey.

The main task of this survey is to determine the feeling of interviewers concerning the value of time which is the result of reducing the travel time in comparison to the value he/she would pay for the reduction. Detailed explanation of survey datasheet and methodology are given in the "Terms of Reference for Survey Conducting".

4 Methodology of data processing and traffic analysis

4.1 Traffic count data processing

Tables in EXCEL format are created for each RSI station by counting days and hours and vehicle categories, for both directions. These data will form the "traffic flow picture" of counted section network with daily and weekly variations. From the difference between seven-day 12-hour counting and 24-hour counting on the days of interviews, the expansion of counting results to 24 hours will be made and also the AADT will be evaluated. The comparison with all counting surveys conducted by Crnagoraput AD Company along overall road network will be made. Also, the AADT will be evaluated for the base year 2007. for all sections of main and regional roads. These data will be used later for calibration of "assignment model" of base year network.

4.2 O-D survey data processing

After the survey is completed, all material (datasheets) will be arranged by stations, hours and vehicle directions. After that, coding of places of Origin and Destination is done, and the numbers of zones are inserted.

Legal system of Montenegro is formed at the level of municipalities. There are 21 municipalities, so the internal zone system includes 21 zones. Numbers of internal zones are adopted on the same principal as in the "Strategic Plan for Maintenance and Development of Road Infrastructure" made by BCEOM in 2002-2003, hence it is possible to make the comparison of results in both creating the trip base-year matrix and in creating and ranking the forecast options by years.

The table below shows municipalities numbered as traffic zones and number of residents in the municipality and the central (urban) settlement, together with the urban percentage of total population.

Table 1: Zone populations & urban percentage in 2003

	Municipality	Total	Urban	Urban (%)
1	Andrijevica	5,785	1,073	18.5%
2	Bar	40,037	13,719	34.3%
3	Berane	35,068	11,776	33.6%
4	Bijelo Polje	50,284	15,883	31.6%
5	Budva	15,909	10,918	68.6%
6	Cetinje	18,482	15,137	81.9%
7	Danilovgrad	16,523	5,208	31.5%
8	Herceg Novi	33034	12,739	38.6%
9	Kolašin	9,949	2,989	30.0%
10	Kotor	22,947	1,331	5.8%
11	Mojkovac	10,066	4,120	40.9%
12	Nikšić	75,282	58,212	77.3%
13	Plav	13,805	3,615	26.2%
14	Pljevlja	35,806	21,377	59.7%
15	Plužine	4,272	1,494	35.0%
16	Podgorica	169,132	136,473	80.7%
17	Rožaje	22,693	9,121	40.2%
18	Šavnik	2,947	570	19.3%
19	Tivat	13,630	9,467	69.5%
20	Ulcinj	20,290	10,828	53.4%
21	Žabljak	4,204	1,937	46.1%
Montenegro		**620,145**	**347,987**	**56.1%**

In addition to the internal zonal system, the system of external zones was adopted, as shown in the table below.

Table 2: Definition of external zones

Zone no.	Description
22	Croatia
23	Bosnia and Herzegovina
24	Serbia 1 (excl. Kosovo and Metohija)
25	Serbia 2 (Kosovo and Metohija)
26	Albania
27	Slovenia
28	Bulgaria and Romania
29	Macedonia
30	Rest of Europe and all other countries

Thus, all trip matrices derived from the survey data will be formatted in MS Excel and expanded to 30 zones: by RSI stations, (for passenger vehicles for 4 travel purposes and in total, and for trucks and buses only the matrix of total trips), so as total for the whole territory of Montenegro.

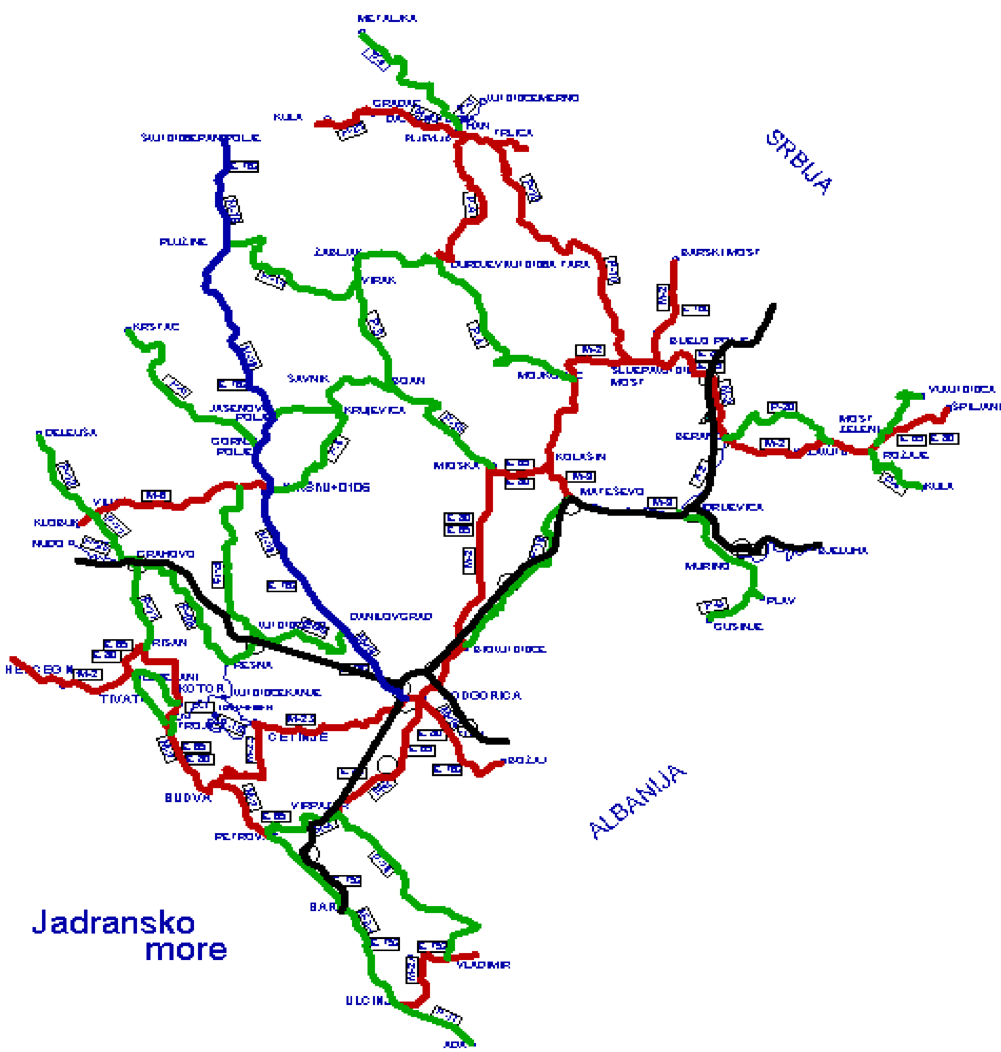
5 Creation of Transport Model of Montenegro

5.1 Road Network Creation

For the purpose of base-year analysis, the existing network state divided into two road categories (main and regional) is used as the road network within the Transport Model. The Crnagoraput AD Company is in charge of maintenance of both.

The network of Spatial Plan of Montenegro which is divided into four categories (highways, express roads, main and regional roads) is formed for the forecast periods.

The map below shows categorized network from the Spatial Plan which will be used for the forecast transport model.



In the Transport Model the map will be geo-referenced so the distances could be calculated directly. Since there is no updated "Road Network Inventory" in Montenegro, the starting speeds on certain road categories so as the road width (from which the capacity of the existing network will be evaluated as well) in the Transport Model will be used from the "Strategic Plan for Road Infrastructure Maintenance and Development".

Centers of both internal and external zones will be connected with nodes along the network, so it will be possible to calculate the minimum travel time and minimum zone distances. Several network options will be used in the Transport Model analysis (from the existing network without investments to fully created network of the Spatial Plan with both highways), depending on adopted realization dynamics.

5.2 Trip Matrices Creation

Matrices which were in the primary processing created at the level of 30 zones for each RSI station for 12 hours of interview will be expanded to 24 hours on the basis of 12-hour and 24-hour of counting and percentage of interviewed drivers. The sum of all RSI stations (by purposes and total) gives the picture of total trip matrices "O-D" over the whole territory of Montenegro.

These matrices are inserted into the Transport Model where the base-year network is already prepared and "section traffic flow" i.e. "traffic flow of network from the model" in the base year by all categories.

After traffic count data for each network section are also inserted (harmonized count data done by Louis Berger and Crnagoraput in 2007), the process of calibration is done, as soon as data from the section traffic flow approximate the data from counting. When creation of "traffic flow picture" of base-year network is completed, the process of traffic forecasts by link will follow.

5.3 Traffic Forecast

Evaluation of forecast factors and annual growth rates of traffic for each zone will be done by team members using data on population growth, employment, income and level of vehicle ownership, so as comparable data from the neighboring countries.

It will probably be unnecessary to create models such as 'trip generation' and 'trip distribution' models. The forecasts will be made on the basis of expected growth rates of traffic to and from each O-D zone, for selected forecast years, i.e., 2012, 2017, etc. (for example, see Technical Memorandum No.2 on population forecasts.)

With harmonized growth rates, for each forecast year the trip matrices will be multiplied for the defined road network for that period in the Transport Model (using adopted realization dynamics) to form a traffic flow picture for each section by vehicle category. The results of these analyses will be expressed for the two highway corridors in this study, and traffic forecasts used in the next phase of economic analysis using the HDM-4 model.

TECHNICAL MEMORANDUM NO. 4

MACRO-ECONOMIC FORECASTS & VEHICLE FLEET GROWTH

CONTENTS

1 Forecast of GDP per-capita growth

Although there are some minor discrepancies depending on data source (i.e., Monstat, IMF, or World Bank) it is clear that the Montenegro economy as a whole, and per-capita income, has grown rapidly in the last few years. The average income - GDP per capita - has grown by a total of nearly 20 percent from 2000 to 2006, or about 3.0 percent per year in real terms, i.e., net of inflation. Government fiscal policies have radically reduced inflation since 2001, unemployment (although still high at around 15%) has declined, and during the period foreign direct investment increased rapidly, in fact well beyond expectations. The positive trends are expected to continue, indeed even accelerating for the medium term, until around 2012. Beyond five years from now the outlook is of course rather uncertain, and most analysts would forecast more conservative, lower, growth rates based on that uncertainty[1] factor.

Since 2003 the economies of countries in the region have grown strongly, as shown in the table below. The year-on-year percentages are for total GDP and for Montenegro, if population growth was included, would be slightly lower in GDP per capita terms.

Table 1: Growth rates of real GDP totals in Montenegro and regional economies 2003-2008

	-2003	2004	2005	2006	2007	2008
Serbia	2.5%	8.4%	6.2%	5.7%	6.0%	5.0%
Bosnia & Herzegovina	3.5%	6.1%	5.0%	6.0%	5.8%	6.5%
Croatia	5.3%	4.3%	4.3%	4.8%	5.6%	4.7%
Albania	5.7%	5.9%	5.5%	5.0%	6.0%	6.0%
Greece	4.9%	4.7%	3.7%	4.3%	3.9%	3.6%
Macedonia FYR	2.8%	4.1%	4.1%	3.0%	5.0%	5.0%
Romania	5.2%	8.5%	4.1%	7.7%	6.3%	6.0%
Slovenia	2.8%	4.4%	4.1%	5.7%	5.4%	3.8%
Montenegro	1.5%	3.7%	4.1%	6.5%	7.0%	6.0%

Source: IMF estimates 2007 (website).

For 2007 to 2012, the main premises for the continuing upward trend in GDP growth are that: i) the tourist industry continues to grow rapidly as in recent years, and its price competitiveness within the region will improve; and: ii) that world aluminium prices will remain stable; and: iii) the government continues forward with legal and other reforms to strengthen the market-based economy and to improve flexibility in the labour market.

In Europe, recent forecasts (November 2007) suggest that economic growth across the EU will slow in 2008 because of a weaker US economy and problems in global financial markets. The European Commission is now forecasting 2.4% growth annually in the 27-member union in both 2008 and 2009, compared to 2.7% this year. In the 13-member eurozone, annual growth is expected to slow to 2.2% next year, down from the 2.6% projected for 2007. There is therefore the risk that growth in Montenegro could be slowed a little by these external factors. GDP per capita forecasts are given below for two scenarios: the standard or 'most likely' forecast, and a lower growth or "pessimistic"

[1] Uncertainty always increases the more distant into the future one looks.

forecast, intended primarily for sensitivity testing. The forecast is given in percentage annual increases for five-year periods starting in 2007, through to year 2037 which is the expected final year of economic analysis.

Table 2: GDP per-capita growth forecast to 2037

			GDP/capita annual growth %	
Period from - to			Standard	Low growth
2007	-	2012	4.0%	2.50%
2012	-	2017	3.0%	2.00%
2017	-	2022	2.5%	2.00%
2022	-	2027	2.0%	1.50%
2027	-	2032	2.0%	1.00%
2032	-	2037	2.0%	1.00%

Thus for the ten, 20, and 30 year horizon years, total growth of GDP per capita compared to year 2007 is forecast as shown below.

GDP per capita increases cp. 2007

Year	Standard	Lower growth
2017	41%	25%
2027	76%	49%
2037	115%	64%

By year 2027 in the standard 'most likely' forecast scenario, average personal incomes in Montenegro will increase by 76 percent, and in the lower growth scenario, by 49 percent. With the standard forecast per-capita income is expected to attain approximately €6,000 per year by year 2037, or about € 4,600 per year under the low growth scenario, as shown below.

Income per capita forecasts

	Income per capita	
Year	Standard growth	Low growth
2007	€ 2,800	€ 2,800
2017	€ 3,949	€ 3,498
2027	€ 4,933	€ 4,160
2037	€ 6,014	€ 4,595

Based on these forecasts, the growth of motor vehicle fleets by municipality is analyzed in the next sections.

2 Motor vehicle fleets by municipality, 2006-2007

The geographical disposition of the national motor vehicle fleet and vehicle ownership rates (vehicles/1000 population) will be used in the traffic modelling process and therefore the current situation is examined and forecasts made by municipality (traffic zone) for the future. The map-diagram below shows totals of registered vehicles (in 000s) by municipality (or traffic zone) for 2006/2007.

Figure 1: Map-diagram of vehicles (000s) by municipality (2007)

Pluzine --		Pljevlja 9.3			
	Zabljak 1.0		BijeloPolje 13.1		
	Savnik --	Mojkovac 1.9			Rozaje 4.8
		Kolasin 1.6		Berane 6.8	
				Andrijevica 1.6	
Niksic 19.0					Plav 2.1
		Danilovgrad 4.3			
Kotor 8.7			Podgorica 61.2		
Herceg Novi 12.5		Cetinje 2.4			
	Tivat 4.9				
		Budva 4.9	Bar 6.2	Ulcinj 6.8	

Of the total current fleet of approximately 177,000 vehicles, 76 percent, or 135,370, are registered in the ten southernmost municipalities (blue cells) of the country. At present, the 11 northern municipalities (yellow cells) account for only about 24 percent (some 35,000) of the national vehicle fleet. As shown, in Pluzine and Savnik there are no registrations, but these are believed to be included in the adjacent municipality of Zabljak.

The table below gives vehicle registration totals for 2007, municipality populations (2003 census) and vehicle ownership per 1,000 population for each municipality. There are wide variations in ownership, from 385 per 1,000 in Podgorica to as low as 155 per 1,000 in Kolasin and Plav; and, curiously, in Bar, where the data appear inconsistent[2] or may be out-of-date.

[2] It also appears possible that some owners register a vehicle in say, Budva or Ulcinj, and reside in Bar.

Table 3: Vehicle ownership (mv/1000 population) by municipality in 2007

Zone		Population 2003	2007 motor fleet Total	per 1000 popln
1	Podgorica	169,132	65,038	385
2	Kotor	22,947	8,744	381
3	Herceg Novi	33,034	12,352	374
4	Tivat	13,630	4,970	365
5	Ulcinj	20,290	6,848	338
6	Budva	15,909	4,888	307
7	Andrijevica	5,785	1,525	264
8	BijeloPolje	50,284	13,068	260
9	Danilovgrad	16,523	4,216	255
10	Niksic	75,282	19,033	253
11	Pljevlja	39,806	9,279	233
12	Zabljak	4,204	916	218
13	Rozaje	22,693	4,761	210
14	Berane	35,068	6,845	195
15	Mojkovac	10,066	1,935	192
16	Cetinje	18,482	3,061	166
17	Kolasin	9,949	1,564	157
18	Plav	13,805	2,165	157
19	Bar	40,037	6,221	155
20	Pluzine	4,272	-	-
21	Savnik	2,947	-	-
	Totals	**624,145**	**177,429**	**284**

It is also worth noting that in the ten southern municipalities vehicle ownership is much higher overall - in fact 50% higher - at 318 per 1,000 population compared to 211 vehicles per thousand in the 11 northernmost municipalities. At the national level it is noted that vehicle ownership in urban households is higher than for rural households, by about 17%, and that households in Podgorica municipality are about 24% more likely to own a car than the national average, as shown in the table (*source: Yearbook 2006, Table 8-3*) below.

Car ownership by households, 2005

All households	54.8%
Urban	57.9%
Rural	49.3%
Podgorica	67.7%

In terms of vehicle fleet composition by type, the table below gives details available for 2006. As shown, more than 90 percent of registered vehicles are cars, with the next largest category being trucks. It seems most probable that the vast majority of farm tractors are unregistered; and casual observation suggests that a significant number of private cars may also be unregistered, not displaying number plates.

Table 4: Vehicle Fleet composition in 2006

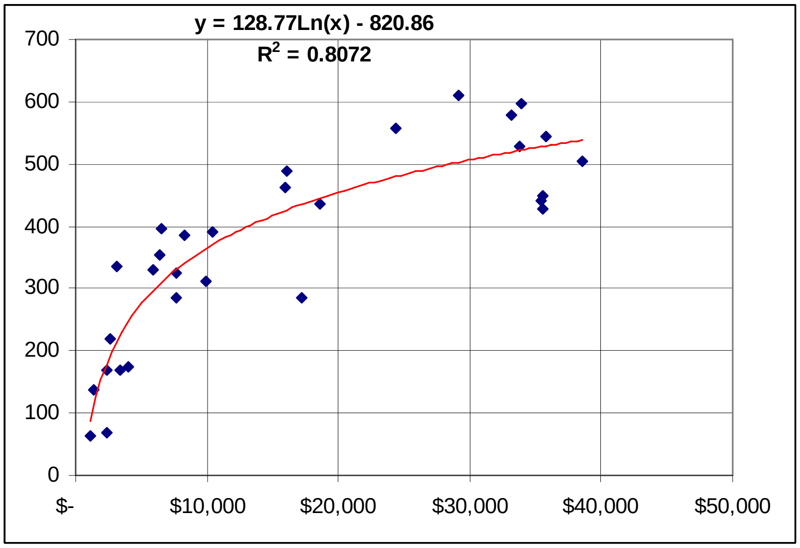
	Name (Montenegrin)	Name (Eng)	Nos.	%
1	automobili	Cars	158,599	91.2%
2	kombi	Kombis & Vans	772	0.4%
3	autobuses	Large Buses	716	0.4%
4	tereto vozila	Trucks	9,997	5.8%
5	specijalna radna vozila	Special Vehicles	788	0.5%
6	vucna vozila	Tractive Units (*)	375	0.2%
7	prikljucna vozila	Trailers & Semi-Trailers	1,068	0.6%
8		Farm Tractors	9	0.0%
9	Motocikl	Motorcycles	1,518	0.9%
	Total 2006	Total 2006	173,842	100.0%

Source: Traffic Directorate

3 Forecast of future vehicle ownership levels

The graph below shows an equation relating GDP per capita (in US dollars) to vehicle ownership (vehicles/1000 inhabitants) and is derived from vehicle ownership data for 30 European countries

Figure 2: Income & vehicle ownership trends in 30 European countries



Source: World Bank and UNDP data 2005

As above, the coefficient for the income X variable (logarithm Ln X) indicates that at relatively low per-capita income levels, vehicle ownership increases very rapidly with rising income.

However, for vehicle ownership (and indeed most transport services) the demand elasticity ratios with respect to income tend to fall as personal incomes increase.

The table below gives data used in the graph. In the table the prediction equation (see graph) was used and the predicted and observed values of mv/1000pop were compared. As shown, the estimated value for Montenegro, of 220 mv/1000pop in 2003, is slightly higher, by 12 percent, than the value (196 mv/1000pop) predicted by the regression equation.

Table 5: GDP per capita ($) and Vehicle ownership (mv/1000 pop) in 30 European countries

Country	GDPcap 2004	mv/1000pop 2003	prediction	(observed/ prediction)-1
Sweden	$ 38,525	504	541	-7%
Austria	$ 35,766	545	532	3%
Finland	$ 35,562	450	531	-15%
Netherlands	$ 35,560	427	531	-20%
United Kingdom	$ 35,485	442	531	-17%
France	$ 33,896	596	525	14%
Belgium	$ 33,807	527	524	1%
Germany	$ 33,212	578	522	11%
Italy	$ 29,143	610	505	21%
Spain	$ 24,360	558	482	16%
Greece	$ 18,560	435	447	-3%
Israel	$ 17,194	284	437	-35%
Slovenia	$ 16,115	490	429	14%
Portugal	$ 15,970	463	428	8%
Czech Republic	$ 10,475	391	373	5%
Hungary	$ 9,962	313	367	-15%
Estonia	$ 8,331	386	344	12%
Croatia	$ 7,724	324	334	-3%
Slovakia	$ 7,635	286	332	-14%
Lithuania	$ 6,480	397	311	28%
Poland	$ 6,346	354	308	15%
Latvia	$ 5,868	329	298	10%
Russian Federation	$ 4,042	174	250	-30%
Romania	$ 3,374	168	227	-26%
Bulgaria	$ 3,109	335	216	55%
Albania	$ 2,439	70	185	-62%
Belarus	$ 2,330	168	179	-6%
Montenegro	$ 2,654	220	196	12%
Ukraine	$ 1,366	137	110	24%
Georgia	$ 1,151	63	88	-29%

Source: World Development Indicators and UNDP Human Development Indicators 2006

As shown in the graph and the table above, there is a fairly wide scatter about the mean value for given income levels; as extreme examples, Bulgaria is 55% above the predicted mean while Albania is some 60% below the mean. Generally, the variances above imply that in different countries there are factors other than GDP-capita which influence car ownership level. Probably among these factors would be:- the income distribution pattern, degree of urbanization, demographic structure and household size, fuel prices and vehicle taxation, and the availability (or convenience) and price of other modes such as metro-rail systems and buses.

Forecasts for total vehicle fleet and vehicle ownership are given in the tables below, for both the standard GDP forecast and the ‘lower growth’ scenario. For the short to medium term the equation in Figure 2 is considered to give rather low estimates; instead, it is assumed that the motor fleet will increase in direct proportion to income-per-capita until year 2022, and that thereafter the income elasticity factor will reduce slightly, from unity to about 0.95 – i.e., that the vehicle fleet will then increase at a slightly slower rate than per-capita incomes.

Table 6: Vehicle Fleet totals in Montenegro to 2037 (Standard GDP growth forecast)

Year	total fleet 000s	mv /1000pop
2007	177.4	280.3
2012	215.8	332.0
2017	250.2	374.1
2022	268.9	390.2
2027	282.1	402.2
2032	295.9	414.6
2037	302.2	416.1

Table 7: Vehicle Fleet totals in Montenegro to 2037 (Lower GDP growth forecast)

Year	total fleet 000s	mv /1000pop
2007	177.4	280.3
2012	200.7	308.7
2017	221.6	331.3
2022	244.7	355.0
2027	250.4	357.0
2032	250.0	350.3
2037	254.9	351.0

Vehicle ownership by 2027 is expected to reach just over 400 motor vehicles per thousand population. This level is compatible with trends in many European countries, as shown in the graph (Figure 2) above. Thereafter, it is assumed that growth in ownership rates will slow considerably.

For future vehicle ownership levels in the municipalities, the view is taken that there will be some convergence. In other words, those zones with low current ownership levels will tend to increase more rapidly than those with high levels, such as Podgorica, Tivat, Kotor and Herceg Novi, which already have attained ownership rates close to those of comparatively rich nations such as Hungary or the Czech Republic (see Table 5). Vehicle populations in the municipalities cited above will continue to increase, but more in line with forecast population increases.

The forecast[3] for motor vehicle totals by municipality is given in the table below, and the subsequent table shows motor vehicle ownership, in vehicles per 1,000 population, for each municipality.

[3] Using the standard economic growth forecasts;

Table 8: Motor Vehicles: Forecast totals by Municipality 2012 -2037

Municipality	2007	2012	2017	2022	2027	2032	2037
Andrijevica	1,500	1,800	2,000	2,100	2,100	2,200	2,200
Bar	6,200	8,200	10,200	11,800	13,300	14,900	16,200
Berane	6,800	8,600	10,200	11,300	12,100	12,900	13,400
BijeloPolje	13,100	16,000	18,700	20,200	21,200	22,200	22,500
Budva	4,900	6,100	7,400	8,200	8,800	9,800	9,900
Cetinje	3,100	3,800	4,500	4,800	5,100	5,400	5,500
Danilovgrad	4,200	5,200	6,100	6,600	6,900	7,300	7,400
Herceg Novi	12,400	14,500	15,800	16,600	16,800	17,100	17,300
Kolasin	1,600	2,000	2,500	2,900	3,200	3,500	3,800
Kotor	8,700	9,500	9,500	9,200	9,500	9,600	9,800
Mojkovac	1,900	2,300	2,600	2,600	2,600	2,700	2,700
Niksic	19,000	23,200	26,900	28,900	30,100	31,300	31,800
Plav	2,200	2,900	3,600	4,200	4,800	5,400	6,000
Pljevlja	9,300	11,200	12,800	13,200	13,700	13,900	14,100
Podgorica	65,000	78,600	90,700	96,700	99,900	103,100	104,500
Rozaje	4,800	6,100	7,500	8,500	9,300	10,200	10,300
Tivat	5,000	6,100	7,100	7,600	8,000	8,400	8,500
Ulcinj	6,800	8,700	10,600	11,900	13,000	14,000	14,200
Zabljak, Savnik & Pluzine	900	1,200	1,400	1,600	1,700	1,900	2,000
Montenegro	177,400	216,000	250,100	268,900	282,100	295,800	302,100

Table 9: Motor vehicles /1000 population forecast by Municipality 2012 -2037

Municipality	2007	2012	2017	2022	2027	2032	2037
Andrijevica	271	344	405	450	442	455	447
Bar	145	178	204	218	242	266	285
Berane	192	241	283	311	327	342	350
Bijelo Polje	258	311	358	382	394	405	404
Budva	292	340	386	400	422	462	459
Cetinje	172	218	267	294	307	319	319
Danilovgrad	250	304	349	370	381	396	394
Herceg Novi	365	411	432	437	435	435	433
Kolasin	161	203	254	296	321	345	368
Kotor	395	453	476	484	492	488	490
Mojkovac	204	272	339	374	367	375	368
Niksic	252	308	356	383	392	400	399
Plav	147	176	198	209	235	260	284
Pljevlja	265	326	382	403	411	410	409
Podgorica	371	429	473	482	490	497	495
Rozaje	201	239	276	294	316	340	337
Tivat	352	407	450	458	473	488	486
Ulcinj	312	366	408	420	451	477	475
Zabljak, Savnik & Pluzine	81	112	135	157	164	181	187
Montenegro	280	332	374	390	402	414	416

TECHNICAL MEMORANDUM NO. 5

METHODOLOGY FOR MULTI-CRITERIA ANALYSIS

CONTENTS

1 Introduction

This Technical Memorandum is presented in order to address one of the tasks as described in the Proposal [Task 17] and now listed as Tasks 38 and 39 in the Work Plan namely:-

"DEFINE THE MULTI-CRITERIA ANALYSIS APPROACH AND OBTAIN APPROVAL"

The memorandum is prepared for presentation to the Client in order to obtain approval for the analysis method which will be used to identify the preferred option for the project highways.

Multi-Criteria Analysis (MCA) is a tool designed for decision-making particularly for complex problems. In a situation where many different criteria are involved, confusion can arise if a logical and well-structured decision-making process is not followed. Another difficulty in decision making of this type is that reaching a general consensus in a multi-disciplinary team can be very difficult to achieve. By using MCA, the members of the team do not necessarily have to agree on the relative importance of the criteria or on the rankings of the alternatives. Instead, each team member enters his or her own judgments, thereby making a contribution to a jointly reached conclusion and a consensus.

The value in the use of MCA in the selection of an option or a strategy lies in its ability to fuse together the often diverse views of professionals from different walks of life into a cohesive approach. By virtue of having these different views, the persons making the evaluation will have their (sometimes extreme) views tempered by listening to other opinions. Thus, the MCA approach provides a means of injecting rationality and objectivity into the decision-making process.

MCA is a tool for comparison in which several points of view are taken into account, and therefore is particularly useful during the formulation of judgments on complex problems. The analysis can be used with apparently contradictory judgment criteria for example, comparing "improved accessibility" with "adverse environmental impact". In general, the technique is mainly used in ex-ante evaluations of public projects and their variations. Within the framework of socio-economic and infrastructure development programmes, it concerns a judgment on the success of the different measures, for the purpose of drawing conclusions.

In summary, MCA evaluation is intended to gather together a group of knowledgeable professionals from various disciplines and uses comparative scoring and open discussion techniques to arrive at a consensus view of the preferred option.

2 Objectives of MCA

As suggested in the Terms of Reference, the Consultant proposed to use an MCA approach (and outlined this in the Proposal) in order to select the preferred alignment options for each of the project highways. The selection process must not be restricted to a single criterion even though economic feasibility is often used as a sole arbiter of the selection process. Furthermore, as noted in the Inception Report (section 3.4) MCA provides a means to fully assess those benefits (or costs) that are not directly quantifiable in money terms.

MCA may employ many other criteria in order to make selections on the basis of a wider spectrum of concepts and ideas. What a Highway Engineer believes to be the best option could be quite different from the best option preferred by, say, an Environmental Scientist or Sociologist. MCA allows all disciplines to have a voice in the decision making process.

3 Steps in the procedure

Conventionally, there are 10 steps in the procedure as described below.

3.1 Step One – Identification of Expert Panel

In this first step, the Client assisted by the Consultant will identify and subsequently appoint a number of eminent people to form a panel to undertake the evaluation process. It is most likely that the panel of experts will be selected from people who are already active in the planning and implementation of regional developments and other transport-related infrastructure ventures. The candidates should come from as diverse a background as possible for this process to be completely successful. It is important when approaching a candidate that he/she is prepared to commit time to the exercise. Although the needs can not be pre-judged exactly at this time, it is likely that the procedures would occupy about the equivalent of 1 to 1½ days spread over three half day sessions, before a solution is achieved.

As a good working minimum, we would expect to have a panel of between 8 and 12 persons. As a guide, for this highway infrastructure project evaluation, we would suggest that the expertise incorporated in the panel would include the following disciplines although others may be added to reflect specific project needs:-

- Environmental Science
- Development Economics
- Development Planning
- Finance & Investment Banking
- Tourism
- Regional Politics
- Engineering Planning

Candidates could be selected from government departments or possibly from the private sector or academic fields. Importantly, there should not be a concentration of any one discipline in the panel, otherwise the result could be biased or skewed toward a single viewpoint.

In this initial stage, the Clients and Consultants will appoint a Moderator who will guide the procedure through all the stages. Although it is customary for the Consultant to take this role, the government may prefer to appoint its own Moderator.

3.2 Step Two – Presentation of Data for all Options

As a lead-in to this step, the Consultant will prepare maps, data, photographs and illustrations in order to show the main features of each option being considered. It is important at this stage that all the options are presented with equal emphasis so as not to influence the expert panel unduly. A Briefing Room will need to be identified and dedicated to this MCA exercise. Typically, there will be the following information posted in the Briefing Room:

- Maps showing the general arrangement of the highways including all options presented as color-coded lines;
- Handouts related to each option describing the main features;
- Description of mutually exclusive sections of highway (thereby forming the basis of the MCA subject;
- Background data on each option including items such as – construction cost, economic viability, and environmental impacts; and
- Photographs and/or sketches of critical issues considered to be important in the decision-making process.

3.3 Step Three – Briefing of Expert Panel

With the panel assembled in the Briefing Room, the Moderator (supported by the technical team from the Consultants) will provide explanations of the basic issues, the advantages and the disadvantages of each option as perceived by the technical team. The material prepared in Step Two will be used to make this procedure a focused exercise.

The Moderator will describe the method of evaluation and will present the options being evaluated to the Panel. Under most circumstances, the Panel will ask for further information or explanations in order to understand the options completely. This is perfectly acceptable.

If the options are numerous or particularly complicated, it is possible that some information will be circulated in advance. However, the best feed-back from the Panel is obtained if all members are present in a single briefing session.

3.4 Step Four – Agreement on Criteria for Selection

Once the options and procedures are understood, the Panel will be guided by the Moderator to select those criteria which in their individual or joint opinions will be significant in making the choice between options. Particular attention must be given to the precise definition of the criteria to be used in the evaluation since this definition, in turn, properly defines the subject of the evaluation. The criteria must reflect the preferences of the decision-makers (in this case the Panel of Experts) so as to group together the diverse characteristics to be used to evaluate

the options. Although the number of options to be compared may be large, it is considered that the number of criteria should not exceed a reasonable limit. Experience has shown that the maximum number of criteria for an effective evaluation is eight or ten at the outside.

This selection of criteria is a key issue in MCA and the involvement of the different actors in the definition of criteria and their weighting is a critical step. If the Moderator is too actively involved in the analysis, the credibility of the results can be undermined. The Moderator's role, therefore is to suggest criteria, or the way to proceed, without dictating the result. At this stage, the Panel must check that the criteria chosen are logical, pertinent and largely independent from one another. Although the final decisions will be for the Panel, the following is a guide to the type of criteria which could be used for this exercise, which is *"The Selection of One from a Number of Motorway Options"*:

- Costs [Construction, Operational and Maintenance];
- Land and Property Acquisition;
- Economic Viability;
- Service to Traffic;
- Improvements in Accessibility;
- Environmental Impacts;
- Ease/Difficulty of Construction; and
- Ability to Implement Politically.

These criteria, and others, will be put forward for the Panel to select what they believe are the most relevant. Clearly, the Panel Members themselves may also put forward their own criteria.

3.5 Step Five – Agreement on Rates and Weightings

In this step the Panel, again guided by the Moderator, will attach scores to each of the criteria set down as being of significance in the selection. In a situation where all of the criteria are judged to be of equal importance, the Panel will make a score usually out of 10 as to how each option measures up to their considered belief.

In some instances, the Panel may decide that some criteria are more important than others. For example, in Montenegro it may be considered that *"environmental preservation is twice as important as accessibility"* or that *"agricultural land take is three times as important as cost".* When the debate is concluded these weights could be added to the scoring system in order to emphasize one or more of the criteria. In fact, as the method goes through its various later stages, the Panel may elect to change the weights or even add/delete one of more of the criteria.

The end product of this exercise will be a table showing all criterion together with the details of the maximum scores and the weightings for each criterion.

3.6 Step Six – First Round Scoring

Following the briefing (Step 3) and allocation of criteria (Step 4) and the specification of rates and weights (Step 5), the Panel will act independently to place scores in all cells of the evaluation matrix. The Evaluation Matrix is a table with Options on one axis and Criteria on the other as shown below:

Option ► Criterion▼	Green Option	Red Option	Blue Option	Yellow Option	ETC…
Cost					
Accessibility					
Environmental Impact					
Etc…….					

The Panel may ask for clarification from the Moderator but the exercise should be undertaken by each Expert independently of other Panel members. This will ensure that there is no influence at this stage from one expert on another.

Given a reasonable number of options to consider against 8 or so criteria, the exercise from Step 4 to Step 8 should take no longer than one half day.

3.7 Step Seven – First Round Data Summarizing

At the conclusion of Step 6, the Moderator will collect the matrices and the first session will be closed. The Moderator will then manipulate the matrices and sum the scores. Summations will be made for each Panel Member individually and for the total of all Members collectively. At this stage the individual's scores will not be revealed and the results will be classified anonymously by numbers or letters.

The Moderator will then analyze the responses and will create a presentation to be delivered at the second session of the Expert Panel.

In a straightforward MCA, the ranking of options will result from the "highest" or "lowest" scores allocated by the Panel Members.

The method to be used is sometimes referred to as the "compensation method" since the calculation of the weighted average makes it possible to compensate between criteria. For example, a measure which had say, a very bad "impact on the environment" could still obtain a good global weighted score if its impact on say "creation of employment" were considered excellent and one bad score was "compensated" for by another criterion's good score.

3.8 Step Eight – Presentation of First Round Results and Discussions

In this step, the matrices calculated from the first round of scoring are presented to the Panel but the findings are declared anonymously. The Moderator will show what he believes are the most surprising variants without naming the source; he will also identify and explain subjects which seemed to have a generally acceptable commonality. The Moderator will then invite comments from the Panel on any or all of the points raised in the presentation.

The debate which follows the presentation of responses and the announcement of option ranking will be most revealing and will be studiously recorded by the Moderator. This is because the individual Panel Members will express views of surprise, agreement or objection. These debates will be carefully monitored since they can be used later to assist in the adjustment of rates and weights if required by the Panel. The debate often clarifies issues which perhaps had not been appreciated previously and often leads on to changes of mind particularly with regard to the weightings given to certain criteria.

Of course, it is possible that the first round of scoring produces an entirely logical result and the Panel can agree the selection. In previous similar exercises, however, there has always been a request for a re-try and re-score with modified entries in the matrix cells.

3.9 Step Nine – Agreement to Revise Rates or Weights

The discussion above (Step 8) can result in an agreement by members of the Panel to add new criteria, change any of criteria, change scores or weights - **provided** that a consensus view is obtained. At this time the Moderator is purely an Advisor and his role is only to clarify or pose new concepts.

At the end of this step, there will be a new matrix formed with revised scores and weights.

3.10 Step Ten – Second Round of Scoring

Following an agreement to make new scores, the procedures from Step 4 to Step 10 are repeated until a consensus is achieved within the Panel. Under most circumstances it is rare to have more than three rounds before agreement is achieved. Each subsequent round of scoring should be allocated one half day.

4 Final Agreement on Preferred Alignments

Under normal conditions the selected option will now be clear and the Consultant can be given the order to proceed to the next step which is the detailing of the Preferred Option and its inclusion into the tendering process.

5 Production of Documentation

The Moderator/Consultant will provide full documentation of this evaluation procedure for each of the project highways in the form of a Technical Memorandum.

TECHNICAL MEMORANDUM NO. 6

STATED PREFERENCE SURVEY ANALYSIS & RESULTS

CONTENTS

1 Introduction & Summary

A stated preference survey was carried out at 16 locations (see Appendix A map) from Wednesday 24th to Friday 26th October 2007, for a 12-hour period (0700-1900) on one day at each location. The objective was to determine the maximum (in euros/hour) drivers would be willing to pay for journey time savings in Montenegro. Details of the field questionnaire utilized and the basic survey technique are given in Appendix B. The fieldwork was carried out by the CEED[1] organization, and the compiled survey data file consisting of 1,714 valid records was delivered to LB on 5th November 2007. Some inconsistencies (220 or 12% of all records) were found in the responses to the six questions on preferences for either: a time saving, or: a money saving. These 220 records were considered valid, but the responses to the six questions were difficult to interpret with confidence, and so they were left aside for the final data analysis, which consisted of 1494 records.

The principal results are given in Table 1 (next page) by survey location, which is considered as the most important independent variable for analysis purposes. The overall mean (average) valuation of a travel time saving was €3.54 per hour, with a standard deviation[2] of €2.36, i.e., a coefficient of variation[3] of 67 percent. The mean number of vehicle occupants (including driver) was 2.14, and a significant proportion (about 35%) of surveyed vehicles had only one occupant. The overall sampling rate was estimated at approximately 3-4 percent of total daytime vehicle flow, and since trucks and buses (excluded from survey) make up about one-third of traffic flows on typical roads, the sampling rate for light vehicles (LV) was estimated at approximately 5 percent.

Apart from the set of six questions (see Appendix B) to determine the value of travel time (VOTT) or willingness to pay for a time saving, the independent (X) variables recorded in the survey are listed in the table below.

Independent variables

1	Survey Location, direction of travel, time of day
2	Gender of respondent
3	No. of vehicle occupants
4	Origin (zone)
5	Destination (zone)
6	Trip Purpose
7	Trip time as estimated by driver
8	Occupation of respondent
9	No. of vehicles in the household

[1] Internet reference: www.visit-ceed.org
[2] Standard deviation = square root of the variance, this being the average of the squared differences between data points and the mean. The usual measure of dispersion of sample data around the mean.
[3] CV% = Standard deviation /Mean

10	Age group of respondent
11	Household consumption (Euros per month)

With the exception of 'number of occupants' and 'trip time estimated by the driver' (3 & 7 above) the independent variables are all categories or classes, not arithmetical. Tests were carried out on the variables listed above (except for the two O&D zones) to check for consistency generally and in particular to check for possibly significant correlations between variables which might bias the estimate of the mean value of travel time savings. These tests are summarized below in Section 2 and described in detail in Appendix B. The table below gives the principal results.

Table 1: Survey results by location: Perceived VOTT (Eur/hour)

locno	roadno	Group	Location	Obs.	Coefficient	Std error	t Stat	EUR/h
1	M-2	Coast	Budva - Tivat	224	2.949	0.149	19.806	€ 2.95
2	M-2.3	Coast	Budva - Cetinje	145	1.744	0.238	7.321	€ 4.69
3	M-2	Coast	Budva - Petrovac	100	1.425	0.269	5.301	€ 4.37
4	E-752	Coast	Petrovac - Bar	123	-0.038	0.251	-0.153	€ 2.91
5	M-2	Coast	Petrovac - Virpazar	32	0.545	0.423	1.289	€ 3.49
6	M-18	Central	Podgorica - Tuzi	144	-0.317	0.239	-1.329	€ 2.63
9	M-2	Central	Podgorica - Bioče	104	0.404	0.264	1.526	€ 3.35
10	E-80	Central	Mioska - Kolašin	41	-0.373	0.380	-0.982	€ 2.58
11	M-9	Central	Mateševo - Andrijevica	2	0.451	1.590	0.284	€ 3.40
7	M-2.3	E-W	Podgorica - Cetinje	177	-0.066	0.225	-0.296	€ 2.88
8	M-18	E-W	Podgorica - Danilovgrad	220	1.348	0.212	6.375	€ 4.30
15	M-18	E-W	Nikšić - Jasnovo Polje	27	1.414	0.456	3.103	€ 4.36
16	M-6	E-W	Vilusi - Klobuk	43	2.437	0.372	6.545	€ 5.39
12	M.2	NE	Berane - Kalače	6	0.818	0.926	0.883	€ 3.77
13	M-2	NE	Junction at Ribarevina	73	0.435	0.301	1.443	€ 3.38
14	M-2	NE	B.Polje - Barski bridge	33	0.681	0.417	1.634	€ 3.63

Note1: T Stat values <1.96 indicate that the coefficient is not significant in statistical terms

Note2: For Location no. 1 the coefficient is the intercept value (a) for Y =a+bX and

the other 15 locations were used as dummy variables (X1, X2, etc.) in the regression.

As shown above, the maximum value (mean) for a location was €5.39 per hour, the minimum €2.88 per hour, and for the 16 locations the coefficient of variation (CV%) was 21 percent. However, as shown in the table, for 10 of 15 locations (one location is used as the intercept for regression analysis) the coefficient value derived from the regression was not significantly different from zero. Although with a strong t Stat (6.545) the very high VOTT value at the Vilusi–Klobuk survey point (No. 16) may explained by the quite small sample size.

2 Summary of the effects of independent variables

2.1 Survey Location, direction of travel and time of day

Results by survey location are given in the table above. The direction of travel at each location was not examined as a specific case. There is no evidence that time of day for the interview influenced responses for VOTT in any significant way.

2.2 Gender of respondent

About 19 percent of respondents were women. There is some evidence that women are prepared to value a time saving rather higher than men, by about 7 percent on average, but the t Stat value (1.747) indicates the coefficient is not well determined, i.e., not significantly different from zero at the 90% confidence level.

2.3 Number of vehicle occupants

The evidence suggests that the more occupants in the vehicle the lower the valuation of travel time saving. In all cases, for 2, 3, 4 and 5 or more occupants, the derived coefficients are all negative, and in two cases, for 2 and 4 occupants, the t Stat values (2.48 & 2.57) are significant in statistical terms. It is not clear why single occupant - driver only - vehicles should produce the highest valuations.

2.4 Trip Purpose

Different trip purposes generally had no effect on perceived VOTT results, perhaps surprisingly. There is some evidence that people on “tourism/holiday” trips had higher valuations, at about 18 percent above the overall mean. However, the response sample size in this category was quite small (62) and the t Stat value (1.781) of the coefficient does not reach the value for t (>1.96) for 90% confidence that the coefficient really is different from zero. This result could be different if the survey were done in the summer peak season.

2.5 Trip time estimated by the driver

There is some evidence that for shorter trips, of up to 30 minutes, the perceived VOTT may be about 10-11 percent less than the mean for journeys of an expected 1 hour or more. However this is not significant in statistical terms. For longer trips, the data suggest that there may be about a 3.5 eurocents/hour increase in valuation for each additional hour of expected journey time; but the statistical significance is low.

2.6 Occupation of respondent

Some results were rather contrary to expectations. The perceived time saving value for persons giving their occupation as ‘own business’ was lower by about 11 percent than for persons describing themselves as ‘employed’, and the coefficient was significant in statistical terms (t Stat = -2.653). For students time saving value was about 5% higher than for employed persons; once again contrary to expectation, but not statistically significant.

2.7 Age group of respondent

The age group of respondents had little effect on results. Drivers under the age of 40 (54% percent of the sample) have slightly higher VOTT on average, by about 5 percent, but this result was not significant in statistical terms. Drivers of age 61 or more gave slightly lower perceived values but represented only 5.5 percent of the sample.

2.8 No. of vehicles in the driver's household

As expected, this variable is positively correlated to some degree (R squared = 0.36) with the household consumption group variable (see below) and so was not utilized further.

2.9 Household consumption level

The household expenditure variable (€/month) was included as a surrogate for income level. For households with consumption above €800 per month, the result is significant (coefficient t Stat value = 3.114) and shows that the higher income group on average has a perceived VOTT about 11 percent higher than the overall mean value of €3.54 per hour. This group represented 26 percent of the sample, and the middle group (€400-€799/month) made up 49 percent of the sample.

3 Conclusions

From 1494 respondents the overall mean utility valuation of a travel time saving was found as €3.54 per hour, with a standard deviation of €2.36, i.e., a coefficient of variation of 67 percent. This fairly wide 'scatter' around the mean is unsurprising, having been found in similar S-P surveys elsewhere, for example the Louis Berger toll-road studies in Beirut Lebanon (TLBJV 1997-99) and the TRL studies in Bandung (Indonesia) in 2000-2001. The survey was carried out at 16 locations widely dispersed throughout Montenegro and so is considered representative of the country as a whole. From the mean values by locations (see Table 1) the coefficient of variation was 22 percent, as expected, much lower than for the complete sample. As shown in Table 1, since the t Stat values for the coefficients are strong (in the range 5.3 to 7.3) there are reasons to believe that the stated preference values of travel time in the Budva–Cetinje–Petrovac areas, and in the Podgorica–Danilovgrad area, are significantly higher than the national average, at around €4.50 per hour. Nonetheless, for analysis purposes the overall average value of travel time, of €3.54 per hour, will be adopted in this study.

APPENDIX A


CRNA GORA
MAGISTRALNI I REGIONALNI PUTEVI
SRBIJA
ALBANIJA
Jadransko
more
METALJKA
ČEMERNO
GRADAC
KULA
PLJEVLJA
TRLICA
ŠĆEPAN POLJE
PLUŽINE
ŽABLJAK
VIRAK
DURDJEVIĆA TARA
BARSKI MOST
KRSTAC
ŠAVNIK
BOAN
MOJKOVAC
BIJELO POLJE
SLIJEPAČ MOST
JASENOVO POLJE
GORNJE POLJE
DELEUŠA
KOLAŠIN
MIOSKA
BERANE
KALAČE
ROŽAJE
MOST ZELENI
VUČA
MATEŠEVO
ANDRIJEVICA
NIKŠIĆ
Krupačko jezero
VILUSI
KLOBUK
NUDO
GRAHOVO
MURINO
PLAV
GUSINJE
DANILOVGRAD
ČEVO
RISAN
RESNA
BIOČE
KOTOR
TIVAT
ČEKANJE
LOVĆEN
TROJICA
CETINJE
PODGORICA
TUZI
BOŽAJ
BUDVA
PETROVAC
VIRPAZAR
Skadarsko jezero
BAR
VLADIMIR
ULCINJ
ADA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Key to the map

Site No.	Road No.	Location (between)
1	M-2	Budva - Tivat
2	M-2.3	Budva - Cetinje
3	M-2	Budva - Petrovac
4	E-752	Petrovac - Bar
5	M-2	Petrovac - Virpazar
6	M-18	Podgorica - Tuzi
7	M-2.3	Podgorica - Cetinje
8	M-18	Podgorica - Danilovgrad
9	M-2	Podgorica - Bioče
10	E-80	Mioska - Kolašin
11	M-9	Mateševo - Andrijevica
12	M.2	Berane - Kalače
13	M-2	Junction at Ribarevina
14	M-2	B.Polje - Barski bridge
15	M-18	Nikšić - Jasnovo Polje
16	M-6	Vilusi - Klobuk

APPENDIX B

Detailed results of SP survey regression analyses

Note: For ease of reference, the section numbers used below correspond to those used in the main text.

2.1 Time of day

Times of day (of the S-P interviews) were analyzed in four 3-hour bands, from 7.00 a.m. to 9.59 a.m., 10.00 a.m. to 12.59 p.m. and so on, as shown below:

Results of regression:

	time of day	*Coefficients*	*Standard Error*	*t Stat*
Intercept	0700-0959	3.653	0.1195	30.561
X Variable 1	1000-1259	-0.016	0.1630	-0.1008
X Variable 2	1300-1559	0.030	0.1606	0.1839
X Variable 3	1600-1859	0.055	0.1663	0.3326

The analysis showed that in no case was the time of day significant in determining a driver's choice of VOTT. As shown in the regression results all t Stat values for X variables are minimal.

2.2 Gender of driver

Results of regression:

	Coefficients	*Standard Error*	*t Stat*
Intercept	€ 3.623	0.0625	57.9936
X Variable 1	€ 0.254	0.1455	1.7472

The coefficient t Stat value indicates that women (18.7% of the sample) may value their travel time by about 7 percent more than men, i.e., by adding the coefficient of the X variable to the intercept, thus Women (X variable 1) = €3.88 per hour, and Men = €3.62/hour. However, the t Stat value is below the value (1.96) needed for 90% confidence that the X coefficient really is different from zero.

2.3 Number of car occupants

Results of regression:

	Coefficients	*Standard Error*	*t Stat*
Intercept (1 occupant)	3.8642	0.0932	41.4491
X Variable 1 (2 persons)	-0.3322	0.1338	**-2.4830**
X Variable 2 (3 persons)	-0.1008	0.1659	-0.6078
X Variable 3 (4 persons)	-0.5431	0.2109	**-2.5750**
X Variable 4 (5 & more)	-0.4463	0.3253	-1.3718

The results above appear perverse, or at least contrary to intuition. It is not clear why the signs of the significant coefficients (for 2 persons and 4 persons) are negative; or conversely, why the single occupant (driver only) vehicles should produce the highest valuation.

2.4 Trip purpose

There is some evidence that people on 'tourist' or 'holiday' trips had higher valuations, at about 18 percent above the overall mean. However, the response sample size in this category was quite small at 62 in total.

Results of regression:

	Trip purpose	*Coefficients*	*Standard Error*	*t Stat*
Intercept	home	3.7703	0.1273	29.6278
X Variable 1	work	-0.1701	0.1571	-1.0829
X Variable 2	shopping-social	-0.1399	0.1768	-0.7914
X Variable 3	school	-0.1507	0.3510	-0.4294
X Variable 4	tourist-holiday	0.5748	0.3228	**1.7806**
X Variable 5	other	-0.1548	0.1933	-0.8011

2.5 Driver-estimated journey times

The time bands used for analysis purposes are shown below -

	estimated trip time (hours)	
dummy variables	from -	to -
Intercept	-	0.50
X Variable 1	0.50	0.75
X Variable 2	0.75	1.00
X Variable 3	1.00	1.50
X Variable 4	1.50	2.00
X Variable 5	2.00	2.50
X Variable 6	2.50	3.00
X Variable 7	3.00	4.00
X Variable 8	4.00	5.00
X Variable 9	5.00	> 5.0

The regression results (table below) indicate that for longer trips people generally perceive a higher value for time savings than for trips of less than 30 minutes. As shown, all the X variable coefficients are positive, and for 45-60 minutes, 1.5 – 2.0 hours, and 2.5 to 3.0 hour trips, are well determined.

Results of regression:

	Coefficients	*Standard Error*	*t Stat*	*Value Eur/h*
Intercept	3.3715	0.0993	33.945	€ 3.372
X Variable 1	0.3828	0.2479	1.5442	€ 3.754
X Variable 2	0.5322	0.1726	**3.0840**	€ 3.904
X Variable 3	0.2319	0.2025	1.1456	€ 3.603
X Variable 4	0.4604	0.2047	**2.2491**	€ 3.832
X Variable 5	0.2766	0.3319	0.8335	€ 3.648
X Variable 6	0.9259	0.2370	**3.9073**	€ 4.297
X Variable 7	0.0107	0.2647	0.0405	€ 3.382
X Variable 8	0.3555	0.3096	1.1483	€ 3.727
X Variable 9	0.5095	0.2337	**2.1799**	€ 3.881

2.6 Occupation of driver

The perceived time saving value for persons giving their occupation as ‘own business’ (some 16% of the total sample) was lower - by about 42 eurocents/hour - than for persons describing themselves as ‘employed’, and the coefficient is significant in statistical terms, as shown below.

Results of regression:

	Occupation	*Coefficients*	*Standard Error*	*t Stat*
Intercept	Employed	3.7260	0.0655	56.927
X Variable 1	Own business	**-0.4166**	0.1570	**-2.6528**
X Variable 2	Student	0.3407	0.2544	1.3391
X Variable 3	Retired	-0.1788	0.2585	-0.6918

This result is somewhat contrary to expectation.

2.7 Age groups

No significant differences are noted for the age group variable, as shown below.

Results of regression:

	Age group	*Coefficients*	*Standard Error*	*t Stat*
Intercept	< 40	3.7530	0.077	48.804
X Variable 1	41-60	-0.1674	0.117	-1.428
X Variable 2	> =61	-0.2421	0.255	-0.948

2.8 Number of vehicles in the household

This variable is positively correlated with the household consumption group variable (see below) and was not utilized further.

2.9 Household consumption group

As expected, persons who declared the highest level of household consumption, also had higher values for travel time savings, by about 49 eurocents/hour, as shown below.

Results of regression:

	Household spends:	*Coefficients*	*Standard Error*	*t Stat*
Intercept	< 400 eur/month	3.4569	0.1117	30.956
X Variable 1	400-800 eur/month	0.1775	0.1377	1.289
X Variable 2	> 800 eur/month	0.4902	0.1574	**3.114**

APPENDIX C

Revealed preference estimates of VOTT

Sozina Tunnel

The revealed preference (RP) value of VOTT for cars and light vehicles using the Sozina tunnel is approximately €6.00 per hour. The toll rate for cars is €2.50. The net time difference for a medium-size car is: [38 minutes on the mountain route minus 12 or 13 minutes via the tunnel] = 25 minutes or 0.4167 hours time saving. Thus €2.50/0.4167 hours = €6.00/hour. The overall estimate for VOTT may be adjusted downward to some extent by the proportion of cars choosing to continue using the old mountain route, however observations so far suggest that these are few, less than 10 percent of the volume through the tunnel. The RP value of travel time for the tunnel is probably about €5.50 per hour.

Kamenari-Lepetani Ferry across Kotor Bay

The price for cars on this ferry service is €4.00 per one-way crossing. At present (although the idea is under consideration) there are no discounts or special tickets for frequent users. There are four vessels in service each with capacity for about 30 light vehicles. Each vessel makes 4-5 crossings per hour, and the service is open 24 hours a day, so total capacity is approximately 10,000 vehicles per day. It is estimated that probably 6,000 – 8,000 vehicles per day use the ferry.

The journey time from Kamenari through Risan to the Tivat-Budva road near Radanovici by land, is estimated at 45 minutes, and by the ferry, from Kamenari to the same point on the Tivat-Budva road, is 15-20 minutes. For a 15 minutes journey time for the ferry mode, the implied VOTT = €8.00 per hour, or for 20 minutes by ferry mode the VOTT would be €9.60 per hour. However, a significant proportion of traffic appears to prefer the land route, so the average implied VOTT will be lower. Examination of CGP traffic count data for 2007 suggests that traffic taking the land route round the bay is about 5,000 per day in 2007. Assuming that 60% of all traffic uses the ferry, the implicit VOTT estimate is between €4.80/hour and €5.76 per hour, and appears fairly consistent with the estimated value for the Sozina tunnel.

TECHNICAL MEMORANDUM NO. 7

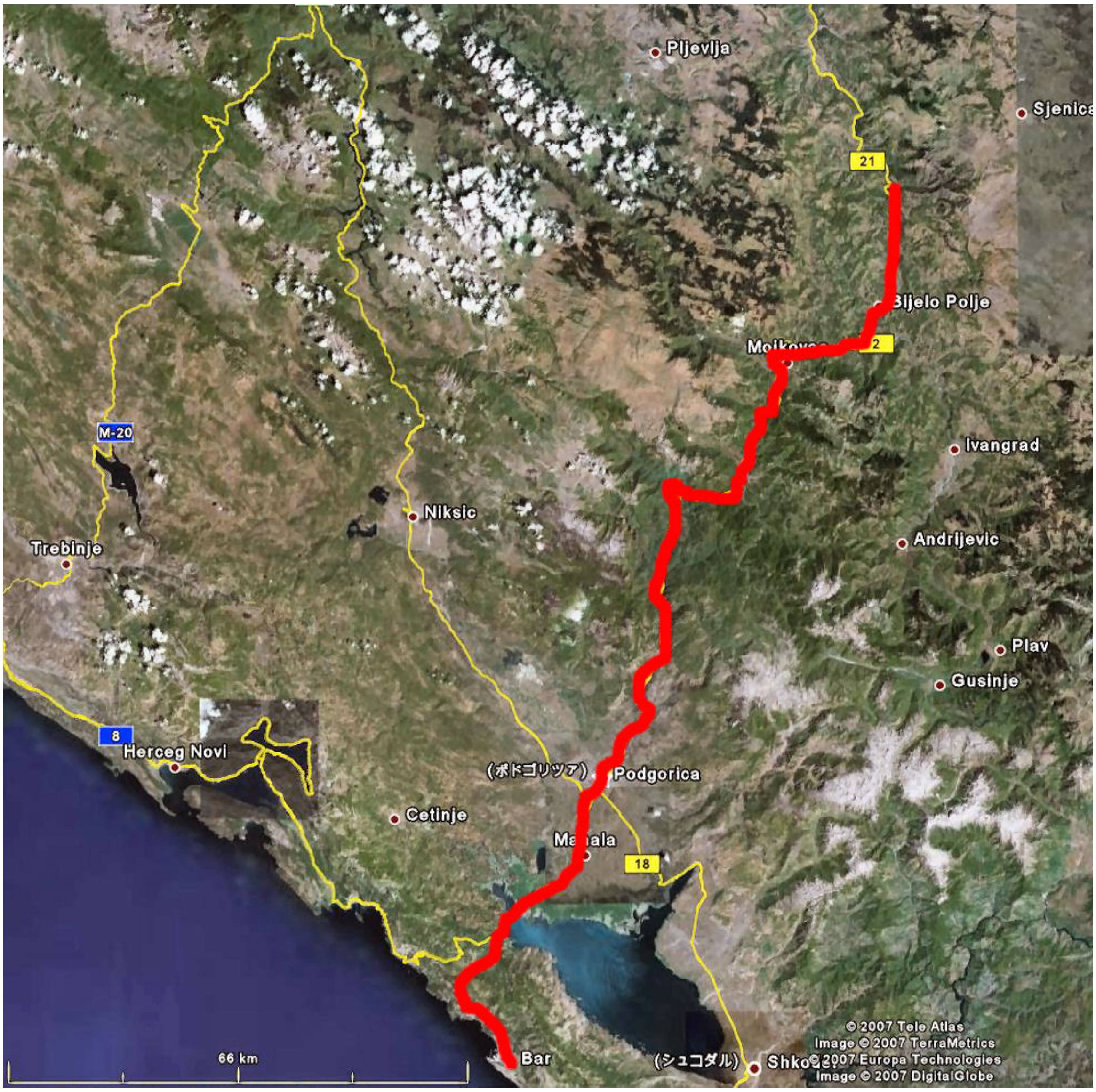
MOTORWAY BAR – BOLJARE
ANALYSIS CONDITIONS OF THE EXISTING ROAD

CONTENTS

1 Background

The length of the analyzed highway[1] from Bar to the Serbian border is approximately 184 km. It is composed of roads M-2.4 from Bar to Petrovac, M2 from Petrovac to Ribarevina and M21 from Ribarevina to Barski most. This is a major road in Montenegro linking the Adriatic seaside with and the Serbian via capital Podgorica (see Figure 1).

Figure 1: Map of Montenegro Republic



[1] According to the U.S. Highway Capacity Manual – HCM (*Federal Highway Administration, 2000*) the Highway is a main road with two-lane carriageway in both directions, without control access from adjacent properties and with all intersection at grade.

The construction of this road started about 40 years ago and was open for service in the 1970s.It linked Belgrade with the seaside. Today it became an International Road linking Montenegro with Serbia.

There is some confusion about the length of the analyzed highway. The different measures are present in the table below.

Table 1: Lengths of the road

Section	Louis Berger 2007		BCEOM 2002	Monte-negro Roads Data 2005	CRNA-GORAPUT 2007
	[Km] (*)	[Km]	[Km]	[Km]	[Km]
Barski most - Bijelo Polje	11.30	11.30	14.18	16.07	22.01
Bijelo Polje - Ribarevina	2.80	2.80		5.60	
Ribarevina - Mojkovac	26.50	26.50	23.65	23.30	23.29
Mojkovac - Kolasin	23.50	23.50	20.51	20.22	20.22
Kolasin - Bioce	57.40	57.40	57.91	57.18	57.16
Bioce - Podgorica Centre	12.50	12.50	13.70	14.75	14.68
Podgorica Centre - Petrovac		34.00	38.61	51.74	51.74
Podgorica Centre - tunnel Sozina	26.90				
tunnel Sozina - Bar	18.60				
Petrovac - Bar		19.10	19.56	19.27	19.26
Total	**179.50**	**187.10**	**188.12**	**208.13**	**208.36**

Author	Length [km]	Differences [km]	[%]
CRNAGORAPUT 2007	208.36	**208.36**	**100.00%**
BCEOM 2002	188.12	**20.24**	**90.29%**
Montenegro Roads Data 2005	208.13	**0.23**	**99.89%**
Louis Berger 2007	187.10	**21.26**	**89.80%**

(*) new road since 2005

2 Technical aspects

The highway was constructed 50 years ago as the Second Class Road according to the former Yugoslavian Standards. The design speed varies from one section to other from 30 km/h[2] (in the difficult mountainous part) to 70 km/h on the others part.

The highway passed through mountainous massifs. The first is between Bar and Podgorica and the difference in level is over 650m (from 30m to 700m).

From Tanki Rt to Smokovac via Podgorica the highway pass through the flat area over about 30 km.

The second massif is between Smokovac practically to Barski most on the Serbian border. On this section the difference in level is over 1000m (from 22m to 1045m).

The picture on the next page shows the relief or terrain through road.

Figure 2: Section Bioce – Bijelo Polje

The table below shows the technical parameters of the Second Class Road.

[2] The Administrative speed limitation is 40 km/h but on the hairpin bends it is difficult and risky to maintain the speed over 30 km/h.

Table 2: Technical parameters

Type	Item		Terrain		
			Flat	Hilly	Mountain
General	Design Speed [km/h]		100	70	60[3]
	Min. Stopping Distance on horizontal curve [m]		140	65	50
	Sight distance for Overtaking [m]		780	560	460
Cross Section	Width of	traffic lanes [m]	3.5	3.0	3.0
		climbing lanes [m]	n.a.	3.0	3.0
		edge marking line [m]	0.35	0.30	0.30
		Shoulders [m]	1.5	1.0	1.0
Plan	Minimum horizontal radii [m]		450	180	120
Longitudinal Profile	Minimum vertical radii (convex) [m]		7,600	1,800	900
	Minimum vertical radii (concave) [m]		5,000	1,200	600
	Maximum longitudinal grade [%]		---	7	8

The pavement of the road was predicted for the Axle load equal to 10T which today is insufficient for the heavy trucks.

Unfortunately in most of places the slopes of cut and embankment are not protected and are deteriorating by erosion.

All intersections were designed according to the former Yugoslavian Standards from 1950s or 1960s which today are very dangerous with high traffic flows of the speediest cars.

In 2002 a rehabilitation works started on this highway. Most of the “black spots” were improved. On the section from Bar to Tanki Rt the toll tunnel Sozina of over than 4km length was constructed and open for the traffic in 2005.

At the present on the section of M-2 road from Mioska to Kolasin there are some pavement rehabilitation works ,retaining walls rehabilitation and slopes readjustment. On the M-2.4 road in Kufin there is curvature construction and the third lane in Sutomore.

For the purpose of reducing traffic jams in the cities, construction of bypasses of Bar, Podgorica, Kolasin and Bijelo Pole will be performed in the following two years.

Today the highway is in good technical conditions with a pavement of 7m width and hard shoulders from 0.5m to 0.75m within different sections. Only a section from Ribarevina to Barski most on the Serbian border has 6m of pavement with 0.70 to 1.0m of shoulders. This information the Consultant found in the Road Database prepared by BCEOM in 2002.

[3] Except hairpin bend

Nevertheless the difference of cross section width between the former Yugoslavian Standards and the situation on terrain should be explained by fact that the road was improved before 2003.

The road is equipped with safety fances,while some sections have climbing lanes (Ulici, Jankovici,Seoce I, Seoce II...).Some sections have galleries for protection of avalanches i.e. rockslides..

The pictures on the next page show the existing road.

Figure 3 Section Kolasin - Smokovac

Figure 4 Section Mojkovac - Kolasin

Figure 5 Entry to the Sozina tunnel

3 Traffic analysis

The table below shows the travel time survey along the M2 highway recorded by Consultant on 19th and 26th October 2007.Additionally the approximate[4] traffic flows is presents on the same table.

Table 3 Travel time survey

Time	Section	Distance	Travel time	Average speed	Average speed / section	AADT (both directions)	Rush hour = 10%	per lane
		[Km]	[min]	[km / h]	[km / h]	[veh]	[veh]	[veh]
12:29	Barski most	0						
12:34	junction - Bistrica	5.1	5	61.2				
12:39	junction - Rasovo	6.2	5	74.4				
12:41	Bijelo Polje begin	1.4	2	42.0				
12:46	Bijelo Polje end	1.4	5	16.8	45.40			
12:52	T-junction (Mojkovac)	4.9	6	49.0				
12:57	junction - Pliveija	6.2	5	74.4		5 040	504	252
13:15	Mojkovac begin	15.4	18	51.3				
13:30	Mojkovac end (*)	0.7	1	42.0				
13:35	bridge over Tara river	2.2	5	26.4				
13:38	junction - local road	3.9	3	78.0	53.10			
13:55	Kolasin	16.7	17	58.9		4 560	456	228
14:19	junction - Rasko	17.5	24	43.8		5 280	528	264
15:00	junction - regional road (Bioce)	39.9	41	58.4				
15:06	Podgorica - bridge over river	5.9	6	59.0	53.80			
15:15	Podgorica - centre	6.6	9	44.0				
14:25	Bar				49.50			
14:33	T-junction tunnel (Podgorica)	6.6	8	49.5				
	tunnel (speed limit 60 km /h)	4.1		60.0				
14:45	T-junction (Petrovac/Podgorica)	12	12	60.0		10 080	1 008	504
15:00	Golubovci	17.5	15	70.0	60.87			
15:04	airport turn-off	3.9	4	58.5				
15:10	Podgorica (bridge over rail line)	5.5	6	55.0				
15:20	Podgorica (office)	4.3	10	25.8				

(*) bridge works delay - take off 14 minutes

Table 4: Preliminary results of traffic survey

Bar – Dobrakovo Road

Section	AADT (both directions) (*)	Rush hour = 10%	per lane
	[veh]	[veh]	[veh]
Barski most - Bijelo Polje	8.766	877	438
Mojkovac - Kolasin	8.210	821	411
Rasko - Podgorica	4.580	458	229
Podgorica - tunnel Sozina	5.852	585	293
Tunnel Sozina - Bar	6.818	682	341

(*) Preliminary data from traffic survey executed 24-25 October 2007

[4] Traffic was counted in period of 10 minutes during reconnaissance trip in October 2007. **This is not a result of any traffic survey** and the Consultant uses it only to have some indication about the existing traffic.

The results of the traffic and O-D survey effectuated in last October by the Consultant are presenting in the Technical Memorandum N° 7-A. This report will also including the road Capacities Calculations and the Level of Service (LOS).

4 Safety aspects

The accident rate on the existing M2 highway is reportedly very high. The reasons for this are multiple. Generally this kind of road is still difficult for drivers for some reasons like the limited distance of visibility linked to the curvature of the road. It is also very important that some drivers have not experience of driving on the mountainous road and **others are too sure of their capacity as drivers**. Note that the psychological aspect for some drivers, **to have a modern, speedy and "safe" car** - also should not be neglected.

Generally the main safety problems are as follows:

- Difficulty linked to the typical mountainous road;
    - Inadequate curve radius;
    - Steep gradients with lack of climbing lanes;
    - Too few overtaking opportunities;
    - Inadequate crash barriers;
    - Inadequate bus stopping facilities, and;
    - Dangerous slopes.
- Weather conditions often bad or difficult for driving;
    - Inadequate lighting
- Mixed traffic flows of speedy modern cars and old slower cars;
- High rate of truck in the traffic flows during the day and night and,
    - Congestion during peak hours;
    - Long journey times.
- **Irresponsible drivers going too fast on the mountainous highway.**
    - Many private accesses with slowing and turning movements;
    - Many at-grade junctions – i.e., junction density too high;
    - High speeds in built-up areas;
    - Lack of safety zones along road, and;
    - Conflicts between vehicles and pedestrians.

5 Summary

The Consultant agrees with the opinion that construction of a new motorway linking Bar with the Serbian border via Podgorica is necessary.

It is not technically possible to improve the existing M2 highway to normal motorway[5] standard. Consequently there are no possibilities to increase the trip speed and assuring maximum safety on the road.

Traffic flows will grow in the next years therefore the conditions of driving will be harder, and rate of accident will increase.

It is important to note that even if a new motorway is in service the following problems will be observed:-

- As the new motorway will be a toll motorway, some drivers will use the existing highway for financial reasons (in particular possibly for truck traffic);
- **It is certain that the density of traffic will decrease on the existing highway, which will give a false impression to some drivers that they can go faster. Consequently the number of accidents (per million vehicle-km) could increase.**

- [5] According to the U.S. Highway Capacity Manual – HCM (*Federal Highway Administration, 2000*) the Motorway is divided highway with full control of access, with two or more lanes for the exclusive use of traffic in each direction, with an Emergency Lane. Opposing directions of flow are continuously separated by a raised barrier, an at-grade median, or a continuous raised median It provides uninterrupted flow; All interchanges must be grade-separated; Direct access to/from adjacent properties not permitted, and with Facilities like Rest and Service Areas

TECHNICAL MEMORANDUM NO. 7A

MOTORWAY BAR – BOLJARE
ANALYSIS: CONDITIONS OF THE EXISTING HIGHWAYS, ANNEX TO TM7, ROAD CAPACITIES

CONTENTS

1. Background

From 23rd October to 28th October the Consultant organized a 24 hours traffic survey on the main roads of Montenegro. The results concerned the existing highway Bar – Dobrakovo show tables below.

The ADT is an Average Daily Traffic which is corresponding to the results of survey.

The ARHT is an Average Rush Hour Traffic which is corresponding to the 10% of the ADT.

Table 1 Results of traffic survey

2. Results of Capacities

The HCS2000[1] software as used for check the existing highway capacities. This software is currently using for the calculations of all highways elements. It was conceived on base of the HCM2000©.

The traffic data used provide from the 23rd October to 28th October traffic survey and also from 26th October 12 hours O-D survey. The table below regroups the results for five sections of the existing highway.

Table 2 Results of HCS2000 analysis

Item	Section				
	Bar - Sozina Tunnel	Sozina Tunnel - Podgorica	Podgorica - Bioce	Kolasin - Mojkovac	Bijelo Pole - Dobrakovo
INPUT DATA					
Highway Class	2	2	2	2	2
Shoulder width	0.5 m	0.5 m	0.5 m	0.7 m	0.8 m
Lane width	3.5 m	3.5 m	3.5 m	3.5 m	3.0 m
Segment length	18.6 km	26.9 km	12.5 km	23.5 km	14.1 km
Terrain type	Rolling	Level	Rolling	Rolling	Rolling
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88
Trucks and buses	16%	45%	19%	19%	7%
Recreational vehicles	3%	3%	3%	3%	3%
No-passing zones	80%	30%	65%	30%	55%
Access points/km	1 km	1 km	1 km	3 km	1 km
Two-way hourly volume, V	692 veh/h	252 veh/h	465 veh/h	561 veh/h	857 veh/h
Directional split	53% / 47%	50% / 50%	52% / 48%	51% / 49%	52% / 48%
AVERAGE TRAVEL SPEED					
Grade adjustment factor, fG	0.93	1.0	0.93	0.93	0.93
PCE for trucks, ET	1.9	1.7	1.9	1.9	1.9
PCE for RVs, ER	1.1	1.0	1.1	1.1	1.1
Heavy-vehicle adjustment factor	0.872	0.760	0.852	0.852	0.938
Two-way flow rate,(note-1) vp	970 pc/h	377 pc/h	667 pc/h	805 pc/h	1116 pc/h
Highest directional split proportion (note-2)	514 pc/h	189 pc/h	347 pc/h	411 pc/h	580 pc/h

[1] HCM2000 conceived by Mc Trans Center, University of Florida

Base free-flow speed, BFFS	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h
Adj. for lane and shoulder width, fLS	7.5 km/h	7.5 km/h	7.5 km/h	4.9 km/h	5.9 km/h
Adj. for access points, fA	0.7 km/h	0.7 km/h	0.7 km/h	2.0 km/h	0.7 km/h
Free-flow speed, FFS	61.8 km/h	61.8 km/h	61.8 km/h	63.1 km/h	63.4 km/h
Adjustment for no-passing zones, fnp	3.7 km/h	3.3 km/h	4.7 km/h	2.6 km/h	2.7 km/h
Average travel speed, ATS	46.0 km/h	53.8 km/h	48.8 km/h	50.4 km/h	46.8 km/h

Item	Section				
	Bar - Sozina Tunnel	Sozina Tunnel - Podgorica	Podgorica - Bioce	Kolasin - Mojkovac	Bijelo Pole - Dobrakovo
PERCENT TIME-SPENT-FOLLOWING					
Grade adjustment factor, fG	0.94	1.0	0.94	0.94	0.94
PCE for trucks, ET	1.5	1.1	1.5	1.5	1.5
PCE for RVs, ER	1.0	1.0	1.0	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.926	0.957	0.913	0.913	0.966
Two-way flow rate,(note-1) vp	903 pc/h	299 pc/h	616 pc/h	743 pc/h	1072 pc/h
Highest directional split proportion (note-2)	479	150	320	379	557
Base percent time-spent-following, BPTSF	54.8%	23.1%	41.8%	48.0%	61.0%
Adj.for directional distribution and no-passing zones, fd/np	13.1	10.1	18.6	11.4	10.2
Percent time-spent-following, PTSF	67.9%	33.2%	60.4%	59.3%	71.3%
LEVEL OF SERVICE AND OTHER PERFORMANCE MEASURES					
Level of service, LOS	**C**	**A**	**C**	**C**	**D**
Volume to capacity ratio, v/c	**0.30**	**0.12**	**0.21**	**0.25**	**0.35**
Peak 15-min vehicle-kilometers of travel, VkmT15	**3657 veh-km**	**1926 veh-km**	**1651 veh-km**	**3745 veh-km**	**3433 veh-km**
Peak-hour vehicle-kilometers of travel, VkmT60	**12871 veh-km**	**6779 veh-km**	**5813 veh-km**	**13184 veh-km**	**12084 veh-km**
Peak 15-min total travel time, TT15	**79.5 veh-km**	**35.8 veh-km**	**33.8 veh-km**	**74.3 veh-km**	**73.4 veh-km**

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

3. Summary

The results below show that except the section Bijelo Pole – Dobrakovo the existing highway has a reserve of capacities with a Level of Service C.

The Level of Service D for the section Bijelo Pole – Dobrakovo is linked to the poor technical conditions of the road (only 3.0m lane width) and the highest traffic flow of all sections.

The Level of Service A for the section Sozina Tunnel - Podgorica is linked to fact that this is a toll section and some of drivers avoid it (the traffic flow is the lowest of all sections).

4. Annex

Original reports from HCM2000 software

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

_____Two-Way Two-Lane Highway Segment Analysis_____

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M2
From/To **BAR - SOZINA TUNNEL**
Jurisdiction
Analysis Year 2007
Description Existing Highway Bar - Dobrakovo

_____Input Data_____

Highway class	Class 2					
Shoulder width	0.5	m	Peak-hour factor, PHF	0.88		
Lane width	3.5	m	% Trucks and buses	16	%	
Segment length	18.6	km	% Recreational vehicles	3	%	
Terrain type	Rolling		% No-passing zones	80	%	
Grade: Length		km	Access points/km	1	/km	
Up/down		%				

Two-way hourly volume, V 692 veh/h
Directional split 53 / 47 %

_____Average Travel Speed_____

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1*	
Heavy-vehicle adjustment factor,	0.872	
Two-way flow rate,(note-1) vp	970	pc/h
Highest directional split proportion (note-2)	514	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	km/h
Observed volume, Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	70.0	km/h
Adj. for lane and shoulder width, fLS	7.5	km/h

Adj. for access points, fA 0.7 km/h

Free-flow speed, FFS 61.8 km/h

Adjustment for no-passing zones, fnp 3.7 km/h
Average travel speed, ATS 46.0 km/h

___________________________Percent Time-Spent-Following_________________________

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.926
Two-way flow rate,(note-1) vp 903 pc/h
Highest directional split proportion (note-2) 479
Base percent time-spent-following, BPTSF 54.8 %
Adj.for directional distribution and no-passing zones, fd/np 13.1
Percent time-spent-following, PTSF 67.9 %

_________________Level of Service and Other Performance Measures________________

Level of service, LOS C
Volume to capacity ratio, v/c 0.30
Peak 15-min vehicle-kilometers of travel, VkmT15 3657 veh-km
Peak-hour vehicle-kilometers of travel, VkmT60 12871 veh-km
Peak 15-min total travel time, TT15 79.5 veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate
   analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

____________________Two-Way Two-Lane Highway Segment Analysis___________________

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M2
From/To **SOZINA TUNNEL - PODGORICA**
Jurisdiction
Analysis Year 2007
Description Existing Highway Bar - Dobrakovo

_____________________________________Input Data___________________________________

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 45 %
Segment length 26.9 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 30 %
Grade: Length km Access points/km 1 /km
Up/down %

Two-way hourly volume, V 252 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.7
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.760
Two-way flow rate,(note-1) vp 377 pc/h
Highest directional split proportion (note-2) 189 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.7 km/h

Free-flow speed, FFS 61.8 km/h
Adjustment for no-passing zones, fnp 3.3 km/h
Average travel speed, ATS 53.8 km/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.957
Two-way flow rate,(note-1) vp 299 pc/h
Highest directional split proportion (note-2) 150
Base percent time-spent-following, BPTSF 23.1 %
Adj.for directional distribution and no-passing zones, fd/np 10.1
Percent time-spent-following, PTSF 33.2 %

Level of Service and Other Performance Measures

Level of service, LOS A
Volume to capacity ratio, v/c 0.12
Peak 15-min vehicle-kilometers of travel, VkmT15 1926 veh-km
Peak-hour vehicle-kilometers of travel, VkmT60 6779 veh-km
Peak 15-min total travel time, TT15 35.8 veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate

analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

____________________Two-Way Two-Lane Highway Segment Analysis___________________

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M2
From/To **PODGORICA - BIOCE**
Jurisdiction
Analysis Year 2007
Description Existing Highway Bar - Dobrakovo

____________________________________Input Data___________________________________

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88

Lane width 3.5 m % Trucks and buses 19 %

Segment length 12.5 km % Recreational vehicles 3 %
Terrain type Rolling % No-passing zones 65 %
Grade: Length km Access points/km 1 /km
Up/down %

Two-way hourly volume, V 465 veh/h
Directional split 52 / 48 %

______________________________Average Travel Speed______________________________

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1*
Heavy-vehicle adjustment factor, 0.852
Two-way flow rate,(note-1) vp 667 pc/h
Highest directional split proportion (note-2) 347 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h

Adj. for access points, fA 0.7 km/h

Free-flow speed, FFS 61.8 km/h

Adjustment for no-passing zones, fnp 4.7 km/h

Average travel speed, ATS 48.8 km/h

__________________________Percent Time-Spent-Following________________________

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.913
Two-way flow rate,(note-1) vp 616 pc/h
Highest directional split proportion (note-2) 320
Base percent time-spent-following, BPTSF 41.8 %
Adj.for directional distribution and no-passing zones, fd/np 18.6
Percent time-spent-following, PTSF 60.4 %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS C
Volume to capacity ratio, v/c 0.21
Peak 15-min vehicle-kilometers of travel, VkmT15 1651 veh-km
Peak-hour vehicle-kilometers of travel, VkmT60 5813 veh-km
Peak 15-min total travel time, TT15 33.8 veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate

analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

___________________Two-Way Two-Lane Highway Segment Analysis__________________

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M2
From/To **KOLASIN - MOJKOVAC**
Jurisdiction

Analysis Year 2007
Description Existing Highway Bar - Dobrakovo

Input Data

Highway class Class 2
Shoulder width 0.7 m Peak-hour factor, PHF 0.88

Lane width 3.5 m % Trucks and buses 19 %

Segment length 23.5 km % Recreational vehicles 3 %
Terrain type Rolling % No-passing zones 30 %
Grade: Length km Access points/km 3 /km
Up/down %

Two-way hourly volume, V 561 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1*
Heavy-vehicle adjustment factor, 0.852
Two-way flow rate,(note-1) vp 805 pc/h
Highest directional split proportion (note-2) 411 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 4.9 km/h
Adj. for access points, fA 2.0 km/h

Free-flow speed, FFS 63.1 km/h

Adjustment for no-passing zones, fnp 2.6 km/h

Average travel speed, ATS 50.4 km/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.913
Two-way flow rate,(note-1) vp 743 pc/h
Highest directional split proportion (note-2) 379
Base percent time-spent-following, BPTSF 48.0 %
Adj.for directional distribution and no-passing zones, fd/np 11.4
Percent time-spent-following, PTSF 59.3 %

Level of Service and Other Performance Measures

Level of service, LOS C

Volume to capacity ratio, v/c 0.25
Peak 15-min vehicle-kilometers of travel, VkmT15 3745 veh-km
Peak-hour vehicle-kilometers of travel, VkmT60 13184 veh-km
Peak 15-min total travel time, TT15 74.3 veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

___________________Two-Way Two-Lane Highway Segment Analysis__________________

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period
Highway M2
From/To **BIJELO POLJE - DOBRAKOVO**
Jurisdiction
Analysis Year 2007
Description Existing Highway Bar - Dobrakovo

___________________________________Input Data__________________________________

Highway class Class 2
Shoulder width 0.8 m Peak-hour factor, PHF 0.88
Lane width 3.0 m % Trucks and buses 7 %

Segment length 14.1 km % Recreational vehicles 3 %
Terrain type Rolling % No-passing zones 55 %
Grade: Length km Access points/km 1 /km
Up/down %

Two-way hourly volume, V 857 veh/h
Directional split 52 / 48 %

____________________________Average Travel Speed______________________________

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.938
Two-way flow rate,(note-1) vp 1116 pc/h
Highest directional split proportion (note-2) 580 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	km/h
Observed volume, Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	70.0	km/h
Adj. for lane and shoulder width, fLS	5.9	km/h
Adj. for access points, fA	0.7	km/h
Free-flow speed, FFS	63.4	km/h
Adjustment for no-passing zones, fnp	2.7	km/h
Average travel speed, ATS	46.8	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.966	
Two-way flow rate,(note-1) vp	1072	pc/h
Highest directional split proportion (note-2)	557	
Base percent time-spent-following, BPTSF	61.0	%
Adj.for directional distribution and no-passing zones, fd/np	10.2	
Percent time-spent-following, PTSF	71.3	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-kilometers of travel, VkmT15	3433	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	12084	veh-km
Peak 15-min total travel time, TT15	73.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TECHNICAL MEMORANDUM NO. 7B

ANALYSIS LENGTHS OF THE EXISTING HIGHWAY MOTORWAY BAR – BOLJARE

TABLE OF CONTENTS

1 GENERAL INFORMATION

Note: This working paper is revision and supplement to Technical Memorandum no. 7 and Technical Memorandum no. 7A.

In the period from February 14th 2008, the Consultant carried out analysis of the existing highway from Bar to Serbian border. It was determined that the total length of the highway is 184.05 km.

For the measuring purposes, the Consultant used high-performance and one of the most powerful devices at the market, GARMIN series eTREX, which represents GPS in its full power. Apart from the standard, this kind of device also contains the following features: barometric altimeter for the precise measurement of altitude, module for calculating different horizontal and vertical road parameters, electronic compass which in addition to precise pointer of directions on the earth also shows azimuth even while you are standing still. The preciseness of this device is 5 – 15 m depending on the quality of transmission, or 3 – 5 m when corrective satellites are reachable.

For the purpose of measurement, the Consultant also used reference road points taken from the document “Review of European, Main and Regional Roads by the level of construction in Montenegro on 31.12.1992”.

The Consultant made pictures of each of these reference points and updated them with precise coordinates i.e. latitude, longitude and altitude, which is shown in Table 1.

2 DATA (TABLES 1 AND 2)

Table 1

	Section	Total length (km)	Coordinates	Coordinates	Altitude (m)
1	**Serbian border**	0	N 43 08.576	E 019 46.799	562
2	**Bijelo Polje** (junction - city center)	13,24	N 43 02.164	E 019 44.835	575
3	**Ribarevina** (junction - Berane)	19,02	N 42 59.633	E 019 44.669	578
4	**Slijepač most** (junction - Pljevlja)	25,01	N 42 59.337	E 019 40.721	623
5	**Krstac** (curvature)	37,37	N 42 59.056	E 019 33.227	989
6	**Mojkovac** (gas station)	41,3	N 42 57.858	E 019 34.661	818
7	**Mojkovac** (junction - Djurdjevića Tara)	42,3	N 42 57.326	E 019 34.558	807
8	**Kolašin** (junction - Kolašin)	62,76	N 42 49.704	E 019 30.816	931
9	**Crkvine** (curvature)	71,89	N 42 47.722	E 019 26.142	1055
10	**Mioska** (junction - Šavnik)	80,11	N 42 49.130	E 019 24.135	574
11	**Manastir Morača**	87,41	N 42 45.837	E 019 23.341	276
12	**Bioče** (junction - Mateševo)	120,36	N 42 30.955	E 019 20.655	87
13	**Smokovac** (mid of bridge)		N 42 28.943	E 019 18.339	63
14	**Podgorica** (junction - Hotel Crna Gora)	132,98			
15	**Podgorica** (junction - Tuzi)	134,39	N 42 25.823	E 019 15.655	49
16	**Podgorica** (junction - Aerodrom)	142,14	N 42 21.796	E 019 13.572	22
17	**Tanki Rt**	158,73	N 42 16.036	E 019 06.729	15
18	**Virpazar**	162,43	N 42 14.557	E 019 05.169	13
19	**Sozina** (Virpazar)	169,68	N 42 12.053	E 019 03.102	196
20	**Sozina** (Đurmani)	174,08	N 42 10.028	E 019 01.694	198
21	**Sutomore** (junction Petrovac - Sozina - Bar)	176,08	N 42 09.211	E 019 01.922	83
21	**Bar** (traffic lights at the entrance of Bar)	184,05	N 42 06.443	E 019 05.419	12

Table 2 below shows review of section lengths and comparison of data with data of Crnagoraput Company from 2007.

Table 2

Section	Louis Berger SAS 2008	Crnagoraput 2007
	[Km]	[Km]
Serbian border - Bijelo Polje	13.24	22.01
Bijelo Polje - Ribarevina	5.78	
Ribarevina - Mojkovac	23.28	23.29
Mojkovac - Kolašin	20.46	20.22
Kolašin - Bioče	57.60	57.16
Bioče - Podgorica Centar	14.03	14.68
Podgorica Centar - Tunel Sozina	35.29	
Tunel Sozina - Bar	14.37	
Total	**184.05**	**137.36**

This table should only serve as a comparison for the purposes of getting as precise result as possible. The Consultant has no intention to present measurements of Crnagoraput as less valid, but to rely on its own measurements and analysis.

3 PHOTOGRAPHS OF REFERENCE POINTS

1. Serbian border

2. Bijelo Polje (junction– city centre)

3. Ribarevina (junction – Berane)

4. Slijepač most (junction – Pljevlja)

5. Krstac (curvature)

6. Mojkovac (gas station)

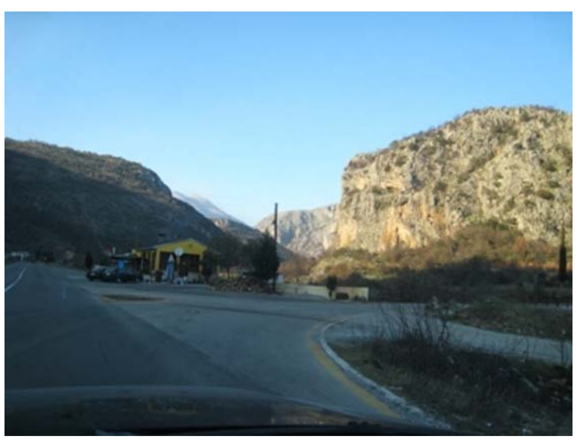
7. Mojkovac (junction – Đurđevića Tara)

8. (Kolašin junction – Kolašin)

9. Crkvine (curvature)

10. Mioska (curvature – Šavnik)

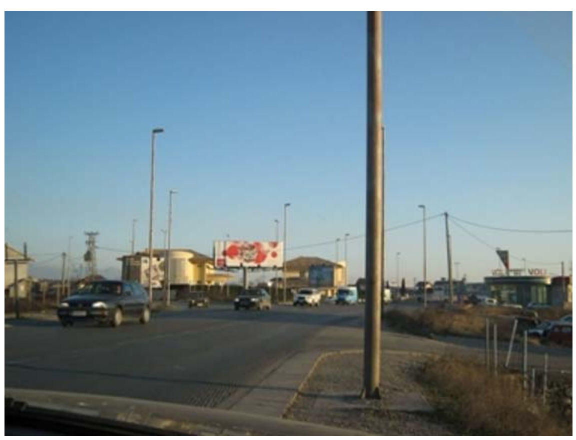
11. Manastir Morača



12. Bioče (junction –Mateševo)

13. Podgorica (junction – Hotel Crna Gora)

14. Podgorica (junction Tuzi)

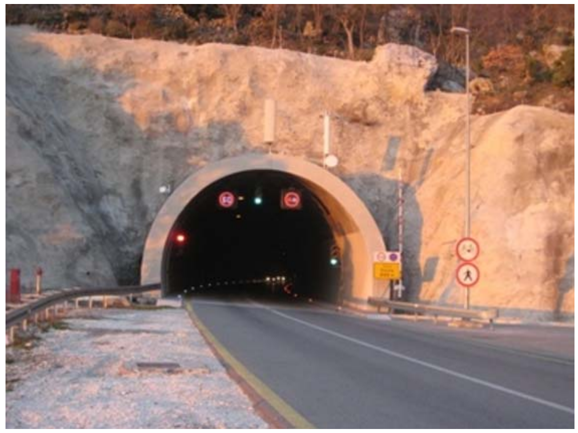


15. Podgorica (junction Airport)

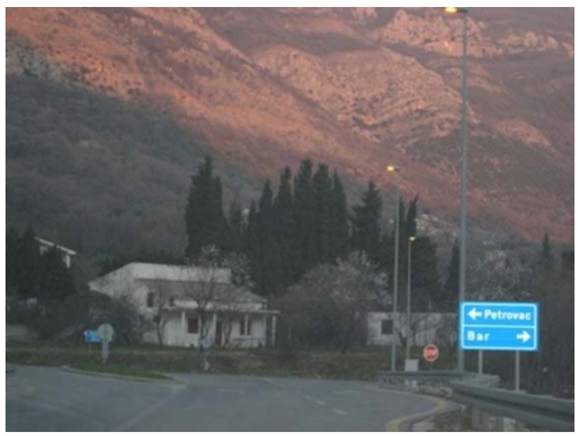
16. Tanki Rt

17. Virpazar

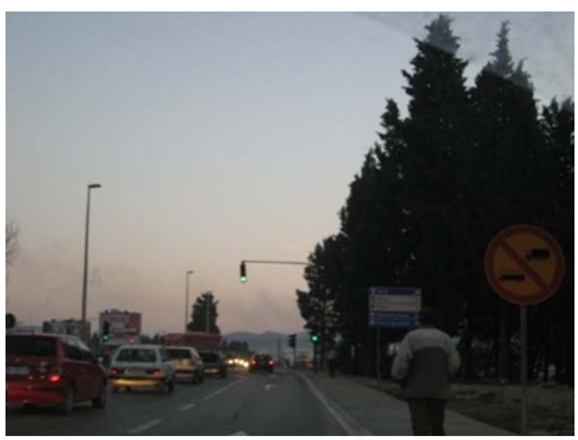
18. Sozina (Virpazar)



19. Sozina (Đurmani)



20. Sutomore (junction Petrovac – Sozina – Bar)



21. Bar (traffic lights – entrance to Bar)

TECHNICAL MEMORANDUM NO. 8

HDM-4 INPUT PARAMETERS

CONTENTS

1 Introduction

The economic evaluation of the proposed new north-south (port of Bar – Serbian border) motorway and the east-west (Adriatic – Ionian) highway alignments are to be carried out using the internationally accepted World Bank's HDM-4 model[1], which has become the standard software application used for international donor funded roads projects. This program models the relationships between traffic and pavement deterioration and maintenance over the design life of a road, within a project-based life cycle approach.

The cost benefit analyses for the proposed road improvement alternatives are based on a comparison of the cost streams for the existing, *without project* situation – usually termed the *base case* – and the proposed *with project* new motorway/highway improvement/upgrading option. The principal cost components incorporated in the analyses are the road (motorway/highway) construction costs, road maintenance costs over the life of the project, and the costs of vehicle operation, travel time and road traffic accidents.

The HDM-4 model structure comprises the following key modules:

- the road network;
- the vehicle fleet;
- the maintenance and improvement works standards; and
- the definition of the alternatives to be evaluated by the model.

For those road sections comprising the analysis, the first of these modules defines their existing functional, physical, geometric and structural characteristics together with the associated average annual daily traffic (AADT). The second of the modules describes the characteristics and the price/cost values of the vehicle classes comprising the vehicle fleet. The third module describes the types of existing and proposed maintenance/improvement works allied with their unit costs. The fourth module describes the alternatives to be compared in terms of defining the base case alternatives – which constitutes the existing road alignments – and the two proposed road section alternatives – representing the new highway improvement options – with respect to the road engineering characteristics and future traffic by means of growth rates for each of the vehicle classes. This last module also defines the basic parameters concerning the analysis period and rate of discount to be used in the evaluation.

All cost data are expressed in Euro, in 2007 prices. Traffic growth rates and forecasts by road section are presented in a separate technical memorandum.

The HDM-4 analyses will be undertaken with reference to each of the disaggregated road sections along the respective study corridors. Identification of these road sections is firstly: on the basis of homogeneous (uniform) traffic volumes in terms of observed AADT for each section.

[1] Highway Development and Management series, version 1.3.

This primary disaggregation of road sections is defined by their *functional* classification, that is, the role in connecting urban centres with one another, and linking with other primary (*magisterial*) and secondary (*regional*) roads. Further, a second level disaggregation may be required on the basis of geometric characteristics, the number of traffic lanes, type of road pavement, width of shoulders, etc.

Taking into account the above criteria, the definition of the existing road sections to be modelled within the HDM-4 program is shown in Table 1.

Table 1: Existing Road Sections for HDM-4 Modelling

North – South corridorBar – Boljare (Serbian border) Highway

Autoput Bar – Boljare

Existing road section **HDM section name**	**HDM code**	**Length km**	**Comments**
1. Bar – Durmani	BB-1	10.3	junction with road to tunnel (Petrovac)
2a. Durmani – Sozina tunnel	BB-2a	2.1	
2b. Sozina tunnel	BB-2b	4.4	designed to motorway standard
2c. Sozina tunnel – Virpazar	BB-2c	7.3	
3. Virpazar – Podgorica 1 (Niksic)	BB-3	20.3	junction primary road
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	7.8	
5. Podgorica 2 (Tuzi) – Bioce	BB-5	14	junction regional road (Matesevo)
6. Bioce – Mioska	BB-6	38.5	junction regional road (Savnik)
7. Mioska – Kolasin	BB-7	16.9	junction primary road (Matesevo)
8. Kolasin – Mojkovac	BB-8	20.6	junction regional road (Pljevlja)
9. Mojkovac – Slijepac Most	BB-9	16.3	junction regional road (Pljevlja)
10. Slijepac Most – Ribarevina	BB-10	6.0	junction primary road (Berane)
11. Ribarevina – Bijelo Polje	BB-11	6.2	
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	13.3	CG border with Serbia
Total: Bar – Granica CG (Barski Most)		**184.05**	

Note: the section "Sozina tunnel" is the only road section that is currently operational and already designed to a standard that will conform with, and constitute part of, the proposed new highway.

East – West corridor Adriatic – Ionian Highway (via Bosnia-Herzegovina)
[Jadransko – Jonski Autoput]

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.5	CG border with Bosnia-Herzegovina
2. Vilusi – Niksic	JJ-BH-2	33.5	junction primary road
3. Niksic – Danilovgrad	JJ-BH-3	33.3	
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	20.2	
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	1.2	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Klobuk – Bozaj)		**115.3**	

East – West corridor Adriatic – Ionian Highway (via Croatia – *ferry crossing*)
[Jadransko – Jonski Autoput]

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	CG border with Croatia
2. Herceg Novi – Kamenari	JJ-C-2	15.0	ferry crossing (Kamenari-Lepetani)
2f. Lepetani – Radanovici	JJ-C-2f	10.1	junction primary road (Kotor/Tivat)
3. Radanovici – Budva	JJ-C-3	19.5	
4. Budva – Cetinje	JJ-C-4	27.7	
5. Cetinje – Podgorica	JJ-C-5	34.9	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Debeli Brijeg – Bozaj)		**141.5**	

East – West corridor Adriatic – Ionian Highway (via Croatia – road route)
[Jadransko – Jonski Autoput]

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	CG border with Croatia
2. Herceg Novi – Kamenari	JJ-C-2	15.0	ferry crossing to Lepetani
2a. Kamenari – Risan	JJ-C-2a	10.4	junction regional road (Vilusi)
2b. Risan – Kotor	JJ-C-2b	17.6	junction primary road (Cetinje)
2c. Kotor – Radanovici	JJ-C-2c	4.4	junction primary road (Tivat/Budva)
3. Radanovici – Budva	JJ-C-3	19.5	
4. Budva – Cetinje	JJ-C-4	27.7	
5. Cetinje – Podgorica	JJ-C-5	34.9	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Debeli Brijeg – Bozaj)		**163.8**	

Source: Consultant's estimates

2 Road Network Data

The road network data that are used by the model comprise a wide range of variables relating to road geometry and to pavement structure, history and condition, most of which have default values that relate to the observed characteristics of each variable on the basis of global road engineering experience and practice over the past 40 years. Nevertheless, there are a number of key parameters for which specific data relevant to local study area conditions need to be applied, corresponding to a *Level 1* calibration[2] of the HDM model.

In the context of the HDM modelling that is to be carried out in this study, the *Strategic Plan for Road Infrastructure Maintenance and Development* carried out in 2002/2003[3] is of direct relevance. That study focused on performance and maintenance of the Montenegrin road network and development of a road maintenance management system. A road database was developed (for HDM modelling) and incorporated detailed information for all of the *magisterial* roads (referred to here as primary roads), and *regional* roads, referred to here as secondary roads.

Most of the road engineering data contained in this database is specifically relevant to this study[4]. However, measurements of geometric characteristics of the road sections in the two study corridors, in particular topography in terms of horizontal and vertical alignment, were undertaken using to 1:25 000 maps[5]. Table 2 lists data for the existing road sections.

Lengths of road sections were referenced from official Crnagoraput 2007 data[6] for all sections excepting those constituting the recently constructed Sozina tunnel, which was only opened to traffic in 2005. For these particular sections, lengths were estimated with reference to AUTOCAD maps used in the development of the study's VISUM traffic model.

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[2] A *Level 1* calibration is the minimum level required in any HDM application. Besides adopting many of the program's default values, this level determines the values of the model's basic input parameters with respect to the key variables within each of the Vehicle Fleet, Road Network and Works Maintenance and Improvement Standards modules:

- Road pavement characteristics;
- Representative vehicle characteristics;
- Traffic composition and growth rates;
- Unit costs (for both the Road Deterioration and Works Effects and the Road User Effects modelling components);
- Environmental (climatic) conditions.

[3] By BCEOM in association with COWI and reported on in various Final Reports dated July 2003.

[4] Drive-through surveys were carried out during September and October 2002 over all of the primary (*magisterial*) and secondary (*regional*) roads in the country (1850 km) using a special purpose vehicle.

[5] The scaling used for horizontal curvature measurements was 1:35700 (hardcopy maps) and for the rise and fall measurements scaling was 1: 13 000 (computer images).

[6] CRNAGORAPUT A.D. Podgorica. JEDNODNEVNO BROJANJE SAOBRACAJA za 2007.
NA MAGISTRALNIM I REGIONALNIM PUTEVIMA REPUBLIKE CRNE GORA. oktobar 2007.

Table 2 Existing Road Section Alignment Measurements

North – South corridor Bar – Boljare (Serbian border) Highway (*Autoput Bar – Boljare)*

Existing road section HDM section name	**HDM code**	**Length km**	**Horizontal curvature degrees / km**	**Vertical rise and fall metres / km**
1. Bar – Durmani	BB-1	10.3	93	29.0
2a. Durmani – Sozina tunnel*	BB-2a	2.1	80	40.0
2b. Sozina tunnel*	BB-2b	4.4	10	5.0
2c. Sozina tunnel – Virpazar*	BB-2c	7.3	100	44.0
3. Virpazar – Podgorica 1 (Niksic)	BB-3	20.3	84	11.0
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	7.8	61	5.0
5. Podgorica 2 (Tuzi) – Bioce	BB-5	14	72	11.0
6. Bioce – Mioska	BB-6	38.5	117	31.0
7. Mioska – Kolasin	BB-7	16.9	132	46.0
8. Kolasin – Mojkovac	BB-8	20.6	117	35.0
9. Mojkovac – Slijepac Most	BB-9	16.3	166	46.0
10. Slijepac Most – Ribarevina	BB-10	6.0	121	41.0
11. Ribarevina – Bijelo Polje	BB-11	6.2	39	5.0
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	13.3	56	9.3
Total: Bar – Granica CG (Barski Most)		**184.05**	**--**	**--**

Note: * estimated alignment for the recently constructed (2004) Sozina tunnel sections.

East – West corridor Adriatic – Ionian Highway (via Bosnia-Herzegovina)
[Jadransko – Jonski Autoput]

Existing Road Section HDM section name	HDM code	Length Km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.458	535	57.8
2. Vilusi – Niksic	JJ-BH-2	33.520	292	46.2
3. Niksic – Danilovgrad	JJ-BH-3	33.334	95	28.5
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	20.229	30	32.1
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	1.150	61	1.0
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.000	17	5.6
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.768	30	1.0
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.810	313	13.9
Total: Granica CG (Klobuk – Bozaj)		**115.269**	**166**	**30.8**

East – West corridor Adriatic – Ionian Highway (via Croatia – *ferry crossing*)
[Jadransko – Jonski Autoput]

Existing Road Section HDM section name	HDM code	Length Km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7		
2. Herceg Novi – Kamenari	JJ-C-2	15.0		
2f. Lepetani – Radanovici	JJ-C-2f	10.1		
3. Radanovici – Budva	JJ-C-3	19.5		
4. Budva – Cetinje	JJ-C-4	27.7		
5. Cetinje – Podgorica	JJ-C-5	34.9		
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	17	5.6
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	30	5.0
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	313	13.9
Total: Granica CG (Debeli Brijeg – Bozaj)		**141.5**		

East – West corridor Adriatic – Ionian Highway (via Croatia – road route)
[Jadransko – Jonski Autoput]

Existing Road Section **HDM section name**	**HDM code**	**Length Km**	**Horizontal curvature degrees / km**	**Vertical rise and fall metres / km**
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7		
2. Herceg Novi – Kamenari	JJ-C-2	15.0		
2a. Kamenari – Risan	JJ-C-2a	10.4		
2b. Risan – Kotor	JJ-C-2b	17.6		
2c. Kotor – Radanovici	JJ-C-2c	4.4		
3. Radanovici – Budva	JJ-C-3	19.5		
4. Budva – Cetinje	JJ-C-4	27.7		
5. Cetinje – Podgorica	JJ-C-5	34.9		
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	17	5.6
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	30	0.0
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	313	13.9
Total: Granica CG (Debeli Brijeg – Bozaj)		**163.8**		

Source: Consultant's estimates

In the case of road condition, given the five year time elapse since the last surveys were conducted[7], data on road surface condition have used the model default values with respect to observed driving conditions and road serviceability during the course of drive-through field surveys in October and November 2007. In this instance, it should be noted that the economic evaluation to be performed in this feasibility study focuses less on pavement characteristics in terms of road roughness and primarily on the wider cost comparisons, including reduction of accidents and travel time, as well as vehicle operation costs, between different topographical route alignments. The 'without project' case assumes that a reasonably high level of maintenance will continue to be undertaken throughout the project evaluation period in order to maintain surface roughness level of approximately 4.0 IRI (International Roughness Index[8]) corresponding to a driving speed of 80 kilometres per hour.

These surveys showed that the existing roads are in relatively good condition, and that maintenance has been prudently carried out. Even with posted speed limits in built-up areas and road sections with tight geometric radii and reduced visibility, driving speeds in a saloon car were comfortably of the order of 80 km/h. Although structural cracking was evident, there were few potholes on the main study routes, evidently due to execution of appropriate patching and repair works. Estimated surface roughness was 4 to 5 IRI.

[7] BCEOM/COWI, September – October 2002 op. cit.
[8] IRI is a measure of surface bumpiness or unevenness expressed in metres per kilometre.

Selected input data for each of the key engineering, geometric and pavement characteristics of the existing roads, as reported by the HDM model, are given in Tables 3a and 3b on the following pages. In respect of pavement strength information, the results of the falling weight deflectometer surveys carried out under the BCEOM 2002/03 Strategic Plan have been directly used and these data are shown in Table 4. For other input data that is common across all study road sections, Table 5 summarises the variables and model default values used.

Table 3a Selected HDM Input Data for Existing Road Sections: Bar – Boljare (Serbian border) Highway

H D M - 4

HIGHWAY DEVELOPMENT & MANAGEMENT

Road Sections - Selected Basic, Geometry, Pavement

Study Name: **Bar-Boljare**

Run Date: **21-11-2007**

ID	Name	Length (Km)	Width (m)	Shoulder width (m)	Altitude (m)	Speed Limit (km/h)	Material Type	Current Surface Thickness (mm)	Previous Surface Thickness (mm)	Last Year Construction /Treatment
BB-1	Bar-Durmani	10.33	7.00	0.00	30	80	AC	40	0	1965
BB-10	Slijepac Most - Ribarevina	6.04	7.00	0.00	1,000	80	AC	40	0	1997
BB-11	Ribarevina - Bijelo Polje	6.18	7.00	0.00	1,000	80	AC	57	0	1969
BB-12	Bijelo Polje - Granic CG (Barski Most)	16.15	7.00	0.00	1,000	80	AC	57	0	1969
BB-2a	Durmani-Sozina tunnel	2.06	7.00	0.50	300	80	AC	40	0	2004
BB-2b	Sozina tunnel	9.60	7.00	2.00	300	60	AC	40	0	2004
BB-2c	Sozina tunnel - Virpazar	4.36	7.00	0.00	300	80	AC	40	0	2004
BB-3	Virpazar - Podgorica 1 (Niksic)	26.93	7.00	0.00	35	80	AC	40	0	1998
BB-4	Podgorica 1 (Niksic) - Podgorica 2 (Tuzi)	1.15	7.00	0.00	45	50	AC	40	0	1990
BB-5	Podgorica 2 (Tuzi) - Bioce	13.53	7.00	0.00	60	80	AC	60	0	1962
BB-6	Bioce - Mioska	39.84	7.00	0.00	500	80	AC	57	0	1964
BB-7	Mioska - Kolasin	17.34	7.00	0.00	1,000	80	AC	45	0	1964
BB-8	Kolasin - Mojkovac	20.23	7.00	0.00	1,000	80	AC	44	0	1997
BB-9	Mojkovac - Slijepace Most	17.26	7.00	0.00	1,000	80	AC	48	0	1997
HDM-4 Version 1.3							**Asphalt Concrete**			

Note: Last year of either construction/reconstruction or treatment works – overlay, resealing, preventative treatment.
Source: Consultant's estimates

Table 3b Selected HDM Input Data for Existing Road Sections: Adriatic – Ionian Highway (via Bosnia-Herzegovina)

H D M - 4 **Road Sections - Selected Basic, Geometry, Pavement**

HIGHWAY DEVELOPMENT & MANAGEMENT

Study Name: **Jadransko-Jonski**

Run Date: **21-11-2007**

ID	Name	Length (Km)	Width (m)	Shoulder width (m)	Altitude (m)	Speed Limit (km/h)	Material Type	Current Surface Thickness (mm)	Previous Surface Thickness (mm)	Last Year Construction /Treatment
BB-4	Podgorica 1 (Niksic) - Podgorica 2 (Tuzi)	1.15	7.00	0.00	45	50	AC	40	0	1990
JJ-BH-1	Granica CG (Klobuk) - Vilusi	3.46	6.00	0.00	800	80	AC	30	0	1980
JJ-BH-2	Vilusi - Niksic	33.52	6.00	0.00	800	80	AC	70	5	1981
JJ-BH-3	Niksic - Danilovgrad	33.33	7.00	0.00	600	80	AC	40	5	1979
JJ-BH-4	Danilovgrad - Podgorica 2 (Niksic)	20.23	7.00	0.00	300	80	AC	42	0	1980
JJ-BH-6	Podgorica 2 (Tuzi) - Tuzi	9.00	6.00	0.00	50	80	AC	30	0	1990
JJ-BH-7a	Tuzi - Granica CG (Bozaj)-std	3.77	6.00	0.00	50	80	DBSD	50	0	1973
JJ-BH-7b	Tuzi - Granica CG (Bozaj)-sgl	10.81	3.50	0.00	200	60	DBSD	65	0	1973
HDM-4 Version 1.3							**Asphalt Concrete**	**Double Bituminous Surface Dressing**		

Note: Last year of either construction/reconstruction or treatment works – overlay, resealing, preventative treatment.
Source: Consultant's estimates

Table 4: Pavement Strength Data for Existing Road Sections

Existing road section HDM section name	HDM Code	SN	Subgrad eCBR
1. Bar – Durmani	BB-1	2.96	75
2a. Durmani – Sozina tunnel*	BB-2a	3.50	75
2b. Sozina tunnel*	BB-2b	3.50	75
2c. Sozina tunnel – Virpazar*	BB-2c	2.66	61
3. Virpazar – Podgorica 1 (Niksic)	BB-3	2.66	57
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)*	BB-4	3.50	75
5. Podgorica 2 (Tuzi) – Bioce	BB-5	2.47	71
6. Bioce – Mioska	BB-6	3.06	68
7. Mioska – Kolasin	BB-7	3.75	31
8. Kolasin – Mojkovac	BB-8	2.98	70
9. Mojkovac – Slijepac Most	BB-9	4.16	83
10. Slijepac Most – Ribarevina	BB-10	3.78	47
11. Ribarevina – Bijelo Polje	BB-11	1.91	96
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	1.91	96

Note: SN = structural number (a measure of the bearing strength of pavement layers);

CBR = California Bearing Ratio

* estimated

Existing road section HDM section name	HDM code	SN	Subgrade CBR
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.82	23
2. Vilusi – Niksic	JJ-BH-2	2.98	81
3. Niksic – Danilovgrad	JJ-BH-3	3.77	68
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	3.41	73
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	3.50	75
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	3.00	81
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	1.16	100
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	0.90	61

Existing road section HDM section name	HDM code	SN	Subgrade CBR
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1		
2. Herceg Novi – Kamenari	JJ-C-2		
2a. Kamenari – Risan	JJ-C-2a		
2b. Risan – Kotor	JJ-C-2b		
2c. Kotor – Radanovici	JJ-C-2c		
2f. Lepetani – Radanovici	JJ-C-2f		
3. Radanovici – Budva	JJ-C-3		
4. Budva – Cetinje	JJ-C-4		
5. Cetinje – Podgorica	JJ-C-5		

Source: Consultant's estimates

Table 5: HDM Input Aggregate Data for Existing Road Sections

Variable	Parameter values				
Traffic Flow Pattern *		**Hours per year**	**Percent of AADT**		
	Period 1	2 190	40.1%		
	Period 2	2 190	33.0%		
	Period 3	2 190	20.2%		
	Period 4	2 190	6.7%		
	Total year	8 760	100.0%		
Speed – Flow Types		**Ultimate capacity PCSE/lane/h**	**Free-flow capacity**	**Nominal capacity**	**Jam speed at capacity km/h**
	Two lane standard	1 400	0.1	0.9	25
	Two lane narrow	1 350	0.1	0.8	23
	Single lane	600	0.0	0.7	10
		Accident rates: no. per 100 million veh-km			
		Fatal	**Injury**	**Damage-only**	
	Two lane standard				
	Two lane narrow				
	Single lane				
Climate Zone	**Moisture classification: sub-humid**				
	Moisture index	**Duration of dry season per cent of year**	**Mean monthly precipitation mm**		
	0	50%	100		
	Temperature classification: temperate – cool				
	Mean	**Average range**	**Days > 32°C**	**Freeze index**	
	12°C	15°C	15	55	
	Percent of time driven on:				
	Snow-covered roads		10%		
	Water-covered roads		5%		

Road Class	Primary (trunk)	
Surface Class	Bituminous	
Pavement Type	AMAB – asphalt mix on asphalt base	

Note: * the traffic flow pattern values have been specifically derived for this study from the traffic count survey data and are not the program's default values.

veh-km = vehicle kilometres

Source: Consultant's estimates

The study base year is taken as 2007. The estimation of traffic volumes on the study roads derive from three sources, these being

- manual classified traffic counts carried out by Crnagoraput (October 2007)
- manual seven-day traffic count surveys undertaken within this study (October 2007)
- traffic assignments on the road network produced by the VISUM traffic model within this study (utilising the survey count data)

A table with finally estimated traffic volumes will be included in a revision of technical memorandum by 15th of January.

3 Vehicle Fleet data

The vehicle fleet data used by the model relate to the operating characteristics as well as to the economic operating costs for each vehicle class included in the evaluation. The selected seven vehicle types accord with those identified for the traffic survey studies, as follows:

- car
- light delivery van / goods vehicle
- mini / micro bus (up to 12 seats)
- bus (conventional bus with more than 30 seats) (2-axle)
- small truck (2-axle)
- medium truck (2-axle)
- heavy truck (5-axle articulated)

Model input data on vehicle characteristics, utilisation and loading together with unit costs, prices and time values have been derived from a combination of sources including information gathered from the traffic count, origin-destination and stated preference surveys carried out as part of this study, research on current price/cost information in Montenegro and the Balkans region, existing data from the earlier BCEOM/COWI studies[9] and the HDM program's set default values. The data sources are summarised in Table 7.

The representative vehicle types are the following:

Car	Volkswagen Golf 1.4
Light delivery van / goods vehicle	Volkswagen T5
Micro bus	Volkswagen Crafter Kombi
Bus (conventional 2-axle)	TEMSA Metropol
Small truck (2-axle)	IVECO Daily 40
Medium truck (2-axle)	Mercedes Atego (7.5 tonne)
Heavy truck (5-axle articulated)	Mercedes Actros (Euro 5)

Notwithstanding the above, prices for a range of models from other vehicle manufacturers falling within the general specification of each representative type were obtained in order to

[9] (i) BCEOM/COWI, September – October 2002 op. cit.;
(ii) COWI/BCEOM Feasibility Study for Belgrade-Montenegro Road, Serbia. Cost Benefit Analyses Working Paper, December 2005.

derive an average price across the range. All economic cost/price data exclude taxes (VAT) and any other duties or levies.

Table 7: HDM Vehicle Operating Cost (VOC) Input Data Sources

VOC input data parameter	LBSAS 2007	BCEOM/COWI 2003/2005
Representative vehicle type and vehicle Characteristics	X	X
Passenger Car Space Equivalent (PCSE)	X	
Tyre details	X	
Vehicle utilisation – annual km, annual working hours, average life	X	X
Vehicle utilisation – private usage, passenger occupancy, work-related trips	X	
Vehicle loading – ESAL (equivalent standard axle load), operating weight	X	X
Economic unit costs – new vehicle price, tyre price, fuel prices, maintenance labour, crew costs, overheads	X	
Economic unit costs – values of passenger travel time	X	

Notes:

The model's default PCSE values for buses and trucks were modified taking into consideration the average generalised passenger car equivalents on motorways as set out in the TEM (Trans European Motorways) Standards and Recommended Practice. All calibration details are the model's default values.

Retail (financial) pump prices for motor vehicle fuel in October 2007 were €1.09 for benzene (unleaded gasoline or petrol) and €1.05 for diesel. On average, the price for semi-synthetic lubricating oil is €7.00 per litre.The following assumptions have been made in deriving the average long-term economic price of fuel as shown in Table 8. The economic price of lubricating oil assumes only the removal of VAT, that is, €5.81 per litre.

Table 8: Economic Fuel Price Derivation

US Gasoline retail price structure*	
Crude oil price per barrel	53.0%
Taxes	19.7%
Refining costs	18.1%)
Distribution/marketing costs	27.1%
** in 2005*	9.0%)
ratio of refining/distribution/marketing costs to crude oil price	0.51
Study assumptions:	
Long term average price of crude oil per barrel (USD)	$ 70.00
Refining/distribution/marketing costs	$ 35.80
Economic price per barrel (USD)	$ 105.80
Litres per barrel	159
Economic price per litre (USD)	$ 0.67
exchange rate USD:Euro	1.40:1
Economic price per litre (€)	€ 0.48

Sources: American Petroleum Institute. Understanding Today's

Crude Oil and Product Markets (Oil Primer). May 2006 (Figure 6).

BP Statistical Review 2007, and Consultant's estimates

This table is under revision and will be available by 15th of January

Values of passenger travel time were derived from results of the Stated Preference (roadside interview) surveys carried out in October 2007 and reported on in Technical Memorandum No.6. Analysis of the survey data showed the overall value of time to be €3.54 per person –hour, averaged across all respondents from the 16 country-wide survey stations.

For purposes of distinguishing between private car users and users of public transport services (buses and micro-buses) for the HDM model, reference has been made to statistical data on average monthly earnings in the Montenegrin economy[10]. The 2005 data showed that the average gross wage in the highest earning financial services sector (€4.28 per person hour) was about 2.3 times greater than the average gross wage for all economic activities as a whole (€1.86 per person hour). This differential has been taken as a reasonable proxy for estimating the different values of working time between higher-income

[10] Statistical Yearbook of the Republic of Montenegro 2006. Table 5-16 (page 64).

earning private car users and public transport users. Thus, the estimated values of working time for car users and bus passengers are €3.54 and €1.53 per hour respectively.

Based on World Bank[11] recommendations, the value of non-working time has been taken as 30 per cent of the overall average value of work time irrespective of transport mode used. This value is therefore €1.06 per person hour.

The interest rate component of new vehicle purchase is, for economic purposes, assumed to be 5 percent, or the net difference between bank lending rates and longer term inflation. Table 9 outlines

key data used for the VOC model inputs whilst the basic and economic vehicle fleet input data as reported by the HDM model are shown in Tables 10a and 10b on the following pages.

Table 9: Key VOC Input Data

Model Input Parameter	**Car**	**Light delivery vehicle**	**Microbus**	**Bus**	**Small truck**	**Medium truck**	**Articu-lated truck**
Vehicle class	*Car*	*Utility*	*Bus*	*Bus*	*Truck*	*Truck*	*Truck*
PCSE	1,0	1,0	1,0	1,8	1,5	2,0	3,0
Number of axles	2	2	2	2	2	2	5
Number of wheels	4	4	4	6	6	6	12
Annual km	16.000	20.000	40.000	40.000	40.000	40.000	80.000
Annual work hours	500	600	1.200	1.200	1.200	1.200	2.000
Average life (years)	12	12	12	12	12	14	14
ESAL factor	0	0	0	0,92	0,02	0,60	3,23
Operating weight (tonnes)	1,10	2,60	2,50	11,84	4,13	7,50	28,85
number of passengers	2	-	4,5	20	-	-	-
New vehicle price	€11 200	€14 500	€18 800	€94 900	€30 000	€51 000	€106 000
Replacement tyre price	€ 78	€ 96	€ 96	€ 227	€ 96	€ 181	€ 341
Workshop labour / hour	€ 6,00	€ 6,00	€ 6,00	€ 9,00	€ 7,00	€ 9,00	€ 9,00
Crew cost per hour	-	-	€ 4,50	€ 4,50	€ 4,50	€ 4,50	€ 4,50
Overheads (annual)	€ 200	€ 220	€ 300	€ 700	€ 380	€ 770	€ 1.180
Passenger work time per hour	€ 3,54	-	€ 1,53	€ 1,53	-	-	-
Passenger non-work time per hour	€ 1,06	-	€ 1,06	€ 1,06	-	-	-

Notes: * tyres on the (articulated) semi-trailer unit are super-single.

Prices and costs are expressed in economic terms, exclusive of VAT and any other taxes and duties.

PCSE = passenger car space equivalent. ESAL = equivalent standard axle load.

[11] Professor Ken Gwilliam, Paper no. OT-5, Transport Department

Given the relatively short travel distances within Montenegro, it is assumed that there are no truck and bus driver assistants. Overheads include annual vehicle registration (licensing) fees, 3rd party insurance premiums and other vehicle related taxes and charges.

Sources: BCEOM/COWI July 2003, op. cit;

COWI/BCEOM December 2005, op. cit;

HDM default values; Consultant's estimates.

Table 10a HDM Input Data for Vehicle Fleet – Basic Characteristics

H D M - 4 **Vehicle Fleet - Basic**

HIGHWAY DEVELOPMENT & MANAGEMENT

Study Name: **Bar-Boljare**
Run Date: **30-11-2007**

Motorised Vehicle Types:

Name	Base Type	PCSE	No. of Wheels	No. of Axles	Tyre Type	Tyre Base Recaps	Tyre Retread Cost (%)	Annual Km	Annual Work Hours	Avg Life	Private Use (%)	Pass-engers	Work Related Trips (%)	ESALF	Oper. Weight (t)	Life Model
Car	Medium Car	1.00	4	2	Bias ply	1.30	15.00	16,000	500	12	100	2	68.00	0.00	1.10	Constant
Micro-bus	Mini Bus	1.00	4	2	Radial ply	1.30	15.00	40,000	1,200	12	0	5	68.00	0.00	2.50	Optimal
Bus	Heavy Bus	1.80	6	2	Bias ply	1.30	15.00	40,000	1,200	12	0	20	68.00	0.92	11.84	Constant
Small Truck	Light Truck	1.50	6	2	Bias ply	1.30	15.00	40,000	1,300	9	0	0	0.00	0.02	4.13	Optimal
Medium Truck	Medium Truck	2.00	6	2	Bias ply	1.30	15.00	40,000	1,200	14	0	0	0.00	0.60	7.50	Optimal
Articulated Truck	Articulated Truck	3.00	12	5	Super single	1.30	15.00	80,000	2,000	12	0	0	0.00	3.23	28.85	Optimal
Light Delivery Vehicle	Light Delivery	1.00	4	2	Radial ply	1.30	15.00	20,000	600	12	0	0	0.00	0.00	2.60	Optimal

HDM-4 Version 1.3 **Page -1 of 1**

Source: Consultant's estimates

Table 10b HDM Input Data for Vehicle Fleet – Economic Characteristics

HDM-4 **Vehicle Fleet - Economic**

HIGHWAY DEVELOPMENT & MANAGEMENT

Study Name: **Bar-Boljare**
Run Date: **30-11-2007**
Currency: **Euro**

Motorised Vehicle Types:

Name	Base Type	New Vehicle	Replace Tyre	Fuel (per litre)	Lubr. Oil (per litre)	Maint Labour (per hr) (per litre)	Crew Wages (per hr)	Annual Overhead	Annual Interest (%)	Passenger Work Time (per hr)	Passenger Non-Work (per hr)	Cargo Holding (per hr)
Car	Medium Car	11,200	78	0.48	5.81	6.00	0.00	170	10.00	3.54	1.06	0.00
Micro-bus	Mini Bus	18,800	96	0.48	5.81	6.00	4.50	300	10.00	1.53	1.06	0.00
Bus	Heavy Bus	94,900	227	0.48	5.81	9.00	4.50	700	10.00	1.53	1.06	0.00
Small Truck	Light Truck	30,000	96	0.48	5.81	7.00	4.50	380	10.00	0.00	0.00	0.00
Medium Truck	Medium Truck	51,000	181	0.48	5.81	9.00	4.50	770	10.00	0.00	0.00	0.00
Articulated Truck	Articulated Truck	106,000	341	0.48	5.81	9.00	4.50	1,180	10.00	0.00	0.00	0.00
Light Delivery Vehicle	Light Delivery	14,500	96	0.48	5.81	6.00	0.00	220	10.00	0.00	0.00	0.00

HDM-4 Version 1.3 **Page -1 of 1**

Source: Consultant's estimates

4 Maintenance Works Standards Input Data

Current unit costs for maintenance works, averaged over 2006 and 2007, are shown in Table 11.

Table 11: Maintenance Works Unit Financial Costs, 2006/07

Maintenance operation	Unit	Unit cost € (financial)
Wide crack sealing	m^2	€ 13.50
Pothole patching	m^2	€ 49.00
Edge repair	m^2	€ 100.00
Overlay – thin (20 mm AC)	m^2	€ 4.90
Overlay (40 mm AC)	m^2	€ 12.00
Overlay (50 mm AC)	m^2	€ 14.00
Overlay (60 mm AC)	m^2	€ 16.28
Drainage	km	€ 290.00
Shoulders maintenance	km	€ 578.00
Safety and operational	km	€ 1,170.00
Winter maintenance	km	€ 2,193.00

Note: AC = asphalt concrete

Source: Ministry of Transport, Maritime Affairs and Telecommunications

The maintenance standards applicable to the existing road sections and for the proposed new highways are set out in Table 12.

Table 12 Planned Maintenance Works over Project Evaluation Period (2008–2030)

Type of Maintenance application	Type of Maintenance Works	Economic cost Euro	After Works Effects of Intervention
Existing Road: without project – base case Routine maintenance Scheduled: every year (2008 – 2037)	Pothole patching	/m^2	100% potholes patched
	Winter snow clearance	/km	
Proposed Highway: with project Overlay Responsive: when IRI => 6.0 Preparatory works: Patching – responsive: when severely damaged area => 5% Crack sealing – responsive: When wide structural cracking => 10% Annual routine maintenance (2008 – 2037)	Overlay 60 mm Surface material AC	/m^2	2.0 IRI
	Pothole patching	/m^2	100% potholes Patched
	Crack sealing	/m^2	100% cracks sealed
	Drainage and snow clearance, road signs markings and barriers	/km	

Note: Economic costs are taken to be 80 per cent of financial costs

Source: Consultant's estimates

5 Project Evaluation Methodology

Using the HDM-4 model, the cost benefit analysis compares the total cost streams over the 30-year evaluation life of the project between the *without project* existing road and the *with project* proposed new highway, for the preferred route alternative. For both the existing road and the proposed new highway, these costs include those of routine maintenance activities, vehicle operation, travel time and accidents; in addition, the capital costs of the new highway construction are included for the *with project* case.

Using the HDM-4 program for analysis conforms with standard international practice and enables direct comparison by funding agencies, and in the event of future consideration of tolling and private sector financing, enables potential investors to examine all model inputs and compare results with motorway project studies elsewhere.

TECHNICAL MEMORANDUM NO 8A

HDM - 4 INPUT PARAMETERS REVISION

CONTENTS

1 INTRODUCTION

The economic evaluation of the proposed new north-south (port of Bar – Serbian border) motorway and the east-west (Adriatic – Ionian) highway alignments are to be carried out using the internationally accepted HDM-4 model[1], which has become the standard software application used for international donor funded roads projects. This program models the relationships between traffic and pavement deterioration and maintenance over the design life of a road, within a project-based life cycle approach.

The cost benefit analyses for the proposed road improvement alternatives are based on a comparison of the cost streams for the existing *without project* situation (often termed the *base case*) and the proposed *with project* new motorway option. The principal cost components incorporated in the analyses are the road (motorway/highway) construction costs, road maintenance costs over the life of the project, and the costs of vehicle operation, travel time and road traffic accidents.

The HDM-4 model structure comprises the following key modules:

- the road network;
- the vehicle fleet;
- maintenance and improvement works standards; and
- definition of alternatives to be evaluated by the model.

For those road sections comprising the analysis, the first of these modules defines the roads' existing functional, physical, geometric and structural characteristics together with the associated average annual daily traffic (AADT). The second of the modules describes the characteristics and the price/cost values of the vehicle classes comprising the vehicle fleet. The third module describes the types of existing and proposed maintenance/improvement works allied with their unit costs. The fourth module describes the alternatives to be compared in terms of defining the base alternatives – which constitutes the existing road alignments – and the two proposed road section alternatives – representing the new highway improvement options – with respect to the road engineering characteristics, and future traffic by means of growth rates for each of the vehicle classes. This last module also defines the basic parameters concerning the analysis period and rate of discount to be used in the evaluation.

All cost data are expressed in Euro, in 2007 prices. Traffic growth rates and forecasts by road section are presented in a separate technical memorandum.

The HDM-4 analyses will be undertaken with reference to each of the disaggregated road sections along the respective study corridors. Identification of these road sections is firstly: on the basis of homogeneous or uniform traffic volumes in terms of observed daily traffic (AADT) for each section.

[1] Highway Development and Management series, version 1.3.

This primary dis-aggregation of road sections is defined by their functional classification, that is, the role in connecting urban centres with one another, and linking with other primary *magistralni* (primary) and *regionalni* (secondary) roads. A second level of dis-aggregation is required on the basis of number of traffic lanes, geometric characteristics, the type of pavement, width of shoulders, etc. Taking into account these criteria, the definition of the existing road sections to be modelled within the HDM-4 program is shown in Table 1.

Table 1: Existing Road Sections for HDM-4 Modelling

North – South corridorBar – Boljare (Serbian border) Highway

Existing road section **HDM section name**	**HDM** **code**	**Length** **km**	**Comments**
1. Bar – Durmani	BB-1	10.3	junction with road to tunnel (Petrovac)
2a. Durmani – Sozina tunnel	BB-2a	2.1	
2b. Sozina tunnel	BB-2b	4.4	designed to motorway standard
2c. Sozina tunnel – Virpazar	BB-2c	7.3	
3. Virpazar – Podgorica 1 (Niksic)	BB-3	20.3	junction primary road
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	7.8	
5. Podgorica 2 (Tuzi) – Bioce	BB-5	14	junction regional road (Matesevo)
6. Bioce – Mioska	BB-6	38.5	junction regional road (Savnik)
7. Mioska – Kolasin	BB-7	16.9	junction primary road (Matesevo)
8. Kolasin – Mojkovac	BB-8	20.6	junction regional road (Pljevlja)
9. Mojkovac – Slijepac Most	BB-9	16.3	junction regional road (Pljevlja)
10. Slijepac Most – Ribarevina	BB-10	6.0	junction primary road (Berane)
11. Ribarevina – Bijelo Polje	BB-11	6.2	
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	13.3	CG border with Serbia
Total: Bar – Granica CG (Barski Most)		**184.05**	

Note: the section "Sozina tunnel" is the only road section that is currently operational and already designed to a standard that will conform with, and constitute part of, the proposed new highway.

Table 1 continued

East – West corridor Adriatic – Ionian Highway (via Bosnia-Herzegovina)

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.5	CG border with Bosnia-Herzegovina
2. Vilusi – Niksic	JJ-BH-2	33.5	junction primary road
3. Niksic – Danilovgrad	JJ-BH-3	33.3	
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	20.2	
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	1.2	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Klobuk – Bozaj)		**115.3**	

East – West corridor Adriatic – Ionian Highway (via Croatia – *ferry crossing*

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	CG border with Croatia
2. Herceg Novi – Kamenari	JJ-C-2	15.0	ferry crossing (Kamenari-Lepetani)
2f. Lepetani – Radanovici	JJ-C-2f	10.1	junction primary road (Kotor/Tivat)
3. Radanovici – Budva	JJ-C-3	19.5	
4. Budva – Cetinje	JJ-C-4	27.7	
5. Cetinje – Podgorica	JJ-C-5	34.9	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Debeli Brijeg – Bozaj)		**141.5**	

East – West corridor Adriatic – Ionian Highway (via Croatia – road route

Existing Road Section HDM section name	HDM code	Length km	Comments
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	CG border with Croatia
2. Herceg Novi – Kamenari	JJ-C-2	15.0	ferry crossing to Lepetani

2a. Kamenari – Risan	JJ-C-2a	10.4	junction regional road (Vilusi)
2b. Risan – Kotor	JJ-C-2b	17.6	junction primary road (Cetinje)
2c. Kotor – Radanovici	JJ-C-2c	4.4	junction primary road (Tivat/Budva)
3. Radanovici – Budva	JJ-C-3	19.5	
4. Budva – Cetinje	JJ-C-4	27.7	
5. Cetinje – Podgorica	JJ-C-5	34.9	
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	CG border with Albania
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	CG border with Albania – single lane
Total: Granica CG (Debeli Brijeg – Bozaj)		**163.8**	

Source: Consultant's estimates

2 ROAD NETWORK DATA

The road network data that are used by the model comprise a wide range of variables relating to road geometry and to pavement structure, history and condition, most of which have default values that relate to the observed characteristics of each variable on the basis of global road engineering experience and practice over the past 40 years. Nevertheless, there are a number of key parameters for which specific data relevant to local study area conditions need to be applied, corresponding to a *Level 1* calibration of the HDM model. A Level 1 calibration is the minimum level required in any HDM application. Besides adopting many of the program's default values, this level determines the values of the model's basic input parameters with respect to the key variables within each of the Vehicle Fleet, Road Network and Works Maintenance and Improvement Standards modules, namely:

- Road pavement characteristics;
- Representative vehicle characteristics;
- Traffic composition and growth rates;
- Unit costs (for both the Road Deterioration and Works Effects and the Road User Effects modelling components);
- Environmental (climatic) conditions.

In the context of the HDM modelling that is to be carried out in this study, the BCEOM *Strategic Plan for Road Infrastructure Maintenance and Development* carried out in 2002/2003[2] is of direct relevance. That study focused on performance and maintenance of the Montenegrin road network and development of a road maintenance management system. A road database was developed (for HDM modelling) and incorporated detailed information for all of the *magistralni* roads (primary roads), and *regionalni* (secondary) roads[3]. In most cases, the road characteristics data used in this study are derived from the BCEOM files obtained from TD. However, geometric characteristics of existing road sections in the two motorway corridors were also checked using the 1:25000 maps. Table 2 lists data for the existing road sections.

Lengths of road sections were referenced from official Crnagoraput 2007 data[4] for all sections excepting those constituting the recently constructed Sozina tunnel, which was opened to traffic in 2005. For these particular sections, lengths were estimated with reference to AUTOCAD maps used in the development of the study's traffic assignment model.

[2] BCEOM in association with COWI, various Final Reports dated July 2003.

[3] Drive-through surveys carried out during September and October 2002 over all of the primary (*magistralni*) and secondary (*regionalni*) roads in the country (approx. 1,850 km) using a special purpose vehicle.

[4] CRNAGORAPUT A.D. Podgorica. JEDNODNEVNO BROJANJE SAOBRACAJA za 2007. NA MAGISTRALNIM I REGIONALNIM PUTEVIMA REPUBLIKE CRNE GORA. oktobar 2007.

Table 2: Existing Road Section Alignment Measurements

North – South corridor Bar – Boljare (Serbian border) Highway (*Autoput Bar – Boljare)*

Existing road section HDM section name	HDM Code	Length km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Bar – Durmani	BB-1	10.3	280	36
2a. Durmani – Sozina tunnel*	BB-2a	2.1	80	40
2b. Sozina tunnel*	BB-2b	4.4	10	1
2c. Sozina tunnel – Virpazar*	BB-2c	7.3	100	45
3. Virpazar – Podgorica 1 (Niksic)	BB-3	20.3	45	7
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	7.8	60	1
5. Podgorica 2 (Tuzi) – Bioce	BB-5	14	230	22
6. Bioce – Mioska	BB-6	38.5	320	17
7. Mioska – Kolasin	BB-7	16.9	500	37
8. Kolasin – Mojkovac	BB-8	20.6	350	20
9. Mojkovac – Slijepac Most	BB-9	16.3	410	35
10. Slijepac Most – Ribarevina	BB-10	6.0	240	13
11. Ribarevina – Bijelo Polje	BB-11	6.2	160	13
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	13.3	160	13
Total: Bar – Granica CG (Barski Most)		**184.05**	**261**	**20**

Note: * Estimated alignment for the recently constructed (2004) Sozina tunnel sections.

East – West corridor Adriatic – Ionian Highway (via Bosnia-Herzegovina)

Existing Road Section HDM section name	HDM code	Length Km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.458	400	46
2. Vilusi – Niksic	JJ-BH-2	33.520	310	20
3. Niksic – Danilovgrad	JJ-BH-3	33.334	90	22
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	20.229	30	9
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	1.150	60	1
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.000	100	7
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.768	70	6
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.810	410	23
Total: Granica CG (Klobuk – Bozaj)		**115.269**	**183**	**18**

Table 2 – continued

East – West corridor Adriatic – Ionian Highway (via Croatia – *ferry crossing*)

Existing Road Section HDM section name	HDM code	Length Km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	136	23
2. Herceg Novi – Kamenari	JJ-C-2	15.0	30	5
2f. Lepetani – Radanovici	JJ-C-2f	10.1	100	11
3. Radanovici – Budva	JJ-C-3	19.5	86	22
4. Budva – Cetinje	JJ-C-4	27.7	204	45
5. Cetinje – Podgorica	JJ-C-5	34.9	232	34
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	101	7
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	74	6
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	411	23
Total: Granica CG (Debeli Brijeg – Bozaj)		**141.5**	**161**	**25**

East – West corridor Adriatic – Ionian Highway (via Croatia – road route)

Existing Road Section HDM section name	HDM code	Length Km	Horizontal curvature degrees / km	Vertical rise and fall metres / km
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	10.7	136	23
2. Herceg Novi – Kamenari	JJ-C-2	15.0	30	5
2a. Kamenari – Risan	JJ-C-2a	10.4	216	13
2b. Risan – Kotor	JJ-C-2b	17.6	181	21
2c. Kotor – Radanovici	JJ-C-2c	4.4	140	28
3. Radanovici – Budva	JJ-C-3	19.5	86	22
4. Budva – Cetinje	JJ-C-4	27.7	204	45
5. Cetinje – Podgorica	JJ-C-5	34.9	232	34
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	9.0	101	7
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	3.8	74	6
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	10.8	411	23
Total: Granica CG (Debeli Brijeg – Bozaj)		**163.8**	**172**	**24**

Source: TD data and Consultant's estimates

In the case of road condition, given the five year time elapse since the last surveys were conducted[5], data on road surface condition have used the model default values with respect to observed driving conditions and road serviceability during the course of drive-through field surveys in October and November 2007. In this instance, it should be noted that the economic evaluation to be performed in this feasibility study focuses less on pavement characteristics in terms of road roughness and primarily on the wider cost comparisons, including reduction of accidents and travel time, as well as vehicle operation costs, between different topographical route alignments. The 'without project' case assumes that a reasonably high level of maintenance will continue to be undertaken throughout the project evaluation period in order

[5] BCEOM/COWI, September – October 2002 op. cit.

to maintain surface roughness level of approximately 4.0 IRI (International Roughness Index[6]) corresponding to a driving speed of 80 kilometres per hour.

These surveys showed that the existing roads are in relatively good condition, and that maintenance has been prudently carried out. Even with posted speed limits in built-up areas and road sections with tight geometric radii and reduced visibility, driving speeds in a saloon car were comfortably of the order of 80 km/h. Although structural cracking was evident, there were few potholes on the main study routes, evidently due to execution of appropriate patching and repair works. Estimated surface roughness was 4 to 5 IRI.

Selected input data for each of the key engineering, geometric and pavement characteristics of the existing roads, as reported by the HDM model, are given in Tables 3a and 3b on the following pages. In respect of pavement strength information, the results of the falling weight deflectometer surveys carried out under the BCEOM 2002/03 Strategic Plan have been directly used and these data are shown in Table 4. For other input data that is common across all study road sections, Table 5 summarises the variables and model default values used.

[6] IRI is a measure of surface bumpiness or unevenness expressed in metres per kilometre.

Table 3a Selected HDM Input Data for Existing Road Sections: Bar – Boljare (Serbian border) Highway

H D M - 4
HIGHWAY DEVELOPMENT & MANAGEMENT

Road Sections - Selected Basic, Geometry, Pavement

Study Name: **Bar-Boljare** Run Date: **21-11-2007**

ID	Name	Length (Km)	Width (m)	Shoulder width (m)	Altitude (m)	Speed Limit (km/h)	Material Type	Current Surface Thickness (mm)	Previous Surface Thickness (mm)	Last Year Construction /Treatment
BB-1	Bar-Durmani	10.33	7.00	0.00	30	80	AC	40	0	1965
BB-10	Slijepac Most - Ribarevina	6.04	7.00	0.00	1,000	80	AC	40	0	1997
BB-11	Ribarevina - Bijelo Polje	6.18	7.00	0.00	1,000	80	AC	57	0	1969
BB-12	Bijelo Polje - Granic CG (Barski Most)	16.15	7.00	0.00	1,000	80	AC	57	0	1969
BB-2a	Durmani-Sozina tunnel	2.06	7.00	0.50	300	80	AC	40	0	2004
BB-2b	Sozina tunnel	9.60	7.00	2.00	300	60	AC	40	0	2004
BB-2c	Sozina tunnel - Virpazar	4.36	7.00	0.00	300	80	AC	40	0	2004
BB-3	Virpazar - Podgorica 1 (Niksic)	26.93	7.00	0.00	40	80	AC	40	0	1998
BB-4	Podgorica 1 (Niksic) - Podgorica 2 (Tuzi)	1.15	7.00	0.00	50	50	AC	40	0	1990
BB-5	Podgorica 2 (Tuzi) - Bioce	13.53	7.00	0.00	60	80	AC	60	0	1962
BB-6	Bioce - Mioska	39.84	7.00	0.00	500	80	AC	57	0	1964
BB-7	Mioska - Kolasin	17.34	7.00	0.00	1,000	80	AC	45	0	1964
BB-8	Kolasin - Mojkovac	20.23	7.00	0.00	1,000	80	AC	44	0	1997
BB-9	Mojkovac - Slijepace Most	17.26	7.00	0.00	1,000	80	AC	48	0	1997

AC = Asphalt Concrete

HDM-4 Version 1.3

Note: Last year of either construction/reconstruction or treatment works – overlay, resealing, preventative treatment.
Source: Consultant's estimates

Table 3b Selected HDM Input Data for Existing Road Sections: Adriatic – Ionian Highway (via Bosnia-Herzegovina)

H D M - 4

HIGHWAY DEVELOPMENT & MANAGEMENT

Road Sections - Selected Basic, Geometry, Pavement

Study Name: **Jadransko-Jonski** Run Date: **21-11-2007**

ID	Name	Length (Km)	Width (m)	Shoulder width (m)	Altitude (m)	Speed Limit (km/h)	Material Type	Current Surface Thickness (mm)	Previous Surface Thickness (mm)	Last Year Construction /Treatment
BB-4	Podgorica 1 (Niksic) - Podgorica 2 (Tuzi)	1.15	7.00	0.00	50	50	AC	40	0	1990
JJ-BH-1	Granica CG (Klobuk) - Vilusi	3.46	6.00	0.00	800	80	AC	30	0	1980
JJ-BH-2	Vilusi - Niksic	33.52	6.00	0.00	800	80	AC	70	5	1981
JJ-BH-3	Niksic - Danilovgrad	33.33	7.00	0.00	600	80	AC	40	5	1979
JJ-BH-4	Danilovgrad - Podgorica 2 (Niksic)	20.23	7.00	0.00	300	80	AC	42	0	1980
JJ-BH-6	Podgorica 2 (Tuzi) - Tuzi	9.00	6.00	0.00	50	80	AC	30	0	1990
JJ-BH-7a	Tuzi - Granica CG (Bozaj)-std	3.77	6.00	0.00	50	80	DBSD	50	0	1973
JJ-BH-7b	Tuzi - Granica CG (Bozaj)-sgl	10.81	3.50	0.00	200	60	DBSD	65	0	1973

HDM-4 Version 1.3

AC = Asphalt Concrete DBSD = Double Bituminous Surface Dressing

Table 4: Pavement Strength Data for Existing Road Sections

Existing road section HDM section name	HDM Code	SN	Subgrade CBR
1. Bar – Durmani	BB-1	2.96	75
2a. Durmani – Sozina tunnel*	BB-2a	3.50	75
2b. Sozina tunnel*	BB-2b	3.50	75
2c. Sozina tunnel – Virpazar*	BB-2c	2.66	61
3. Virpazar – Podgorica 1 (Niksic)	BB-3	2.66	57
4. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)*	BB-4	3.50	75
5. Podgorica 2 (Tuzi) – Bioce	BB-5	2.47	71
6. Bioce – Mioska	BB-6	3.06	68
7. Mioska – Kolasin	BB-7	3.75	31
8. Kolasin – Mojkovac	BB-8	2.98	70
9. Mojkovac – Slijepac Most	BB-9	4.16	83
10. Slijepac Most – Ribarevina	BB-10	3.78	47
11. Ribarevina – Bijelo Polje	BB-11	1.91	96
12. Bijelo Polje – Granica CG (Barski Most)	BB-12	1.91	96

Note: SN = structural number (a measure of the structural strength of pavement layers); CBR = California Bearing Ratio (resistance of the sub-grade to deformation under wheel loads)
* estimated

Existing road section HDM section name	HDM code	SN	Subgrade CBR
1. Granica CG (Klobuk) – Vilusi	JJ-BH-1	3.82	23
2. Vilusi – Niksic	JJ-BH-2	2.98	81
3. Niksic – Danilovgrad	JJ-BH-3	3.77	68
4. Danilovgrad – Podgorica 2 (Niksic)	JJ-BH-4	3.41	73
5. Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	BB-4	3.50	75
6. Podgorica 2 (Tuzi) – Tuzi	JJ-BH-6	3.00	81
7a. Tuzi – Granica CG (Bozaj)-std	JJ-BH-7a	1.16	100
7b. Tuzi – Granica CG (Bozaj)-sgl	JJ-BH-7b	0.90	61
Existing road section **HDM section name**	**HDM** **code**	**SN**	**Subgrade** **CBR**
1. Granica CG (Debeli Brijeg) – Herceg Novi	JJ-C-1	2.75	47
2. Herceg Novi – Kamenari	JJ-C-2	2.95	65

2a. Kamenari – Risan	JJ-C-2a	3.11	91
2b. Risan – Kotor	JJ-C-2b	2.95	63
2c. Kotor – Radanovici	JJ-C-2c	2.00	46
2f. Lepetani – Radanovici	JJ-C-2f	3.26	54
3. Radanovici – Budva	JJ-C-3	3.10	30
4. Budva – Cetinje	JJ-C-4	3.00	69
5. Cetinje – Podgorica	JJ-C-5	3.90	68

Source: Consultant's estimates

Table 5: HDM Input Aggregate Data for Existing Road Sections

HDM-4 Variables & parameter values				
Traffic Flow pattern	**Hours / year**	**% of AADT**		
Period 1	2,190	40.1%		
Period 2	2,190	33.0%		
Period 3	2,190	20.2%		
Period 4	2,190	6.7%		
Total year	8,760	100.0%		
Speed – Flow types	**Ultimate capacity PCSE/lane/h**	**Free-flow capacity**	**Nominal capacity**	**Jam speed at capacity km/h**
Two lane standard	1,400	0.10	0.90	25
Two lane narrow	1,350	0.10	0.80	23
Four lane divided	2,000	0.40	0.95	40
Speed – Flow types	**Accident rates: per 100 million vkm**			
	Fatal	**Injury**	**D-O**	
Two lane standard	4.8 / 6.8	104.2 / 148.2	na	
Two lane narrow	na	na	na	
Four lane divided	2.0	40.0	na	
Climate Zone	**Moisture classification: sub-humid**			
Moisture index	**Duration of dry season**	**Mean monthly precipitation (mm)**		
0	50%	100		
Temperature classification: temperate – cool				
Mean annual temperature	**Average range**	**Days > 32°C**	**Freeze index**	
12°C	15°C	15	55	
Percent of time driven on:				
Snow-covered roads		10%		
Water-covered roads		5%		
Road Class: Primary (trunk)				
Surface Class: Bituminous				
Pavement Type: AMAB – asphalt mix on asphalt base				

Note: * the traffic flow pattern values have been specifically derived for this study from the traffic count survey data and are not the program's default values.
vkm = vehicle kilometres Source: Consultant's estimates

The study base year is taken as 2007. The estimation of traffic volumes on the study roads derive from three sources, these being:

- manual classified traffic counts carried out by Crnagoraput (October 2007)
- manual seven-day traffic count surveys undertaken within this study (October 2007)

- traffic assignments on the road network produced by the traffic model within this study (utilising the survey count data)

Table 6 gives the ADT traffic data (total average daily traffic) for the two October count surveys and the annualised average daily traffic (AADT) as produced by the traffic model.

Table 6: Daily Traffic on Existing Study Road Sections, 2007

Existing road section HDM section name	CGP counts ADT	LBSAS counts ADT	LBSAS traffic model AADT*
North – South corridor Bar – Boljare (Serbian border) Highway			
Bar – Durmani	5 385	6 919	
Durmani – Sozina tunnel	-	-	
Sozina tunnel **	-	*6 360*	
Sozina tunnel – Virpazar	-	-	
Virpazar – Podgorica 1 (Niksic)	6 875	-	
Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	-	-	
Podgorica 2 (Tuzi) – Bioce	5 380	4 650	
Bioce – Mioska	4 485	-	
Mioska – Kolasin	4 325	-	
Kolasin – Mojkovac	6 552	5 611	
Mojkovac – Slijepac Most	5 832	-	
Slijepac Most – Ribarevina	5 052	-	
Ribarevina – Bijelo Polje	-	-	
Bijelo Polje – Granica CG (Barski Most)	5 518	8 574	
East – West corridor Adriatic – Ionian Highway			
Granica CG (Klobuk) – Vilusi	-	-	
Vilusi – Niksic	1 691	1 029	
Niksic – Danilovgrad	6 036	-	
Danilovgrad – Podgorica 2 (Niksic)	-	9 347	
Podgorica 1 (Niksic) – Podgorica 2 (Tuzi)	-	-	
Podgorica 2 (Tuzi) – Tuzi	6 747	6 667	
Tuzi – Granica CG (Bozaj)-std	2 536	-	
Tuzi – Granica CG (Bozaj)-sgl	-	-	
Granica CG (Debeli Brijeg) – Herceg Novi	4 473	**-**	

Herceg Novi – Kamenari	5 804	-	
Kamenari – Risan	3 479	-	
Risan – Kotor	-	-	
Kotor – Radanovici	1 669	-	
Lepetani – Radanovici	-	-	
Radanovici – Budva	13 349	10 690	
Budva – Cetinje	8 759	5 102	
Cetinje – Podgorica	7 623	8 695	

Notes: * AADT calibrated model assignment values actually input to the HDM model.
** Sozina tunnel traffic data from MONTEPUT D.O.O. (10 months data: January – October).

Sources: CRNAGORAPUT
Consultant's estimates

3 VEHICLE FLEET DATA

The vehicle fleet data used by the model relate to the operating characteristics as well as to the economic operating costs for each vehicle class included in the evaluation. The selected seven vehicle types accord with those identified for traffic surveys. Model input data on vehicle characteristics, utilisation and loading together with unit costs, prices and time values have been derived from a combination of sources, including information from the traffic counts and origin-destination surveys carried out as part of this study, research on current price/cost information in Montenegro and the Balkans region, data from the earlier BCEOM/COWI studies[7] and the HDM program default values. All data sources are summarised in Table 7 below.

The representative vehicle types are the following models:-

Car	Volkswagen Golf 1.4
Light delivery van / goods vehicle	Volkswagen T5
Mini bus	Volkswagen Crafter Kombi
Bus (conventional 2-axle)	TEMSA Metropol
Small truck (2-axle)	IVECO Daily 40
Medium truck (2-axle)	Mercedes Atego (7.5 tonne)
Heavy truck (5-axle articulated)	Mercedes Actros (Euro 5)

However, prices for a range of models from other vehicle manufacturers falling within the general specification of each representative type were obtained in order to derive an average price across the range. All economic cost/price data exclude taxes (VAT) and other duties or levies.

Table 7: HDM Vehicle Operating Cost (VOC) Input Data Sources

VOC input data parameter	LBSAS 2007	BCEOM/COWI 2003/2005
Representative vehicle type and vehicle characteristics	X	X
Passenger Car Space Equivalent (PCSE)	X	
Tyre type and size details	X	
Vehicle utilisation – annual km, annual working hours, average life	X	X
Vehicle utilisation – private usage, passenger occupancy, work-related trips	X	

7 (i) BCEOM/COWI, September – October 2002 op. cit.;
(ii) COWI/BCEOM Feasibility Study for Belgrade-Montenegro Road, Serbia. Cost Benefit Analyses Working Paper, December 2005.

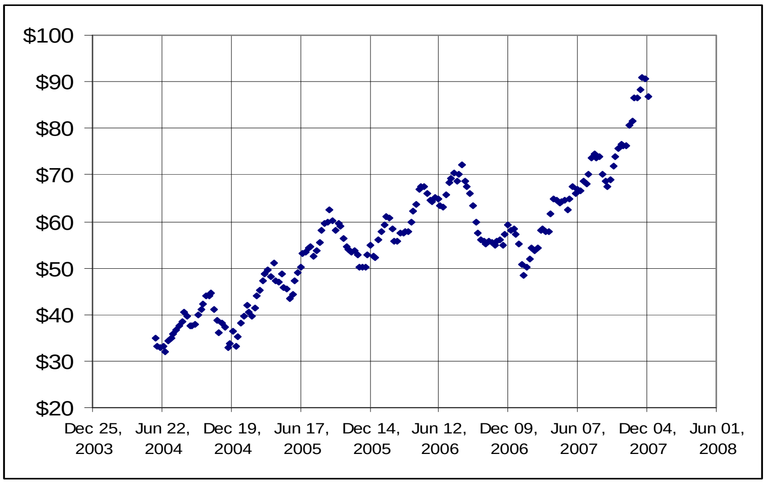
Vehicle loading – ESAL (equivalent standard axle load), operating weight	X	X
Economic unit costs – new vehicle price, tyre price, fuel prices, maintenance labour, crew costs, overheads	X	
Economic unit costs – value of passenger travel time	X	

The model's default PCSE values for buses and trucks were modified taking into consideration the average generalised passenger car equivalents on motorways in the TEM (Trans European Motorways) Standards and Recommended Practice.

3.1 Fuel Prices

Retail (i.e., financial) pump prices for motor vehicle fuel in October 2007 were €1.09 for benzene (unleaded gasoline or petrol) and €1.05 for diesel. On average, the price for semi-synthetic lubricating oil is €7.00 per litre, and the economic cost is calculated by removing only VAT (17%), that is, €5.98 per litre. Costs of petroleum fuels have increased rapidly in the past three years, chiefly because of large increases in demand from China and India driving the market price of crude oil, trebled since mid-2004, as shown in the graph below.

Figure 1
Market price of OPEC crude: June 2004 – Dec 2007 (US$/bbl)



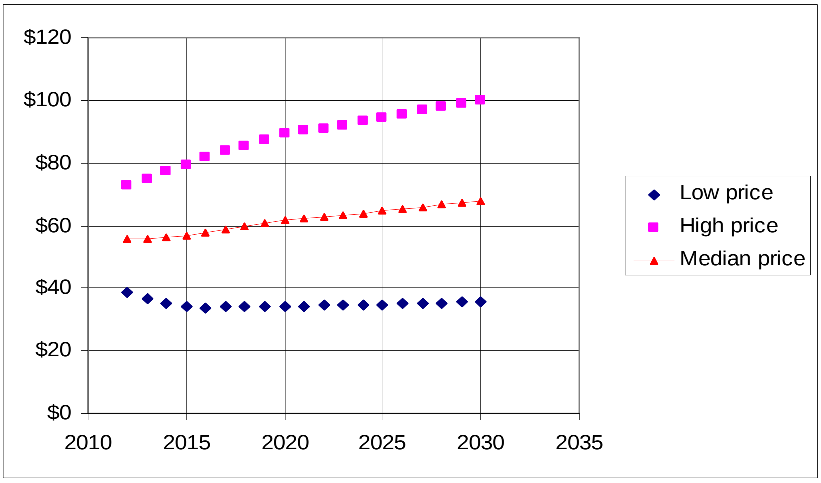
Source: www.eia.doe.gov/oiaf/ieo/index.html.

However, analysis of crude prices in constant dollar terms indicates that over a 20-25 year period, coefficients of variation[8] (of annual average prices in constant terms) may be up to 60%. Thus, the relentless increase in prices over the last three years may not be a good guide to future behaviour of the market. Prices can also fall sharply, for example (as above graph) the OPEC average price in August 2006 was $72/bbl, falling to $48 in January 2007, a 33 percent decrease. For a forward projection of crude oil prices in the long term, the

[8] CV = the standard deviation divided by the mean (expressed as percent).

median of the U.S. Government Energy Information Agency (EIA) 'High' and 'Low' forecasts is used, as shown in the graph below.

Figure 2
EIA future estimates of crude oil prices, 2012-2030



Source: www.eia.doe.gov/oiaf/ieo/index.html.

Thus, the long term price of crude oil is estimated at US$65 per barrel, based on the median values of the EIA forecasts, although it should be recognized that there is a large degree of uncertainty in these forecasts. Information was obtained from the Ministry of Economic Development on recent costs of imported fuels, both diesel and petrol. Data are given in the table below, including premiums and estimated refinery manufacturing margins based on a crude acquisition cost (in December 2007) of US$92 per barrel.

Table 8: Cost of fuel imports and refinery margins (US $ per tonne)

Fuel type	CIF Genova		Manufacturing	
	incl. Premium		margins	
Super MB 98	$	846.50	$	167.14
Unleaded BMB 95	$	840.50	$	161.14
Diesel D2	$	855.40	$	173.54
Eco Diesel	$	877.90	$	196.04

Note: Includes premiums on Platt's CIF prices, $5.00 for petrol and $7.50 for diesel.
Source: Ministry of Economic Development (10Dec 2007) and Consultant estimate.

Based on the table above, and the cost assumption for crude oil of US$65 per barrel in the longer term, the economic cost of fuels for HDM-4 analysis is given in the table below. Crude oil is traditionally[9] traded in dollars, and the long term exchange rate for US dollars per Euro is assumed as $1.40. Inland distribution costs, consisting of road transport and retailer margins, are estimated at € 0.055 per litre or $0.077/litre.

[9] OPEC recently (Dec. 2007) decided to continue using US dollars despite speculation of a change.

Table 9: Economic Cost of fuels (US$/litre)

Fuel type	CIF Genova (1)	CIF per litre (2)	Economic cost/lt
	(US$/tonne)	(US$/lt)	(+ inland costs)
Super MB 98	$ 647.00	$ 0.477	$ 0.554
Unleaded BMB 95	$ 641.00	$ 0.473	$ 0.550
Diesel D2	$ 655.00	$ 0.577	$ 0.654
Eco Diesel	$ 678.00	$ 0.597	$ 0.674

(1) includes premiums on CIF prices, $5.00 for petrol and $7.50 for diesel.
(2) Density = 1,351 lt/tonne for petrol and 1,190 lt/tonne for diesel.

Average economic costs for petrol and diesel are therefore estimated as €0.40/litre and €0.47/litre respectively in Euro terms, using the long term exchange rate assumption given above.

3.2 Value of Travel Time (VOTT)

Car Passengers

Values of travel time cars & private vehicles were derived from results of the Stated Preference (S-P) roadside surveys carried out in October 2007 and reported in Technical Memorandum No. 6. The VOTT derived from the surveys is a value representing the 'willingness to pay' (WTP) – an approach that is clearly not intended to represent a working[10] time value. Analysis of survey data showed the overall perceived value of time to be €3.54 per person-hour, averaged across all respondents from the 16 country-wide survey stations. In the S-P surveys, average car-occupancy (including driver) was found to be 2.14 persons per vehicle. However, for the car passengers, it cannot be assumed they would perceive the value of a travel time saving the same as the driver, and hence a workable hypothesis is needed. In the S-P surveys only drivers were interviewed (for practical reasons it was considered that interviews would take too long if the questionnaire were applied to all occupants) and so there is no direct evidence on the WTP value of passenger time saving. In partial regression analysis tests of the survey data, when 'number of occupants' was used as the independent variable, results showed that the more occupants in a vehicle, the lower the valuation (by the driver) of a travel time saving. In all cases (for 2, 3, 4 and 5 or more occupants) the derived regression coefficients were negative, and on average, drivers of vehicles with more than one occupant gave a VOTT value about 9% lower than the mean. This result perhaps appears contrary to expectation; however, the first clear inference is that when answering the survey questions, drivers did not take into account their passengers. Secondly, is not entirely clear why single occupant vehicles should produce the highest time values, but it is likely that, compared to cars with two or more occupants, single occupant vehicles were driven by persons with higher incomes. For car passengers, the hypothesis is that some passengers will have a WTP value at least as high as the driver (€3.54/hour) while others would have a value of close to zero; then, assuming a normally distributed range of choices, the mean value for passengers would be [3.54/2] or €1.77 per hour. The overall value of time for cars and private vehicles is therefore €5.56 per car-hour, of which,

[10] In fact, survey results showed that, if anything, working time was valued at marginally less than the mean for all other trip purposes.

car passengers (1.14 per vehicle) contribute about 36 percent. In real terms time saving values will increase in line with the GDP per-capita forecast and thus the values above are adjusted by a factor of 1.296 to reflect the average annual growth of personal incomes in the analysis period (2.58% per year) and the discount rate of 8 percent. (See TM No. 16 section 2). The HDM input value is thus €7.21 per car-hour, or € 3.37 per occupant-hour.

Bus Passengers

Bus passengers were not included in the S-P surveys, and so a standard method of estimating VOTT is used. For users of buses and micro-buses, reference was made to data on average monthly earnings. The gross wage rate (including employer contributions) average for 2007 is estimated as €484 per month[11] thus giving a value of €2.77 per hour at an average 175 working hours per month. From World Bank[12] recommendations, the value of non-working time is taken as 30 per cent of the gross value of working time. This value is therefore estimated as €0.83 per person-hour. Based on 2003 studies[13] it is estimated that 25% of bus passengers travel for work or business purposes, and there are an average 22 persons per bus trip. The overall value of travel time is therefore €28.90 per bus-hour, of which, the non-working time element contributes 47 percent. Adjusted for future increases in real per-capita incomes as for cars (see previous paragraph) the HDM input values become €3.58 per working hour and €1.08 per person-hour for non-working trips on buses.

3.3 Interest Rate in the HDM road user effects model

The interest rate component of new vehicle purchase is, for economic purposes, assumed to be 8 percent, or the net difference between bank lending rates and longer term inflation.

3.4 Summary of Road User input data

The table below summarizes principal data for the model inputs of road user data. Basic and economic vehicle fleet data (in HDM report formats) are shown in Tables 11a and 11b on the following pages.

[11] Source: Montenegro Business Outlook, Sept. 2007
[12] Professor Ken Gwilliam, Paper no. OT-5, Transport Department, World Bank.
[13] BCEOM/COWI, 2003, Final Report, Vol. 5 *Calibration of Road User Effects Input to HDM-4*.

Table 10: Road User Input Data – summary

Model Input Parameter	Car	Light delivery vehicle	Microbus	Bus	Small truck	Medium truck	Articu-lated truck
Vehicle class	*Car*	*Utility*	*Bus*	*Bus*	*Truck*	*Truck*	*Truck*
PCSE	1.0	1.0	1.0	1.8	1.5	2.0	3.0
Number of axles	2	2	2	2	2	2	5
Number of wheels	4	4	4	6	6	6	12
Annual km	16,000	20,000	40,000	40,000	40,000	40,000	80,000
Annual work hours	500	600	1,200	1,200	1,200	1,200	2,000
Average life (years)	12	12	12	12	12	14	14
ESAL factor	0	0	0	0.92	0.02	0.60	3.23
Operating weight (tonnes)	1.10	2.60	2.50	11.84	4.13	7.50	28.85
number of passengers	2.1	-	4.5	22.0	-	-	-
New vehicle price	€11 200	€14 500	€18 800	€94 900	€30 000	€51 000	€106 000
Replacement tyre price	€ 78	€ 96	€ 96	€ 227	€ 96	€ 181	€ 341
Workshop labour / hour	€ 6.00	€ 6.00	€ 6.00	€ 9.00	€ 7.00	€ 9.00	€ 9.00
Crew cost per hour	-	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50	€ 4.50
Overheads (annual)	€ 200	€ 220	€ 300	€ 700	€ 380	€ 770	€ 1,180
Passenger work time/ hour	€ 3.37	-	€ 3.58	€ 3.58	-	-	-
Non-working time /hour	-	-	€ 1.08	€ 1.08	-	-	-

Notes: The articulated truck semi-trailer tyres (6) are super-singles.
Prices and costs are expressed in economic terms, exclusive of VAT and all other taxes and duties.
PCSE = passenger car space equivalent. ESAL = equivalent standard axle load.
Given relatively short travel distances within Montenegro, it is assumed that there are no truck and bus driver assistants. Overheads include annual vehicle registration or licensing fees, third party insurance costs and other vehicle related taxes and charges.

Sources: BCEOM/COWI July 2003, op. cit;
COWI/BCEOM December 2005, op. cit;
HDM default values; Consultant's estimates.

Table 11a: HDM Input data - vehicle fleet basic characteristics

H D M - 4 Vehicle Fleet - Basic

HIGHWAY DEVELOPMENT & MANAGEMENT Study Name: Bar-Boljare Run Date: 21-Jan-08

Motorised Vehicle Types:

Name	PCSE	No. of Wheels	No. of Axles	Tyre Type	Tyre Base Recaps	Tyre Retread Cost %	Annual Km	Annual Work Hours	Avg Life	Pass-engers	Work Related Trips %	ESALF	Operating Weight (t)	Life Model
Car	1.00	4	2	Radial ply	1.30	30.0	16,000	500	12	2.14	100.0	0.00	1.10	Constant
Micro-bus	1.00	4	2	Radial ply	1.30	30.0	40,000	1,200	12	4.50	25.0	0.00	2.50	Optimal
Bus	1.80	6	2	Radial ply	1.30	30.0	40,000	1,200	12	22.0	25.0	0.92	11.84	Optimal
Small Truck	1.50	6	2	Radial ply	1.30	30.0	40,000	1,300	12	0	0.0	0.02	4.13	Optimal
Medium Truck	2.00	6	2	Radial ply	1.30	30.0	40,000	1,200	12	0	0.0	0.60	7.50	Optimal
Articulated Truck	3.00	12	5	Super single	1.30	30.0	80,000	2,000	14	0	0.0	3.23	28.85	Optimal
Light Delivery Vehic	1.00	4	2	Radial ply	1.30	30.0	20,000	600	12	0	0.0	0.00	2.60	Optimal

HDM-4 Version 1.3 Page -1 of 1

Table 11b: HDM Input data - vehicle fleet economic characteristics

H D M - 4 Vehicle Fleet - Economic

HIGHWAY DEVELOPMENT & MANAGEMENT Study Name: Bar-Boljare Run Date: 21-Jan-08

Currency: Euro

Motorised Vehicle Types:

Name	Base Type	New Vehicle	Replace Tyre	Fuel (/litre)	Lubr. Oil (/litre)	Maint Labour (per hr)	Crew Wages (per hr)	Annual Overhead (Eur)	Passenger Work Time (per hr)	Passenger Non-Work (per hr)
Car	Medium Car	11,200	78	0.40	5.98	6.00	0.00	170	3.37	0.00
Micro-bus	Mini Bus	18,800	96	0.47	5.98	6.00	4.50	300	3.58	1.08
Bus	Heavy Bus	94,900	227	0.47	5.98	9.00	4.50	700	3.58	1.08
Small Truck	Light Truck	30,000	96	0.47	5.98	7.00	4.50	380	0.00	0.00
Medium Truck	Medium Truck	51,000	181	0.47	5.98	9.00	4.50	770	0.00	0.00
Articulated Truck	Articulated Trucl	106,000	341	0.47	5.98	9.00	4.50	1,180	0.00	0.00
Light Delivery Vehic	Light Delivery	14,500	96	0.47	5.98	6.00	4.50	220	0.00	0.00

HDM-4 Version 1.3 Page -1 of 1

Source: see text

4 MAINTENANCE WORKS STANDARDS INPUT DATA

Current unit costs for maintenance works, averaged over 2006 and 2007, are shown below. For economic analysis, the resource costs are estimated as 80 percent of the financial prices.

Table 12: Maintenance Works Unit Costs (2006/07 prices)

Maintenance operation	Unit	Unit costs	
		€ (Financial)	€ Economic
Wide crack sealing	m^2	€ 13.50	€ 10.80
Pothole patching	m^2	€ 49.00	€ 39.20
Edge repairs	m^2	€ 100.00	€ 80.00
Overlay – thin (20 mm AC)	m^2	€ 4.90	€ 3.92
Overlay (40 mm AC)	m^2	€ 12.00	€ 9.60
Overlay (50 mm AC)	m^2	€ 14.00	€ 11.20
Overlay (60 mm AC)	m^2	€ 16.28	€ 13.02
Drainage	km	€ 290.00	€ 232.00
Shoulders maintenance	km	€ 578.00	€ 462.40
Safety and operational	km	€ 1,170.00	€ 936.00
Winter maintenance	km	€ 2,193.00	€ 1,754.40

Note: AC = asphalt concrete
Source: Ministry of Transport, Maritime Affairs and Telecommunications, TD.

5 PROJECT EVALUATION METHODOLOGY

Using the HDM-4 model, the cost benefit analysis compares the total cost streams over the 30-year evaluation life of the project between the *without project* existing road and the *with project* proposed new highway, for the preferred route alternative. For both the existing road and the proposed new highway, these costs include those of routine and periodic maintenance activities, vehicle operation, travel time and accidents; in addition, the capital costs of the new highway construction are included for the *with project* case.

Using the HDM-4 program for analysis conforms with standard international practice and enables direct comparison by funding agencies, and in the event of future consideration of tolling and private sector financing, enables potential investors to examine all model inputs and compare results with motorway project studies elsewhere.

TECHNICAL MEMORANDUM NO. 11

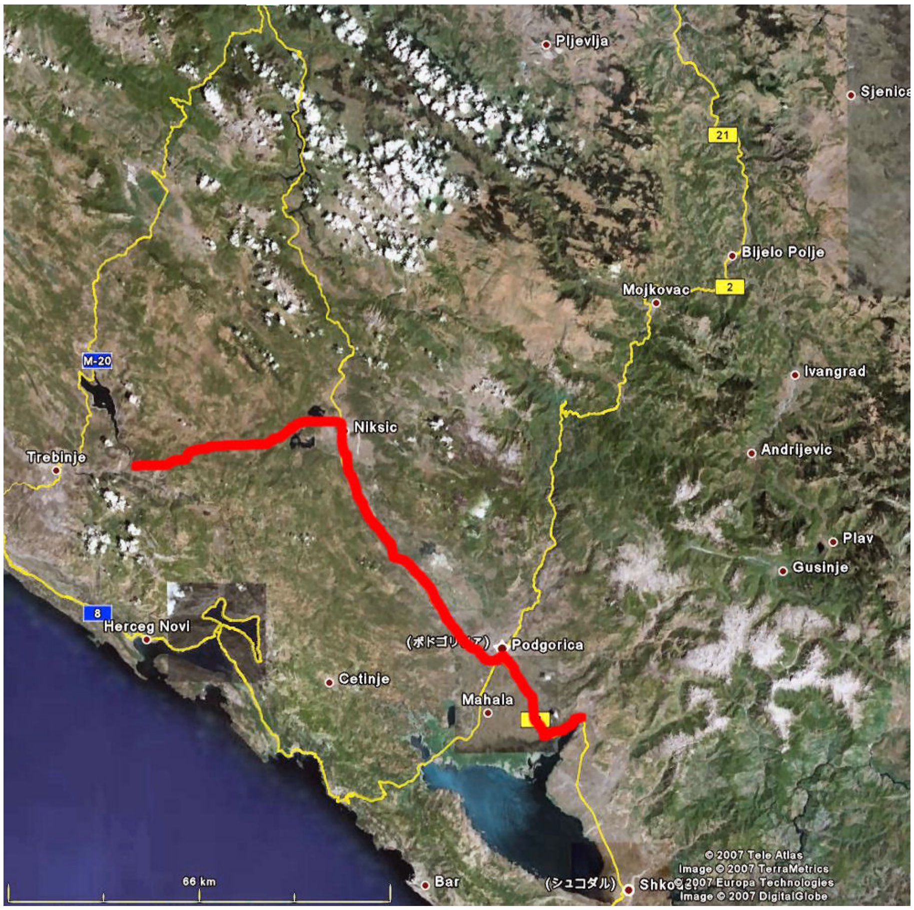
ADRIATIC-IONIAN MOTORWAY PROJECT
ANALYSIS: CONDITIONS OF THE EXISTING ROADS

CONTENTS

1 Background

The length of the analyzed highway[1] from the Bosnian border (Klobuk) to the Albanian border (Bozaj) is approximately 115km. It is composed of roads M6 from the Bosnian border (Klobuk) to Niksic and M18 from Niksic the Albanian border (Bozaj) via Podgorica. This is a one of major road in Montenegro linking Croatia and Bosnia & Herzegovina with the capital Podgorica. From Podgorica to Bozaj it is a main road (see Figure 1).

Figure 1 Map of Montenegro Republic



The construction of the M6 highway started in the 1976 and finished in 1981. The construction of the M18 highway started in the 1974 and finished in 1980. In 1973 was constructed M18 section from Podgornica to Bozaj.

[1] According to the U.S. Highway Capacity Manual – HCM (*Federal Highway Administration, 2000*) the **Highway is a main road with two-lane carriageway in both directions, without control access from adjacent properties and with all intersection at grade**

Today it is effectively an international road, linking Bosnia & Herzegovina with Albania through Montenegro.

There is some confusion about the length of the analyzed highway. The different measures are present in the table below.

Table 1: Lengths of the road

Section	Louis Berger 2007	BCEOM 2002	Monte-negro Roads Data 2005	CRNA-GORAPUT 2007
	[Km]	[Km]	[Km]	[Km]
B&H border - Vilusi	3,50	4,02	4,00	3,45
Vilusi - Niksic	33,50	33,04	33,00	33,52
Niksic - Danilovgrad	33,30	33,23	55,00	33,32
Danilovgrad - Podgorica Centre	20,20	20,38		17,09
Podgorica Centre - Tuzi	13,90	5,08	25,00	10,15
Tuzi - Albanian border (Bozaj)	10,90	18,48		14,57
Total	**115,30**	**114,23**	**117,00**	**112,10**

Autor	Lenght [km]	Diferences [km] [%]	
CRNAGORAPUT 2007	112,10	**112,10**	**100,00%**
BCEOM 2002	114,23	**2,13**	**101,90%**
Montenegro Roads Data 2005	117,00	**4,90**	**104,37%**
Louis Berger 2007	115,30	**3,20**	**102,85%**

2 Technical aspects

This highway is divided on four different sections.

The first is from the Bosnian border (Klobuk) to Niksic. The highway passes through hilly areas with the difference in level of over 400m (from 1000m to 600m).

The second is from Niksic to Podgorica where the highway passes on slope of hills and the difference in level is over 500m (from 600m to 22m).

The third is from Podgorica to Vuksan Lekici. On this section the highway is practically on the flat area.

The last section is from Vuksan Lekici to the Albanian border (Bozaj). The highway passed on slope of hills and the difference in level is over 180m (from 200m to 22m).

The M6 and M18 highways were constructed 30 years ago as the Second Class Road according to the former Yugoslavian Standards. The design speed is 70km/h from Vilusi to Tuzi and less than 40km/h[2] from Tuzi to the Albanian border (Bozaj).

The table on the next page shows the technical parameters of the Second Class Road.

[2] The Administrative speed limitation is 40 km/h but on the hairpin bends it is difficult and risky to maintain the speed over 30 km/h.

Table 2: Technical parameters

Type	Item		Terrain		
			Flat	Hilly	Mountains
General	Design Speed [km/h]		100	70	60[3]
	Min. Stopping Distance on horizontal curve [m]		140	65	50
	Sight distance for Overtaking [m]		780	560	460
Cross Section	Width of	traffic lanes [m]	3.5	3.0	3.0
		climbing lanes [m]	---	3.0	3.0
		edge marking line [m]	0.35	0.30	0.30
		Shoulders [m]	1.5	1.0	1.0
Plan	Minimum horizontal radii [m]		450	180	120
Longitudinal Profile	Minimum vertical radii (convex) [m]		7,600	1,800	900
	Minimum vertical radii (concave) [m]		5,000	1,200	600
	Maximum longitudinal grade [%]		---	7	8

The pavement of the road was designed for the Axle Load equal to 10T which today is insufficient for the heavy trucks.

Unfortunately in most places the slopes of cut and embankment are not protected and are deteriorating by erosion. There is a high risk of damage to vehicles by fallen stones from unprotected cut slopes, especially on the section from the Bosnian border (Vilusi) to Niksic.

All intersections were designed according to the former Yugoslavian Standards from 1950s or 1960s which today are very dangerous with high traffic flows of the speediest cars.

Today the road from the Bosnian border (Vilusi) to Podgorica is in good technical condition with a pavement of 7m width and hard shoulders from 0.5m to 0.75m within different sections. The road is equipped with safety barriers, some important gradients have climbing lanes.

From Podgorica to Tuzi the highway has a pavement from 6 to 7m width or without hard shoulders.

The last section from Tuzi to the Albanian border (Bozaj is below standards (4 - 6m width), without shoulders and no safety barriers.

The pictures on the next page show the existing road.

[3] Except hairpin bend

Figure 2 Section Podgorica – Niksic

Figure 3 Section Niksic - Vilusi

Figure 4 Section Podgorica -Tuzi

Figure 5 Section Tuzi - Bozaj

3. Traffic analysis

The table below shows the travel time survey along the M6 & M18 road sections recorded by Consultant on 03rd and 10th November 2007. Additionally the approximate[4] traffic flows are presented on the same table.

Table 3: Travel time survey

Time	Section	Distance	Travel time	Average speed	Average speed / section	AADT (both directions)	Rush hour = 10%	per lane
		[Km]	[min]	[km / h]	[km / h]	[veh]	[veh]	[veh]
08:51	Podgorica (bridge over river)	0.0			65.22			
09:04	T-junction regional road (Danilovgrad)	14.3	13	66.0				
09:27	Niksic by-pass	29.0	23	75.7		**6 840**	**684**	**342**
09:30	T-junction (Vilusi)	2.7	3	54.0				
09:30	T-junction (Vilusi)	0.0	0		68.89			
09:57	T-junction local road (nr Vilusi)	31.0	27	68.9		**1 680**	**168**	**84**
14:18	Podgorica (outskirts)				51.57			
14:25	Tuzi (centre)	7.4	7	63.4		**2 400**	**240**	**120**
14:46	Bozaj	13.9	21	39.7				

Table 4: Preliminary results of traffic survey

Adriatic - Ionian Highway

Section	AADT (both directions) (*)	Rush hour = 10%	per lane
	[veh]	[veh]	[veh]
Vilusi - Niksic	**1 288**	129	64
Niksic - Podgorica	**8 788**	879	439
Podgorica - Tuzi	**7 726**	773	386
Podgorica - Bozaj	**unavailable**		

(*) Preliminary data from traffic survey executed 24-25 October 2

The results of the traffic survey effectuated in last and O-D October by the Consultant are presenting in the Technical Memorandum N° 11-A. This report will also including the road Capacities Calculations and the Level of Service (LOS).

[4] Traffic was counted using the moving observer method during reconnaissance trips in November 2007. **This is not a result of a traffic survey** and is included here only as an indication of existing traffic levels.

4. Safety aspects

The accident rate on the existing M6 highway is very high. The reasons for this are multiple. Generally this kind of road is still difficult for drivers for some reasons like the limited distance of visibility linked to the curvature of the road. It is also very important that some drivers have not experience of driving on the mountainous road and **others are too sure of theirs capacities like drivers**. It is to note the psychological aspect valuable for some drivers of **to have a modern, speediest and safety car** it is also not to neglect.

Generally there the main safety problems are as following:

- Difficulty linked to the typical mountainous road;
    - Inadequate curve radius;
    - Steep gradients with lack of climbing lanes;
    - Inadequate overtaking opportunities;
    - Inadequate crash barriers;
    - Inadequate bus stopping facilities, and;
    - Dangerous cliffs.
- Weather conditions very often bad or difficult for driving;
    - Inadequate lighting
- Mixed traffic flows of speediest modern cars and old slowest cars;
- High rate of truck in the traffic flows during the days and the nights and
    - Congestion during peak hours;
    - Long journey times.
- **Irresponsible drivers driving too fast on the mountainous highway.**
    - Using the mobile phones when driving;
    - Many private accesses with slowing and turning movements;
    - Many at-grade junctions – junction density;
    - High speeds in built-up areas;
    - lack of safety zone along road, and;
    - Conflicts between vehicles and pedestrians.

5. Summary

The Consultant agree with opinion that a construction of the new motorway linked the Bosnian border (Klobuk) to the Albanian border (Bozaj) via Podgorica should be necessary in the next years.

It is not technically possible to improve the existing M6 & M18 highways to motorway[5] standard. Consequently there are no possibilities to increase the trip speed and assuming the total safety on the road.

Physical Plan of Republic Montenegro proposes a “shortcut route” from the Bosnian border (Vilusi) to Podgorica passing thought the mountains. This solution in our opinion has a risk to be not filled by the traffic flows. In our opinion the main traffic flows is going from Podgorica via Niksic to north of the Montenegro and later to the North Bosnian border.

We recommend analysing the second corridor for the motorway passing parallel to the existing highway from the Bosnian border (Vilusi) to Podgorica via Niksic. It is considered necessary to make technical and economical analysis to compare both variants and find an optimal solution.

The traffic flows will grow in the next years therefore the conditions of driving will be harder and number of accidents will increase.

As the new motorway will be a toll motorway, some drivers will continue to use the existing highways in the corridor for financial reasons. The rate of diversion is not known at present and will be examined using the traffic assignment model.

[5] **According to the U.S. Highway Capacity Manual – HCM (*Federal Highway Administration, 2000*) the Motorway is divided highway with full control of access, with two or more lanes for the exclusive use of traffic in each direction, with an Emergency Lane. Opposing directions of flow are continuously separated by a raised barrier, an at-grade median, or a continuous raised median It provides uninterrupted flow; All interchanges must be grade-separated; Direct access to/from adjacent properties not permitted, and with Facilities like Rest and Service Areas**

TECHNICAL MEMORANDUM NO. 11A

ADRIATIC-IONIAN MOTORWAY PROJECT ANALYSIS: CONDITIONS OF THE EXISTING ROADS, ANNEX TO TM11, ROAD CAPACITIES

CONTENTS

1 Background

From 23rd October to 28th October the Consultant organized a 24 hours traffic survey on the main roads of Montenegro. The results concerned the existing highway Vilusi –Bozaj show tables below.

The ADT is an Average Daily Traffic which is corresponding to the results of survey.
The ARHT is an Average Rush Hour Traffic which is corresponding to the 10% of the ADT.

Table 1: Results of traffic survey.

RSI & COUNTING LOCATION No. 6 (Podgorica - Tuzi)

	29 Mon	23 Tue	24 Wed	25 The	26 Fri	27 Sat	28 Sun	SUM	Total	ADT	ARHT	%
P.Car (1,2,3)	6264	6703	6799	6444	6830	6493	2697	42231	44374	6339	634	95%
Light Delivery&Mikro bus (4,5)	306	392	397	353	309	311	75	2143				
Bus (more than 30 seats)(10,11,12)	21	26	31	35	43	31	16	201	2293	328	33	5%
Small truck (2-axle) (6,7)	112	140	195	114	100	84	39	783				
Medium truck (2-axle) (8)	71	119	163	98	87	85	24	646				
Heavy truck (5-axle art.) (9)	113	90	142	87	117	90	24	662				
TOT	6886	7471	7727	7130	7486	7093	2874	46667		6667	667	
					Directional split		I way	23336	50%			
							II way	23331	50%			

RSI & COUNTING LOCATION No. 8 (Podgorica - Niksic)

	29 Mon	23 Tue	24 Wed	25 The	26 Fri	27 Sat	28 Sun	SUM	Total	ADT	ARHT	%
P.Car (1,2,3)	8423	7229	7096	8323	8133	8798	7011	55013	58814	8402	840	90%
Light Delivery&Mikro bus (4,5)	516	624	658	589	677	476	259	3800				
Bus (more than 30 seats)(10,11,12)	321	309	306	322	336	222	166	1983	6615	945	94	10%
Small truck (2-axle) (6,7)	151	157	157	192	161	100	55	973				
Medium truck (2-axle) (8)	269	278	260	275	330	181	116	1709				
Heavy truck (5-axle art.) (9)	280	321	312	320	350	251	116	1949				
TOT	9960	8919	8789	10022	9986	10028	7724	65428		9347	935	
					Directional split		I way	32202	49%			
							II way	33226	51%			

RSI & COUNTING LOCATION No. 16 (Niksic - Vilusi)

	29 Mon	23 Tue	24 Wed	25 The	26 Fri	27 Sat	28 Sun	SUM	Total	ADT	ARHT	%
P.Car (1,2,3)	774	680	579	716	870	1048	990	5657	6054	865	86	84%
Light Delivery&Mikro bus (4,5)	42	56	62	71	75	43	47	397				
Bus (more than 30 seats)(10,11,12)	7	1	2	4	5	2	3	24	1151	164	16	16%
Small truck (2-axle) (6,7)	14	22	22	30	31	16	16	150				
Medium truck (2-axle) (8)	26	45	24	36	54	29	26	240				
Heavy truck (5-axle art.) (9)	98	114	115	93	103	107	107	737				
TOT	961	918	804	950	1138	1245	1189	7204		1029	103	
					Directional split		I way	3460	48%			
							II way	3744	52%			

2 Results of Capacities

The HCS2000[1] software as used for check the existing highway capacities. This software is currently using for the calculations of all highways elements. It was conceived on base of the HCM2000©.

The traffic data used provide from the 23rd October to 28th October traffic survey and also from 26th October 12 hours O-D survey. The table below regroups the results for five sections of the existing highway.

Table 2: Results of HCS2000 analysis

Item	Section		
	Vilusi - Niksic	**Niksic - Podgorica**	**Podgorica - Tuzi**
INPUT DATA			
Highway Class	2	2	2
Shoulder width	0.5 m	0.5 m	0.0 m
Lane width	3.0 m	3.5 m	3.0 m
Segment length	31.0 km	46.0 km	7.4 km
Terrain type	Rolling	Rolling	Level
Peak-hour factor, PHF	0.88	0.88	0.88
Trucks and buses	16%	10%	5%
Recreational vehicles	3%	3%	3%
No-passing zones	60%	70%	70%
Access points/km	1 km	1 km	2 km
Two-way hourly volume, V	103 veh/h	935 veh/h	667 veh/h
Directional split	52% / 48%	51% / 49%	50% / 50%
AVERAGE TRAVEL SPEED			
Grade adjustment factor, fG	0.71	0.99	1.0
PCE for trucks, ET	2.5	1.5	1.2
PCE for RVs, ER	1.1	1.1	1.0
Heavy-vehicle adjustment factor	0.805	0.950	0.990
Two-way flow rate,(note-1) vp	205 pc/h	1130 pc/h	766 pc/h
Highest directional split proportion (note-2)	107 pc/h	576 pc/h	383 pc/h

[1] HCM2000 conceived by Mc Trans Center, University of Florida

Base free-flow speed, BFFS	70 km/h	70 km/h	70 km/h
Adj. for lane and shoulder width, fLS	8.5 km/h	7.5 km/h	8.5 km/h
Adj. for access points, fA	0.7 km/h	0.7 km/h	1.3 km/h
Free-flow speed, FFS	60.8 km/h	61.8 km/h	60.2 km/h
Adjustment for no-passing zones, fnp	3.8 km/h	3.0 km/h	4.3 km/h
Average travel speed, ATS	54.4 km/h	44.7 km/h	46.3 km/h

Item	**Section**		
	Vilusi - Niksic	**Niksic - Podgorica**	**Podgorica - Tuzi**
PERCENT TIME-SPENT-FOLLOWING			
Grade adjustment factor, fG	0.77	0.94	1.0
PCE for trucks, ET	1.8	1.5	1.1
PCE for RVs, ER	1.0	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.887	0.952	0.995
Two-way flow rate,(note-1) vp	171 pc/h	1187 pc/h	762 pc/h
Highest directional split proportion (note-2)	89	605	381
Base percent time-spent-following, BPTSF	14.0%	64.8%	48.8%
Adj.for directional distribution and no-passing zones, fd/np	17.2	9.6	15.2
Percent time-spent-following, PTSF	31.2%	74.4%	64.0%
LEVEL OF SERVICE AND OTHER PERFORMANCE MEASURES			
Level of service, LOS	**A**	**D**	**C**
Volume to capacity ratio, v/c	**0.06**	**0.35**	**0.24**

Peak 15-min vehicle-kilometers of travel, VkmT15	**907 veh-km**	**12219 veh-km**	**1402 veh-km**
Peak-hour vehicle-kilometers of travel, VkmT60	**3193 veh-km**	**43010 veh-km**	**4936 veh-km**
Peak 15-min total travel time, TT15	**16.7 veh-km**	**273.4 veh-km**	**30.3 veh-km**

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.

2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

3 Summary

The results below show that except the section Niksic - Podgorica the existing highway has a reserve of capacities with a Level of Service A and C.

The Level of Service D for the section Niksic - Podgorica is linked to the highest traffic flow of all sections.

4 Annex

Original reports from HCM2000 software

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

____Two-Way Two-Lane Highway Segment Analysis____

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M6
From/To **VILUSI - NIKSIC**
Jurisdiction
Analysis Year 2007
Description Existing Highway Vilusi - Bozaj

____Input Data____

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.0 m % Trucks and buses 16 %
Segment length 31.0 km % Recreational vehicles 3 %
Terrain type Rolling % No-passing zones 60 %
Grade: Length km Access points/km 1 /km
Up/down %

Two-way hourly volume, V 103 veh/h
Directional split 52 / 48 %

____Average Travel Speed____

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.805
Two-way flow rate,(note-1) vp 205 pc/h
Highest directional split proportion (note-2) 107 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 8.5 km/h

Adj. for access points, fA 0.7 km/h

Free-flow speed, FFS 60.8 km/h

Adjustment for no-passing zones, fnp 3.8 km/h
Average travel speed, ATS 54.4 km/h

___________________________Percent Time-Spent-Following_________________________

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.887
Two-way flow rate,(note-1) vp 171 pc/h
Highest directional split proportion (note-2) 89
Base percent time-spent-following, BPTSF 14.0 %
Adj.for directional distribution and no-passing zones, fd/np 17.2
Percent time-spent-following, PTSF 31.2 %

_________________Level of Service and Other Performance Measures________________

Level of service, LOS A
Volume to capacity ratio, v/c 0.06
Peak 15-min vehicle-kilometers of travel, VkmT15 907 veh-km
Peak-hour vehicle-kilometers of travel, VkmT60 3193 veh-km
Peak 15-min total travel time, TT15 16.7 veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M18
From/To **PODGORICA - NIKSIC**
Jurisdiction
Analysis Year 2007
Description Existing Highway Vilusi - Bozaj

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 10 %
Segment length 46.0 km % Recreational vehicles 3 %
Terrain type Rolling % No-passing zones 70 %
Grade: Length km Access points/km 1 /km
Up/down %

Two-way hourly volume, V 935 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.950
Two-way flow rate,(note-1) vp 1130 pc/h
Highest directional split proportion (note-2) 576 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.7 km/h

Free-flow speed, FFS 61.8 km/h

Adjustment for no-passing zones, fnp 3.0 km/h
Average travel speed, ATS 44.7 km/h

_________________Percent Time-Spent-Following_________________

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.952	
Two-way flow rate,(note-1) vp	1187	pc/h
Highest directional split proportion (note-2)	605	
Base percent time-spent-following, BPTSF	64.8	%
Adj.for directional distribution and no-passing zones, fd/np	9.6	
Percent time-spent-following, PTSF	74.4	%

___________Level of Service and Other Performance Measures___________

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-kilometers of travel, VkmT15	12219	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	43010	veh-km
Peak 15-min total travel time, TT15	273.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

___Two-Way Two-Lane Highway Segment Analysis___

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 29/11/2007
Analysis Time Period 12h / 7 days
Highway M18
From/To **PODGORICA - TUZI**
Jurisdiction
Analysis Year 2007
Description Existing Highway Vilusi - Bozaj

___Input Data___

Highway class Class 2
Shoulder width 0.0 m Peak-hour factor, PHF 0.88
Lane width 3.0 m % Trucks and buses 5 %
Segment length 7.4 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 70 %
Grade: Length km Access points/km 2 /km
Up/down %

Two-way hourly volume, V 667 veh/h
Directional split 50 / 50 %

___Average Travel Speed___

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.2
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.990
Two-way flow rate,(note-1) vp 766 pc/h
Highest directional split proportion (note-2) 383 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 8.5 km/h
Adj. for access points, fA 1.3 km/h

Free-flow speed, FFS 60.2 km/h

Adjustment for no-passing zones, fnp 4.3 km/h
Average travel speed, ATS 46.3 km/h

______________Percent Time-Spent-Following______________

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.995	
Two-way flow rate,(note-1) vp	762	pc/h
Highest directional split proportion (note-2)	381	
Base percent time-spent-following, BPTSF	48.8	%
Adj.for directional distribution and no-passing zones, fd/np	15.2	
Percent time-spent-following, PTSF	64.0	%

_________Level of Service and Other Performance Measures_________

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.24	
Peak 15-min vehicle-kilometers of travel, VkmT15	1402	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	4936	veh-km
Peak 15-min total travel time, TT15	30.3	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TECHNICAL MEMORANDUM NO. 12

ROAD ACCIDENT REDUCTION BENEFITS

CONTENTS

1. Background

1.1 Rates in Montenegro

In 2007 an estimated 2,560 road accidents[1] involving personal injuries (including fatal injuries) were recorded by the Police, the number being an overall increase from year 2006 of about 16 percent. The Police data for 2006 & 2007 personal-injury accidents (PIA) are given in the table below, by municipality, together with estimated accident rates (PIA/100,000 registered vehicles).

Table 1: Personal injury accidents by Municipality 2006-7

Municipality	2006	2007 *	2007 incr%	Accidents /100,000 vehicles
Andrijevica	10	15	*50%*	984
Bar	246	251	*2%*	9,061
Berane	82	78	*-5%*	1,132
Bijelo Polje	104	131	*26%*	1,004
Budva	298	329	*10%*	6,726
Cetinje	84	108	*28%*	3,512
Danilovgrad	53	58	*8%*	1,364
Herceg Novi	195	309	*58%*	2,500
Kolasin	131	126	*-4%*	8,072
Kotor	196	290	*48%*	3,317
Mojkovac	38	60	*58%*	3,101
Niksic	40	na	*na*	*na*
Plav	11	16	*48%*	751
Pljevlja	48	30	*-38%*	323
Pluzine	13	19	*44%*	*na*
Podgorica	409	461	*13%*	709
Rozaje	62	73	*17%*	1,523
Savnik	16	19	*17%*	*na*
Tivat	51	70	*37%*	1,408
Ulcinj	130	106	*-18%*	1,552
Zabljak	8	11	*41%*	1,228
Country	**2,225**	**2,559**	*15%*	**1,471**

Source: Police communication October 2007

Some differences between 2006 and 2007, notably for Herceg Novi, Kotor, and Mojkovac, clearly indicate inconsistencies in the data. Five municipalities, namely:- Podgorica, Budva, Herceg Novi, Kotor, and Bar, account for nearly two-thirds (64%) of the total injury-accidents recorded in 2007(and 60% in 2006). This may be due to the concentrations of high traffic volumes on roads in the capital and coastal areas, and the density of population. Bar, Budva, and Kolasin exhibit accident rates per registered vehicle (PIA/100,000mv) of more than 5 times the country average (1471 PIA/100,000mv). Kolasin has the second highest accident rate at over 8,000 PIA/100,000mv, and Mojkovac has a rate double the average. The high rates appear likely to be related to road & traffic conditions on the existing (M-2) road in those areas. The table below gives the national accident data as submitted to SEETO in 2007. The 2006 total given for personal injuries

[1] Estimate based on 292 days of data to October 2007. The 15% increase in 2007 appears fairly consistent with traffic increases across the network.

(2,342) is reasonably consistent with the Police total for municipalities (2,225) given in the table above.

Table 2: Accident data submitted to SEETO, June 2007

Category	2004	2005	2006
Total Accidents	5,377	6,192	7,185
Personal Injury-Accidents (PIA)	1,220	1,347	1,554
Persons Injured	1,750	1,942	2,257
Persons Killed	91	95	85
Total Killed & Injured	1,841	2,037	2,342
Killed & Injured / Accident (PIA)	1.51	1.51	1.51
Damage Only Accidents	4,157	4,845	5,631

Source: MoTMAT, submitted to SEETO 04.06.2007 by Dragan Klikovac

Although total fatalities (averaging 90 per year 2004-2006) appear comparatively little, Montenegro ranks unfortunately high among European nations in terms of persons killed per million citizens. In the table below, the UNECE data for 2000 and 2001, Montenegro data is for 2006.

Table 3: Persons killed in 30 European countries 2000, 2001 (per million population)

Country	Total fatalities	Year	Population (millions)	Killed/ million
Russian Federation	29,594	2000	145.23	203.8
Lithuania	706	2001	3.59	196.7
Greece	2,116	1999	10.59	199.8
Portugal	1,629	2000	10.12	160.9
Croatia	647	2001	4.41	146.7
Spain	5,776	2000	40.10	144.1
Poland	5,534	2001	38.64	143.2
Slovenia	278	2001	1.99	139.6
Montenegro (2006)	**85**	**2006**	**0.63**	**134.9**
Czech Republic	1,334	2001	10.28	129.8
France	7,643	2000	59.35	128.8
Bulgaria	1,011	2001	8.06	125.4
Hungary	1,239	2001	10.11	122.6
Austria	958	2001	8.12	118.0
Slovakia	625	2001	5.40	115.8
Romania	2,499	2000	22.42	111.5
Ukraine	5,185	2000	49.50	104.7
Serbia and Montenegro	1,048	2000	10.64	98.5
Denmark	498	2000	5.35	93.2
Germany	7,503	2000	82.05	91.4
Turkey	5,510	2000	67.15	82.1
FYR of Macedonia	162	2000	2.03	79.9
Switzerland	544	2001	7.17	75.9
Netherlands	1,085	2001	15.98	67.9
Sweden	591	2000	8.84	66.9
Armenia	237	2001	3.80	62.3
Norway	274	2001	4.48	61.2
United Kingdom	3,580	2000	59.65	60.0
All 30 nations	**87,891**		**695.66**	**126.3**

Source: UNECE, Statistics of Road Traffic Accidents in Europe and North America 2002.

It is worth noting that many European (EU) countries have significantly reduced fatalities since 2000/2001. The overall mean value of 125 per million is influenced greatly by the very large total (nearly 30,000) of fatalities in the Russia Federation; otherwise (Russia excluded) the mean would be 85 per million.

In Montenegro a person is, therefore, about 60% more likely to die in a road traffic crash than the average citizen of all other (excluding Russia) European nations, and about twice as likely to be killed as a person in Sweden or in Holland. The UNECE data refer to the number of persons killed or dying within 30 days as a result of a road traffic accident; except in France (6 days) and Latvia (7 days). In terms of personal injury-accidents (PIA) per 1,000 motor vehicles (including fatal injuries) Montenegro also ranks too high, as shown below.

Table 4: Personal injury accidents per 1,000 vehicles in Europe 1995-2001

	1995	2001	2001 /1995
Montenegro (2006)	na	13.22	na
Croatia	15.37	11.80	-23.2%
Slovenia	8.04	9.70	20.6%
Austria	10.01	9.50	-5.0%
Belgium	10.28	9.00	-12.5%
Germany	7.88	7.46	-5.4%
Czech Republic	8.35	6.72	-19.5%
Greece	7.32	6.70	-8.5%
Hungary	7.75	6.42	-17.1%
Russian Federation	9.01	6.23	-30.9%
Portugal	9.69	6.11	-37.0%
Switzerland	6.14	6.04	-1.6%
Cyprus	6.95	5.97	-14.2%
Slovakia	17.68	5.58	-68.4%
Iceland	7.95	5.57	-30.0%
Italy	4.96	5.20	4.8%
FYR Macedonia	7.44	5.20	-30.1%
Estonia	3.60	4.95	37.4%
Poland	6.35	4.80	-24.4%
Ireland	6.11	4.61	-24.5%
Lithuania	4.90	4.50	-8.2%
Spain	4.43	4.40	-0.8%
Norway	4.17	3.66	-12.2%
France	4.62	3.61	-21.8%
Sweden	3.95	3.60	-8.9%
Denmark	3.04	3.30	8.5%
Finland	3.50	2.58	-26.2%
Luxembourg	4.67	1.97	-57.8%
Netherlands	1.81	1.60	-11.4%

Source: UNECE (as Table 2)

As shown above, most countries in Europe made significant reductions in PIA per 1,000 vehicles in the period 1995-2001, and most notably in this region: Croatia, Macedonia, and Slovakia.

The statistics above are of general use in official safety campaigns and for other comparative purposes; however, they may also be misleading[2] in that there are significant differences in car utilization (km per year) among countries.

In practice, what is of most interest is the **rate** of accidents, fatalities, and injuries per 100 million vehicle-km (100mvkm) traveled on the roads concerned in the project evaluation. The table below shows, for the Bar-Barski Most (Serbia border) route, injury-accident rates in 2006 as assessed from Police data available so far.

Table 5: Injury-Accident rates per 100 million vehicle-km (100mvkm) for 2006

Road	from -	to -	Accidents 2006	AADT in 2006	Length km	mvkm 2006	Accidents /100 mvkm
M2-1	Barski Most	Bijelo Polje	46	4,949	16.2	29.3	157
M2-1	Bijelo Polje	Ribarevina	36	4,949	6.2	11.2	321
M2	Kolasin	Mojkovac	41	4,338	20.2	32.0	128
M2	Mojkovac	Slijepac Most	9	3,314	17.3	20.9	43
M2	Bioce	Monastir Moraca	31	3,886	40.0	56.7	55
	Northern	***Totals***	*163*		*99.9*	*150.1*	***109***
M2-4	Bar	Petrovac	150	6,589	19.3	46.3	324
M2	Petrovac	Virpazar	41	4,900	24.8	44.4	92
M2	Virpazar	Podgorica	55	5,649	33.0	68.0	81
	Southern	***Totals***	*246*		*77.1*	*158.8*	***155***

Source: Police data and Consultants estimates

The Police data evidently refer to personal injury accidents (PIA including fatal injuries) since the totals closely match the data reported to SEETO (Table 2). In general, these accident rates above would confirm anecdotal evidence: that the safety record on the main road from Bar to Barski Most is indeed inferior. The very high accident rates for two sections, namely Bijelo Polje-Ribarevina, and Bar-Petrovac, may be attributed to these sections being largely urban or sub-urban in character[3].
For comparison, data for two roads in Serbia approaching the Montenegro border are shown in the table below.

Table 6: Accident rates per 100mvkm on Serbian roads 2001-2003

Road section / accident types	Cajetina - Gostun	Kraljevo - Ribarici-Spiljani
Accidents Total	106.3	137.0
Fatal Injuries	3.5	7.9
Severe Injuries	13.4	21.1
Minor Injuries	46.8	41.8
All personal injuries (PIA)	***63.7***	***70.8***
Material Damage only (DO)	42.6	66.2

Source: EAR Cost-Benefit Analysis working paper Table 8.2 (COWI Dec 2005)

[2] For example Britain has among the lowest PIA per 100 million vehicle-km of all countries, despite ranking fairly high (about 8.2 PIA/1,000 registered vehicles) in Table 4.
[3] It may therefore be inferred that the current MoTMAT and Municipality proposals for bypasses and relief road schemes in those areas would be high priority schemes.

As shown, accident rates on the Serbian roads adjacent to Montenegro are significantly lower[4] than the mean Montenegrin accident rates.

For economic analysis in the HDM model, injury-accident (PIA) rates for the existing Bar-Barski Most route will be taken as follows, Podgorica-Barski Most: 109 PIA /100mvkm, and Bar-Podgorica: 155 PIA /100mvkm. Official data supplied to SEETO (Table 2) indicate that the proportion of fatal injuries to total PIA was 4.4% in the 2004-2006 period. Thus for the Podgorica-Barski Most road, fatalities are estimated as 4.8 per 100mvkm, and for the Bar-Podgorica section, at 6.8 per 100mvkm.

1.2 Motorway Accident Rates

The table below gives comparative data, in 1999 - for nine European nations on motorway accident rates in terms of fatalities per 100 million vehicle-km of travel.

Table 7: Fatality rates on European Motorways, 1999

Country	Motorway travel (mvkm)	Fatalities	Fatalities / 100 mvkm
Denmark	9,164	9	0.10
Great Britain	93,400	202	0.22
Finland	3,693	9	0.24
Sweden	9,853	25	0.25
Holland	48,883	132	0.27
France	102,586	492	0.48
Belgium	30,083	213	0.71
Austria	16,207	146	0.90
Portugal	8,156	123	1.51
Total	**322,025**	**1,351**	**0.42**

Source: C. Schoon, SWOV Institute for Road Safety Research, Netherlands (CARE Report 2003)

Above there is wide variance (coefficient of variation 108%) about the mean. Denmark, Finland and GB are well below average, but Austria and Portugal about 2 or 3 times above average. Thus indicating that, even on motorway-standard roads much can be done (e.g., enforcing speed limits, seat belts, etc.) to reduce fatality rates. There is evidence that in some south-eastern European countries, motorway fatality rates can be considerably higher than those above, for example in Romania for 2003, the fatal injury rate was estimated at 3.2 per 100mvkm[5]. Low fatality rates in northern Europe are the product of long experience (motorways in Britain opened in the 1960s) and of efficient police enforcement procedures. Evidence from Hungary[6], where the motorway experience is fairly recent, indicates that motorway fatality rates are one-third of those for other main roads. This ratio is considered reasonable for all personal-injury accidents in this study.

[4] .This appears consistent with the SEETO study data.
[5] Source: CESTRIN, Romania Highway Agency.
[6] State Motorway Management Company Ltd. (SMMC Ltd. Hungary)

1.3 Accident Rates for this study

Road accident rates for this study are given in the table below.

Table 8: Accident rates for this study (Personal injuries per million km)

Road type / route	Fatal	Non-fatal
Motorway	2.0	40.0
Bar-Podgorica	6.8	148.2
Podgorica - border	4.8	104.2

The next section turns to the economic valuation of preventing or reducing road accidents.

2 The Social Value of accident reductions

2.1 Comparative Cost Data

The table below gives some comparative values for benefits of preventing road accidents from recent studies in Serbia (EAR/COWI, 2006), in Romania (Kampsax 2004, and Berger 2007) and the UK Department for Transport for 2005.

Table 9: Benefits (Eur 000s) of road accident prevention – comparisons

Country / year	Serbia 2006	Romania 2004	Romania 2007	Britain 2005
Fatality	€ 287.0	€ 100.0	€ 140.2	€ 1,784.9
Severe injury	€ 37.0	€ 30.0	€ 6.0	€ 200.6
Minor Injury	€ 3.0	na *	€ 0.5	€ 14.9
Damage only	€ 1.0	na	na	na

(*) In Romania 2004, Eur 30,000 was used for all injuries.

As shown, the British values (in 2005) are far higher than for Serbia and Romania, the essential difference being that the UK values are derived from extensive research (by TRL and others) and are mainly based on the willingness-to-pay (WTP) approach[7]. In many other countries the WTP method (normally involving extensive household surveys) is not used and values are most often based on average per-capita income or wage rates. In the UK, since the social (economic) value of preventing death and injury on the roads is comparatively high, it is no coincidence that UK accident rates are among the lowest in the world.

2.2 Estimate of Costs in Montenegro

The gross output or 'human capital' approach is used here. The value of preventing an accident involving injury (including fatality) can be divided into two main parts: (i) costs that are due to a loss or diversion of current resources and (ii) the costs due to a loss of future output. Included in (i) is vehicle damage, medical treatment and police costs. Determining loss of future output is done using the average wage rate, gross of tax, to determine lost output for the year the accident occurred and then for future years. Costs in the future years (that the person might have lived) are discounted to give present values.

The gross wage rate for 2007 (including employer contributions) is estimated as € 484 per month (Montenegro Business Outlook, May 2007) giving a value of € 5,808 per year. The mean age of those killed in road accidents is calculated as 40 years, based on data for all accidental deaths (Statistical Yearbook 2006, table 4-18). Assuming retirement from full-time work at age 65, the present value (PV) of 25 years of lost output, discounted at 8 percent per year, equals €62,784. For severe injuries, three years lost output are counted, giving a PV of €14,968, and for less severe or minor injuries, 6 months of lost output equals €2,904.

However, apart from the economic value of lost output, equally or more important is the human cost of being denied a full life. The average life expectancy in Montenegro is 69.9

[7] Reference: Highways Economics Note 1, DfT, January 2007.

years and 75.2 years for men and women respectively[8]. This means that on average people have five to ten years in leisure or non-paid activity with their families after ceasing work, and this is taken into account in the human costs element of premature loss of life. A significant amount is added to the lost output component, to reflect pain, grief and suffering of the victim and to those (relatives, friends) who care for him or her[9]. In the UK cost estimates (see table above) the human costs are equal to 190% of fatal injury, 680% of severe injury, and 450% of minor injury loss-of-output costs. There is (so far) no agreed consensus valuation in Montenegro; however, human costs are estimated here as 150% and 200% of the loss-of-output values for fatal injury and severe injury respectively, i.e., relatively less than the UK values. The basic values of road accident prevention are given in the table below.

Table 10: Social values of injury-accident prevention on roads

Social costs	**Death**		**Severe injury**		**Minor injury**	
Lost output	€	62,800	€	15,000	€	3,000
Human cost		150%		200%		0%
Total	€	157,000	€	45,000	€	3,000

As a check on these estimates, the 2006 Police and SEETO data are used, and the table below adds up the total social cost of road accidents in Montenegro in 2006. Although detailed information is not currently available, 80 percent of non-fatal injuries are assumed to be minor, based on the statistics from other European nations.

Table 11: Estimated total social costs of injury- accidents in 2006 (in million Euros - Meuro)

Type of injury	**Totals 2006**	**Injury cost (Eur)**		**Total (Meuro)**
Fatal	85	€	157,000	13.35
Severe	428	€	45,000	19.26
Minor	1,712	€	3,000	5.14
Total	2,225	€	16,962	**37.74**

In the table above, all injury-accident costs on Montenegro roads in 2006 are estimated at Euros 38 million, or about 2.0 percent of the national GDP[10], which percentage appears typical of many countries in the region. A World Bank study (*Road Traffic Safety in Europe And Central Asia*

Region Working Paper No. 1, Sven-Ake Blomberg, March 1999) notes that:- "The socio-economic costs of road traffic accidents were estimated using a formula developed by the EU .. The results indicate total costs of road accidents equivalent to between 1.5 and 2.5% of GDP in most countries and even more in many of the Accession countries. Poor people, especially in urban areas, suffer particularly seriously from road accidents. Accident reports show that, on average, some 30-40% of all persons killed in road traffic accidents in the region are pedestrians or using non-motorized vehicles, the majority of whom are poor".

[8] Monstat, 2006 Yearbook, Table 28-3. (2003 data)

[9] Overseas Road Note 10: Costing Road Accidents in Developing Countries, Dr. G. Jacobs, TRL, 1995)

[10] GDP for 2005 was estimated as Euros 1,785 million. (Monstat, Yearbook 2006)

TECHNICAL MEMORANDUM NO. 13

GENERAL TRAFFIC FORECAST

CONTENTS

1. Background

GDP per-capita annual growth percentages are given in the table below, as in Technical Memorandum No. 4.

from - to		Standard	Low growth
2007	2012	4.00%	2.50%
2012	2017	3.00%	2.00%
2017	2022	2.50%	2.00%
2022	2027	2.00%	1.50%
2027	2032	2.00%	1.00%
2032	2037	2.00%	1.00%

In order to forecast traffic growth the elasticity ratio, of traffic increase with respect to GDP/capita growth, is assumed as 1.83, as estimated in the recent SEETO[1] traffic studies for the region to year 2012; forecasts were made for Albania, Bosnia & Herzegovina, Croatia, Serbia, and Montenegro. This gives rise to our forecasts of annual growth of traffic in five year periods, shown in the table below.

from - to		Standard	Low growth
2007	2012	7.32%	4.58%
2012	2017	5.49%	3.66%
2017	2022	4.58%	3.66%
2022	2027	3.66%	2.75%
2027	2032	3.66%	1.83%
2032	2037	3.66%	1.83%

It should be noted that the income elasticity (ratio) for actual travel demand is much higher than the assumed income elasticities of demand for cars and vehicles (see TM no. 4). This is because over time the national vehicle fleet growth will consist to a significant extent of renewals. As personal incomes increase many older vehicles will be scrapped and the households will invest in newer cars. Thus, average vehicle utilization (km/year per vehicle) is expected to increase significantly. The border crossing traffic (vehicles to and from neighboring countries) is also expected to increase rapidly in future years.

[1] South Eastern Europe Traffic Observatory

In conclusion, the above forecasts are compared with other recent studies in the table below; this gives growth multiplying factors for given years for each study.

	This study		BCEOM 2003		EAR 2006
Year	*Standard*	*Low*	*Optimistic*	*Medium*	*High growth*
2007	1.00	1.00	1.00	1.00	1.00
2012	1.424	1.251	1.456	1.325	1.274
2017	1.860	1.497	1.887	1.641	1.520
2022	2.326	1.792	2.397	1.996	1.769
2027	2.784	2.052	3.044	2.428	1.978

As shown above, for the 2027 outcome there is a small difference, about 8%, between the study 'standard' forecast and that of the BCEOM 2003 optimistic scenario. For the earlier years the differences in outcome are much smaller, less than 3% for 2022, and less than 2% for year 2017. For this study, the outcome in 2027 is 40% higher than the EAR (COWI Consult) March 2006 'high growth' forecast for the Serbian–Montenegro motorways.

TECHNICAL MEMORANDUM NO 13A

GENERAL TRAFFIC FORECAST - REVISION

CONTENTS

1 BACKGROUND

Note: This working paper supersedes and revises the whole of Technical Memorandum No. 13, (General Traffic Forecast) and the GDP forecasts contained in Technical Memorandum No. 4 (Macro-Economic Forecasts and Vehicle Fleet Growth).

The revision of GDP and traffic forecasts arose mainly from advice of Professor A. Lojpur and uses the Central Bank of Montenegro (CBCG) forecasts of total GDP for the period 2006-2020, and the Physical Plan (PPM) document of 2006 estimates for population growth. The PPM document itself has a forecast to 2020 of GDP per capita, but it is apparent that the values given, Eur 8,000 per-capita in 2020, and an estimated average growth of 6.5% per year, should be viewed more as target figures for a plan, rather than as forecasts or specific predictions. In this respect there is some inconsistency in the PPM, since Euros 8,000 per-capita by 2020 is equivalent to growth of nearly 7.7% per year.

The GDP forecasts by the Central Bank (CBCG) for 2006-2020[1] are given in the table below, together with estimates for GDP per capita growth rates. The CBCG 'most likely' scenario – of 6% p.a. for total GDP, or 5.4% p.a. in per capita terms, is slightly lower than the PPM estimate.

Table 1: CBCG forecasts for GDP 2006-2020 (%/year)

Scenario	Symbol	**Annual growth rates**	
		GDP	GDP /capita
Pessimistic	GDP p	4.0%	3.4%
Most likely	GDP r	**6.0%**	**5.4%**
Optimistic	GDP o	7.0%	6.4%

Source: CBCG document, Table 7.1 & PPM Table 16

After 2020, there is no official forecast, and more conservative growth rates are anticipated. The CBCG forecast growth rate (to 2020) is extended until 2021. Then for the periods 2022-2027 and 2028-2037, slightly lower rates of growth are forecast in keeping with the greater level of uncertainty that is inherent in longer term forecasts. These are shown in the table below.

Table 2: Income per-capita growth forecasts to 2037 (% per year)

Period	**Most likely**	**Optimistic**	**Pessimistic**
2006-2021	5.4%	6.4%	3.4%
2022-2027	3.6%	4.3%	2.3%
2028-2037	2.4%	2.9%	1.5%

Source: CBCG and consultant estimates.

The above estimates give rise to the following scenarios for GDP per-capita in given future years as shown below.

[1] Central Bank: *Godišnji Izvještaj Glavnog Ekonomiste 2006*, Chapter 7 Međunarodna Ekonomija, Table 7.1 *Prognoza kretanja stope rasta BDP-a od 2006-2020*. (http://www.cb-mn.org/)

Table 3: Per-capita incomes in future years (Euros/year)

Year	Most likely	Lower growth
2007	€ 2,932	€ 2,822
2012	€ 3,817	€ 3,341
2017	€ 4,970	€ 3,954
2022	€ 6,360	€ 4,629
2027	€ 7,595	€ 5,183
2037	€ 9,637	€ 6,030

Source: previous table

The CBCG 'most likely' income growth scenario is used for this study's 'standard' traffic forecast, and the CBCG 'pessimistic' scenario for the 'low traffic growth' forecast.

Table 4: Revised Traffic Growth scenarios

Period from - to	Demand elasticity	Annual traffic growth		
		Standard	Median	Low growth
2007-2012	1.50	8.1%	6.6%	5.1%
2012-2017	1.40	7.6%	6.2%	4.8%
2017-2021	1.30	7.0%	5.7%	4.4%
2022-2027	1.30	4.7%	3.8%	3.0%
2028-2032	1.30	3.1%	2.5%	2.0%
2032-2037	1.30	3.1%	2.5%	2.0%

Source: Previous tables and Consultant estimates

In the above table the traffic growth rate for 2007-2012 is exactly consistent with the SEETO forecast (to 2012) for Montenegro. After 2017 the demand elasticity ratios are likely to gradually decrease; as personal incomes continue to increase it has been found in other European countries that the elasticity ratios tend to decrease.

Table 5: General traffic growth multipliers (2007 =1) for the 'standard', 'median', and 'low' forecasts

Year	Standard	Median	Low growth
2007	1.0	1.0	1.0
2012	1.476	1.379	1.282
2017	2.125	1.872	1.618
2021	2.788	2.356	1.924
2022	2.888	2.428	1.968
2027	3.504	2.866	2.229
2032	3.962	3.185	2.408
2037	4.620	3.636	2.652

Source: Table 4

Comparing with the BCEOM (2003) roads study in Montenegro (see Technical Memorandum no 13, final table), the standard forecast multiplier for 2027 (3.504 in above table) results in a general traffic volume some 15 percent higher than the BCEOM 'optimistic' forecast. It is also more than 70 percent higher than the EAR (March 2006, COWI) study forecast 'high growth area' for the Belgrade-Montenegro motorway project.

TECHNICAL MEMORANDUM NO. 14

DRAFT REPORT
TRAFFIC SURVEYS

CONTENTS

1 Introduction

The annual traffic counting conducted regularly by the Crnagoraput Company is the base for traffic volume determination along the road network of Montenegro. Such are one-day counting carried out at 35 locations along the main and regional network once a year in September.

However, in order to determine the “travel willingness” and “traffic flows” which are necessary in creating “the forecast transport models” it was also, apart from counting, necessary to conduct roadside interviews of vehicle drivers on the road.

This is the reason why the Louis Berger Company organized seven-day 12-hour and 24-hour counting and roadside interviews in October 2007, carried out at 16 RSI stations along the corridors of future highways at almost same places where Crnagoraput Company conducts its annual counting.

During seven-day counting period more than 450 000 vehicles classified in 12 types (5 types of passenger vehicles, 4 types of trucks and 3 types of buses) were counted, and on days when 24-hour interviews were carried out, 83 000 vehicles were counted.

Within the O-D and travel purpose surveys around 10 000 vehicle drivers were interviewed.

This action involved more than 150 counters and interviewers who were stopping the vehicles at RSI stations with the assistance of 16 mandatory police patrols in order to perform the interviews.

Beside regular questions “What is your place of origin/destination?”, drivers were also asked on “their trip purpose”, i.e. what is the main reason for their trip, so as how often do they travel (everyday, weekly, monthly etc.).

After all data were submitted the trip matrices were formed for the base year 2007 which were then being transformed into the Transport Model which is used, following the process of calibration, in creating “traffic picture” of the road network in Montenegro.

To determine the future traffic flows total traffic forecasts were made (“forecast trip matrices” were defined for every five years), and forecasted options of road network were determined within the Transport Model as a base for decision making regarding the need and time of constructing certain sections.

2 Summary Results of Traffic Counting and Interviews

The main categorization of vehicle types in the process of counting and interviews was the classification into 12 categories by which the counting and interviews were conducted.

In the counting analysis the number of vehicle type was adjusted to 6 categories for both need of using them in the models and also possibility of comparing them with multi-annual counting conducted by the Crnagoraput Company.

Defined were the following categories:

1. Passenger car
2. Van + minibus
3. Bus
4. Light truck
5. Medium truck
6. Heavy truck and Heavy truck with trailer

Within the O-D Survey analysis two types of matrices were formed.

1. Passenger vehicle matrix (passenger car, van and minibus) for which the travel purposes were also specified

2. Truck and bus matrix for which the origin and destination zones were specified.

SUMMARY OF COUNTING AND INTERVIEWS

	Counting					Interwiev			
Count location	Count. 07-19h	Count. 19-07h	Count. . ToT	24h	12h	SP	OD	SP%	OD%
1	55136	2932	58068	11280	8348	230	**1641**	2,76%	19,66%
2	26730	1367	28097	5447	4080	148	**819**	3,63%	20,07%
3	26344	869	27213	4767	3898	137	**717**	3,51%	18,39%
4	31219	2443	33662	6818	4375	126	**689**	2,88%	15,75%
5	3635	120	3755	597	477	32	**106**	6,71%	22,22%
6	38552	1325	39877	7727	6402	186	**1018**	2,91%	15,90%
7	46718	2024	48742	8743	6719	188	**1094**	2,15%	16,28%
8	50220	2031	52251	8789	6758	221	**893**	2,51%	13,21%
9	23495	1284	24779	4580	3296	114	**476**	2,49%	14,44%
10	28220	1855	30075	6211	4356	124	**641**	2,85%	14,72%
11	2098	143	2241	394	251	4	**21**	1,59%	8,37%
12	13479	1057	14536	2892	1835	34	**451**	1,85%	24,58%
13	22436	836	23272	4223	3387	75	**398**	2,21%	11,75%
14	44741	2243	46984	8766	6523	35	**463**	0,54%	7,10%
15	5728	235	5963	898	663	29	**121**	3,23%	18,25%
16	5108	241	5349	804	563	43	**169**	5,35%	30,02%
Tot	**423859**	**21005**	**444864**	**82936**	**61931**	**1726**	**9717**	**2,95%**	**15,69%**

	12 h counting		24 h counting		Expansion fac. for counting		12 h interview		Expansion fac. for 12 h RSI	
Count location	PC	TRUCK	PC	TRUCK	F1-PC	F1-TRUCK	PC	TRUCK	F2-PC	F2-TRUCK
1	7026	1322	9752	1528	1,39	1,16	1438	203	**4,89**	**6,51**
2	3582	498	4785	662	1,34	1,33	762	57	**4,70**	**8,74**
3	3111	787	3926	841	1,26	1,07	631	86	**4,93**	**9,15**
4	3543	832	5672	1146	1,6	1,38	569	120	**6,23**	**6,93**
5	295	182	385	212	1,31	1,16	88	18	**3,35**	**10,11**
6	5934	468	7196	531	1,21	1,13	934	84	**6,35**	**5,57**
7	6012	707	7846	897	1,31	1,27	1042	52	**5,77**	**13,60**
8	5962	796	7754	1035	1,3	1,3	793	100	**7,52**	**7,96**
9	2664	632	3624	956	1,36	1,51	382	94	**6,97**	**6,72**
10	3556	800	4753	1458	1,34	1,82	540	101	**6,59**	**7,92**
11	219	32	352	42	1,61	1,31	20	1	**10,95**	**32,00**
12	1618	217	2433	459	1,5	2,12	432	19	**3,75**	**11,42**
13	2773	614	3387	765	1,25	1,25	377	21	**7,36**	**29,24**
14	6134	389	8161	605	1,33	1,56	408	55	**15,03**	**7,07**
15	572	91	773	125	1,35	1,37	113	8	**5,06**	**11,38**
16	468	95	641	163	1,37	1,72	126	43	**3,71**	**2,21**
Tot	**53469**	**8462**	**71440**	**11425**			**8655**	**1062**		

Seven-day counting locations

23.10. - 29.10.2007

3 Traffic Counting Results Analysis

From the seven-day traffic counting, derived were the expansion factors for average daily traffic on the day of counting and also average daily traffic in the week of counting (AWDT – Average Weekly Daily Traffic). From the Crnagoraput traffic counting data, derived were factors of Weekly Traffic Distribution in the month (October) of counting (AMDT – Average Monthly Daily Traffic) so as factors of Monthly Traffic Distribution in a year (AADT – Average Annual Daily Traffic).

Derived factors are the following:

Daily Traffic Distribution Factor (24 hour counting/12 hour counting)………………….1,34

Weekly Traffic Distribution Factor (is obtained directly from 7-day counting)…………1,00

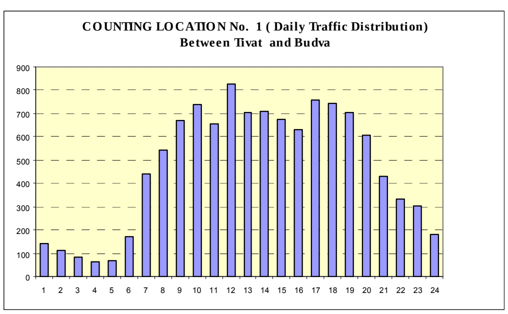
Monthly Traffic Distribution Factor (weekly counting (22-29) in October)……………...0,99

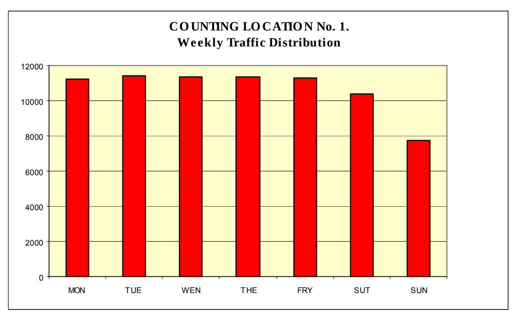
Annual Traffic Distribution Factor (AADT/AMDT)……………………………………..1,20

Tables below show seven-day counting summary results expanded to the level of Average Annual Daily Traffic (AADT) in 2007.

RSI & COUNTING LOCATION No. 1(Between Budva and Tivat)

										F A C T O R S			
		29	23	2425	26	27	28		1,00	0,99	1,20		
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**	
1	P.Car (1,2,3)	9042	9150	9030	9198	9014	8696	6793	**60923**	8703	8616	**10339**	
2	Light Delivery&Mikro bus (4,5)	700	756	793	724	738	570	271	**4553**	650	644	**773**	
3	Bus (more than 30 seats)(10,11,12)		279	277	290	277	316	273	255	**1968**	281	278	**334**
4	Small truck (2-axle) (6,7)	453	465	472	426	475	340	150	**2782**	397	393	**472**	
5	Medium truck (2-axle) (8)	517	573	545	545	474	327	141	**3122**	446	441	**530**	
6	Heavy truck (5-axle art.) (9)	236	179	253	203	263	200	151	**1485**	212	210	**252**	
	TOT	**11228**	**11400**	**11383**	**11374**	**11280**	**10407**	**7760**	**74832**	10690	10583	**12700**	

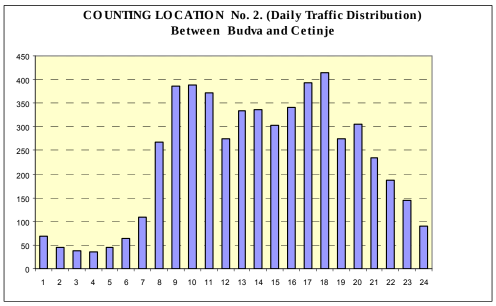


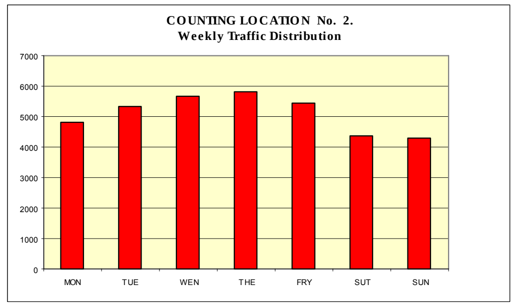


RSI & COUNTING LOCATION No. 2 Between Budva and Cetinje

		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3940	4071	4453	4560	4408	3552	3615	**28599**	4086	4045	**4854**
2	Light Delivery&Mikro bus (4,5)	281	534	408	467	377	320	237	**2625**	375	371	**445**
3	Bus (more than 30 seats)(10,11,12)	139	181	176	150	142	128	153	**1070**	153	151	**182**
4	Small truck (2-axle) (6,7)	126	133	149	159	146	101	84	**897**	128	127	**152**
5	Medium truck (2-axle) (8)	177	257	205	213	188	120	90	**1250**	179	177	**212**
6	Heavy truck (5-axle art.) (9)	156	170	269	249	186	139	106	**1274**	182	180	**216**
	TOT	**4818**	**5345**	**5659**	**5798**	**5447**	**4361**	**4285**	**35714**	5102	5051	**6061**

FACTORS

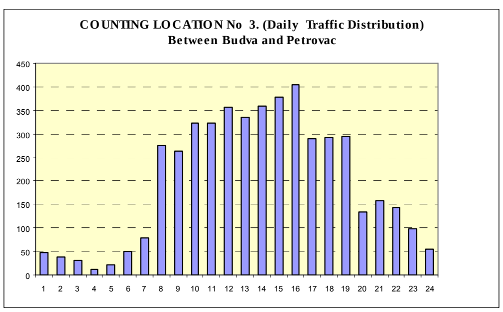


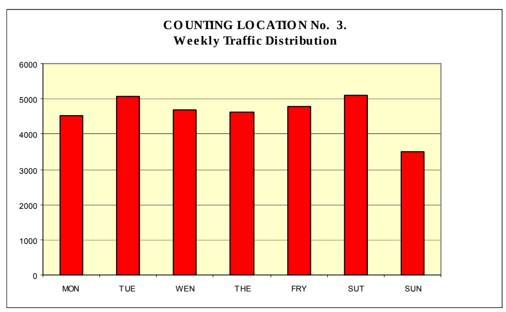


RSI & COUNTING LOCATION No.3 Between Budva and Petrovac

		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3480	3914	3588	3631	3605	3823	2695	**24736**	3534	3498	**4198**
2	Light Delivery&Mikro bus (4,5)	257	339	294	271	321	308	201	**1991**	284	282	**338**
3	Bus (more than 30 seats)(10,11,12)	164	114	114	97	113	153	133	**887**	127	125	**150**
4	Small truck (2-axle) (6,7)	175	187	180	159	197	209	129	**1236**	177	175	**210**
5	Medium truck (2-axle) (8)	174	196	183	167	173	206	131	**1231**	176	174	**209**
6	Heavy truck (5-axle art.) (9)	289	309	333	281	358	411	207	**2187**	312	309	**371**
	TOT	**4538**	**5059**	**4692**	**4605**	**4767**	**5110**	**3496**	**32266**	4609	4563	**5476**

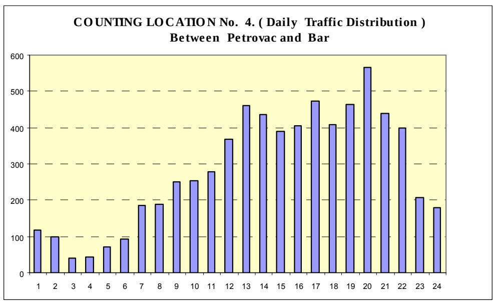
FACTORS

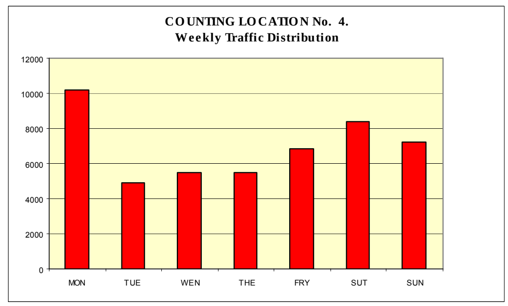




RSI & COUNTING LOCATION No. 4 Between Petrovac and Bar

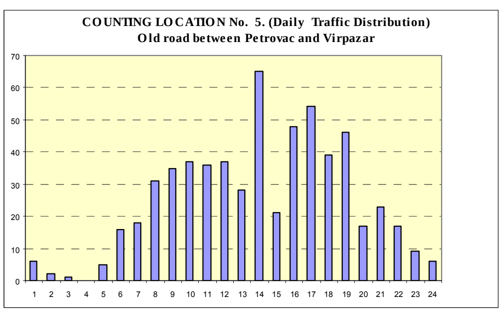
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	7970	3636	4145	4126	5280	6363	6030	**37551**	5364	5311	**6373**
2	Light Delivery&Mikro bus (4,5)	640	241	344	315	392	627	396	**2955**	422	418	**501**
3	Bus (more than 30 seats)(10,11,12)	131	78	92	71	115	147	62	**695**	99	98	**118**
4	Small truck (2-axle) (6,7)	350	294	254	271	236	305	172	**1881**	269	266	**319**
5	Medium truck (2-axle) (8)	488	310	228	287	339	401	247	**2299**	328	325	**390**
6	Heavy truck (5-axle art.) (9)	599	326	420	384	456	570	296	**3050**	436	431	**518**
	TOT	**10177**	**4884**	**5483**	**5453**	**6818**	**8414**	**7203**	**48431**	6919	6850	**8219**

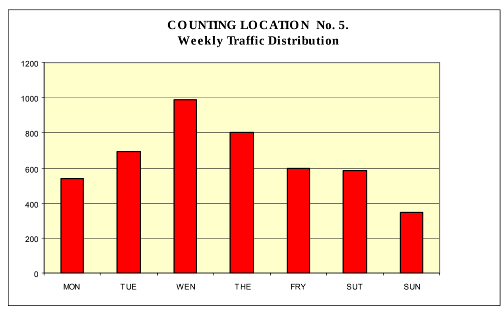




RSI & COUNTING LOCATION No. 5 Between Petrovac and Virpazar

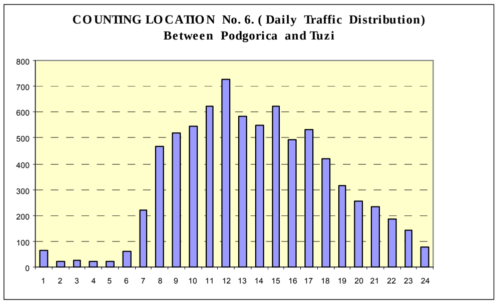
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	279	418	502	424	330	315	253	**2522**	360	357	**428**
2	Light Delivery&Mikro bus (4,5)	51	63	68	59	55	47	30	**374**	53	53	**63**
3	Bus (more than 30 seats)(10,11,12)	2	1	1	4	1	1	0	**10**	1	1	**2**
4	Small truck (2-axle) (6,7)	57	44	92	62	45	34	21	**354**	51	50	**60**
5	Medium truck (2-axle) (8)	71	111	234	182	100	128	26	**851**	122	120	**145**
6	Heavy truck (5-axle art.) (9)	81	56	93	70	66	57	17	**440**	63	62	**75**
	TOT	**541**	**693**	**990**	**801**	**597**	**583**	**347**	**4552**	650	644	**773**

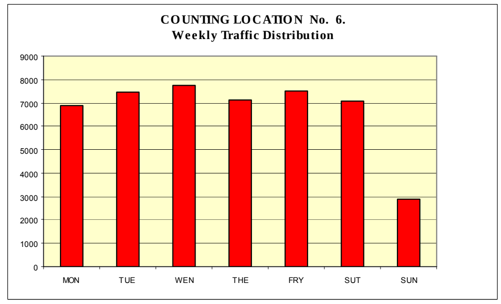




RSI & COUNTING LOCATION No. 6 Between Podgorica and Tuzi

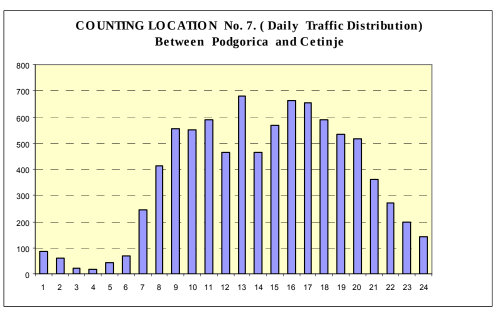
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	6264	6703	6799	6444	6830	6493	2697	**42231**	6033	5973	**7167**
2	Light Delivery&Mikro bus (4,5)	306	392	397	353	309	311	75	**2143**	306	303	**364**
3	Bus (more than 30 seats)(10,11,12)	21	26	31	35	43	31	16	**201**	29	28	**34**
4	Small truck (2-axle) (6,7)	112	140	195	114	100	84	39	**783**	112	111	**133**
5	Medium truck (2-axle) (8)	71	119	163	98	87	85	24	**646**	92	91	**110**
6	Heavy truck (5-axle art.) (9)	113	90	142	87	117	90	24	**662**	95	94	**112**
	TOT	**6886**	**7471**	**7727**	**7130**	**7486**	**7093**	**2874**	**46667**	6667	6600	**7920**

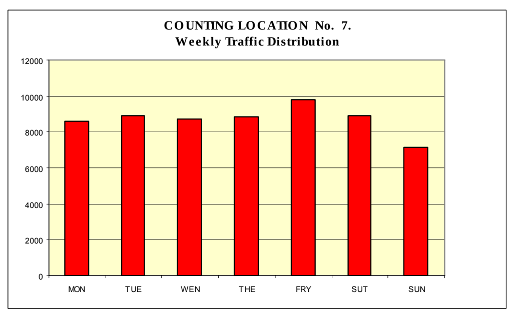




RSI & COUNTING LOCATION No. 7 Between Podgorica and Cetinje

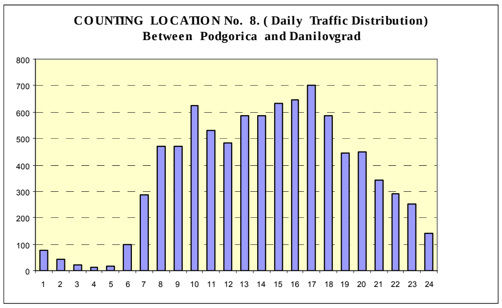
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	7269	7387	7250	7244	8265	7715	6436	**51566**	7367	7293	**8752**
2	Light Delivery&Mikro bus (4,5)	528	652	596	663	607	492	257	**3794**	542	537	**644**
3	Bus (more than 30 seats)(10,11,12)	145	155	162	153	177	128	149	**1070**	153	151	**182**
4	Small truck (2-axle) (6,7)	103	169	170	170	127	85	41	**866**	124	122	**147**
5	Medium truck (2-axle) (8)	220	257	317	315	283	181	98	**1670**	239	236	**283**
6	Heavy truck (5-axle art.) (9)	299	272	248	307	324	286	161	**1895**	271	268	**322**
	TOT	**8564**	**8892**	**8743**	**8852**	**9782**	**8886**	**7142**	**60862**	8695	8608	**10329**

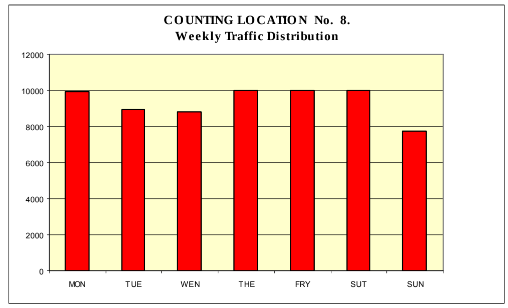




RSI & COUNTING LOCATION No. 8 Between Podgorica and Danilovgrad

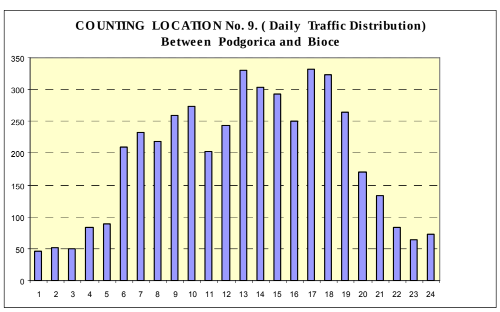
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**		
	AMDT	**AADT**										
1	P.Car (1,2,3)	8423	7229	7096	8323	8133	8798	7011	**55013**	7859	7780	**9337**
2	Light Delivery&Mikro bus (4,5)	516	624	658	589	677	476	259	**3800**	543	537	**645**
3	Bus (more than 30 seats)(10,11,12)	321	309	306	322	336	222	166	**1983**	283	280	**336**
4	Small truck (2-axle) (6,7)	151	157	157	192	161	100	55	**973**	139	138	**165**
5	Medium truck (2-axle) (8)	269	278	260	275	330	181	116	**1709**	244	242	**290**
6	Heavy truck (5-axle art.) (9)	280	321	312	320	350	251	116	**1949**	278	276	**331**
	TOT	**9960**	**8919**	**8789**	**10022**	**9986**	**10028**	**7724**	**65428**	9347	9253	**11104**

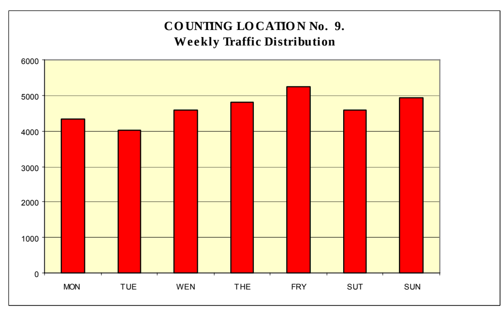




RSI & COUNTING LOCATION No. 9 Between Podgorica and Bioče

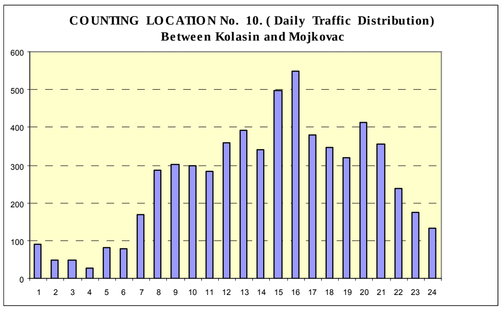
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3295	2818	3252	3450	3829	3613	4083	**24341**	3477	3443	**4131**
2	Light Delivery&Mikro bus (4,5)	269	292	372	344	354	269	262	**2162**	309	306	**367**
3	Bus (more than 30 seats)(10,11,12)	108	81	123	112	141	124	146	**835**	119	118	**142**
4	Small truck (2-axle) (6,7)	133	139	150	161	146	68	70	**869**	124	123	**147**
5	Medium truck (2-axle) (8)	224	254	243	279	285	187	136	**1607**	230	227	**273**
6	Heavy truck (5-axle art.) (9)	307	447	440	469	496	329	245	**2734**	391	387	**464**
	TOT	**4338**	**4031**	**4580**	**4814**	**5251**	**4590**	**4944**	**32548**	4650	4603	**5524**

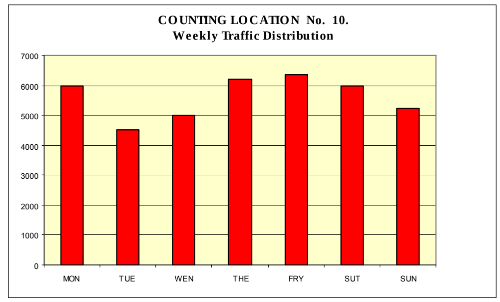




RSI & COUNTING LOCATION No. 10 — Between Kolašin and Mojkovac

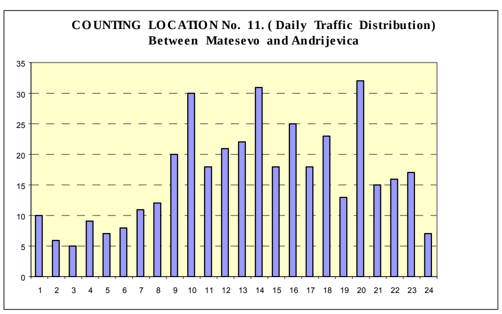
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	4739	3026	3657	4164	4710	4637	4115	**29049**	4150	4108	**4930**
2	Light Delivery&Mikro bus (4,5)	400	306	446	589	452	373	323	**2889**	413	409	**490**
3	Bus (more than 30 seats)(10,11,12)	93	104	83	167	111	126	109	**793**	113	112	**135**
4	Small truck (2-axle) (6,7)	92	147	87	203	140	121	84	**875**	125	124	**148**
5	Medium truck (2-axle) (8)	174	263	148	276	244	187	99	**1392**	199	197	**236**
6	Heavy truck (5-axle art.) (9)	484	658	583	812	697	557	489	**4281**	612	605	**727**
	TOT	**5982**	**4505**	**5005**	**6211**	**6354**	**6003**	**5220**	**39279**	5611	5555	**6666**

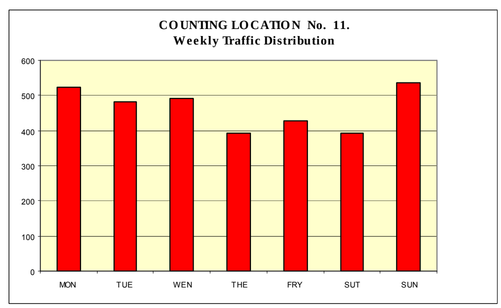




RSI & COUNTING LOCATION No. 11 — Between Mateševo and Andrijevica

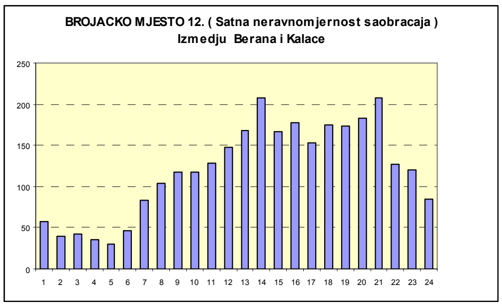
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	451	407	441	336	354	370	489	**2848**	407	403	**483**
2	Light Delivery&Mikro bus (4,5)	20	6	14	16	14	8	2	**80**	11	11	**14**
3	Bus (more than 30 seats)(10,11,12)	0	0	0	0	0	0	0	**0**	0	0	**0**
4	Small truck (2-axle) (6,7)	9	15	7	10	17	4	12	**73**	10	10	**12**
5	Medium truck (2-axle) (8)	40	48	25	23	32	8	28	**202**	29	29	**34**
6	Heavy truck (5-axle art.) (9)	5	5	6	9	11	4	4	**44**	6	6	**7**
	TOT	**525**	**481**	**492**	**394**	**428**	**394**	**535**	**3248**	464	459	**551**

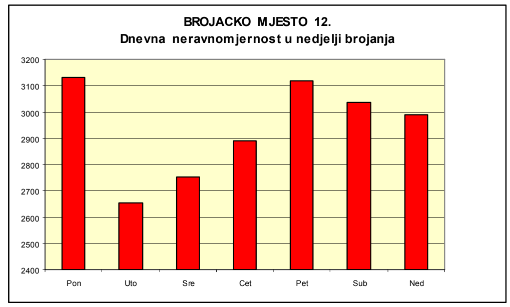




RSI & COUNTING LOCATION No. 12 Between Berane and Kalače

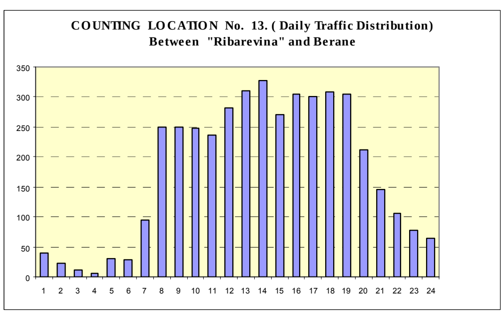
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	2546	2072	2237	2263	2479	2393	2500	**16490**	2356	2332	**2799**
2	Light Delivery&Mikro bus (4,5)	176	166	150	170	210	199	139	**1210**	173	171	**205**
3	Bus (more than 30 seats)(10,11,12)	80	80	97	79	94	70	62	**561**	80	79	**95**
4	Small truck (2-axle) (6,7)	52	69	57	93	100	77	39	**488**	70	69	**83**
5	Medium truck (2-axle) (8)	96	81	68	92	68	120	50	**575**	82	81	**98**
6	Heavy truck (5-axle art.) (9)	181	186	143	195	170	178	199	**1252**	179	177	**213**
	TOT	**3131**	**2653**	**2753**	**2892**	**3120**	**3038**	**2989**	**20576**	2939	2910	**3492**

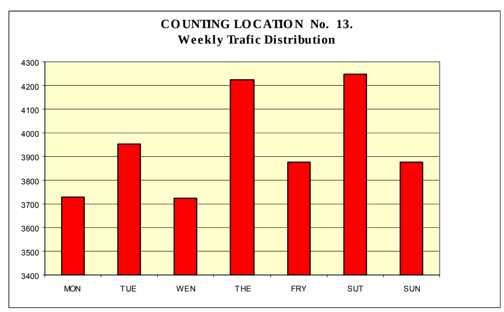




RSI & COUNTING LOCATION No. 13Between "Ribarevina" and Berane

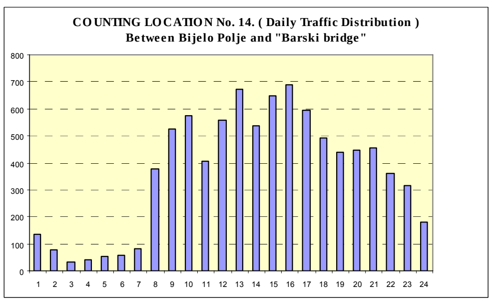
		29	23	24	25	26	27	28		FACTORS		
										1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	3013	3154	2902	3186	3150	3574	3279	**22258**	3180	3148	**3778**
2	Light Delivery&Mikro bus (4,5)	160	347	330	272	131	174	143	**1556**	222	220	**264**
3	Bus (more than 30 seats)(10,11,12)	117	79	115	134	107	91	93	**735**	105	104	**125**
4	Small truck (2-axle) (6,7)	129	50	71	176	165	108	95	**794**	113	112	**135**
5	Medium truck (2-axle) (8)	155	174	113	193	142	142	103	**1022**	146	145	**173**
6	Heavy truck (5-axle art.) (9)	153	150	194	262	182	162	162	**1266**	181	179	**215**
	TOT	**3726**	**3954**	**3725**	**4223**	**3877**	**4250**	**3876**	**27632**	3947	3908	**4689**

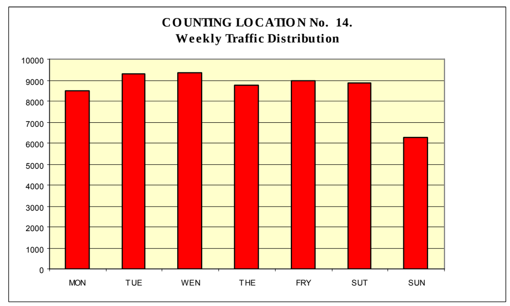




RSI & COUNTING LOCATION No. 14Between B.Polje and "Barski" bridge

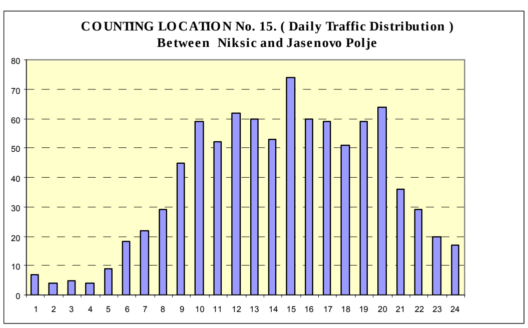
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**		
	AMDT	**AADT**										
1	P.Car (1,2,3)	7739	8188	8194	7842	7963	8121	5727	**53775**	7682		
	7605	**9126**										
2	Light Delivery&Mikro bus (4,5)	237	506	400	319	350	295	231	**2338**	334	331	**397**
3	Bus (more than 30 seats)(10,11,12)	76	94	88	91	106	66	32	**551**	79	78	**94**
4	Small truck (2-axle) (6,7)	107	124	162	80	127	87	72	**760**	109	107	**129**
5	Medium truck (2-axle) (8)	144	124	219	182	147	129	74	**1019**	146	144	**173**
6	Heavy truck (5-axle art.) (9)	194	266	285	252	264	184	129	**1573**	225	222	**267**
	TOT	**8497**	**9302**	**9347**	**8766**	**8958**	**8882**	**6264**	**60016**	8574		
	8488	**10186**										

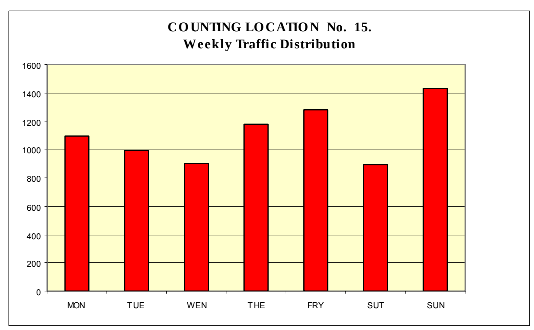




RSI & COUNTING LOCATION No. 15 Between Nikšić and Jasnovo Polje

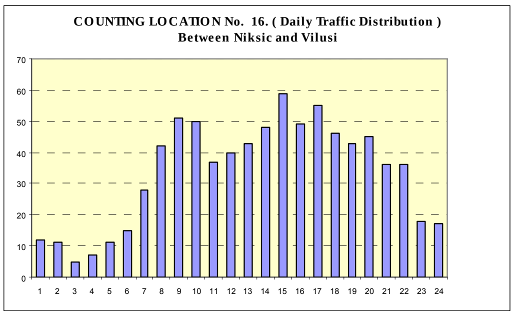
		29	23	24	25	26	27	28		FACTORS 1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	851	756	704	928	987	748	1222	**6195**	885	876	**1051**
2	Light Delivery&Mikro bus (4,5)	89	82	69	65	91	64	94	**555**	79	78	**94**
3	Bus (more than 30 seats)(10,11,12)	19	15	13	15	25	4	16	**106**	15	15	**18**
4	Small truck (2-axle) (6,7)	66	51	49	80	79	35	51	**412**	59	58	**70**
5	Medium truck (2-axle) (8)	69	62	58	85	76	35	39	**424**	61	60	**72**
6	Heavy truck (5-axle art.) (9)	5	24	5	3	21	10	9	**77**	11	11	**13**
	TOT	**1098**	**990**	**898**	**1175**	**1279**	**896**	**1432**	**7769**	1110	1099	**1318**

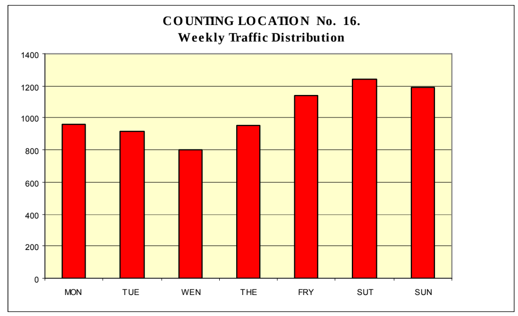




RSI & COUNTING LOCATION No. 16Between Vilusi and Klobuk

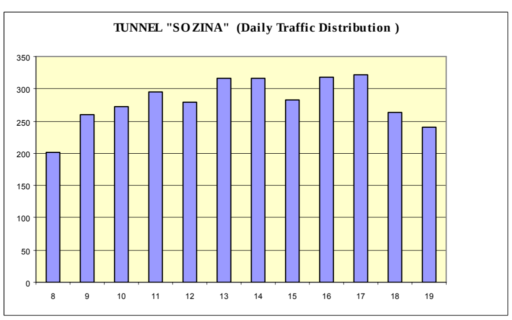
										FACTORS		
		29	23	24	25	26	27	28		1,00	0,99	1,20
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**AWDT**	**AMDT**	**AADT**
1	P.Car (1,2,3)	774	680	579	716	870	1048	990	**5657**	808	800	**960**
2	Light Delivery&Mikro bus (4,5)	42	56	62	71	75	43	47	**397**	57	56	**67**
3	Bus (more than 30 seats)(10,11,12)	7	1	2	4	5	2	3	**24**	3	3	**4**
4	Small truck (2-axle) (6,7)	14	22	22	30	31	16	16	**150**	21	21	**25**
5	Medium truck (2-axle) (8)	26	45	24	36	54	29	26	**240**	34	34	**41**
6	Heavy truck (5-axle art.) (9)	98	114	115	93	103	107	107	**737**	105	104	**125**
	TOT	**961**	**918**	**804**	**950**	**1138**	**1245**	**1189**	**7204**	1029	1019	**1223**

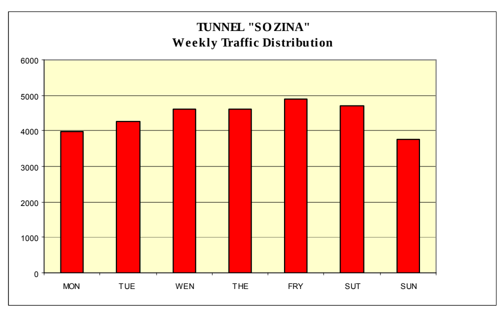




For traffic through the Sozina Tunnel data from the Monteput Company which is in charge of traffic management in the tunnel are used. The next table shows data on vehicles passing through the tunnel on days when counting and interviews took place.

	TYPE	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**Total**
1	passenger car	3400	3701	3691	3867	4020	3348	3215	**25242**
2	passenger car with trailer	22	22	31	22	23	24	18	**162**
3	van	292	292	300	334	254	153	252	**1877**
4	small trucks	106	146	104	132	108	57	130	**783**
5	medium tricks	148	145	162	185	72	37	100	**849**
6	bus	34	39	37	44	34	42	40	**270**
7	heavy trucks	272	253	277	305	209	98	213	**1627**
	TOTAL	**4274**	**4598**	**4602**	**4889**	**4720**	**3759**	**3968**	**30810**

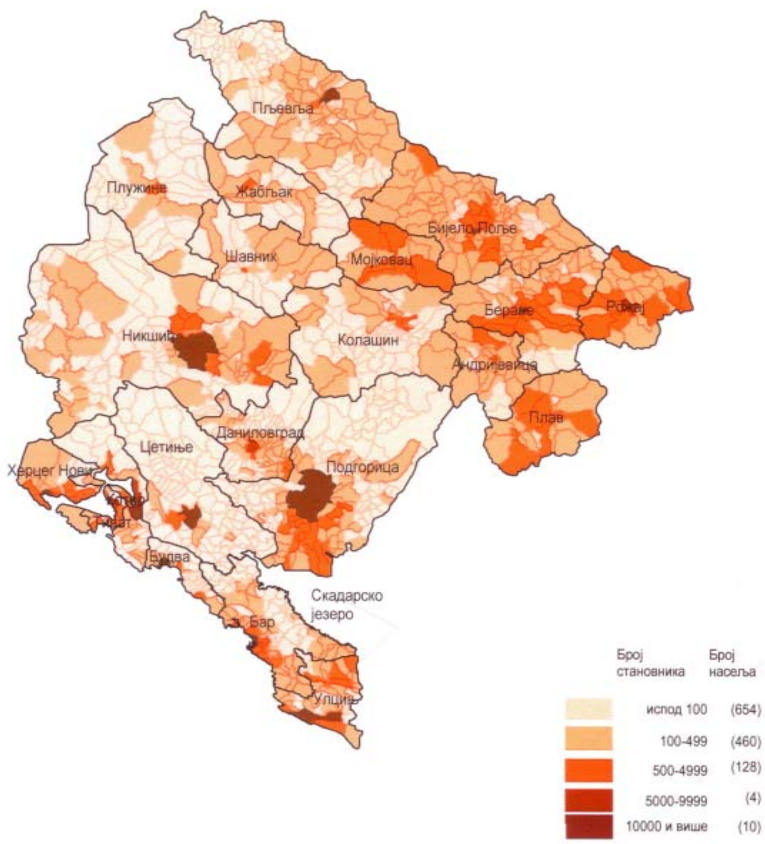




4 Origin-Destination Survey Results Analysis

Although the roadside surveys were conducted only within the zones of two corridors (Bar-Boljare and Adriatic-Ionian) responses of road-users referred to the trips over the whole territory of Montenegro and out of the country. Therefore, it was necessary to divide the whole territory of Montenegro into several areal units (information carrier) in order to code the trips and insert them into the transport model.

The selected areal unit (traffic zone) is the Municipality. There are 21 Municipalities in Montenegro, so the zonal system was formed at such level. Below is the map with the name and location of Municipalities in Montenegro.



Municipalities (Zones) were given the following code numbers:

1. Herceg Novi	16. Žabljak
2. Tivat	17. Mojkovac
3. Kotor	18. Berane
4. Budva	19. Rožaje
5. Bar	20. Pljevlja
6. Ulcinj	21. Bijelo Polje
7. Cetinje	Beside these, defined are also zones out of Montenegro:
8. Nikšić	22. Croatia
9. Danilovgrad	23. Bosnia and Herzegovina
10. Podgorica	24. Serbia (1)
11. Plužine	25. Serbia (2)
12. Šavnik	26. Albania
13. Kolašin	27. Slovenia
14. Andrijevica	28. Bulgaria and Rumunia
15. Plav	29. Macedonia
	30. Europe and all other countries

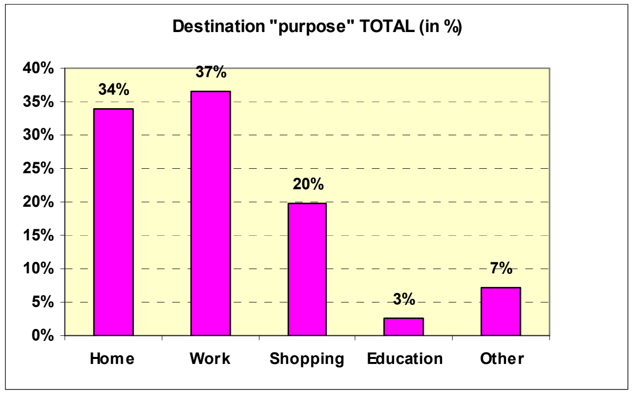
All passenger vehicle trips were divided into four basic trip purposes for which the ‘matrices’ were formed at the level of Municipalities (Zones) for the whole territory of Montenegro.

The following trip purposes were processed:

1. Home
2. Work
3. Shopping/selling
4. Education/school

Truck and bus trips were processed at the level of origin-destination zones (Municipalities) and separate ‘trip matrices’ were formed for them.

The chart below shows participation percentage of particular ‘purposes’ of total number of trips over the whole territory of Montenegro.



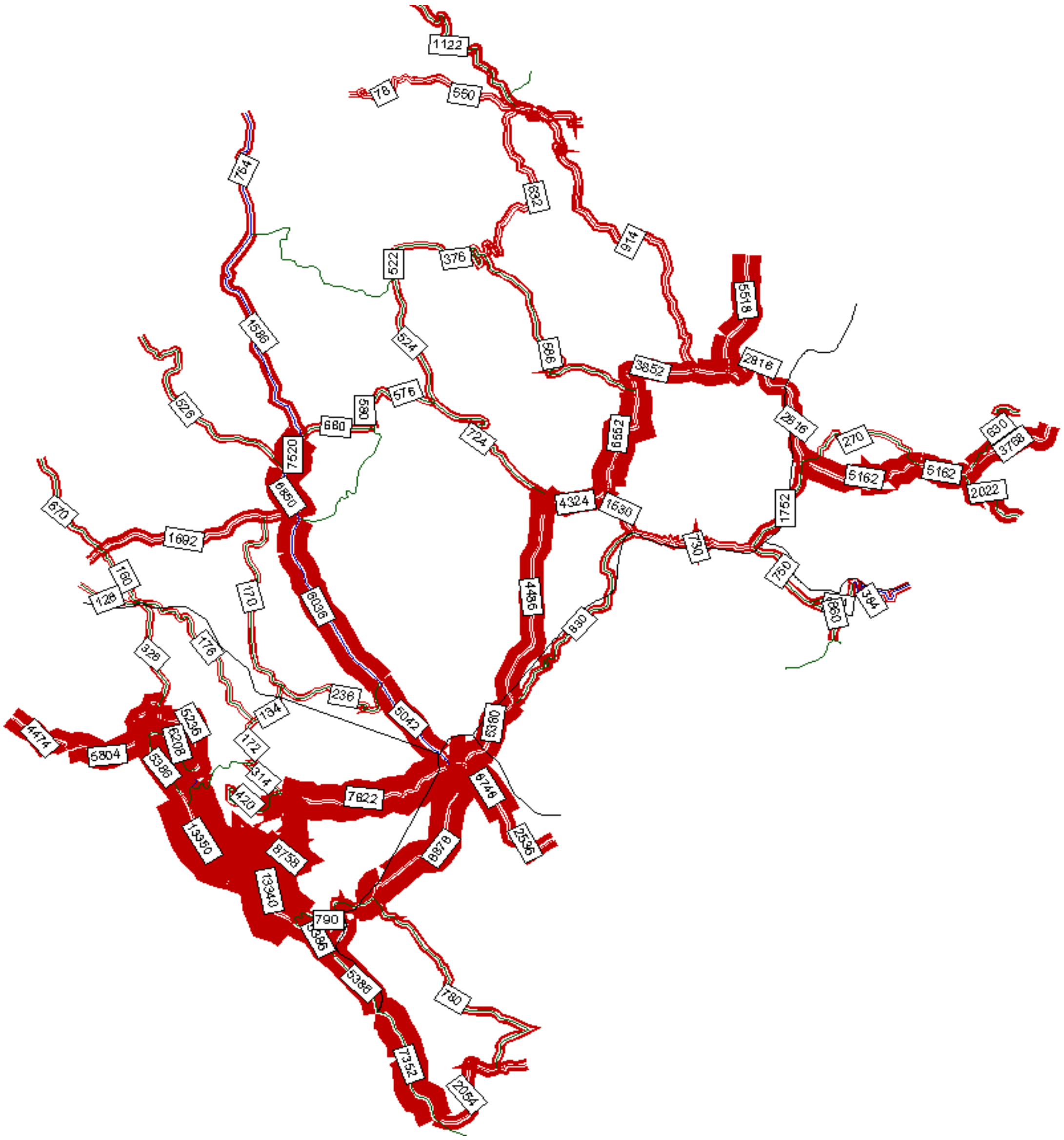
Unusually high percentage of trips “to work” is the result of the fact that in the ‘out of town’ trips majority of ‘business’ trips are defined as trips to work, and such trips will not necessarily finish in one day with the return ‘home’.

5 Network Assignment Model Calibration of base year 2007

Trip matrices by O-D zones and trip purposes derived from 12-hour survey conducted at 16 RSI stations within the zones of future highways were first expanded to the level of 24-hours. The parallel counting conducted at the same time at RSI stations was used for this action.

For the purpose of obtaining as clear assignment model picture as possible in the Transport Model, and also due to the fact that the survey did not include those RSI stations which are because of the spatial and program limitations located far from the direct influence on future highways, the traffic counting data obtained by Crnagoraput in September 2007 were also used in this process of calibration.

The map below shows road network load of Montenegro in 2007 on the basis of traffic counting conducted by Crnagoraput in September 2007.



Existing road network of Montenegro has (according to the official report of the Crnagoraput Company which is in charge of road maintenance) 844,724 km of main and 962,806 km of regional roads.

For the maintenance purposes these are divided into five sections:

1. Podgorica section 241,099 km of main and 126,250 km of regional roads

2. Kotor section 210,542 km of main and 213,116 km of regional roads

3. Niksic section 152,300 km of main and 243,660 km of regional roads

4. Berane section 198,973 km of main and 118,346 km of regional roads

5. Pljevlja section 41,810 km of main and 261,407 km of regional roads

This network was used in the Transport Model for the purpose of trip calibration and determination of transport state in the base year 2007.

ANUALY AVERAGE DAILY TRAFFIC ON THE ROAD NETWORK IN MONTENEGRO (AADT 2007)

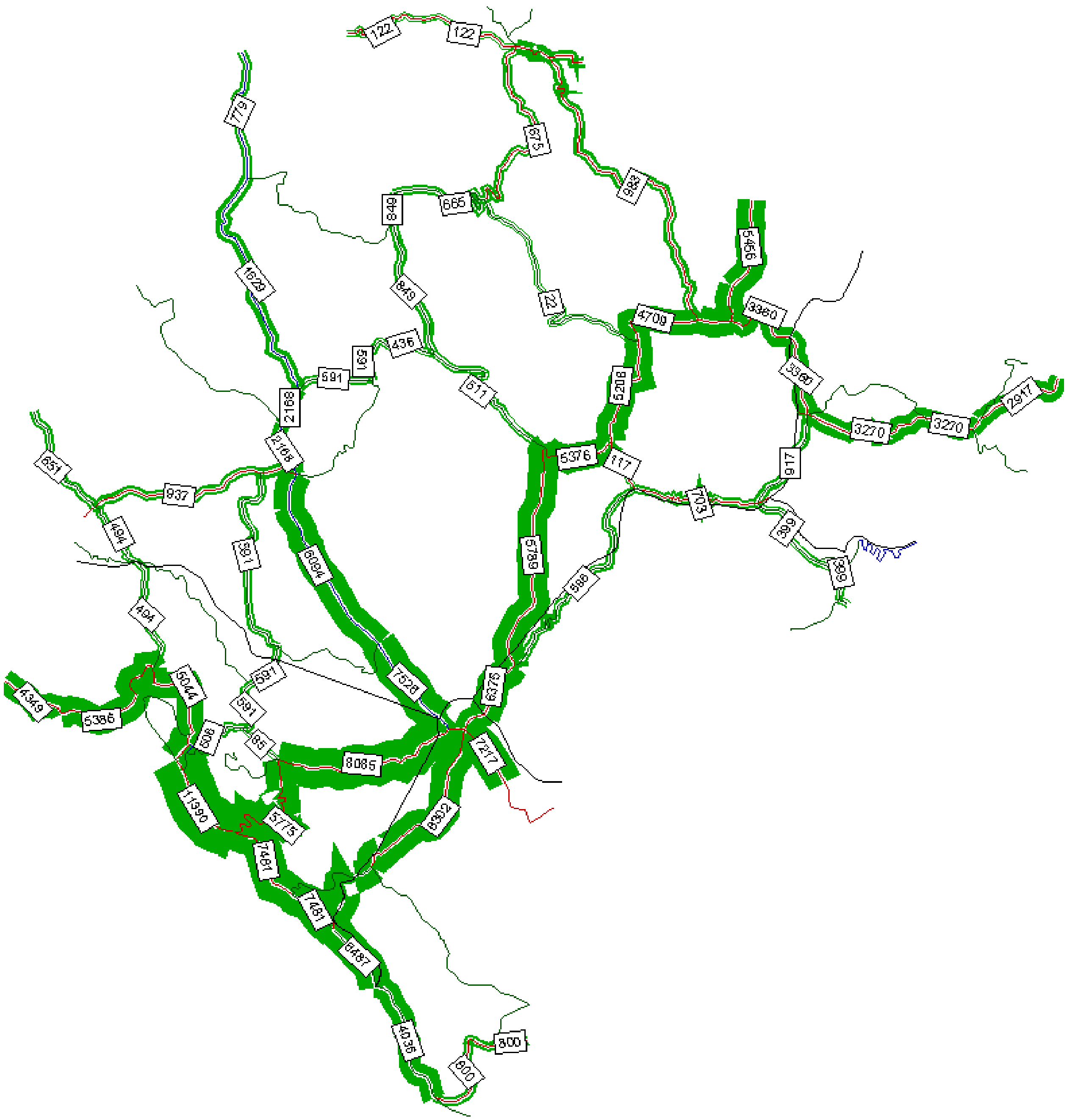
AADT 2007

	DESTINATION																														
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	**SUM**
1	0	15	500	155	229	65	67	139	39	625	4	0	13	12	6	0	12	40	12	41	24	1500	28	129	12	4	0	0	0	0	**3670**
2	10	0	10	986	137	19	86	119	51	568	0	0	4	0	0	4	0	7	0	10	25	4	0	94	0	0	0	0	0	0	**2133**
3	500	16	0	722	319	82	171	223	30	623	0	0	15	0	16	4	11	27	11	16	53	500	0	146	0	8	0	0	0	0	**3493**
4	166	1158	802	0	867	112	292	284	83	984	0	4	14	6	16	10	6	15	8	22	17	35	45	187	0	5	5	0	0	4	**5147**
5	239	221	239	630	0	1390	116	110	53	321	0	0	6	11	0	10	6	29	54	26	19	17	22	178	19	0	7	0	3	6	**3730**
6	65	54	51	80	1370	0	41	18	0	107	0	0	0	0	0	0	0	1	42	6	8	29	7	52	28	400	0	0	0	0	**2359**
7	41	68	102	240	111	30	0	92	59	1740	0	0	21	0	6	0	10	6	0	0	16	6	25	30	5	0	3	0	0	0	**2610**
8	111	58	98	222	164	29	78	0	1003	781	404	55	23	10	11	16	23	74	26	31	34	8	534	59	0	0	0	0	0	0	**3854**
9	17	16	20	61	0	9	22	1006	0	1321	4	0	6	0	6	0	0	0	0	0	23	2	0	6	0	0	0	0	0	0	**2518**
10	503	505	571	871	490	149	1566	1534	1484	0	10	8	217	76	80	26	110	85	126	111	86	46	106	359	64	3554	14	0	5	2	**12759**
11	0	0	0	0	4	6	0	391	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**419**
12	0	0	0	0	8	0	0	77	0	32	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	**123**
13	14	4	5	38	10	8	11	29	18	274	0	0	0	28	10	0	148	62	6	6	71	0	0	46	3	0	0	0	3	0	**793**
14	10	4	0	0	6	0	0	0	0	46	0	0	79	0	0	0	0	6	12	0	14	0	0	9	250	0	0	0	0	0	**435**
15	0	0	0	0	23	0	0	10	0	58	0	0	0	0	0	0	0	0	15	0	35	0	6	6	6	0	3	0	0	6	**170**
16	6	0	6	9	0	0	6	62	0	31	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	**126**
17	11	4	12	6	11	5	11	52	19	103	0	0	95	0	6	0	0	35	6	0	36	0	6	0	0	0	0	0	0	0	**418**
18	16	12	62	24	42	7	18	61	42	47	0	23	6	0	0	0	35	0	250	29	474	6	6	141	500	0	3	0	0	0	**1803**
19	11	4	4	29	18	16	6	0	30	49	9	0	12	9	15	0	14	234	0	6	173	0	6	6	500	6	0	0	0	0	**1154**
20	19	34	12	9	27	15	0	18	13	75	0	0	0	0	0	0	0	12	0	0	435	4	6	500	0	0	0	0	0	0	**1179**
21	12	21	15	12	45	1	11	58	76	40	0	0	67	18	46	0	29	540	122	412	0	0	18	1223	9	0	0	0	0	12	**2787**
22	1500	4	500	18	44	30	0	0	0	42	0	0	0	0	0	0	0	0	0	0	7	0	0	6	14	4	0	0	0	0	**2170**
23	0	16	9	6	27	12	5	512	0	59	0	0	4	0	0	0	0	12	9	0	0	0	0	9	49	0	0	0	0	0	**729**
24	106	59	82	163	262	50	17	103	82	293	0	0	29	21	6	0	0	146	0	524	1354	10	8	0	23	0	0	0	0	0	**3338**
25	0	8	4	3	6	35	0	0	0	34	0	0	3	250	6	0	0	520	500	0	6	0	0	0	0	0	0	0	4	9	**1389**
26	0	0	0	6	5	400	0	18	0	3582	0	0	0	0	0	0	0	0	0	0	0	6	0	0	5	0	0	0	4	0	**4024***
27	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	**16**
28	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**
29	0	0	0	7	5	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	3	6	0	0	0	0	0	0	0	0	**26**
30	6	0	5	2	0	4	8	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	10	0	0	0	0	**45**
TOT	**3362**	**2285**	**3112**	**4309**	**4240**	**2479**	**2539**	**4924**	**3091**	**11882**	**442**	**102**	**627**	**454**	**245**	**86**	**422**	**1876**	**1216**	**1265**	**2935**	**2198**	**844**	**3211**	**1517**	**4017***	**63**	**28**	**48**	**68**	**63423**

*** Trips between zones (10 – 26) are intrazonal trips between Podgorica and Tuzi**

Based on calibrated trip matrix and characteristics of the categorized road network of Montenegro in the Transport Model, the first iteration of 2007 Network Assignment Model was done.

In over 90% of sections the model simulation put nearly the same transport load on transport network, therefore the next phase of model simulation i.e. creation of forecast matrices and future corridor options can proceed.



Explanation of assignment procedures

Transport model provides six assignment procedures for private transport, whereby the first five procedures are static assignment procedures with no explicit time modeling, while the sixth procedure uses a time-dynamic model of the traffic flow:

Combination of two statistic models was used for the purpose of this Study: Incremental Model and Equilibrium Model.

- *Incremental assignment* divides the O-D matrix on a percentage basis into several partial matrices. These partial matrices are then are then successively assigned to the network. The route search considers the impedance which results from the traffic volume of the previous step.
- *Equilibrium assignment* distributes demand according to Wardrop' s first principle: "Every individual road-user chooses his route in such a way so that his journey takes the same time on all alternative routes and that switching routes would only increase personal journey time." The state of equilibrium is reached multi-successive iteration based on an incremental assignment as a starting solution. In the inner iteration step two routes of a relation are brought into a state of equilibrium by shifting vehicles. The outer iteration step checks if new routes with lower impedance can be found as a result of the current network state.

Forecast Trip Matrices Creation

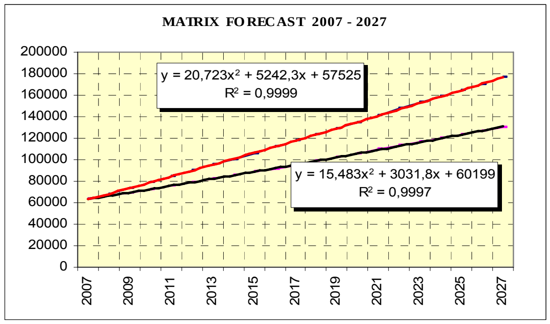
General vehicle fleet growth forecasts in Montenegro were made on the basis of GDP forecasts as shown in the Technical Memorandum no. 4.

Defined were two vehicle fleet growth rates which were used in creating general trip matrices in Transport Models "Road Network Load".

The table and chart below show vehicle fleet growth in the trip matrices by 'standard' and 'low' growth rate from 2007 to 2027.

MATRIX FORECAST 2007 - 2027

	Standard forecast			Low forecast		
	Multip. factors	Matrix value	Growth rate	Multip. factors	Matrix value	Growth rate
2007		63423			63423	
2012	1,424	90292	7,32%	1,251	79340	4,58%
2017	1,860	117952	5,49%	1,497	94961,2	3,66%
2022	2,326	147554	4,58%	1,792	113659	3,66%
2027	2,785	176606	3,66%	2,052	130170	2,75%


MATRIX FORECAST 2007 - 2027
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
y = 20,723x² + 5242,3x + 57525
R² = 0,9999
y = 15,483x² + 3031,8x + 60199
R² = 0,9997
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027

TECHNICAL MEMORANDUM NO. 15

MOTORWAY BAR – BOLJARE
ANALYSIS OF THE SERBIAN DESIGN STANDARDS FOR THE BEOGRAD – SOUTH ADRIATIC MOTORWAY

CONTENTS

1. Background

On 13th December the Consultant received from the Ministry of Transport, Maritime Affairs and Telecommunications request to check the Serbian Design Standards for the Beograd – South Adriatic Motorway.

The table below regroups the Serbian Design Standards and compares them with the TEM Standards and Recommended Practice, issued in 2002. (*by TEM Project Central Office, 3rd Edition, February 2002. sections 3.1 & 3.2)*

On left side of the table below there are all geometrical parameters from the Serbian design. In the right column are our comments, i.e., the comparison with TEM.

Table 1: Serbian & TEM Standards

Type	Item	DESIGN STANDARDS		TEM Comments
		SERBIAN	TEM	
General information	Motorway Design Speed	**100 km / h**	**100 km / h**	
	Slip Roads Design Speed	not defined	**40 km / h**	
	Maximum length of a straight alignment	2,000 m	none	“Avoid the use of very long straights” – chapt. 3.1.1.7 a
	Minimum Stopping Distance (MSD)	180 m	150 m	
	Absolute minimum Sight distance for Overtaking	not defined	400 m	
	Desirable minimum Sight distance for Overtaking	not defined	600 m	
	Maximum width of lateral visibility	9.2 m	none	Not necessary, covered by MSD
Plan	Minimum horizontal radii	450 m	450 m	
	Minimum horizontal radii with a normal crossfall	3,000 m	450 m	2,500 m
	Minimum length of a transition curve	110 m	195 m	
	Minimum horizontal radii for slip roads	not defined	40 m	
	Minimum length of a climbing lane	700 m	1,000 m	
Longitudinal Profile	Minimum convex radii for Motorway	8,500 m	6,000 m	must be 10,000 m for two way carriageway (I stage) – chapt. 3.1.6.1
	Minimum convex radii for Slip Roads	not defined	800 m	
	Minimum concave radii on Motorway	5,500 m	none	Vertical acceleration must be no more than $0.25 m/s^2$ – chapt. 3.1.6.2
	Minimum concave radii for Slip Roads	not defined	400 m	

	Maximum longitudinal grade	6% Max. 2.5% in tunnels	5%	"In tunnels the use of maximum permitted gradients should be avoided" - chapt. 8.2.3.3
	Maximum longitudinal grade for Slip Roads	not defined	7% upward 8% downward	

Type	Item		DESIGN STANDARDS		TEM Comments
			SERBIAN	TEM	
Longitudinal Profile	Minimum longitudinal grade on embankment		0%	0.3%	If there are curb it must be 0.5%
	Minimum longitudinal grade on cut		0.5%		
	Minimum crossfall		2.5 %	2.0 %	
	Maximum crossfall		7.0%	7.0%	
	Average value of relative gradient of the edges of carriageway		0.5%	<0.5%	
Motorway Cross Section	Width of	traffic lanes	3.5 m	3.75 m	
		climbing lanes	3.0 m	3.5m	It could become a traffic lane in the future
		emergency lanes	2.5 m	2.50 m	including right edge marking line 0.25 m
		emergency lanes in tunnels or on bridges	Not if L>500m	still desirable	Chapt. 3.2.1.1 & 8.2.1.4
		left edge marking line	0.35 m	0.25 m	
		right edge marking line	0.20 m	0.25 m	
		central reserve	4.0 m or 3.0 m	4.0 m or 3.0 m	
Slip Roads Cross Section	Width of	Slip Roads traffic lanes	3.5 m	4.0 m	
		left edge marking line	0.35 m	0.25 m	
		right edge marking line	not defined	0.25 m	
		emergency lane	1.65 m	not defined	

2. Summary

The presented Serbian document called “SMJERNICE ZA PROJEKTOVANJE AUTOPUTA BEOGRAD – JUŽNI JADRAN” is incomplete and therefore a more detailed analysis is impossible.

The missing items are:

- Overtaking distance;
- Shoulders width;
- Overhead clearance;
- Deceleration / acceleration lanes;
- Axel load value;
- Pavement definition;
- Safety devices positions and
- Lay-bys definitions if not emergency lanes (in tunnels and on bridges).

It is difficult to understand why the proposed Standards are so different from TEM Standards when the motorway Bar – Boljare is being presented as an approved Trans -European North-South Motorway (TEM) on the 2006 map.

Additionally on the last page of the above document in the list of references there are:

- TEM Standards and Recommended Practice, issued in 2003 and;
- TEM Project Central Office.

TECHNICAL MEMORANDUM NO. 16

INFORMATION FOR FURTHER INPUT TO HDM-4 ANALYSIS

CONTENTS

1 The discount rate: a test rate for economic analysis

In many countries, particularly in Africa and Asia, 12 percent is used as the social discount rate for economic analysis. This is considered too high for European countries, especially since transport infrastructure is normally considered a low risk investment. The table below gives examples of social (i.e., for public spending) discount rates used in Europe and elsewhere in recent times. The source is EC "*Guide to cost-benefit analysis of Investment Projects*" (Structural Fund-ERDF, Cohesion Fund and ISPA) new edition, Annex B2.

Table 1: Discount rates for public projects in Europe &USA

World Bank & EBRD	10%
France	8%
USA	7%
United Kingdom	6%
Spain – transport projects	6%
Bulgaria - transport (1)	6%
Italy	5%
Spain – water projects	4%

Sources: (1) Recent EC project data. (2) EC Guide, Annex B2.

A test discount rate of 8 percent, at the maximum, is therefore considered suitable, although 6 per cent, or even perhaps 5 percent as a minimum, could be used, based on an observation in the EC text (op cit.) that "eventually for .. regions lagging behind, a 5 percent return is compatible with the [third] approach, where a standard benchmark discount rate is used reflecting a required real growth objective" (EC, op cit. p 105). It is also noted that EC in its ISPA manual working document (April 2002 DG-REGIO) recommends 8 percent for all financial analyses.

The EAR study of upgrading two links between Belgrade and Montenegro (COWI-BCEOM, March 2006) adopted a discount rate of 7 percent. A test discount rate of 8 percent is therefore considered suitable for this study.

If necessary, economic tests can be done at both 8 and 10 percent. Besides the net present value (NPV), the estimated economic internal rates of return (EIRR) will show if or not the two projects confer positive benefit for given discount rates.

2 Adjustment Factors for increasing unit costs over time

The intrinsic values of travel time and accident savings are expected to increase over time, in line with real increases in GDP per capita. However in the HDM-4 model only one initial value (for base year) can be input, and so there is a need for an appropriate input value or adjustment factor which takes expected future unit cost increases into account. The method used is as follows:-

To estimate an input value in HDM-4 for VOTT or other costs rising over time:

For a given discount rate:-

i) calculate the NPV of the single base year value (NPVa)

ii) calculate NPV of the base year value as increased over time by the chosen growth rate (NPVb)

Then ratio (NPVb) / (NPVa) gives the adjustment factor for the single (base year) entry value allowed in HDM-4.

The adjustment factors shown in the table below are for test discount rates of 8, 10 and 12 percent. Longer analysis periods mean higher NPV, and so adjustment factors are given for analysis periods of twenty, 25, and 30 years.

Table 2: Calculated increase factors

Discount rate = 8%	*Analysis period - years*		
Annual growth rate	**20**	**25**	**30**
1.0%	1.077	1.090	1.101
2.0%	1.163	1.193	1.219
3.0%	1.259	1.311	1.357
4.0%	1.366	1.446	1.519
Discount rate = 10%	*Analysis period - years*		
Annual growth rate	**20**	**25**	**30**
1.0%	1.071	1.081	1.089
2.0%	1.137	1.173	1.192
3.0%	1.237	1.277	1.311
4.0%	1.334	1.396	1.449
Discount rate = 12%	*Analysis period - years*		
Annual growth rate	**20**	**25**	**30**
1.0%	1.065	1.073	1.079
2.0%	1.137	1.155	1.169
3.0%	1.216	1.248	1.272
4.0%	1.304	1.353	1.391

In general, for intermediate rates of growth (e.g., 1.5%) the appropriate adjustment factor can be interpolated from the above table. For this study, the factors to be used are given in the table below, based on i) a discount rate of 8% per annum, and ii) discount rate of 10% per annum.

Table 3: Factors used in this study

	Standard case	Lower growth
Average growth of personal income 2007-2037 (%pa)	2.58%	1.67%
Discount rate 8%	1.296	1.178
Discount rate 10%	1.259	1.156

These factors will be applied to adjust the base year (2007) values of travel time savings per hour, and the base year values used for the prevention of fatal road accidents and injuries.

Thus for example, the values for VOTT for the car, at 8% discount rate, will be €4.59 per hour for the Standard growth case, and € 4.17 per hour for the lower growth case. At a 10% discount rate the VOTT car values are € 4.46, and € 4.09 per hour, respectively.

3 Generalized user costs

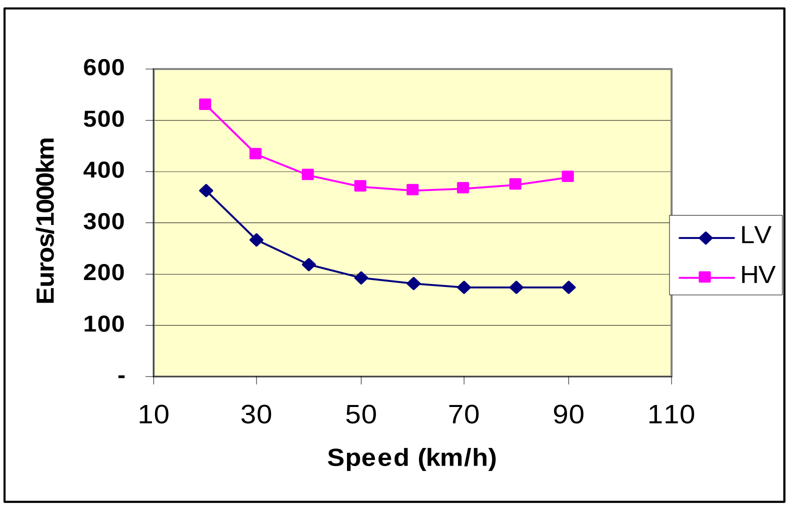
The road user cost functions (equations) presented below are used for predictive purposes in the traffic assignment models. These costs are known as “generalized costs” or sometimes “behavioural costs” because they are used to mimic behaviour of drivers on the road network when faced with differing choices of route. Thus, behavioural costs consist only of:-

i) the market price of fuel, either unleaded petrol or eco-diesel.

ii) the perceived cost of travel time in the case of cars (LV) and the market price of driving crews in the case of heavy vehicles (HV).

The cost estimates are shown in graphic form below.

Chart 1: Generalized User Costs graphed (Eur/1,000km)



The generalized cost functions take the form of an equation as follows:-

$$\text{Cost} = a + b/V + cV^2$$

where: V = average speed on the link in km/hour, and **a, b, c** are the estimated parameter values. Cost is expressed as Euros per 1,000 kilometres.

The parameter values a, b, c for these cost functions are given in the table below.

Table 4: Generalized cost parameter values (Eur/1000km)

	LVs incl cars	HVs (trucks and buses)
a	54.2	217.3
b	6,144	6,141
c	0.006561	0.012535

Using the equation parameters above, generalized costs (Eur/1000km) are given in the table below for a range of average speeds: from 20 km/hour – 90 km/hour.

Table 5: Average speed (km/h) and Costs/1000km

km/h	LVs incl cars	HVs (trucks and buses)
20	€ 364	€ 529
30	€ 265	€ 433
40	€ 218	€ 391
50	€ 193	€ 371
60	€ 180	€ 365
70	€ 174	€ 366
80	€ 173	€ 374
90	€ 176	€ 387

These values correspond to the graph in Chart 1 above. To estimate fuel consumption (lt/1000km) the UK Department for Transport COBA9 model values for cars and goods vehicles were used. The market price (unit cost) of unleaded petrol is Eur 1.15 per litre, and of eco-diesel Eur 1.06 per litre. For this purpose, all cars and light vehicle are assumed to use petrol and all HVs to use diesel. [1]

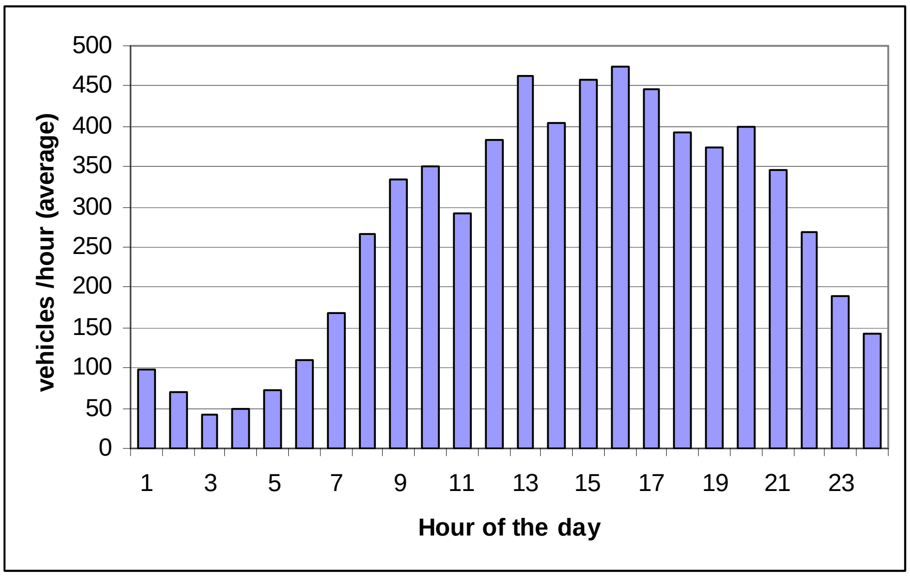
For travel time costs, for LVs the value is Eur 3.54 per vehicle-hour, as estimated from the recent Stated Preference surveys, and for HVs the cost is estimated as Eur 2.82 per hour, based on gross monthly salary (including employer contributions) of Eur 550, and average hours worked of 195 hours per month. After estimating the equation parameters for fuel consumption, these time costs (in 000s) are added are added to the **b** parameter values as in Table 1.

[1] This is not strictly correct, of course: but we only want to measure the height of the waves, not the depth of the ocean.

4 Daily traffic profiles for the N-S existing road

Data from the 24-hour traffic counts at stations nos. 4, 9, 10, and 14 were examined to check the daily traffic profile (a 24 hour histogram) against default histograms provided in HDM-4. For the four stations on the N-S existing road in October 2007 the mean traffic flow profile in vehicles/hour throughout the day, is shown in the graph below. The HDM model defaults consist of:- free-flow, commuter, seasonal, and inter-urban. However none of these was found to correspond with the profiles observed at the four counting stations on the N-S existing road. A new daily histogram was therefore created for HDM modelling purposes.

Figure 2
24 hour traffic profile for existing roads in Bar-Boljare corridor



The HDM input traffic profile is shown in the table below, consisting of four flow-periods of 2,190 hours each per year (denoted HRYR) with percentages of total traffic (denoted PCNADT) in the flow-period for the year. In the table, for reference purposes the average hourly flows in percent of total (denoted HV) are shown, and the annual average hourly traffic ratio[2] (AAHT) for each flow-period, AAHT expressing flows as a ratio of the 24 hour average, i.e., of 1/24 or 4.17 percent per hour.

If 24 hour traffic counts were available for July-August, with several more hours of daylight, and the holiday seasonal factor, the daily profile could possibly be different; but since at present the peak hours traffic volumes still represent fairly low volume/capacity (V/C) ratios, (see Fig. 1) this difference will have little effect on economic analysis.

[2] Used in the UK Ministry of Transport COBA model, but not in HDM-4.

Table 6: Daily traffic profile for existing N-S route

Flow name	HRYR	PCNADT	HV	AAHT
Period 1	2,190	40.1%	6.69%	1.605
Period 2	2,190	33.0%	5.51%	1.322
Period 3	2,190	20.2%	3.36%	0.806
Period 4	2,190	6.7%	1.12%	0.268
	8,760	100.0%		

For reference purposes only , the HDM-4 default values for the inter-urban traffic profile are shown below.

Table 7: HDM-4 Default inter urban traffic profile

Flow name	HRYR	PCNADT	HV	AAHT
Period 1	87.6	2.2%	9.00%	2.160
Period 2	350.4	7.7%	8.00%	1.920
Period 3	613.2	11.8%	7.00%	1.680
Period 4	2978.4	40.8%	5.00%	1.200
Period 5	4730.4	38.9%	3.00%	0.720
	8760	101.3%		

Note: The calculation in HDM-4 allows a tolerance of max. 1.4% for the PCNADT total.

TECHNICAL MEMORANDUM NO. 17

MOTORWAY BAR – BOLJARE
SECTION SMOKOVAC - UVAC
ANALYSIS OF THE DESIGN PREPARED BY THE FACULTY OF CIVIL ENGINEERING OF PODGORICA

CONTENTS

1. BACKGROUND

In the third week of January 2008 the Consultant received from the Traffic Directory a CD-ROM containing a Technical & Economical Report from January 2008, and AutoCAD drawings of longitudinal and horizontal alignments. These documents were prepared by the Faculty of Civil Engineering of Podgorica. The drawings are for the section called Smokovac – Uvac, and there are 2 variants, nos. V.11 and V.12. The Technical & Economical Report is for the section Smokovac – Verusa.

2. ANALYSIS OF SUBMITTED DOCUMENTS

2.1. Written documents

The first part of the report compares 9 previous variants of the design in general terms only. On the pages from 21 to 26 there are 9 tables – one for each variant - presenting construction cost of motorway. However the tables are in general summary form, and there are only three groups of cost, as follows:

- Road Construction;
- Bridges & Viaducts;
- Tunnels.

For the Road Construction element there are no details and it is not possible to determine what cost elements are included. However, the average unit cost - of € 5.85 million /km - is twice as much as the average west European cost at present.

The unit prices for the bridges and tunnel depend on their length, but they are less than other unit costs used at present by other design offices in Montenegro.

In our opinion the following items must be included in the cost table, as follows:

- Road Equipment (marking, signing, safety barriers, lighting, rest areas, tollbooths, telecommunication;
- Retaining walls;
- Interchanges.

The table below (next page) presents the cost proposed by the Faculty of Civil Engineering extended and compared with others prices used in Montenegro.

SMOKOVAC - UVAC
Gradianski Facultet
Variant 11

red. br.	VRSTA RADOVA	jed. mere	Smokovac - Uvac V11 39.79 količina	jedin. Cena GF	jedin. Cena XX	ukupna vrednost GF (keuro)	ukupna vrednost XX (keuro)	
	Road Construction	km	20.27	5 850	2 697	**118 580**	**54 672**	
14.	Ivična traka 0,20x0,20.	m'	162 160		0.014		2 189	
18.	Oprema puta.	km	80		8		637	
21.	Rasveta /otvorena trasa, mostovi/.	km	20		50		976	estimated
23.	Naplatne rampe.	kom	8		375		3 000	estimated
24.	Benzinske pumpe.	kom	1		188		188	estimated
22.	Telekomunikacije /otvorena trasa mostovi/.	km	40		60		2 387	
	Total						**9 377**	
15.	Potporni zidovi od betona MB 20 sa iskopom temelja.	m3	120 000		0.200		**24 000**	estimated
19.	Mostovi i vijadukti to 500m	m'	5 217	16		83 468		
	500-1000m	m'	534	20		10 672		
	>1000m	m'	1 010	24		24 235		
	Total		**6 760**		26	**94 140**	**178 468**	
20.	Tunel to 400m	m'	3 308	10	17.5	33 075	57 881	
	400-2000m	m'	7 018	13.5	19.5	94 739	136 845	
	>2000m	m'	2 437	17	19.5	41 422	47 514	
	Total	m'	**12 762**			**169 236**	**242 240**	
25.	Denivelisanje raskrsnice.	kom	**2**		2750		**5 500**	estimated
	Total Cost					**381 956**	**514 257**	

GF = Gradianski Facultet
XX = other design office

It is apparent that the estimated cost is likely to increase, in practice.

The Consultant did not check the second written document, Technical & Economical Report, since this refers only to the section Smokovac–Verusa.

2.2. Drawings

There are three drawings on the CD-ROM:

- Situation Plan on scale 1:25,000 of Variant 11 & 12;
- Longitudinal profile of Variant 11 on scale 1:50,000 / 5,000 and
- Longitudinal profile of Variant 12 on scale 1:50,000 / 5,000.

On the Situation Plan both variants are represented by thick lines of different colours. The only detail given is the chainage for each variant.

The drawings should include the following items: Horizontal radii; Positions of all bridges, viaducts and tunnels, and Interchanges.

Both longitudinal profiles have all necessary technical details corresponding to the design scale, the only missing element being a legend.

2.3. Comparison of Variant 11 & 12.

Unfortunately in the presented Technical & Economical Report there are not clearly mentioned which design speed was proposed, despite of citation of for different Roads Design Standards (Serbian, Croatian, Slovenian and TEM).

The Variant 11 is the longest by 3.38 km, compared to Variant 12. This difference is due to two loops – extensive 180 degree curves – that are included in Variant 11 to break a long longitudinal slope. The value of the horizontal radii is not given, but presumably corresponds to the proposed design speed.

The most important vertical alignments of both variants are as follows:

- Variant 11 - Two gradients of 5.0% and 5.95% each over 7 km in length, separated by a section of 2% gradient of 5 km in length.
- Variant 12 (effectively a ‘short cut’ of Variant 11) having one gradient of 5% over more than 15 km in length.

3. CONCLUSION

In our opinion the Variant 12 is not an acceptable design. A downward gradient of 5% over a distance of 15 km is extremely dangerous, and certainly a likely source of accidents involving heavy trucks. On such a long slope, it is known to be impossible to stop a heavy truck using only the braking system, the only way is to use the engine's power and low gear. Hence, if there is a drive-train failure or the driver fails to engage a low enough gear, the truck is effectively out of control. Thus, on this slope it would be necessary to construct escape lanes (probably every 1,000m) and even this would not provide a guarantee of safety.

The upward gradient of 5% on such a long section would reduce speed of heavy trucks to possibly even less than 30 km/hour. Thus, some (less heavy) trucks will attempt to overtake the slower trucks by using the outside lane, and this clearly produces extra risks for light vehicle traffic.

The Variant 11 is clearly better than the Variant 12, however it is still desirable in this case that vertical and horizontal alignment should be improved to avoid long slopes.

Finally, of course the Consultant has not such long experience as Montenegrin designers on this project. We also know that many variants were already proposed, nevertheless we suggest to continue searching for the most appropriate alignment. For example, according to TEM Standards you can decrease the design speed to 80km/h (only for the longitudinal alignment), and in this case a maximum gradient 6% can be used (as in V 11) but, we suggest, on sections of reasonably short lengths.

We remain at your disposal for any questions.

REPUBLIC OF MONTENEGRO

MINISTRY OF TRANSPORT, MARITIME AFFAIRS AND TELECOMMUNICATIONS

RIMSKI TRG 46 "VEKTRA BUILDING"

81000, PODGORICA, MONTENEGRO

CONTRACT NO. 01-3814/1 DATED 10 AUGUST 2007

FEASIBILITY STUDY FOR TWO HIGHWAYS IN MONTENEGRO

TECHNICAL MEMORANDA

VOLUME IV

BOOK 2

PREPARED BY:

Louis Berger
Development Consultants

Tour Mercure III, 4th Floor 55 bis, Quai de Grenelle
75015 PARIS, FRANCE
PODGORICA, AUGUST, 2008

No.	LIST OF TECHNICAL MEMORANDA	DATES SUBMITTED
19.	REVIEW AND COMMENT ON THE DRAFT LAW ON CONCESSION	03.03.2008.
20.	PREPARATION FOR SESSION VII OF COUNCIL FOR CONSTRUCTION OF MOTORWAYS IN MONTENEGRO	20.03.2008.
21.	ASSESSMENT OF TRAFFIC, SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF THE PROPOSED ALIGNMENT FOR THE ADRIATIC-IONIAN MOTORWAY	08.05.2008.
22.	MOTORWAY BAR – BOLJARE, ANALYSIS: OPENING OF THE SECOND TUBE OF THE SOZINA TUNNEL	08.04.2008.
23.	OPTIMAL SOLUTION PROPOSAL FOR SELECTION OF THE ALIGNMENT ON NEWLY DESIGNED SECTIONS	02.04.2008.
24.	REVIEW AND COMMENT ON THE LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES	02.04.2008.
25.	OPTIONS FOR TOLLING STRATEGIES	08.04.2008.
26.	FINANCIAL ANALYSIS, BAR – BOLJARE MOTORWAY	08.04.2008.
26A.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – REVISION	/
26B.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – REVISION	18.04.2008.
26C.	FINANCIAL ANALYSIS BAR – BOLJARE MOTORWAY – 3RD REVISION	12.05.2008.
27.	CHANGING CONSTRUCTION SCHEDULES AND THEIR MAIN EFFECTS	18.04.2008.
28.	REVIEW AND COMMENT ON THE SECOND DRAFT LAW ON CONCESSION	08.05.2008.
29.	PUBLIC-PRIVATE PARTNERSHIPS: POTENTIAL CONTRIBUTIONS OF THE PRIVATE AND PUBLIC SECTORS IN THE IMPLEMENTATION STAGE	19.04.2008.
30.	DIFFICULTIES OF STAGE CONSTRUCTION (TWO PHASES) FOR THE SMOKOVAC – MATESEVO - BOLJARE MOTORWAY	29.04.2008.
31.	ECONOMIC ANALYSIS, BAR (ĐURMANI) – BOLAJRE MOTORWAY (REVISION)	23.05.2008.

TECHNICAL MEMORANDUM NO. 19

REVIEW AND COMMENT
ON THE DRAFT
LAW ON CONCESSION

TABLE OF CONTENTS

1 COMMENTS ON THE DRAFT LAW ON CONCESSION

As far as EU rules are concerned, EU Treaty can be summed up in a few obligations: fixing of the rules applicable to the selection of the private partner, adequate advertising of the intention to award a concession and of the rules governing the selection in order to be able to monitor impartiality throughout the procedure, introduction of genuine competition between operators, compliance with the principle of equality of treatment of all participants throughout the procedure, selection on the basis of objective, non-discriminatory criteria. Thus the Community law applicable to Concession and the award of Concessions is derived primarily from general obligations which involve no coordination of the legislation of Member States in the field of concession. In addition, and although the Member States are free to do so, very few have opted to adopt national laws to lay down general and detailed rules governing the award of works or services concessions. So there are very few rules which could be transferred directly from community law in the law of Montenegro.

In accordance with the Terms of Reference, the Consultant is obliged to review and comment on the PPP legislation currently in force. This paper records the Consultants' reviews and makes suggestions for changes to some clauses in the Law on Concessions (hereinafter the "Law"), which governs any form of PPP. It is important to note that the Law is written for all concessions and not only for highway schemes [see Article 6].

2 GENERAL REMARKS

The draft law is a comprehensive document, which covers a lot of useful points. In such matters, the nature of the concession subjects are so sophisticated, so complex, need so many expertises in the technical, financial and legal fields, that a law being very detailed, as this one, and therefore less flexible than a short one, faces the risk to miss some points that a future and different environment may bring. The second point arises out of the will to address in this law most of the questions, therefore not leaving room for negotiations, to the implementing tool which is the concession Agreement and its annexes. The risk is to block the subsequent building of the Agreementual set up. Some rules in the law designed to protect the public interest may be shown to be rigid and prevent a suitable negotiation. The third point in this draft law is the lack of articulation with applicable general legal principles or rules in force in Montenegro (arising out of either civil law, Agreement law, or administrative law), with sector laws and public law (public procurement law). We don't see any mention of other Law of Montenegro.

3 PROVISIONS WHICH ARE LACKING

3.1 Easements

A provision of the law should lay down a rule on the fact that the competent authority or other public authority under the terms of the law and the concession Agreement shall make available to the concessionaire or, as appropriate, shall assist the concessionaire to enjoy the right to enter upon, transit through or do work or fix installations upon property of third parties, as appropriate and required for the implementation of the project in accordance with (*indicates the provisions of the laws that govern easements).*

3.2 Confidentiality

The law and the concession Agreement should prescribe provision on confidentiality ie the Competent Authority and bodies involved in the concession award process shall not disclose information forwarded to it by economic operators which they have designated as confidential; such information includes, in particular, technical or trade secrets and the confidential aspects of tenders. Such provisions are particularly important in the case of competitive dialogue.

3.3 Participation of Consortia

If such the participation of consortia is viewed in the law, there is no condition fixed in the law nor mentioned as possible or mandatory in the concession Agreement.

3.4 Transfer of controlling interest

The concession Agreement may provide that a controlling interest in the concessionaire may not be transferred to third parties without the consent of the competent authority, and the law should foresee that the concession Agreement shall set forth the conditions under which consent of the competent authority shall be given.

4 CONCESSIONAIRE PROCUREMENT

The Law covers this aspect in reasonable detail and the requirements are clearly defined in most cases, although there are some ambiguities.

A pre-requisite of any concession being granted requires that the Ministry prepare a Concession Act [see Articles 20 and 21]. However, since the Act has to be presented to a Concession Commission, this body has to be formed in accordance with the Law [see Articles 10 to 14].

> The Law allows for unsolicited proposals from interested parties and, if agreed by the competent authority (i.e. the Ministry), the interested party needs to deposit funds such that the work required to complete the Concession Act can be prepared. The Ministry has then to commence work on the Concession Act within 30 days of receipt of the funds.

If however, the usual procedures are undertaken, it is the Ministry which takes the initiative and prepares the Concession Act [see Article 20]. The Act requires a substantial amount of data to be provided[1] including the following major tasks:-

- The Project Description – which will include the Design (assembled as part of this study);
- The Economic Feasibility – which will include possible options and risk assessment (presumably of the Economic Feasibility Study) (assembled as part of this study);
- Duration of the Concession;

[1] It has been estimated that a minimum period of 4 months would be required to gather this data together and complete the formalities of submitting this Act to the Commission.

- Technical Documentation – which will be required to be assembled prior to the granting of the concession;
- Public announcement;
- Background Data – such as the National Development Plan;
- Competency Description – which will define the abilities required by the potential Concessionaires;
- Draft Tender Documentation;
- Draft Concession Agreement;
- Evaluation Criteria – for the selection of the Concessionaire;
- Operational Plan;
- Bonds and Guarantees to be provided;
- The Anticipated Concession Fee – to be paid by the Concessionaire;
- Toll Rates – including reasons for the selection;
- Quality Control;
- Supervision Services (presumably the Independent Engineer, but see Section 5 below);
- Environmental Mitigation Measures; and
- Results of a Public Dialogue – lasting no longer than 30 days.

The Law allows for an “Open” or a “Two-Tier” procedure [see Article 22]. In the statement above the period for developing the Act could be used as well to include the Two-Tier procedure and go through the sequence of pre-qualification of potential Concessionaires. Under Article 20 (5), the Commission will adopt (or reject) the Act within 30 days of receipt. At this point, the Commission will advertise the Public Announcement. The Law is not clear on the point where the Two-Tier procedure is used as to whether the Public Announcement is made only to those consortia which are pre-qualified, in which case it is not really a “public” announcement or whether the Public Announcement may be considered as the call for Expressions of Interest which can be issued early in the process of completing the Concession Act and can run in parallel with that exercise. However, Article 21 (5) does show that the Concession Act should contain the *“basic elements of public announcement”* which suggests that the Public Announcement follows the approval of the Concession Act by the Commission.

After the approval of the Act by the Commission, Article 23 (4) allows for a period of a minimum of 52 days for the selected consortia to submit their “Statement of Intentions”. This is presumably based upon the information submitted within the Concession Act, which basically includes the data usually found in a “Request for Proposals”. This assumption is reinforced by Article 28 which refers to word “proposal”[2]. If this is the intention, then the period of 52 days is far too short for consortia to give a reasonable offer. Our estimate is a minimum period of 4 months.

[2] See also Article #31 “Verification of Proposals”.

During the period of the proposals, the Concession Commission needs to establish the Tender Commission in accordance with Articles 28 and 29. The Tender Commission then evaluates [Article 34] the proposals within a period of 30 days from their receipt. Their decision is then communicated to the Ministry as per Article 33. Under Article 35, the Concession Commission will review the decision of the Tender Commission and will then communicate their final decision to the Government. It is unclear at this point in the Law whether the Concession Commission also informs the bidders of their decision at the same time as it informs the Grantor, since Article 34 immediately discusses the appeals procedure open to the losing bidders. It seems more likely that the bidders would only be informed after the Grantor has considered the recommendation and given his approval. But this is by no means clear.

In order to make our assumptions clear on this issue, we have included a chart (see Figure 3-1) showing the sequence of events as we understand them.

5 SPECIFIC REMARKS ON THE DRAFT CONCESSION LAW

Article 2, parag (1) states that among the aims of the concession "*the participation of the private sector in the utilization of natural resources, property in general use and other property of general interest, performance of activities of general interest, development and functioning of infrastructure". S*uch wording is not related to the aim but is a part of the Concession definition and is as such repeated in article 4 1) below.

Article 2, second paragraph gives a list of specific objectives of the concession. It is unclear if every specific purpose therein mentioned, must be satisfied.

Article 3 on principles, states the Principle of freedom of will "*The principle of freedom of will includes the freedom of Agreementing parties to arrange, in accordance with the law and other regulations and good faith, the mutual rights and obligations at their own discretion."* One wonders if such a principle is not already contained in a general law such as civil law.

Article 4 bearing on Definitions, gives the definition of five terms. Some others, used in the draft, unless already defined in some general law, should be defined. For example, unless such definitions are already given in general laws of Montenegro, the following terms should be defined:

- "property in general use",
- "property of general interest",
- "activities of general interest",
- "Concession agreement"
- " Concession act" (in line with articles 10, 20 and 21),
- "Natural resources",
- "Concession Commission" (in line with articles 10 to 12),
- "Unsolicited proposal" (in line with article 19),
- "facility and infrastructure facility".

The definition of the Tenderer does not make the difference between an economic operatorwho has submitted a tender and the one which has just sought an invitation to take part in a restricted or negotiated procedure or a competitive dialogue. It is suggested to make the difference as in the EU law, and to designate the latter as a "candidate".

Figure 3-1 Project Plan (replace this page with MPP)

The definition of the “concession” paragraph 2 should be, at least partly, reworded, unless it is a pure question of translation. “”…*or to perform activities of general interest, which are handed over to the Concessionaire…”.*

Article 6 “ Concession subject”, being very detailed, bears a risk of being incomplete. Many items are quoted, but either one chooses a very synthetic formula, or one chooses to be specific, and then some other items should be added. To avoid that, a general umbrella provision should be inserted in this article such as: “*The concession subject may be any facility or service which is used by and/or provided for the benefit of members of the public (or any section of the public) and, when appropriate, shall include, without limitation…. ».*

Items 8, 9, 13, 14, 15 and in fact the whole article could be rephrased.

Roads are quoted as a possible “concession subject”, but beside a road, some others constructions - facilities such as bridges, tunnels or other roads facilities may be part of a road concession or conceded separately. Therefore, they should be added in the list.

The same can be said for railways lines. Railways Facilities and any system linked to the railways lines construction and or exploitation should be mentioned.

Ports are mentioned as “concession subject”. Ports facilities and any ancillary ports facilities and services should also be mentioned.

Besides “medical institutions”, health sector facilities should also be acknowledged as concession subject, and the Power Sector is also a valid candidate.

In addition to the “performance of public proper education program” (item 11), one should also mention “education sector facilities”.

Sewerage and sewage facilities, wastes treatment and disposals facilities could also be the subject of concession.

The three first lines of article 6 (2) (*Besides the subject of concession as referred to in the paragraph 1 of this article, in accordance with the law, the subject of concession may also be the exploitation of other natural resources, property in general use and other property of general interest, in state ownership…)* should be deleted and replaced by the word concession, as such a wording is already defined as a concession.

Article 6, (15), 3) decides: “*As and exception from paragraphs 1 and 2 of this Article, special law may determine what is not and cannot be the concession subject”.* Such a rule could be challenged, on grounds of legal policy.

Article 8 on the Duration of the Concession Period, lays down two options. The first one fixes a maximum of 60 years which seems a lot, and stands far above international standards and practices. Article 8 foresees that it may even be longer upon the consent of the Parliament of Montenegro. A term of thirty years would look as an already rather long period and it should be prescribed that the consent of the Parliament is to be sought for any concession lasting 20 or more years.

In article 9: "Competence for the granting of concessions", paragraph (3) provides that for all concession subjects located in the area of sea and national parks' property, the Concessionaire is obliged to pay the fee for using sea property, i.e. natural resources and national parks' property to public enterprises". Such a rule has nothing to do with the competence for the granting of a concession and should be removed and replaced elsewhere in the law.

> Paragraph 4 of the same article lays down the rule according to which the "*Parliament of Montenegro …., awards Concessions for the Concession Subjects above the value established by the law"*. A Parliament usually does not award Agreements, except for its own management. It is supposed that it was meant "*authorises"* and above the *"period*" established by the law.

Article 13 on conflict of interest, mentions the conflict of interest without any precision or qualification, without any reference to a general law which could define the concept of conflict of interest, without any provision or reference to a procedure on how to solve the case when a conflict of interest appears.

Article 19 on unsolicited proposal is rather unclear, for example paragraph (1) states that: "*Interested party may submit to the Competent Authority <u>an initiative</u> for starting process of granting concession…".* No procedural rules are provided on such "initiative". Written as it is, this article could endanger the effectiveness of the principles of fair competition and transparency.

> A set of procedural rules should be inserted in the law, as regards the criteria to admit unsolicited proposals, the procedures for determining this admissibility, the selection procedure in accordance with the other provisions of the law, the respective rules to be observed in case unsolicited proposals do involve or do not involve intellectual property, trade secrets or other exclusive rights.

Article 20 on Concession Act deserves to be clarified. First the word "*concession act*" is a bit confusing. It may come from the translation. The "*public discussion*" mentioned in item (3) is not defined. The article does (not?) foresee any procedure to conduct this "*public discussion".*

Article 21 on content of the Concession act, contains a very comprehensive provision of useful points, to deal with in a concession "act", a sort of check-list, but one always wonders if such a check-list has to figure in a law or should the matter be for a by-law. Some items may not be relevant in some specific cases. On one hand the Law should then prescribe that if one or some of the items are not included in the concession "act", the Competent Authority should report on the grounds for which these items were not included, to the Concession Commission, on the basis of the "general" article 10 (2).

> Aside from 2 oblique references [Article #20 paragraph 2 and Article #44 paragraph 3], the duties and role of the Independent Engineer are not covered. There should be a reference to this role and that it is a mandatory function. The details can reasonably left for definition in the Concession Agreement.

The point (2) of **article 22 "mode of granting of concession",** relating to the exclusion of public competition, has a very limited scope ("…*the expansion of region for the performance of concession activity, which due to technical-technological causes cannot be confirmed as a special exploitation field…"*) and should be enlarged. Under certain conditions, recourse to the negotiated procedure should sometimes be made possible in the case of a Agreement when *"the nature of the works or the risks attaching thereto do not permit prior overall pricing"*. Such a derogation would cover solely the exceptional situations in which there is uncertainty a priori, regarding the nature or scope of the work to be carried out, provided it does not to cover situations in which the uncertainties result from other causes, such as the difficulty of prior pricing owing to the complexity of the legal and financial package put in place. An example is given by the 2004 EU Green paper on PPP, according to which exclusion of public competition may apply, when the works are to be carried out in a geologically unstable or archaeological terrain. For this reason the extent of the necessary work is not known when launching the tender procedure and exclusion of public competition applies.

Procedure and more specific conditions should be foreseen in the case of the point (2) of article 22, to guarantee, in such cases, the public interests.

In addition, this article 22 should be articulated with article 40 below "Procedure in the case of a single proposal". (See our remarks under article 40).

There is a passing reference to Risk Assessment and this is restricted to the Economic Feasibility Study [see paragraph (2)]. This is a major aspect of any PPP or Concession and it is our view that the Law should be more specific in insisting that a robust Risk Assessment should be undertaken on the whole concession process not just the economic aspects.

Article 24 on public announcement establishes deadlines for submitting proposals, as referred to in paragraph 3, item 3, of this Article 24. This deadline deals with "*concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR"*; for which are fixed a deadline of 52 days, and another deadline of 30 days "*for concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR*." The difference between the two amounts is somewhat difficult to grasp at least in the English translation. But more important is the fact that under the amount of 5.278.000 €, figure arising out of the EC Directive 18/ 2004 on public Agreements, there is no deadline laid out. Some concessions in Montenegro may stand under these figures.

Article 27, on subAgreementing, is different from EU law, when applicable, in that sense that in the case of public works concession, the competent Authority may either fix a minimum percentage of works to be subAgreemented or leave to the bidder the choice to specify in its tender the percentage, if any, of the total value of the work for which the concession Agreement is to be awarded, which they intend to assign to third parties. The second point is that EU forbids any discrimination based on nationality, but such a rule is not applicable in Montenegro.

Article 30 bearing on right of priority contains provisions that are inspired of mining or gas research and exploitation law. Such concession subjects are usually subject to special legislative provisions, since research in these sectors implies heavy costs. Such rules in a "general" concession law appear unclear, and can't answer the questions raised by mining and gas research and exploitation. Such a matter is usually dealt with in one or several special laws or codes.

As for point 3 of the article 30 stating that "*With exception to paragraphs 1 and 2 of this article, under the conditions of equally evaluated proposals, the submitter of the unsolicited proposal has the right of priority in the granting of the concession*", we refer to the remarks already done under article 19 above.

Article 31 on verification of proposals mentions the concept of "*invalid*" and "*valid proposals*". But invalid proposals and valid proposals are not defined. The law should at least foresee in article 21 that the so called Concession Act, should in each case provide which elements are mandatory, if not all, the absence of which renders the proposal invalid.

Article 32 on Proposal Evaluation Criteria, **give a useful list of sub-criteria, but it should be mentioned that such sub-criteria could not be limited to the ones listed in this articles. A law has to be open and leave room to the specific subject of concession.**

Article 33 on Proposed ranking of Tenderers, **is somewhat vague when ruling that: (1) "*Tender Commission ranks proposals by assigning certain points based on each sub-criterion*", or "*In extraordinary complicated cases*". In the first case, the law should decide that the concession bidding document and the public announcement must mention the criteria to assign points on each evaluation sub-criteria mentioned in article 32.**

In the second case, the mention of "extraordinary complicated cases" is too vague and criteria of complication should be given.

Articles 34 and 35 on Right of insight and complaint, are confusing. We don't know which is the Commission mentioned in para. (1) and (2) since in case the "*Commission"* would establish *"a violation of the procedure or improper application of criteria"*, the proposed ranking would be returned "*to the Tender Commission for removal of irregularities".* We supposed that the "Commission" aimed at in this article is the Concession Commission, but it should be clearly mentioned.

Article 36 bearing on Proposition for granting concessions mentions that: *"Competent Authority submits to the Concession Grantor the proposition of the ranking of the Tenderers, ….In case of proper application of the rules of procedure and criteria*,".

The requirement of such a "*Proper application*" should be more precise or it should be required from the Competent Authority a reasoned opinion on the grounds on which its refusal of the ranking proposed by the Competent Authority. The same could be said for (para. (1) "*excerpt from the tender documentation provided by the Tenderers*", where a detailed list of the tender documentation should be submitted to the Concession Grantor.

Article 41, on two tier procedure and conducting procedure, rules that: "*In case the Competent Authority expects the tender to be: complicated in technical, legal, financial or other aspect, or"*

Such a wording could be bettered, it could be rephrased as follow:

"*when the Agreementing authority does not deem it to be feasible to describe in the request for proposals the characteristics of the project such as project specifications,* *performance indicators, financial arrangements or Agreementual terms in a manner sufficiently detailed and precise to permit final proposals to be formulated."*

After point (3): *"Prequalification criteria is established depending on the concession subject, and especially includes:*

The ability for concession realization (technical and/or financial requirements), previous experience in performing concession activities".

It is proposed to add: "*Personal situation of the candidate or tenderer, Suitability to pursue the professional activity, Economic and financial standing, Technical and/or professional ability, Quality assurance standards, Environmental management standards, Additional documentation and information, Official lists of approved economic operators and certification by bodies established under public or private law of the tenderer /candidate country. etc.)".*

But also the two tier procedure can be an opportunity to improve the quality of the concession requirements. If the procedure of competitive dialog is not used, such a two stage procedure could retain some elements inspired from the competitive dialog procedure. Thus in the initial request for proposals, could call upon the bidders to submit, in the first stage, initial proposals relating to project specifications, performance indicators, financing requirements or other characteristics of the project as well as to the main Agreementual terms proposed by the Agreementing authority.

Item 8 of article 41**,** on two tier procedure deals with the case where only one Tenderer satisfying the prequalification criteria, appears at the public tender, and rules that in this case "*the Competent Authority may continue or terminate the procedure for the granting of concession".*

Such provisions should be more specific and determine:

- precise rules to decide that the prequalification criteria have not been satisfied;
- the cases and conditions to continue the procedure, in order to protect the public person interests when there is no longer any competition system to ensure that the best offer will be sought.

Such cases and conditions may make the negotiations subject to the approval of different higher authorities (Parliament for example for important concessions), depending on the nature of the services to be provided or the infrastructure sector concerned. In those cases, the law may add a reference to provisions of its law where these approval requirements are set forth.

Subject to certain conditions, the law could contain provision allowing the Competent Authority to continue the procedure:

- Where there is an urgent need for ensuring continuity in the provision of the service;
- Where terminating the procedure for the granting of concession would be impractical, (also providing that the circumstances giving rise to the urgency were neither foreseeable by the Agreementing authority nor the result of dilatory conduct on its part);

- Where the project is of short duration and the anticipated initial investment value does not exceed a certain amount set forth in an article of the law specifying the monetary threshold below which a concession may be awarded without competitive procedures;
- Where the project involves national defence or national security;
- Where there is only one source capable of providing the required service, such as when the provision of the service requires the use of intellectual property, trade secrets or other exclusive rights owned or possessed by a certain person or persons.

The law could provide that in the above mentioned situations, the fulfilment of these conditions have to be duly proved and mentioned in a report to the Concession Commission established under article 10 above. Another condition, to ensure transparency in such cases would be to require publicity in newspapers in Montenegro.

Article 42 bearing on "*Consulting Dialogue*" elsewhere called "*Competitive dialogue*", just raises the principle of consultative dialogue in para. 1. Such a delicate procedure should encompass rules on how to ensure transparency, fair competition.

The law should lay down rules stating that the Competent Authority should:

- Publish a "concession Act" setting out their needs and requirements;
- Define in each case the exact content of the "concession Act" (notice) and/or in a descriptive document;
- If necessary, open a dialogue, with the candidates selected in accordance with provisions which could bear on the points already mentioned for prequalification in a two tier procedure;
- Define the aim of the dialogue which should be to identify and define the means best suited to satisfying their needs;
- Provide that during the dialogue, the Competent Authority will ensure equality of treatment among all tenderers and that in particular, it shall not provide information in a discriminatory manner which may give some tenderers an advantage over others;
- Not reveal to the other participants solutions proposed or other confidential information communicated by a candidate participating in the dialogue without his/her agreement;
- Foresee that the Competent Authority may provide for the procedure to take place in successive stages in order to reduce the number of solutions to be discussed during the dialogue stage by applying the award criteria in the "concession Act" (notice) or the descriptive document. The "concession Act"(notice) or the descriptive document shall indicate that recourse may be had to this option;
- Continue such dialogue until it can identify the solution or solutions, if necessary after comparing them, which are capable of meeting its needs;
- Declare that the dialogue is concluded and having so informed the participants, Competent Authority shall ask them to submit their final tenders on the basis of the solution or solutions presented and specified during the dialogue.

The law should lay down rules stating that:

- These tenders may be clarified, specified and fine-tuned at the request of the competent authority. However, such clarification, specification, fine-tuning or additional information may not involve changes to the basic features of the tender or the call for tenders, variations in which are likely to distort competition or have a discriminatory effect.
- At the request of the competent authority, the tenderer identified as having submitted the most financially advantageous tender may be asked to clarify aspects of the tender or confirm commitments contained in the tender provided this does not have the effect of modifying substantial aspects of the tender or of the call for tenders and does not risk distorting competition or causing discrimination.

Article 43 "Rights of the participants in the procedure for public announcement" rules that the participants in the public announcement have the right of refund of the tender bond in a manner as determined by the public announcement. This question is somewhat redundant with article 24 item 13, but the law should lay down rules on points on which the starting date could be based, and time limits to refund the tender bond, or rule that the public announcement should deal with the said questions.

Article 44 on conclusion and content of the Concession Agreement, contains a very comprehensive provision in point (2) 2, "rights and obligations of the Agreementing parties", but also rather detailed provisions on what a concession Agreement should encompass. Some items may not be relevant in some specific cases. On the one hand the Law should then foresee that if one or some of the list of items are not included in the concession Agreement the Competent Authority should report on the grounds for which these items were not included, to the Concession Commission, on the basis of the "general" article 10 (2) 4) On the other hand, if one chooses to cover a maximum of items in the law as guidance for the drafting of the concession Agreement, the following points could be added:

- The assistance that the Agreementing authority may provide to the concessionaire in obtaining licences and permits to the extent necessary for the implementation of the infrastructure project;
- Any requirements relating to the establishment and minimum capital of a legal entity incorporated in Montenegro;
- Procedures for the review and approval of engineering designs, construction plans and specifications by the Agreementing authority, and the procedures for testing and final inspection, approval and acceptance of the infrastructure facility;
- The extent of the concessionaire's obligations to ensure, as appropriate, the modification of the service so as to meet the actual demand for the service, its continuity and its provision under essentially the same conditions for all users;
- Mechanisms to deal with additional costs and other consequences that might result from any order issued by the Agreementing authority or another public authority in connection with item 7) above, including any compensation to which the concessionaire might be entitled;
- Any rights of the Agreementing authority to review and approve major Agreements to be entered into by the concessionaire, in particular with the concessionaire's own shareholders or other affiliated persons;

- Insurance policies to be maintained by the concessionaire in connection with the implementation of the infrastructure project;
- Remedies available in the event of default of either party;
- The governing law ;
- The rights and obligations of the parties with respect to confidential information;
- Compensation for specific changes in legislation;
- Revision of the concession Agreement;
- Takeover of an infrastructure project by the Agreementing authority;
- Substitution of the concessionnaire ;
- Transfer of controlling interest in the concessionaire,
- Step-in clause;
- Wind-up and transfer measures;
- Disputes involving customers or users of the infrastructure facility;
- Independent Engineer (see above comment on Article 21).

The law should make mandatory for the Concession Agreement that are taken all the necessary measures to ensure that concessionaires which apply the transparency and non discrimination principles, advertising rules concerning publication of notice (public announcement), when subAgreementing or awarding works Agreements to third parties, and fix the minimum value of Agreements where these rules are applicable.

Article 44 (8) refers to the Financial Plan but there are no further articles defining this aspect. Since the financial aspect of the concession is the main reason for entering into the PPP, it is suggested that this aspect should be explained in more detail even though the Concession Agreement will concentrate on this issue.

Article 49 "Findings" should rule that the concession Agreement has to determine the other mutual rights and obligations of the Parties in such cases (financial indemnification).

Article 50 "Monitoring of the execution of Agreementual obligations" provides that *"Annual concession fee shall be calculated by the Competent Authority",* which may seem strange. One expects to read that the calculation is made in accordance with the concession Agreement, which could provide for methods and formulas, if needed, for the establishment and adjustment of those fees. In addition this rule is conflicting with article 58 *"Payment of the Concession fee*" which provides that: "*Certain concession Agreements may determine the payment of the Concession Fee, which is to be paid for the granted concession in accordance with the concession act and the Concession Agreement".*

Provision of article 50 (5), according to which: "*Commission has the right to, at least once per year, appoint certified experts for purposes of establishing compliance with the rights and obligations determined by the Concession Agreement*", is a principle and as such needs implementing rules. The law should refrain from being too detailed and the Concession Agreement should be entrusted with the task of providing rules and procedures to appoint certified experts, usually called independent engineer in infrastructure Agreements.

Article 53 bearing on the "Transfer of the Agreement", should also require that, when such a transfer is allowed, the concession Agreement stipulates other cases and other conditions under which such a transfer is allowed.

Article 54 on termination of the concession Agreement should be limited to require that the provisions it lists are dealt with, in the concession Agreement. This article lays incomplete and vague rules, such as for example: (1) 2) (*revocation of the concession for severe violation and repeating of material Concession Agreement violations related to the obligations of concessionaire*), or 3) *(breaking of Concession Agreement in accordance with the legislation regulating obligatory relationships).*

Notwithstanding the items included within the Law, there are a number of issues which are either missing or are not treated in the detail they deserve:-

- Article #59 covers disputes resolution but restricts such resolution to Montenegro. It is considered that there should be more flexibility in this regard since many such concessions and concessionaires would wish to know that difficult disputes could be handled internationally.

Relief from payment of the Concession Fee is foreseen in **Article 60**, but only in the case of unpredicted circumstances, i.e. in case of force majeure. Some other situations may happen such as a decision of the Competent Authority to suspend the Concession exploitation, for example, in the case of findings made on location of performance of concessionaire activities (See article 49), or for any other reasons decided by the Competent Authority.

APPENDIX A *Unofficial translation by Louis Berger SAS*

LAW ON CONCESSIONS

DRAFT
January 31st, 2008

I.BASIC PROVISIONS

Subject of the law

Article 1

(1) The present Law shall determine the planning of, conditions, modes and the procedure for granting concessions, the concession subject, forming of the Concession Commission, duration of the concession period, Concession Contract, practice of concessionary rights and duties and other matters of significance for the realization of concession.

(2) This law is obligatory for the granting of all concessions.

Purpose of the Law

Article 2

(1) The aim of the law is to determine general, transparent and nondiscriminatory conditions under which concessions may be granted, as well as to remove unwanted limitations to the participation of the private sector in the utilization of natural resources, property in general use and other property of general interest, performance of activities of general interest, development and functioning of infrastructure, by establishing special procedures for awarding concession contracts.

(2) Concessions are granted in order to:

1) enable efficient, proper and rational exploitation of natural resources, property in general use and other property of general interest;

2) provide technical and technological improvement of activities which are the subject of concession, i.e. the technical-technological unity of system in the field of infrastructure;

3) provide revenues for the Concession Grantor or achieve adequate public interest, higher employment, introduction of new technologies and secure increased economic development;

4) provide financial resources for the construction, rehabilitation, modernization of the projects relevant for rendering public services;

5) strengthen the competition in the sector in which the concessions are granted;

6) provide environmental protection and improvement.

Principles

Article 3.

Principle of non-discrimination
All the Tenderers have equal treatment in the procedure for the granting of concession.

Principle of freedom of will
The principle of freedom of will includes the freedom of contracting parties to arrange, in accordance with the law and other regulations and good faith, the mutual rights and obligations at their own discretion.

Principle of transparency
In the procedure for granting of concessions it must be ensured that all the interested parties be provided with equal, complete, timely and correct information about the procedure, standards and criteria for the selection of the concessionaire, supplied with reasoned information on the Tenderer which was awarded the Concession Contract and the terms of his proposal, information on the execution of the Concession Contract in terms of payment of the concession fee by the concessionaire.

Definitions

Article 4

Terms used in this Law shall have the following meaning:

1) **"Concession"** means the right, established through contract in written form, regulating mutual rights and obligations of Concession Grantor and Concessionaire:
    - to exploit natural resources, property in general use and other property of general interest or to perform activities of general interest, which are handed over to the Concessionaire by the Concession Grantor, for a definite period, under provisions stipulated by this law, whereby the payment of the concession fee by the Concessionaire or the provision of financial support to the Concessionaire for the realization of adequate public interest may be agreed,
    - to build or reconstruct and finance facilities, installations or plants, their operation and transfer, in the contracted period, to the property of Concession Grantor, in accordance with this law and the Concession Contract (BOT system, including all forms of this system);
2) **"Concession Grantor"** means the Government of the Republic of Montenegro (hereinafter: Government), Administrative Center, Capital City and local self-government unit (hereinafter: Municipality);
3) **"Concessionaire"** means a domestic or foreign legal entity, an entrepreneur or a physical entity to which the concession is granted, including consortium

or other form of business association with mutual relationships regulated by special contract;

4) **"Competent Authority"** means the ministry and authority, for concessions in the competence of Government, i.e. municipal secretariat, for concessions in the competence of municipality, depending on the concession subject and the law regulating the concession subject, i.e. in compliance with regulations determining the competences of authorities.

5) **"Tenderer"** or **"Tenderers"** means domestic or foreign, legal or physical entity, entrepreneur, consortium or other form of business association for the purpose of concession ventures, participating in the process of selection concerning the award of concession.

Conditions for granting concession

Article 5

Concession may be granted to Tenderer(s) in the manner and under conditions stipulated by this Law, Concession Act and Public Announcement.

Concession Subject

Article 6

(1) The concession subject may be:

1) Research, or research and exploitation, or exploitation of all kinds of mineral resources;
2) Utilization of watercourses and other waters, i.e. their parts or certain quantity of water for purposes specified by a special law;
3) Construction, rehabilitation, maintenance and utilization of water facilities;
4) Utilization of arable, construction, forest and other land;
5) Harvesting of forests;
6) Utilization of radio-frequency spectrum;
7) Construction of hydromelioration systems and extraction of materials from water areas;
8) Construction, maintenance and operation or reconstruction/modernization, maintenance and operation or operation of:
   - roads,
   - railway lines,
   - air traffic facilities and airports,
   - water traffic facilities and ports,
   - telecommunication facilities,

- oil pipelines, gas pipelines, facilities for storage, transport and distribution of oil and gas,
- medical institutions,
- public utility facilities for the performance of public activities;

9) Construction, maintenance and operation of energy-related and other facilities for the purpose of generation, transfer and distribution of electricity and heat or their reconstruction, modernization, maintenance and operation;

10) Development, enhancement and exploitation of sea assets and national parks' assets, riverbanks and lake shores;

11) Performance of public proper education program;

12) Organization of games of chance;

13) Construction, maintenance and operation of sports and recreational facilities, sport fields and areas for sports, recreation and cultural activities;

14) Construction of facilities, reconstruction, modernization and operation of existing facilities in localities with natural curative capacities and other natural values, for the purpose of their exploitation;

15) Construction, maintenance and operation of tourist infrastructure facilities or their reconstruction, modernization, maintenance and operation.

(2) Besides the subject of concession as referred to in the paragraph 1 of this article, in accordance with the law, the subject of concession may also be the exploitation of other natural resources, property in general use and other property of general interest, in state ownership, as well as the performance of other activities specified by law as activities of general interest.

(3) As and exception from paragraphs 1 and 2 of this Article, special law may determine what is not and cannot be the concession subject.

Notification on the subjects and regions of concessions

Article 7

(1) At the recommendation of the Competent Authority, the Concession Grantor issues, publishes and updates the plan of concession subjects and regions on its internet website.

(2) Plan referred to in the paragraph 1 of this Article shall be issued per sectors, upon carrying out of public discussion by the competent authority, at latest by the end of the year for the following year.

Duration of the Concession Period

Article 8

Option 1

(1) The duration of the concession period as referred to in the paragraph 1 of this article is determined depending on the concession subject, public interest and period of investment return, and shall not be longer than 60 years.

(2) Duration of the concession period may be longer than the period determined in the paragraph 1 of this article upon consent of the Parliament of Montenegro.

(3) Concession Contract may be extended at most by up to half of the agreed duration, but not to a total period longer than 60 years.

(4) In the case of paragraph 3 of this Article contracting parties conclude the Annex to the Concession Contract, which is to be registered and published as a part of the basic contract.

Option 2

(1) The duration of the concession period shall be determined depending on the concession subject, public interest and period of investment return.

(2) Concession Contract may be extended at most by up to half of the agreed duration, in which case contracting parties conclude the Annex to the Concession Contract, which is to be registered and published as a part of the basic contract.

II. INSTITUTIONAL STRUCTURE

Competence for granting concessions

Article 9

(1) The government makes the decision on the granting of concessions for the concession subject for which Montenegro has the rights of ownership and authorizations.

(2) The Municipality issues the decision on the granting of the concession for the concession subject for which the ownership rights and authorizations are held by the municipality.

(3) For all concession subjects located in the area of sea and national parks' property, Concessionaire is obliged to pay the fee for using sea property, i.e. natural resources and national parks' property to public enterprises.

(4) Parliament of Montenegro, at the recommendation of the Government, awards Concessions for the Concession Subjects above the value established by the law.

Establishing and Competence of Concession Commission

Article 10

(1) By virtue of this Law, a Concession Commission of the Republic of Montenegro (hereinafter: Commission) shall be established.

(2) The competence of the Commission is:

1) verification of Concession Act as regarding its formal completeness, especially whether, and to what extent the proposed concession stands in compliance with the criteria from this law:

2) verification whether the concession act is feasible to significant extent and whether it can be concluded, especially:

- to what extent the proposed concession represents the best available option for the rendering of the service;
- to what extent the proposed concession delivers suitable value for invested money;
- to what extent is the proposed concession technically, legally and financially feasible;
- to what extent the commercial, technical, financial and other risks are identified, assessed and balanced in a just and transparent manner between the Concession Grantor and the Concessionaire.

3) rejection of the concession act on the basis of formal and significant incompleteness or inability of conclusion and returning of the concession act to the competent authority for reworking and submittal.
4) Ordering the competent authority to ensure that the tender documentation and the Draft Concession Contract are composed according to standards required by the Commission;
5) Resolving complaints related to violation of the evaluation process and the proposal ranking;
6) Making recommendations for the control of Concession Contract execution, the content and structure of reports submitted by the holder of the concessionary rights;
7) Maintaining Concession Contracts Register;
8) Recommending modifications and additions, i.e. termination of the Concession Contract in cases of severe contract violations.
9) Performing other work determined by this law.

(3) Sublegal acts regulating issues from the paragraph 2, items 6 and 7, of this Article shall be issued by the Government, at the recommendation of the Commission.

Composition of the Commission and Decision Making

Article 12

(1) The Commission is composed of experts, especially in the legal, economic-financial, technical and environmental field.

(2) The Commission is a permanent body appointed by the Government and composed of the Chairperson and four members.

(3) The Chairperson and the members of the Commission shall be citizens of Montenegro.

(4) Members of the Commission include:

- three representatives of the Government;
- representative proposed by the representative association of employers;
- representative proposed by the Association of Municipalities.

(5) A person effectively convicted of a criminal act against property, economy, constitutional order and for abuse of official position may not be appointed in the Commission.

(6) A member of the Commission may be appointed for the period of five years and may once be reappointed.

(7) In case the position of a member of the Commission becomes vacant before the expiry of the mandate, the Government shall appoint a new member for the time before the expiry of the mandate.

(8) The Commission may engage experts and institutions specialized in certain fields if, by the estimate of the Commission, such help is necessary.

(9) The Government shall determine the authority for performance of professional and administrative operations for the Commission or it shall form a special service for the performance of such operations.

Conflict of Interest

Article 13

(1) The member of the Commission must not have direct or indirect interests in the concession subject which might cause a conflict between his/her personal interests and his/her official duties in the concession granting.

(2) In case the work of the Commission is disabled as a result of the conflict of interest, the Government, exceptionally in the actual case, appoints deputy members for the members who stand in the conflict of interest.

Expiry of Terms of Office and Dismissal

Article 14

The terms of office of a member of the Commission may expire, i.e. he/she may be relieved from duty:

- upon proposal of the entity which recommended his/her appointment in the Commission;
- in the case he/she submits a written resignation;
- in the case he/she becomes effectively convicted to a prison sentence for a criminal act which makes him/her unfit for the performance of duties;
- in the case he/she permanently looses the capacities for the performance of duties;
- in the case he/she performs poorly and inefficiently the functions of Commission member;
- in case he/she is absent on three consecutive sessions of the Commission without prior permission.

Financing of the Commission

Article 15

(1) Funds needed for the operation of the Commission shall be secured from the budget of Montenegro.
(2) The utilization of the funds by the Commission is subject to auditing in accordance with the regulations.

Concession Contract Register

Article 16

(1) Commission shall maintain and regularly update Concession Contract Register.
(2) Concession contracts register contains the following data: name of the concessionaire, concession subject, date of the conclusion of the Concession Contract, duration of the concession period, agreed and finally calculated annual amount of the concession fee, extent of payment realization by the concessionaire of annual concession fee.
(3) Concession contract register is to be published on the internet website of the Commission.
(4) All interested parties have the right of insight into the Concession Contract Register.

Annual work report

Article 17

(1) The Commission submits to the Government, at latest by March 31st in the current year, the annual report on its work during the previous year, with the report on the performed auditing.
(2) The Commission is obliged to submit to the Government, at latest by June 30th, the report on the realization of obligations from the Concession Contract in the previous year.
(3) Reports from paragraphs 1 and 2 of this Article the Commission shall also submit for insight to the municipalities.

III. PROCEDURE FOR GRANTING OF CONCESSIONS

Initiative for the starting of the procedure

Article 18

The procedure for the granting concessions may be started at the initiative of:
1) competent authority,
2) interested party.

Unsolicited Proposal

Article 19

(1) Interested party may submit to the Competent Authority an initiative for starting process of granting concession for which a public announcement hasn't been issued.
(2) If the competent authority estimates the initiative as acceptable it will determine a deadline by which the submitter of the initiative should deposit the estimated funds for the production of the concession act, costs of the operation of the Concession Commission and the costs of conducting public discussion.
(3) Competent authority is obliged to start the process of the preparation of concession act within 15 days from the date of the deposited funds.
(4) In case the concession should be granted to a Tenderer who is not the submitter of the unsolicited proposal, the competent authority shall immediately return the deposited funds to the submitter of the unsolicited proposal.

Concession Act

Article 20

(1) The concession act forms the basis for granting concession.
(2) The concession act is produced by the competent authority and submitted to the Commission for approval.
(3) Prior to sending the concession act to the Commission, the competent authority organizes and conducts public discussion within the period not longer than 20 days, whereby the comments and suggestions from the public discussion shall be discussed during the course of the production of the concession act.
(4) The competent authority may engage external advisors, legal or physical entities, for the performance of work and the rendering of technical assistance for the production of the draft concession act. Persons from this paragraph cannot be Tenderers as referred to in this Law.
(5) The Commission shall accept or reject the concession act within 30 days from the date of the communication of the concession act.

(6) In case the Commission does not reject the Concession Act as referred to in the paragraph 5 of this Article, the Concession Act shall be considered accepted.
(7) Upon accepting the Concession Act by the Commission, the Competent Authority shall submit the Concession Act to the Concession Grantor for adoption.
(8) Concession Grantor may offer financial assistance to the concessionaire, including, but not limited to, the payment for performance of activities of public interest, giving guarantees, material giving, giving of donations, provided such a possibility is envisaged by the public announcement.

Article 21

(1) Concession act contains as per a rule the following:
1) detailed description of the subject of concession and specification of area, region and location where the concession activity shall be conducted;
2) basic parameters for the development of the economic feasibility of investment, as well as:
    - assessment of alternative possibilities for rendering of services;
    - indicators that the concession shall ensure public interest;
    - analysis, assessment and balancing of risks between the Concession Grantor and the concessionaire.
3) minimal or maximal concession period;
4) list of required technical documentation, with conditions for its production if that is envisaged by a special law, necessary licenses, permissions and approvals which should be obtained prior to the start of the conduction of concession activity;
5) basic elements of public announcement and directions in terms of tender documentation;
6) data from spatial-planning and town-planning documentation, data on the need for solving property-legal relationships, data on infrastructural and other facilities located in the region for conduction of concession activity, as well as the opinions of competent authorities, professional institutions or companies, in compliance with special laws;
7) conditions which the concessionaire must satisfy in terms of technical capacities, financial capability and other references and proofs of which the Tenderer must submit on that basis;
8) draft tender documentation (public announcement, documentation related to the proposal);
9) Draft Concession Contract;
10) criteria for the selection of the most preferred proposal;

11) conditions and modes of performing concession activities, especially conditions and modes of rendering services to users;
12) proposition of type and level of guarantee or other securities for irresponsible proposals and for performance of concession activity;
13) smallest expected amount of Concession Fee;
14) modes for determination of rates;
15) rendering of expected services and with the desired quality of services;
16) proposition of mechanism for supervision of rendering services from the Concession Contract;
17) environmental measures as determined by regulations;
18) other elements of significance for the granting of concession.

(2) If the concession subject is the exploitation of mineral resource, the concession act also contains the data on conducted geological research and the data on established quantity and quality of mineral resources.

(3) If the concession subject is the reconstruction, adaptation or the rehabilitation of existing facilities, the concession act also contains the assessment of the level of investment determined in relation to the value of facilities for which the reconstruction, adaptation or rehabilitation is the subject of concession, as well as the desired status of resources which are the subject of the transfer after the expiration of the deadline.

Modes of Granting Concession

Article 22

(1) Concessions are granted on the basis of:
1) public competition in an open procedure (hereinafter: open procedure),
2) public competition in a two-tier procedure – prequalification (hereinafter: two-tier procedure).

(2) Exceptionally, the public competition procedure may be excluded in the case of extension of concession as referred to in the Article 8, paragraph 4, of this law (for option 2 Article 8, paragraph 2) or of the expansion of region for the performance of concession activity, which due to technical-technological causes cannot be confirmed as a special exploitation field for conducting concession activity by other concessionaires.

(3) Without issuing public announcement the concession may also be granted for the exploitation of other mineral resources as a follow-up of the approved exploitation field provided that the duration of the concession period may not be longer than the period determined by the Concession Contract for the exploitation of primary mineral resource on that exploitation field.

(4) The procedure for granting concession without the announcements as referred to in the paragraphs 2 and 3 of this article, may be conducted upon consent by the Commission.

(5) On the basis of requirements as referred to in the paragraphs 2 and 3 of this article, the annex of the Concession Act is produced which also

provides the explanation of the need for the conducting of the granting of concession with exclusion of the public competition.

Open procedure

Public announcement

Article 24

(1) Upon adoption of the Concession Act, the Competent Authority, except in the case referred to in the Article 22, paragraphs 2 and 3 of this law, issues Public Announcement.
(2) Announcement shall be published in the "Official Gazette of Montenegro", in, at least, one daily printed media, printed and distributed on the territory of entire Montenegro and on the internet website of the Competent Authority, and when the subject of concession is of strategic significance for Montenegro, as well as in one representative international economic printed media.
(3) Text of the public announcement especially contains:
1) subject of the public announcement;
2) relevant parts of the concession act;
3) address and deadline for submitting of the proposal for public announcement;
4) criteria for the participation in public announcement and the possibility of submitting the joint proposal;
5) rules of conducting public announcement;
6) modes for deliverance of the proposal (under code or under the full title of the Tenderer);
7) criteria for evaluation of proposals;
8) date, time and place of opening of received proposals for public announcement;
9) time period during which the proposal for public announcement may be withdrawn;
10) establishing the form of the proposal, technical and financial or just financial proposal;
11) Data on the level and form of the tender bond and guarantee;
12) Possible relieves and aids for the Concessionaire:
13) Conditions, terms and modes for return of tender bond and guarantee;
14) Stipulations on subcontracting;
15) Name of the person in charge for presenting relevant information in the procedure of public announcement;
16) Redemption price for tender documentation in the level of costs of its production.
(4) Deadline for submitting proposals as referred to in paragraph 3, item 3, of this Article must be sufficient for the proposal preparation and, counting

from the day of publishing of the public announcement, it cannot be shorter than:

- 52 days for concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR;
- 30 days for concession subjects, i.e. investments in BOT system, with the value less than 5.278.000 EUR.

(5) Costs of issuing public announcement are borne by the Competent Authority.

Modifications

Article 24

(1) Competent Authority may, upon the issuing of the Public Announcement, modify the Public Announcement, with exception to the elements determined by the Concession Act.

(2) In the case as referred to in the paragraph 1 of this article, the Competent Authority shall, under the same procedure by which the Public Announcement was published, make modifications to the Public Announcement, provided that the deadline for the submitting of proposals must be extended for the number of days elapsed since the day of the issuing of announcement.

Submitting of the proposals

Article 25

A legal or physical entity or an entrepreneur may submit only one proposal, which he shall submit independently, in a consortium, or in some other form of business association.

Security

Article 26

For the purposes of protection from irresponsible proposals, the security may be required in a form of pecuniary deposit, or in a form of guarantee, in the amount which will ensure the protection of Concession Grantor's interests, but will not repulse persons interested in the participation in the procedure of public announcement, and within the period not longer than necessary to protect the Concession Grantor from irresponsible proposals.

Subcontracting

Article 27

The public announcement may determine the minimal percent of the total value of project works the Tenderer is obliged to assign through public competition to companies registered in Montenegro.

Tender Commission

Article 28

(1) The procedure of opening of the proposals, verification of the proposals in terms of their correctness, the proposal evaluation and ranking of Tenderers, in compliance with the act brought by the Government, is conducted by the tender commission, comprised of an odd number of members, and formed by the Competent Authority.
(2) One member of the Commission shall be the representative of the municipality on the territory of which the concession is realized.
(3) In case the Concession is realized on the territory of two or more municipalities, the representative in the Tender Commission is proposed by the Association of Municipalities, through consultation with representatives of municipalities on the territory of which the concession is realized.
(4) Costs of the operation of the tender commission are borne by the Competent Authority.
(5) A member of the tender commission may not have direct or indirect interests which would, during the operation of the tender commission, cause a conflict of his/her personal or business interests in the evaluation of proposals and the recommendation of the ranking of Tenderers.
(6) In case the member of the Tender Commission stands in conflict of interests, the Competent Authority shall appoint another member.

Operation of tender commission

Article 29

(1) Tender commission, based on criteria from the Public Announcement and submitted proposals, makes a proposition of the ranking of the Tenderers.
(2) Tender commission shall make decisions by a majority of votes of the total number of members.

Right of priority

Article 30

(1) During the course of preparation of the recommendation for the ranking of the Tenderers, as well as during the course of selection of the concessionaire for the exploitation of natural resources, under the conditions of equally evaluated proposals, the priority goes to the person that conducted previous research in the region envisaged for the exploitation.
(2) If the submitter of the proposal in the public announcement or the initiative for the granting of the concession is the owner of the land which is the concession subject, under conditions of equally evaluated proposals, he shall have the priority over other Tenderers, except in relation to the persons as referred to in the paragraph 1 of this article.
(3) With exception to paragraphs 1 and 2 of this article, under the conditions of equally evaluated proposals, the submitter of the unsolicited proposal has the right of priority in the granting of the concession.

Verification of Proposals

Article 31

(1) Prior to proposal evaluation, proposals shall be verified for identification of possible insufficiencies and variations in terms of requirements of the Public Announcement, in compliance with the stipulations of Article 28, paragraph 1 of this Law.
(2) Invalid proposals shall be rejected, and valid shall be evaluated.

Proposal Evaluation Criteria

Article 32

(1) Basic criterion for proposal evaluation is economically most preferred proposal.
(2) Basic criterion as referred to in the paragraph 1 of this article consists several sub-criteria, depending on the concession subject these are:
   1) Proposed concession period;
   2) Proposed Concession Fee;
   3) Proposed costs, i.e. rates for rendering of services;
   4) Quality of services;
   5) Level of achieving public interest;
   6) Level of utilization of natural resources;
   7) Impacts on employment, infrastructure and economic development;
   8) Level of subcontracting;
   9) Program and level of conservation of environment;
   10) Scope and level of relieves and aids expected from the Concession Grantor;
   11) Other criteria determined by the Concession Grantor.
3) Public Announcement determines the value of points on the basis of selected evaluation sub-criteria, whereby the sum of all points is 100.

Proposed ranking of Tenderers

Article 33

(1) Tender Commission ranks proposals by assigning certain points based on each sub-criterion stated in the Public Announcement.
(2) Tender Commission shall, within 30 days from the day of the opening of the proposals, submit to the Competent Authority the proposed ranking of Tenderers, a report on the conducted procedure with explanation of the proposed ranking of the Tenderers, the minutes from the proceedings of the public announcement and the complete tender documentation.
(3) In extraordinary complicated cases, at the recommendation of the Tender Commission, the Competent Authority may extend the deadline as referred to in the paragraph 2 of this article, in compliance with the provisions of the law regulating this administrative procedure.

Right of insight and complaint

Article 34

(1) Tenderers, after the publishing of the proposed ranking of Tenderers by the Tender Commission, upon written request, have the right of insight into the complete tender documentation as referred to in the Article 33, paragraph 2 of this Law, except for the one which represents confidential information as determined by the law.
(2) The Tenderer has the right to file a complaint concerning the lawfulness of the conducted procedure. A complaint may be filed to the Government within 15 days from the publishing of the proposed ranking by Tender Commission on the notice-board of the Competent Authority, i.e. on the internet website of the Competent Authority.
(3) Upon filing the complaints, the Commission makes decisions within a period of up to 30 days from the end of the deadline as referred to in the paragraph 2 of this article.

Right of Insight and Complaint

Article 35

(1) Commission, upon complaint by the Tenderer:
   1) Evaluates whether the tendering procedure was properly conducted by the Tender Commission;
   2) Establishes whether the determined evaluation criteria were properly applied by the Tender Commission.
(2) In case the Commission establishes a violation of the procedure or improper application of criteria, the proposed ranking is returned to the Tender Commission for removal of irregularities.

Proposition for Granting Concession

Article 36

(1) Competent Authority submits to the Concession Grantor the proposition of the ranking of the Tenderers, report on the conducted procedure with explanation of the proposed ranking of the Tenderers, minutes from the proceedings, Draft Concession Contract and excerpt from the tender documentation provided by the Tenderers.
(2) In case of proper application of the rules of procedure and criteria, the Competent Authority is obliged to respect the ranking proposed by the Tender Commission.
(3) Upon request of the Concession Grantor, the Competent Authority is obliged to provide other required documentation.

Decision on selection of the Concessionaire

Article 37

(1) Concession Grantor makes a decision on the granting or withdrawing from granting of the concession within 30 days from the date of the receipt of the proposal. Exceptionally, if it is required by the complexity of the concession, Concession Grantor may extend the deadline by a maximum of 30 days, which is communicated to the Tenderers in an appropriate manner.
(2) In case of withdrawal from granting of the concession, the Concession Grantor is obliged to compensate reasonable expenses to the first ranked Tenderer for participation in the Public Announcement, unless envisaged otherwise by the Public Announcement.

Withdrawal from concluding Concession Contract

Article 38

If the first ranked Tenderer withdraws from the contract conclusion or he doesn't conclude the Concession Contract within time determined by the decision on the selection of the Concessionaire, the Concession Grantor may invite the subsequently ranked Tenderers in order of precedence to conclude the Concession Contract or may decide to revoke the public announcement.

Notification of the results of the Public Announcement

Article 39

(1) Upon making of the decision on the selection of the Concessionaire, the Competent Authority delivers, in a written form, a reasoned notification of the results of the Public Announcement to all participants in the Public Announcement.
(2) Decision of the Concession Grantor on the selection of the Concessionaire or the decision on the revocation of the Public Announcement is published in "The Official Gazette of Montenegro"

Procedure in the case of a single proposal for the public announcement

Article 40

If only one Tenderer applies for the public announcement, and the Commission establishes that it satisfies the conditions and criteria of the public announcement, the Competent Authority may decide to revoke the public announcement or continue the procedure for the granting of the concession.

Two-tier procedure
Conducting procedure

Article 41

(1) In case the Competent Authority expects the tender to be:
- complicated in technical, legal, financial or other aspect, or
- expects a large number of Tenderers

it may decide to apply a two-tier procedure.

(2) In the case of the two-tier procedure, the Competent Authority determines prequalification criteria which must be satisfied by the persons applying for prequalification, in order to qualify for the tendering procedure. Those criteria must be established in an impartial, non-discriminatory and a transparent way.

(3) Prequalification criteria is established depending on the concession subject, and especially includes:
- The ablity for concession realization (technical and/or financial requirements, previous experience in performing concession activities, etc.);
- Proposed terms of realization of the concession (deadlines, financial requirements, guarantee requirements, maintenance, repair);
- proposed solutions (conceptual, technical, financial, legal, economical) for the realization of the project.

(4) Two-tier procedure consists of:
- Public announcing,
- Prequalification phase, when the Tender Commission appointed by the Competent Authority assesses applications for prequalification and accepts or rejects applications based on previously established prequalification criteria,
- Provision of Concession Act to the qualified Tenderers and Invitation for Proposals,
- Evaluation and ranking of proposals recieved from qualified Tenderers;
- Recommendation for the selection and the selection of the Concessionaire.

(5) During the prequalification procedure, Tenderers submit documents required by the prequalification announcement, in order to confirm the

satisfaction of prequalification criteria. Deadline for submitting prequalification documents cannot be shorter than 30 days for concession subjects, i.e. investments in BOT system, as stated in the Article 23, paragraph 4, item 1 of this Law, and 20 days for concession subjects, i.e. investments in BOT system, as stated in the Article 23, paragraph 4, item 2 of this Law.

(6) Stipulations of Article 28, paragraph 1 of this Law shall regulate the procedures of opening, reviewing and verification of submitted documentation and the selection of the Tenderers which shall be qualified for the submitting of proposals.

(7) In the procedure as referred to in the paragraph 4 of this article, stipulations provided by the articles 23-40 of this Law shall be applied accordingly, unless otherwise established by this article.

(8) If only one Tenderer who satisfies the prequalification criteria appears at the public tender, the Competent Authority may continue or terminate the procedure for the granting of concession.

Consulting dialogue

Article 42

(1) In the case of technically, legally, financially or otherwise complicated public tenders, the Competent Authority shall prepare the competition phase in a consultative way, wherein the Tenderers and the Competent Authority start a dialog with the aim of determining the best technical, legal, financial or other solution.

(2) Upon consultative dialogue, in the competition phase, the Competent Authority provides each qualified Tenderer with the final Tender Documentation, including Draft Concession Contract, technically, legally, financially or otherwise finalized concept, on the basis of which all of the Tenderers submit their proposals.

IV. PROTECTION OF RIGHTS OF PARTICIPANTS IN TENDER

Rights of the Participants in the Procedure of Public Announcement

Article 43

(1) A participant in the public announcement, its representative or agent, has the right to attend the opening of the proposals.

(2) A participant in the public announcement has the right, upon written request, to withdraw the proposal at latest upon expiration of the time period determined by the public announcement. The proposal is considered to be withdrawn upon receipt of a written request for the withdrawal of the proposal. In case of withdrawal of the proposal, the same is returned to the Tenderer unopened.

(3) A Tenderer has the right to file a complaint to the Commission concerning the lawfulness of the conducted procedure in accordance with this law.
(4) Participants in the public announcement have the right of refund of the tender bond in a manner as determined by the public announcement.
(5) If the Tenderer selected as the concessionaire withdraws from the conclusion of the Concession Contract he shall not have the right of refund of the deposited tender bond.

V. CONCESSION CONTRACT

Conclusion and the Contents of the Concession Contract

Article 44

(1) Unless otherwise determined by the public announcement, within 15 days from the date of Decision on the Award of Concession, the Concession Contract shall be finalized by the Competent Authority and the Tenderer with the highest ranking in accordance with the provisions of the Concession Act, public announcement, first ranked proposal and the Decision on the Award of Concession and Draft Concession Contract, as it is finally provided to the Tenderers prior to expiry of the deadline for submitting of the proposals.
(2) Concession Contract as per a rule contains the following:
1) contracting parties;
2) rights and obligations of the contracting parties;
3) concession subject;
4) conditions and modes of utilization of the Concession Subject;
5) duration of the utilization of Concession Subject;
6) levels, deadlines, conditions and modes of payment of concession fee;
7) operations related to obtaining necessary authorizations for conducting activities in accordance with the Concession Contract, as well as the right of the Competent Authority to monitor works performed and services rendered by the Concessionaire, and the conditions and extent to which the competent authority may order variations regarding works and rendering of services;
8) modes and deadlines for securing funds for financing concession activities (financial plan) and the time schedule of investment;
9) duration of preparatory operations;
10) product and service standards, transfer of technology;
11) relieves and help which, in compliance with the regulations, shall be provided by the Concession Grantor to the Concessionaire, as well as the participation of the Concession Grantor in the payment to the Concessionaire for the performance of concession activity;
12) means and assets given for use by the Concession Grantor;
13) amount and modes of securing guarantees for the execution of the Concession Contract;
14) obligations of the concessionaire regarding environmental protection;

15) Concessionaire's handling of objects of value, with historical, cultural or natural value, found during the operation of the Concession Subject.
16) obligation towards revitalization of renewable energy sources, i.e. the rehabilitation – recultivation of surfaces degraded by the performance of concession activity;
17) conditions for the modification or termination of contract and the consequences thereof, changed circumstances and force majeure;
18) description of events considered force majeure;
19) sanctions and compensations due to non-performance of obligations of contracting parties;
20) conditions for the performance of concession activity, criteria and ways of determination of end user prices, i.e. rates for products and services;
21) rights and obligations in terms of taking measures of general security, health and environmental protection as well as the responsibility for the compensation for damage incurred by threatening general security and environmental protection;
22) right to contractual fees on the basis of the increase to the concession value;
23) provisions on timing and modes of the transfer of immovable property, facilities, installations or plants to Concession Grantor and the state they must be transferred in.
24) modes of settlement of disputes and application of the ruling law;
25) other elements significant to the concession subject.

(3) The contract also determines the modes of mutual reporting on the performance of contractual obligation, modes of controlling that performance and the practice of rights and obligations of contracting parties.

(4) The contract is signed by the senior officer of the Competent Authority, upon authorization from the Concession Grantor, and by the authorized person of the Concessionaire.

Expropriation

Article 45

(1) If, in relation to the operation of the concession, expropriation of immobile property, i.e. establishment of the construction site, needs to be undertaken, then the costs, modes and deadlines for payment of the expropriation, i.e. establishment of the construction site, are regulated in accordance with the Law.

(2) In case the owner of the land as referred to in the paragraph 1 of this article is the Concession Grantor, no expropriation shall be undertaken, but it is considered that the concessionaire has the consent for its use by the granting of the concession.

Registering Immovable Property Concession Contract

Article 44

Concession Contract related to immovable property shall be registered in the Cadastre of Real Estates in accordance with the law.

Obligation of reporting

Article 47

The Competent Authority shall submit the original of the concluded Concession Contract to the Commission and the body competent for the collection of public revenues.

Increase of the Concession Subject value

Article 48

Unless otherwise specified by the Concession Contract, every increase to the value of devices and facilities in state property, which stand in function of the performance of concession activity, and occurring on the basis of performance of concession activity, is a state property.

Findings

Article 49

(1) Every finding made on location of performance of concessionaire's activity which is the concession subject contract, having historical, cultural or natural value, and not being the subject of concession, is considered to be state property and the concessionaire is obliged to notify a competent state authority about the same, and immediately terminate or limit the concession activity if this may threaten the objects found as referred to in this paragraph, until further instruction from that authority.

(2) Competent state authority as referred to in the paragraph 1 of this article is obliged to immediately, and at latest within ten days from the receipt of the notification, issue instructions to the concessionaire on the management of the concession subject as referred to in the paragraph 1 of this article, namely on the need for the termination or limitation of the performance of concession activity on the location where the objects as referred to in the paragraph 1 of this article have been found.

(3) During the period of termination or limitation of concession activities the time periods as determined by the Concession Contract are not elapsing.

Unofficial translation by Louis Berger SAS

Monitoring of the execution of contractual obligations

Article 50

(1) Competent authority shall monitor the execution of contractual obligations of the Concession Contract.
(2) Annual concession fee shall be calculated by the Competent authority.
(3) Collection of Concession revenues shall be performed by the authorities competent for the collection of public income.
(4) Authorities as referred to in the paragraphs 2 and 3 of this Article shall submit data to the Commission.
(5) Commission has the right to, at least once per year, appoint certified experts for purposes of establishing compliance with the rights and obligations determined by the Concession Contract. Costs of work of the competent professional authority shall be borne by the Concessionaire, in case it should be proven that the data provided by the Concessionaire is incorrect.
(6) Report as referred to in the paragraph 5 of this article forms a part of the report in Article 17, paragraph 2 of this Law.

Rights of the concessionaire

Article 51

(1) The concessionaire has the right to utilize resources and property of the Concession Grantor in accordance with the Concession Contract.
(2) In case of change of regulations, the Concession Contract remains effective unless agreed otherwise by the contracting parties.
(3) In case the Concession Contract provides for the necessity of investment in investigation prior to exploitation, that contract may also include the exploitation of the subject of investigation.

Obligations of the concessionaire

Article 52

(1) The Concessionaire is obliged to meet the conditions prescribed for the performance of concessionary activity.
(2) The Concessionaire is obliged to perform activity determined as the concession subject and may not extend it beyond the scope as determined by the contract.

Transfer of the contract

Article 53

(1) The Concession Contract may be transferred to another Concessionaire with previous consent of the Concession Grantor, provided that the new concessionaire satisfies at least the same conditions as the concessionaire.
(2) Transfer of concession without the consent of the Concession Grantor is legally void.

Termination of the Concession Contract

Article 54

(1) The concessionary relationship is terminated:
   1) by expiration of the period for which the Concession Contract has been concluded;
   2) by revocation of the concession for severe violation and repeating of material Concession Contract violations related to the obligations of concessionaire;
   3) by breaking of Concession Contract in accordance with the legislation regulating obligatory relationships.
(2) Concessionary relationship is terminated by revocation of concession, in the case if:

1) concessionaire wasn't performing concession activity for more than a year, except in the case of force majeure, i.e. if the concession activity wasn't performed in compliance with the time schedule and within the scope determined by the Concession Contract;
2) concessionaire didn't conduct preparatory operations within the contracted period or doesn't start the concession activity within the contracted period;
3) the process of insolvency or liquidation of the concessionaire is initiated, except in the case of the process of reorganization under the law regulating the insolvency of companies.
4) the concession is granted on the basis of falsely stated data relevant to the making of the decision on the granting of the concession;
5) the performance of concession activity jeopardize life environment and health of people or the areas and objects protected by law, which couldn't be foreseen at the time of granting of concession, and the measures proposed by special regulations are not sufficient for the prevention;
6) concessionaire makes a transfer of concession without prior consent of the Concession Grantor.

(3) In the case of revocation of concession as referred to in the paragraph 2 of this article the concessionaire has no right of compensation for damages.

Hand-over of facilities

Article 55

(1) Concessionaire who constructed facilities on the basis of concession shall remove the same upon the expiry of the Concession Contract, unless they become the property of the Concession Grantor as regulated by the Concession Contract.
(2) In case the Concessionaire intends to sell the property which remained in its ownership after the expiry of Concession Contract, and which was in function of the concession activity, the Concession Grantor has the right of priority for purchasing within 120 days from the date of receipt of the concessionaire's offer.
(3) Upon termination of the concessionary relationship per BOT. system, the concessionaire shall hand over facilities, devices and installations constructed and engaged in the performance of activity, in a good operational state, in accordance with the Concession Contract.

Article 56

The concession cannot be the subject of insolvency or liquidation process.

Temporary interruption of Concession Contract

Article 57

In case of force majeure or an extraordinary event which couldn't be foreseen at the time of conclusion of the Concession Contract, the Concession Contract shall be temporarily interrupted until the end of the effect of force majeure, i.e. extraordinary event. The decision shall be made by the competent authority in association with the Commission, on the basis of written request from the concessionaire.

VI. CONCESSION FEE

Payment of the Concession Fee

Article 58

Certain concession contracts may determine the payment of the Concession Fee, which is to be paid for the granted concession in accordance with the concession act and the Concession Contract.

Allocation of a Part of the Concession Fee

Article 59

Part of the concession fee, assigned by the Government, shall be allocated to the municipality on the territory where natural resources which are the subject of the concession are located, in percentage specified by special laws.

Relief from Payment of the Concession Fee

Article 60

Concessionaire may, in compliance with the contract, partially or entirely be relieved from the payment of the concession fee in cases of unpredicted circumstances, i.e. force majeure. The decision, based on the written and reasoned request from the Concessionaire, shall be made by the Concession Grantor.

Concession Fee Determination Criteria

Article 61

(1) The payment of the concession fee, if applicable, is determined depending on the concession subject, on the basis of the criteria, especially:
   1) the type, category, quantity, quality and the market price of the resource which is the subject of the Concession Contract;

2) the type of activity which is the subject of the Concession Contract and the market conditions for its performance;
3) Concession Period;
4) time for the return of investment;
5) anticipated profit;
6) other criteria.

(2) Government acts shall elaborate in more detail the criteria as referred to in the paragraph 1 of this Article.

VII. SETTLEMENT OF DISPUTES

Judicial and Arbitration Competence

Article 62

For the settlement of disputes arising from the practice of other international rights and obligations between the Concession Grantor and the Concessionaire, domestic arbitration competence may be agreed and also international arbitration competence in case the Concessionaire is a foreign person.

VIII. SUPERVISION

Supervision

Article 63

Supervision of the enforcement of this law shall be performed by the competent inspection authorities, in compliance with special legislation.

IX. TRANSITIONAL AND CONCLUDING PROVISIONS

Transitional Provisions

Article 64

(1) Sublegal acts for the enforcement of this law shall be issued within six months from the effective date of this law.
(2) The concession commission of the Republic o Montenegro shall be established within 90 days from the effective date of this law.
(3) Until the establishing of the Commission as referred to in the paragraph 2 of this article its activities shall be performed by the Commission for Concessions and BOT arrangements, founded by the Decision on founding Commission for Concessions and BOT arrangements ("The Official Gazette of the Republic of Montenegro", no. 48/03).
(4) The Commission is obliged to establish the Concession Contract Register, as referred to in the article 16 of this law, within 90 days from the date of the sublegal acts regulating the maintenance of this Register.
(5) Procedures for the granting of concessions started in accordance with the previous law shall be continued in accordance with that law.
(6) Valid contracts on granting of concessions, concluded prior to effectiveness of this law, shall be submitted to the Commission within 60 days from the date of establishing of Concession Contract Register.
(7) Concession contracts concluded after the effectiveness of this law, shall be submitted to the Commission by the ministries or state administration authorities within 15 days from the date of the Concession Contract conclusion.
(8) Concession contracts concluded prior to coming into force of the present law shall remain effective.

Concluding provisions

Article 65

The present Law shall supersede on its effective date the Law on Participation of Private Sector in the Delivery of Public Services ("The Official Gazette of the Republic of Montenegro", No. 30/02) in the part referring to concessions and BOT arrangements, and provisions of other laws regulating the procedure for granting of concessions shall not be applied.

Article 66

Prior to issuing of more detailed regulations on the basis of this law, the regulations based of the Law on Participation of Private Sector in the Delivery of Public Services ("The Official Gazette of the Republic of Montenegro", No. 30/02) shall be applied, unless in opposition to this law.

Article 67

Procedures for granting concession started before the effectiveness of this law shall be completed in accordance with provisions of the law which was effective at that time.

Article 68

The present Law shall come into force on the eighth day after its publication in "The Official Gazette of Montenegro".

APPENDIX A *Unofficial translation by Louis Berger SAS*

Rationale

I Constitutional frame for the passing of the law

Constitutional frame for the passing of the Law on concessions is stated in the article 16, paragraph 5 of the Constitution of Montenegro, which specifies that matters of interest for the Republic, among which is the granting of the concessions, are to be regulated by law.

II Reasons for the passing of the law

The Law on Participation of Private Sector in the Delivery of Public Services ("The Official Gazette of the Republic of Montenegro", No. 30/02) is applied since July 1st, 2002. The purpose of the law is to increase the extent of participation of the private sector in the delivery of public services through contracts on leasing, management, concessions and BOT arrangements. In the previous application of this law problems have been perceived in terms of complexity of specified procedures for the awarding of stated contracts, with the participation of numerous bodies in the course of contract awarding and of the long lasting procedure, whereupon it was concluded of the necessity for passing of a new law which shall resolve the aforementioned issues in a simpler and faster way, which is of interest for all the potential concessionaires and the authorities themselves which conduct the procedure for the granting of concessions.

The Law on Concessions makes it possible for the Government of Montenegro and the municipalities (Administrative Center, Capital City, local self-government units), and if the concessions don't meet the requirement of the duration and the level of investment for granting by the Government, then a ministry, a state administration authority or public enterprises for management of sea assets or national parks, in accordance with criteria established by the law. The Law makes it possible to transfer to the private sector the risk of investment and operation, i.e. risk distribution between public and private sector, as the case may be, which shall provide funds for the reconstruction, upgrade or construction of new infrastructural facilities and on that basis the delivery of the services which have until now mostly been delivered by the state, i.e. local administration, through their institutions or public enterprises, with expectations that private sector will raise the level of efficiency, achieve greater employment and higher quality of services. On the other hand, the private sector expects in the sufficiently long term of concession operation to return the invested funds with a profit, as well as to have a secure investment. The state should primarily be oriented towards setting goals for achievement of public interest, quality of public services and prices for their rendering, as well as supervision of entire procedure, and leave the mere realization of goals to private investors.

The law makes it possible for the inclusion of private sector in the delivery of public services to be done in a transparent way, without discrimination among the Tenderers, in accordance with previously clearly established criteria.

III Compliance with European legislation and confirmed international conventions

Primary sources:
The **European Union Treaty** doesn’t mention concessions in a single paragraph. Starting with the purposes and the contents of the law, the law has been conformed to the provisions of articles 2, 3, 10, 16, 31, 43 – 55, 81 – 89, 95 and 296 of the Treaty.

Secondary sources:
Directive 2004/18/EC of the European Parliament and of the Council of 31 March, 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (OJ L 134/04)
The Directive mainly refers to public procurement and by a minor part (Chapter III) to concessions. The Directive determines rules applying to concessions for public works with values equal or greater than 6.242.000 Euros. It regulates the modes of announcing concessions, deadlines for the submitting of applications, provisions on subcontracting, and also introduces a so called competitive dialog for the granting of concessions. The law is conformed to the provisions of the Directive, whereby it doesn’t make a difference between the concessions of lesser value than the value proposed by the Directive, which means that the application of basic principles from the Directive is secured: transparency, forbidding discrimination and principle of equal treatment for all types of concessions. The Directive provides the possibility of shortening the period for submitting of proposals in the cases of submitting of notifications and all other contractual and other documents by electronic means, as well as its extensions in case of necessities to perform visits to location prior to proposal preparation, etc. However the law determines a minimal period of 52 days in the case of granting concession with the participation of the Concession Council, with shorter minimal period for submitting proposals in other cases.

IV Explanation of the basic legal institutes

The Law regulates conditions and modes of granting concessions for the utilization of natural resources, property in general use and other property of general interest which are in state ownership, and for the performance of activities of general interest.

The law includes nine chapters: Basic Provisions, Institutional Structure, Procedure for Granting of Concessions, Protection of rights of participants in the tender, Concession Contract, Concession Fee, Settlement of Disputes, Supervision and Transitional and Concluding Provisions.

APPENDIX A *Unofficial translation by Louis Berger SAS*

Chapter I – Basic provisions (Articles 1 – 8)

Determines the concession subject (exploitation of natural resources, property in general use and other property of general interest, and the performance of activities of general interest), the purpose of the law and principles which make the basis for the procedure for granting concessions.

Provides the definitions and terms used in the law.

Concessionaire may be a domestic or a foreign legal entity, entrepreneur or a physical entity, including a group of legal entities, entrepreneurs and physical persons with its mutual relationships regulated by a special contract, and the Concession Grantor: Government of Montenegro, municipalities and competent authorities (ministries, state administration authorities, public enterprises managing sea assets and national parks).

Period for the granting of concession is determined according to Concession Subject, public interest and the period of return of the investment. Period may be extended by up to half of the agreed duration, but not exceeding a total period longer than 60 years. Concession may be granted with period exceeding that limit only with the consent of the Parliament of Montenegro.

There is a provision on the obligation of the Concession Grantor to publicly announce and update the subjects and areas for which the concession is to be granted, which is supposed to animate parties interested in obtaining a concession.

Chapter II – Institutional structure (Articles 9 – 17)

Depending on the deadline for the granting of the concession and the value of the concession subject, namely the level of the investment in BOT system, as well as the distribution of ownership rights and competences, the competence for granting of concessions is determined. The Parliament of the Republic of Montenegro gives consent for the contracts for granting concessions in the cases where the value of the concession subject, i.e. the level of investment in BOT system, is at least 200 mills €.

The Concession Council of Montenegro is established, with the competence for the procedure of granting concessions awarded by the Government of Montenegro and municipalities, in case the concessions are granted for a period shorter than 10 years and when the value of the Concession Subject i.e. the investment in BOT system, is at least 1.000.000 euros. The Commission Council processes the concession act received from the competent authority, verifies its formal completeness and feasibility of concession act, secures the production of tender documentation and Draft Concession Contract by the competent authority according to standards required by the Council, conducts the procedure of public announcement for the granting of concession, resolves complaints related to the violation of the procedures of evaluation and ranking of proposals performed by the Tender Commission, makes recommendation for the award of the

Concession Contract, keeps a register of concessions, suggests modifications and additions, i.e. termination of Concession Contract in cases of severe violations of contractual obligations.

The Council is appointed by the Government of Montenegro and consists of four members representing the Government of Montenegro, a representative recommended by the Representative Association of Employers and two representatives recommended by the Association of Municipalities. Members of the Council are appointed for the period of five years. Following Issues are regulated: conflict of interests, the expiration of terms of office and the dismissal of members of Council, as well as modes of decision making of the Council.

Operation of the Council is financed from the budget of Montenegro. The Council submits a report on its work to the Government, as well as the report on realization of obligations from the Concession Contract. The disposal of funds by the Council is subject to audit.

Council and Competent Authorities conducting procedure of granting concessions, in cases when Government or municipalities are not competent for the granting of concessions below the stated minimal period and value of the concession, i.e. investment in BOT systems, maintain Concession Contract Register, as public book and it shall be published on the internet website of the authority maintaining the register.

Chapter III – Procedure for granting concessions (Articles 18 – 42)

Procedure for granting concessions is started upon the initiative of a competent authority and an interested party. Competent Authority is obliged to start preparation of the Concession Act within the period of 15 days since the day of depositing funds estimated for its development, costs of the work of Tender Commission and the conducting public discussion.

The basis for the granting of concession is the Concession Act. The detailed content of the Concession Act is determined. Prior to delivering the concession act to the Council, the Competent Authority arranges and conducts a public discussion within the time period not longer than 20 days. The Commission adopts or rejects the concession act within 30 days.

The procedure for granting concession is started upon obtaining consent from the Concession Grantor on the basis of the excertp from the Concession Act provided by the Council.

Concessions are granted in public competitions in an open procedure (open procedure) and public tenders in two-tier procedure – prequalification. The procedure of public competition may be excluded in the case of concession extension or the extension of region for the performance of concession activity, which due to technical-technological conditions cannot be established as a special exploitation field.

The Council, upon recommendation of the Competent Authority, determines the final text of the public announcement and publishes it in the “Official Gazette of Republic of Montenegro”, in one daily printed media distributed on the territory of the Montenegro, on the internet website of the Council and, if the concession has strategic significance, also in one representative international economic printed media, wherewith it is secured that a larger number of interested subjects shall receive the information of the public announcement. Depending upon who is the Concession Grantor, the deadline for submitting proposals by the Tenderers is determined.

The procedure of evaluation of proposals and ranking of Tenderers is conducted by a special tender commission, formed by the Council. Tenderers have the right to file a complaint on the procedure conducted by tender commission, which is decided by the Council.

In the two-tier procedure, the Council, in an objective, nondiscriminatory and transparent way establishes the prequalification criteria which must be satisfied by persons applying for prequalification. The two-tier procedure consists of the following phases: prequalification, application assessment, submitting of the prequalified Tenderers’ proposals. In the case of a technically, legally, financially or otherwise complicated public competition, the Council prepares the competition phase in a consultative way, whereby Tenderers and the Council, in cooperation with the Competent Authority, engage in a dialog with the aim of determining the best technical, legal, financial or other solution, after which Tenderers are supplied with tender documentation and they submit their proposals.

Within 30 days from the day of the opening of the proposals, the tender commission delivers the proposed ranking of the Tenderers to the Council, the report on the conducted public tender and the complete tender documentation. The Council, upon a complaint from the Tenderer or by its official duty, estimates whether the tender commission conducted the tender procedure properly and whether the established evaluation criteria were properly applied. In case it estimates that there has been a violation of procedure and the criteria, the Council returns the proposal to the Tender Commission for removal of the established irregularities, and if the procedure has been conducted properly the Council is obliged to respect the proposed ranking. The Council publishes the final recommendation of the ranking on its notice-board and on its internet website. Tenderers may file a complaint within 15 days from the date of the publication of the proposed ranking of the Tenderers. The Council must determine the final ranking within 30 days from the expiry of the deadline for filing complaints.

Concession Grantor makes the decision on the granting of the concession within 30 days from the day of receipt of recommendation, except in case when the complexity of the concession requires a longer period.

The decision is published in “The Official Gazette of the Republic of Montenegro”, and the Council is obliged to notify all the participants in the public announcement of its decision, in written form with explanation.

By inclusion of a special Tender Commission in the procedure for granting concessions and the Concession Council, the principle of impartiality is realized in the granting of concession because of their competence for the procedure of conducting public announcement, opening and evaluation of proposals and ranking Tenderers, as well as for making a recommendation for the award of Concession to the Concession Grantor. Representatives of the Competent Auhtority preside in the work of the Tender Commission, and the participation of representatives of the municipality on the territory of which the concessionary activity will be performed is also envisaged. In case the granting of concession is done by the municipality it is envisaged that the majorty of Tender Commission members shall be appointed by the Council upon recommendation of the Association of Municipalities.

Chapter IV – Protection of rights of participants in the tender (Article 43)

Article 42 regulates the rights of participants in the public announcement: to be present on the opening of proposals, to withdraw proposal upon written demand, to file a complaint to the Council on the lawfulness of the conducted procedure, for refunding of deposited funds.

Chapter V – Concession Contract (Articles 44 – 57)

Regulation of the content of the Concession Contract. Unless otherwise specified by the public announcement, the Concession Contract is concluded by the Senior Officer of the Competent Authority, by authorization from the Concession Grantor, and the Concessionaire. The issue of proceedings in case of finding of an object with historical, cultural or natural value is also regulated. Performance of contractual obligations is supervised by the Competent Authority, also making the calculation of the Concession Fee. The rights and obligations of the concessionaire are determined, the termination of Concession Contract and the possibility of transferring the Concession Contract based solely upon Concession Grantor’s consent.

Chapter V - Concession Fee (Articles 58 – 61)

Obligation of payment of concession fee may be determined for particular concession contracts in accordance with the concession act and the Concession Contract. A part of the concession fee determined by the Government of Montenegro or the competent authority is allocated to the municipality on which territory the natural resource which represents the concession subject is located. It provides a list of criteria for the determination of Concession Fee, which is to be elaborated in more detail by the Government Act.

Chapter VI – Settlement of disputes (Article 62)

It is specified that disputes between the Concession Grantor and the Concessionaire the subject of which is immovable property, shall be settled by a competent court in Montenegro, and that for the settlement of other disputes it is possible to agree an arbitration competence.

Chapter VII – Supervision (Article 63)

It is established that the supervision of the compliance with the Law on concession shall be performed by the competent inspection authorities, in accordance with special laws.

Chapter VIII – Transitional and concluding provisions (Article 64 – 67)

Following deadlines are determined: deadline for issuing of sublegal acts for the enforcement of laws, for the establishing of the Council, establishing of the Concession Contracts Register, effective date of the law and the termination of validity of the Law on Participation of Private Sector in the Delivery of Public Services, in the part related to concessions and BOT arrangements, which has regulated the issues of granting of concessions until now.

IV The need for securing funds from the Budget of Montenegro

For the enforcement of this law it is necessary to secure funds for the operation of the Concession Council of Montenegro. The Council consists of a Chairperson and six members. The Government of Montenegro shall appoint an authority for performing professional and administrative functions for the Council or it will form a special service for the performance of such work.

Calculation of costs:

- salaries of Council members: 7 members x 12 months x 1.000 Euros = **84.000 Euros**
- meals for the Council members: 7 members x 12 months x 25 Euros = **1.925 Euros**
- operation of tender commissions: 4 commissions x 5 members x 12 months x 500 Euros = **120.000 Euros**
- office space rent: 2.000 Euros x 12 months = **24.000 Euros**

Total: 229.925 Euros

TECHNICAL MEMORANDUM NO. 20

PREPARATION FOR SESSION VII OF COUNCIL FOR CONSTRUCTION OF MOTORWAYS IN MONTENEGRO UPDATED INFORMATION ON DRAFTING OF FEASIBILITY STUDY FOR TWO MOTORWAYS

TABLE OF CONTENTS

1 INFORMATION ON DRAFTING OF FEASIBILITY STUDY

The primary objective of the Feasibility Study has been identified as the following:

- to identify the optimal solution in various respects: technically, environmentaly, economically, financially; based on a robust analysis of all possible alternatives (alternatives in alignments, in selection of standards etc.) and comparison of possible alternatives.

The following represents the secondary objectives for the assignment:

- to prepare traffic forecasts for a number of different scenarios (optimistic, normal, pessimistic) for a defined appraisal period.
- to provide reliable cost estimates of the proposed solution, estimating quantities and determining unit prices from recently completed projects in similar conditions. The cost estimates shall include tentative expropriation costs.
- to determine the optimal phases in realization of the projects.
- to determine the economic and financial viability of the proposed investments, reporting the economic criteria.
- to undertake risk and sensitivity analysis of the proposed investments.
- to undertake an environmental scooping study for the corridors.
- to provide an indication as to the potential contribution of the private and public sectors in the implementation stage
- to review and comment on the PPP legislation currently in force

The **two** specific links to be studied under the present Terms of Reference are:

a) Bar-Boljare Motorway

The link from the port of Bar to the border with the Republic of Serbia in Boljare.

The approximate length of this link is of about 180 km. The link will combine some existing motorway sections, length 10 km, (Sozina Tunnel) with the construction of a completely new part of the motorway. By preparing designs for the two lacking sections (Matesevo – Andrijevica and Virpazar – Smokovac) the Consultant will fully complete the Bar – Boljare motorway project.

The Consultant is obliged to:

- upgrade the existing documentation up to the level necessary for completion of the Feasibility Study
  - existing projects are revised and updated (costs and quantities, SEA);
- prepare graphic documentation – General design for two lacking sections (BoQ, alignments and climate and hydrology study)
  - completed are general designs for both lacking sections with all supporting studies and these are submitted to the Client for adoption and revision;
- carry out traffic analysis
  - draft study is already effectively submitted to the Client through Technical Memoranda, and the final version of the study is expected to be completed at the beginning of April 2008;
- prepare Strategic Environmental Assessment
  - the document is completed and submitted to the Client for adoption and revision
- carry out economic and financial analysis;
  - a draft version is completed and enclosed. The final document will be completed by the end of March 2008.
- to consolidate existing documentation.

b) Adriatic – Ionian Motorway

The link which starts with Border of Bosnia and Herzegovina, via city of Podgorica, and ends at the Border with Republic of Albania.

The length of this link is about 110 km. This link should consist of a completely new motorway to be built in the future. The two links in Montenegro have a common route in zone of Podgorica (Mareza - Smokovac), in the length of around 12 km.

For these two roads, the obligation of the Designer is, among other things, to consolidate project documentation done so far, and to prepare general designs for the sections for which no project documentation was done.

The Consultant is obliged to:

- prepare General design for the motorway (BoQ, alignments and climate and hydrology study)
  - documentation is in the phase of preparation and will be completed by the end of March, depending on Client' s feedback;
- carry out traffic analysis
  - draft study is already submitted to the Client through Technical Memoranda and the final version of the study is expected to be completed at the beginning of April;
- prepare Strategic Environmental Assessment
  - document is completed and already submitted to the Client for adoption and revision;
- do the economic and financial analysis
  - the document is in the process of preparation.

2 INFORMATION ON THE STATE OF PROJECT DOCUMENTATION FOR BAR–BOLJARE MOTORWAY

The Terms of Reference contain the list of the project documentation prepared so far. The obligation of the Designer is to make the general designs of sections for which no project documentation was done.

For the whole Bar – Boljare motorway a need has arisen to prepare general designs for two sections and those are:

- For Mateševo - Andrijevica section there is no project documentation done. The designs were done but the route was treated as a road, not a motorway and the adopted value for design speed was 80 km/h. There was a possibility left in the project for the road (depending on traffic load) to become a motorway and for the designed road to be one carriageway of the motorway.
- In draft new Physical Plan of the Republic the position of the Podgorica bypass is changed in part between junction Farmaci and Velje brdo, so the two variants are done although adopted general and conceptual designs exist.

The biggest changes refer to the following sections:

- **Podgorica bypass**

According to the adopted draft new Physical Plan of the Republic, the position of the Podgorica bypass alignment moves towards west so the biggest part of designed alignment is cancelled, of the motorway section Smokovac – crossing with the road Podgorica – Cetinje (Farmaci) covered by the design.

- **Bar – Đurmani**

According to the draft Physical Plan of the Republic, the section Bar - Đurmani should be a part of express way, not a motorway.

The following designs of certain motorway sections were done:-

- ***General design of motorway Bar - Tanki rt (R 1:25000)***

  Saobraćaj-inženjering – Podgorica

- ***General design of motorway Tanki rt – crossing with the road Podgorica – Cetinje (Farmaci) (R 1:5000)***

  Put inženjering - Podgorica

- ***General design of motorway Smokovac – crossing with the road Podgorica-Cetinje (Farmaci) (R 1:5000)***

  Republic Institute for Urban Planning and Design - Podgorica

- ***General design of motorway Andrijevica - Berane – Boljare (R 1:25000)***

  Put inženjering – Podgorica

- ***Conceptual design of motorway Đurmani - Tanki rt ("Sozina" tunnel) (R 1:1000)***

  Republic Institute for Urban Planning and Design – Podgorica

- ***Conceptual design of motorway Smokovac - crossing with the road Podgorica - Cetinje (R1:1000)***

  Traser - Sarajevo.

- ***Main design of motorway Đurmani – Virpazar ("Sozina" tunnel)(R 1:1000)***

  Civil Engineering Institute of Croatia - Zagreb.

- ***General design of motorway Mateševo – Veruša***

  Put-inženjering - Podgorica

- ***Main design of motorway Veruša – Mateševo –*** the design is not adopted yet ***(R 1:1000)***

  Civil Engineering Institute of Croatia - Zagreb.

In the mentioned list from the Terms of Reference there are several designs prepared by the Republic Institute for Urban Planning and Design from Podgorica 25 years ago (Conceptual solution for the road Podgorica –Mateševo and General design of motorway Bioče-Tanki rt), but with less elements, as it was required then and they can represent only potential corridors.

After the adoption of changes and amendments to the Physical plan of the Republic from 1997, the drafting of project documentataion for certain sections of Bar-Boljare motorway was started in a more serious maner.

Monteput was the ordering party of the general design Podgorica - Veruša, which elaborates the so-called “Kuci variant” although the drafting of conceptual design for Smokovac – Veruša section has already begun, over Bratonožići.

Conceptual design of motorway (R 1:1000) Smokovac-Veruša, together with Road Center of Vojvodina from Novi Sad, is done by the Civil Engineering faculty from Podgorica.

It is important to note that, in case the proposed Physical Plan of the Republic is adopted, there would be certain changes, which means that a part of project documentation done so far would not be usable.

At the Client’s request, motorway Bar-Boljare was divided into five sections. In line with the Terms of Reference, the following sections and priorities were treated:

- I: Virpazar – Tanki Rt – Farmaci – Mareza – Smokovac (Podgorica bypass)
- II: Smokovac – Veruša – Mateševo
- III: Mateševo – Andrijevica – Berane
- IV: Bar – Đurmani –Sozina tunnel – Virpazar
- V: Berane – Boljare (border with Republic of Serbia)

In these bills of quantities, for previously done designs (most of them done 9-10 years ago), the prices of work items were modified. The given prices were calculated based on the prices on the contracted works on main roads reconstruction (sections Mioska,

Rafailovići, Bečići) of different Contractors and based on the construction prices of Serbian Road Directorate.

In the given documentation, the costs of land acquisition are not included in the bill of quantities.

The sites of auxiliary facilities are included in the layouts (parking lines, gas stations, motels, caffees). Four classes (types A,B,C,D) of facilities are given, as shown below:

	Facility type			
	A	**B**	**C**	**D**
Free space	**x**	**x**	**x**	**x**
Parking area	**x**	**x**	**x**	**x**
Gas station	**x**	**x**	**x**	
Motel	**x**			
Coffee bar	**x**	**x**	**x**	**x**
Restaurant		**x**		
Sanitation	**x**	**x**	**x**	**x**

2.1 Bar – Virpazar Section

Data for motorway general design, section Bar – Virpazar, are taken up from General design of motorway for Bar – Tanki rt section.

The Designers of project documentation were Saobraćaj inženjering and Civil Engineering faculty from Podgorica. The design was done in 1998, and the responsible design engineer was Ljubica Lazarević, B.Sc. in Civil Engineering.

In the given documentation the Existing alignment is covered with variant 3, because the proposal of the Revision Comission, given in the final report from 15th Oct 1998, for further treatment of the existing alignment with variant 3.

The proposed corridor with the existing variant and variant "3", on Bar-Virpazar section, is 24 951.2 m long. Within Bar -Virpazar section the construction costs of grade-separated junction "Virpazar" are also included.

Total designs on Bar – Virpazar section:

- bridges and viaducts 2 430 m
- tunnels 10 070 m
- facilities in total 12 500 m or 50.1%
- open alignments 12451.2 m or 49.9% of overall alignment length.

The design speed V = 100 km/h is adopted in the design and based on it and the terrain category – hilly terrain, the elements of motorway are defined:

- minimum horizontal radii R_{min} = 450 m (implemented once)
- maximum longitudinal gradient i_{max} = 5% (5.00% at the length of 2080m)
- minimum vertical radii (convex) R_{min} = 10 000 m
- minimum vertical radii (concave) R_{min} = 7 000 m
- traffic lane width t_s = 3,5 m
- emergency lane width t_z = 2,5 m
- edge marking line width t_i = 0,2 m
- central reserve width R_t = 4,0 m
- shoulders width b = 1,0 m
- gutters width r = 0,75 m
- berm width b' = 1,0 m
- stopping distance p_2 = 175 m
- sight distance for overtaking p = 320 m

The other costs were presented in bill of quantities by the percentage of construction works and these are:

- Surveys 2%
- Technical documentation 3%
- Fees 3%
- Supervision 2%
- Unexpected works 5%.

Bill of quantities for design works, for both stage I (half motorway) and for final solution (full motorway) is reduced for 5120m of the constructed part of motorway and one tunnel tube Sozina constructed.

In the BoQ the Consultant revised the unit prices and quantities for this section.

As already noted, according to the draft Physical Plan of the Republic, which is to be adopted by parliament soon, section Bar – Đurmani should be an express way for motor traffic, not a motorway (i.e., tollroad).

Regardless of the draft Physical plan of the Republic, the Consultant remained consistent to the Terms of Reference during the design revision and treated this part of Bar-Virpazar section as a motorway.

2.2 Virpazar – Smokovac Section

For section Virpazar - Smokovac, within the Feasibility study the Consultant has prepared the General design.

The Designers of project documentation are the company Louis Berger SAS and the subcontractor, design bureau SIMM inženjering from Podgorica, and the responsible design engineer is Simeun Matović, B.Sc. in Civil Engineering.

The Design is in the process of preparation, and the data given in the documentation has not been revised yet.

The following project documentation was done and delivered to the Client:

- Graphical documentation in three variants with the Bill of Quantities;
- The Study of geologic, climate and engineering-geologic characteristics;
- The Study of climate, hydrologic and hydrographic parameters.

Data for general design of the motorway, section Virpazar – Smokovac are taken up from the following designs:

- The first part of the alignment, Virpazar-Tanki rt (first 3.0km), is taken up from the general design of motorway for Bar – Tanki rt section, of the Designer Saobraćaj inženjering and Faculty of Civil Engineering from Podgorica. The design was done in 1998, and the responsible design engineer was Ljubica Lazarević, B.Sc. in Civil Engineering;

- The following part, Tanki rt - junction Farmaci, is taken up from the General design of motorway for Tanki rt – crossing with the road Podgorica – Cetinje section. The design was done by the company Put inženjering from Podgorica, and the responsible design engineer was Radenko Ostojić, B.Sc. in Civil Engineering;
- The combination of variants was taken up ''6'', ''3'' and ''1'', in line with the conclusion of the Revision Commission, which also proposed variant ''2'' for further elaboration. Variant ''2'' has not been considered because it is situated on the other side of the railway line and is not in line with harmonization done between this general design and the conceptual design of Đurmani - Tanki rt section. The variant (6-3-1) is not completely harmonised and adopted, but there is a minor aberration here, and this could be solved during preparation of conceptual design. In conceptual design the alignment above water source Bole sestre should also be modified, which is to be used for the purposes of regional water supply line for the coastal area. When the design was done as the water source for the purposes of regional water supply line, Karuč was actual, but in the meantime the situation changed. The alignment can and should bypass water protection zone, because bypassing of the zone is a much better solution compared to special protection measures and passing through the zone.
- The remaining part of the alignment, on the existing alignment, between the junctions ''Farmaci'' and ''Smokovac'', is taken up from the general design of the section Smokovac – crossing with the road Podgorica - Cetinje. The design was done by the Republic Institute for Urban Planning and Design from Podgorica and the responsible design engineer is Branislav Canić, B.Sc. in Civil Engineering.

In the Physical Plan of the Republic, which is to be adopted soon, the alignment of Podgorica bypass is moved. According to the current Physical Plan of the Republic – Changes and amendments (1997) and the adopted general and conceptual design, the motorway alignment was supposed to pass through Beri and southeast side of Zelenika hill.

In the new draft PPR, the alignment bypasses the Beri area and passes the northwest side of Zelenika hill. This alignment is longer and somewhat more expensive, but it jeopardises agricultural soil incomparably less. Due to the protection of certain water sources which are on lower level than the alignment, the processes of collection and purifying of complete water pouring down from the carriegeway must be done, which was also done so far in more detailed elaboration (Conceptual and Main design) of the project documentation. In the given documentation this is variant ''Komani''.

At the request of the authorities from the capital city of Podgorica the variant (''Zelenika'' tunnel) was elaborated, which is situated, by position and length, between the two previously stated variants.

In all designs previously done the design speed is 100km/h and the following elements of the cross-section were prescribed:

- minimum horizontal radii $R_{min} = 450$ m
- maximum longitudinal gradient $i_{max} = 5\%$
- minimum vertical radii (convex) $R_{min} = 10\,000$ m
- minimum vertical radii (concave) $R_{min} = 7\,000$ m

- traffic lane width t_s = 3,5 m
- emergency lane width t_z = 2,5 m
- edge marking line t_i = 0,2 m
- central reserve width R_t = 4,0 m
- shoulders width b = 1,0 m
- gutters width r = 0,75 m
- berm width b' = 1,0 m

Thus, the same elements were implemented when designing the variants ''Komani'' and ''Zelenika''.

The maximum radients are 4.30 % (1675m) on the existing alignment, 5% (669m) on variant ''Komani'' and 4.50 % (1123m) on variant with tunnel ''Zelenika''.

Minimum implemented horizontal radii is 450m on the existing alignment and 500m on variants, except that on variant ''Komani'' in the grade- separated junction, smaller radii are implemented (200m and 400m).

Within Bill of Quantities the prices for construction are given for all three variants separately for stage I (half motorway) and separately for Full motorway. On the Podgorica bypass it was planned to perform the overall earthworks in the stage I.

Junction ''Smokovac'' is not included in the Bill of quantities, because, according to the statements of the persons responsible in the Traffic Directorate, it is included in the following section from Smokovac to Mateševo.

The comparison of all three proposed variants is presented in Table 1 and Table 2. The colours in tables are actually the colours of variants in the layout and they are given for easier overview.

Table 1

VIRPAZAR -SMOKOVAC					
Section	Total Length (km)	**BRIDGES**		**TUNNELS**	
		Length (km)	%	Length (km)	%
Variant According To The Previously Adopted General Design	38.23	3.980	10.4%	5.510	14.4%
Variant "Komani" According To The New Physical Plan Of The Republic	40.98	5.425	13.2%	5.510	13.4%
Variant "Zelenika" – Request By The Capital City	39.54	4.242	10.7%	5.510	13.9%

Table 2

VIRPAZAR -SMOKOVAC (costs in Eur 000s)					
Section	Total Length (km)	HALF MOTORWAY		FULL MOTORWAY	
		per km	Total	per km	Total
Variant According To The Previously Adopted General Design	38.23	€ 8,405	€ 321,343	€ 12,283	€ 469,595
Variant "Komani" According To The New Physical Plan Of The Republic	40.98	€ 8,341	€ 341,810	€ 12,198	€ 499,855
Variant "Zelenika" – Request By The Capital City	39.54	€ 8,810	€ 348,285	€ 12,781	€ 505,301

2.3 Smokovac – Mateševo Section

In the second half of 2007 the Traffic Directorate entrusted preparation of the Conceptual Design for the Smokovac - Veruša motorway section to the Civil Engineering Faculty Podgorica University jointly with the Road Center of Vojvodina (from Novi Sad). During design preparation the length of section to Uvac has been extended, i.e. it reached the middle of Verusa – Matesevo section.

For Matesevo – Verusa section, the general design (Put inzenjering – Podgorica) and main design (Institut gradjevinarstva Hrvatske – Zagreb) have been prepared. As far as we know, the general design has not been adopted yet. The problem here is that the alignment from Verusa to Matesevo junction in the length of 12.50 km crosses over the Tara River no less than 17 times.

Within the Conceptual Design, several variants have been elaborated. Variants 11 and 12 (among other things also site plan, longitudinal profile and only approximative Bill of Quantities) were submitted to the Consultant. The Revision Commissin has not as yet adopted the optimal variant, and the basic remark concerning given variants refers to the long alignment with 5% gradient which requires correction of proposed solutions.
Comments for this section are given in Technical memorandum number 17.

2.4 Mateševo - Andrijevica – Berane Section

Feasibility Study requires preparation of General design for the Matesevo – Andrijevica section. Accordingly, project documentation Designers are Louis Berger SAS Company and sub – contractor, SIMM Inzenjering design office from Podgorica, with the head designer Mr. Simeun Matovic B.Sc. in Civil Engineering.

Project is in the phase of preparation and data given in the documentation are not revised.

The following project documentation was done and delivered to the Client:

- Graphical documentation in two variants with the Bill of Quantities;
- The study of geologic, climate and engineering-geologic characteristics;
- The study of climate, hydrologic and hydrographic parameters.

Design speed of 100 km/h is adopted for the design purposes and therefore the terrain chategory (hilly terrain).

Taking into account terrain conditions and expected traffic flow, the following road elements are adopted:

- minimum horizontal radii R_{min} =450 m
- maximum longitudinal gradient i_{ma} i_{max} =5%
- design speed V=100km/h
- traffic lane width t_k=3,5 m
- emergency lane width t_z=2,5 m
- right edge marking line t_{ikz}=0,20 m
- left edge marking line t_i=0,35 m
- central reserve width R_t=4,00 m (3.00 m)
- shoulders width b=1,0 m
- gutters width r=0,75 m
- climbing lane t_s=3.00m

The other costs were presented in bill of quantities by the percentage of construction works and these are:

- Surveys 2%
- Technical documentation 3%
- Fees 3%
- Supervision 2%
- Unexpected works 5%."

Elaborated are two variants and the basic difference is in the length of tunnel Tresnjevik, i.e. in the maximum elevation altitude.

As for the variant 1, tunnel length is 3,600m and the entrance portal is at the level of 1165m AMSL. Concerning variant 2, tunnel length is 2,785m but the maximum elevation is 1215m AMSL.

The comparison of two proposed variants is presented in Table 3 and Table 4. The colours in tables are also the colours of variants in the layout and they are given for easier overview.

Table 3

MATEŠEVO – ANDRIJEVICA					
		BRIGDES		TUNNELS	
SECTION	Length (km)	length (m)	% of alignment	length (m)	% of alignment
VARIANT "1"	23.40	2,900.00	12.39	5,735.00	24.51
VARIANT "2"	23.56	3,060.00	12.99	5,443.00	23.1

Table 4

MATEŠEVO – ANDRIJEVICA					
		HALF MOTORWAY		FULL MOTORWAY	
SECTION	Length (km)	Per km	Total	Per km	Total
VARIANT "1"	23.40	€ 5,902,188	€ 138,111,208	€ 11,090,961	€ 259,528,478
VARIANT "2"	23.56	€ 5,668,665	€ 133,553,752	€ 10,653,543	€ 250,997,466

2.5. Berane – Boljare Section

Data for General design of Berane – Boljare motorway section are taken from the General design of the Andrijevica – Berane - Boljare motorway section.

Project documentation designer is Put Inzenjering Company from Podgorica. Design was elaborated in 1998, and the head Designer was Mr. Radenko Ostojic, B.Sc., Civil Engineering.

In the given documentation, variant 1 with sub-variant 2 was elaborated. This was done on the request of Revision Commission, given in the final report in 1998, which refered to further elaboration of variant 1 with sub-variants 2 and 3 which are similar. Since the sub-variant 3 has a longitudinal gradient of 6.50% in the length of 4712.42m, variant 2 is elaborated with the max gradient of 5.50% in the length of 2358.16m.

Proposed corridor with variant 1 and variant 2 on the Berane – Beljare section is 41 235.83 m long. The section begins in the chainage 11+550.00 and its end is at the chainage 52+785.83.

The following is designed on the section, in total:

- bridges and viaducts 1 460 m.
- tunnels 3 690 m
- structures 5 150 m or 12.5%
- alignment 36 085.83 m or 87.5%

Realistically, there should be higher percentage of structures, since on certain locations there are cuts which are more than 30m deep (even 44 m at the ends), and there are also large embankments.

Considering also terrain conditions and expected traffic flow, the following motorway elements are adopted:

- Minimum horizontal radii R_{min} = 450 m (min implemented 550m)
- Max longitudinal gradient i_{max} = 7% (implemented 5.50% for 2358.16m)
- Traffic lane width t_s = 3,50 m
- Climbing lane width t_s = 3,00 m
- Emergency lane width t_z = 2,50 m
- Left edge marking lane width t_i = 0,35 m
- Right edge marking lane t_i = 0,20 m
- Central reserve width R_t = 4,00 (3.00) m
- Shoulder width b = 1,0 m
- Gutter width r = 0,75 m

Project does not include costs for the grade-separated intersections, ancillary facilities, toll plazas...

Design for the Bar – Virpazar section includes costs, in percentage, of the further elaboration of project documentation, surveys, fees, supervision, unexpected works, and also cost of land acquisition. All this is not included in the Andrijevica – Berane – Boljare design, therefore the construction costs are relatively low.

Costs from the project are corrected in the given BoQ (project was elaborated 9 years ago). Given costs are derived on the basis of costs used in the contracted reconstruction works of main roads (sections Mioska, Rafailovici. Becici) of different Contractors and also on the basis of Serbian Traffic Directorate's construction costs.

The Layout includes locations of ancillary facilities taken for the project (parking places, gas stations, motels, coffee bars, etc.) Four types (A,B,C,D) of ancillary facilities which are not included in the project BoQ are given below.

	Facility type			
	A	**B**	**C**	**D**
Free space	**x**	**x**	**x**	**x**
Parking area	**x**	**x**	**x**	**x**
Gas station	**x**	**x**	**x**	
Motel	**x**			
Coffee bar	**x**	**x**	**x**	**x**
Restaurant		**x**		
Sanitation	**x**	**x**	**x**	**x**

2.6 Economic Analysis: North-South Motorway project - brief results & notes

The table of brief results for economic analysis is given on next page, below are notes about the individual schemes.

I. The result (noted below table) for the Virpazar - Smokovac section is only provisional, as the traffic diversion analysis requires further refinement. Further economic analysis will be carried out for the bypass itself (approximately 15.4 km long, from Farmaci to Smokovac) and separately for the Virpazar-Farmaci section. It is assumed that the bypass will be subject to tolls.

II. For the Smokovac-Matesevo section, the result indicates that a ‘half motorway’ (single carriageway 7.5 metres wide plus 3m shoulders each side) could feasibly be started sometime in 2009. The analysis also indicates that a ‘full’ motorway would be feasible by about 2018 and an opening year traffic level of approximately 17,800 vehicles per day.

III. The sections Matesevo-Berane and Berane-Boljare were analyzed together, since the forecast traffic volumes (with toll) in year 2027 are closely similar. For these sections, the most crucial assumption or proviso is that the motorway in Serbia – from Pozega to Boljare – will be opened by 2015. Should the Serbian section be delayed, traffic benefits for the Matesevo-Berane-Border section would be severely reduced. In analysis it is (perhaps rather conservatively) assumed that border crossing delay at the new motorway border post will be the same as at Barski Most (Dobrakovo). In reality, by 2015 it may be expected that on the motorway, border delays to vehicles will be kept to the minimum and will be much less than on the old road, probably using new technologies.

IV. For the Bar-Virpazar section, for the ‘half’ motorway scheme, it is assumed that the Sozina Tunnel will not require widening. Thus, the cost of the scheme is only an estimated 38 percent of the ‘full’ 4-lane motorway.

This analysis used traffic forecasts based on the CBCG ‘most likely’ GDP growth scenario for the period until 2020. Using a ‘median’ traffic growth forecast (mid-way between this forecast and the CBCG ‘pessimistic’ scenario) would result in about 17 percent less traffic volume on average, and would in most cases mean that construction starts need to be postponed, until rather later years than those given in the attached table.

As shown in the table, the period between when a full motorway is required, compared to the ‘half’ schemes, is about seven years, while the traffic volume ‘threshold’ is about 75% higher on average for the ‘full’ schemes. However, since costs for construction in two stages are likely to be 120% - 130% higher than otherwise, the financial aspects of stage construction must therefore be examined in detail.

Economic Analysis: North-South Motorway project - summary results

Costs in Millions of Euros (Meur)

Analysis Sections >	Virpazar-Farmaci	Farmaci-Smokovac	Smokovac-Uvac Matesevo	Matesevo Berane	Berane-Boljare	Bar-Virpazar	**North-South Motorway**
MTMAT Priority order:	*1*	*1*	*2*	*3*	*5*	*4*	*1 - 5*
Length of Motorway (km)	22.9	15.4	43.5	34.4	41.3	25.0	**182.3**
Variante analysed	General design	General design	Civil Eng var 11	Var. 1	Var. 2	osovna trasa + Var.3	--
Half Motorway econ (Meur)	€ 151.17	€ 101.4	€ 348.6	€ 133.2	€ 128.7	€ 90.8	€ 953.9
'Half' Financial Cost (Meur)	*€ 188.96*	*€ 126.8*	*€ 435.8*	*€ 166.5*	*€ 160.9*	*€ 113.5*	***€ 1,192.3***
Construction start year	2015.0	2014.0	2009.5	2013.0	2013.0	2012.0	2009.5
Constr. Period (years)	2.0	2.0	3.0	2.5	2.5	2.0	7.50
Progress - average km/year	11.4	7.7	14.5	13.7	16.5	12.5	24.3
Opening year Half Mway	2017.0	2016.0	2012.5	2015.5	2015.5	2014.0	2017.0
EIRR* Half motorway	9.4%	9.1%	7.1%	12.1%	12.1%	7.5%	--
AADT opening year	11,050	8,330	10,200	10,700	10,700	10,800	--
Full motorway econ (Meur)	€ 220.9	€ 148.2	€ 512.7	€ 251.2	€ 216.5	€ 236.2	€ 1,585.7
*Total Financial Cost (**Meur**)*	*€ 276.1*	*€ 185.3*	*€ 640.8*	*€ 314.0*	*€ 270.6*	*€ 295.2*	***€ 1,982.1***
Construction start year	2015.0	2017	2018	2020	2020	2017	2015.0
Constr. Period (years)	2.5	3.0	3.0	3.0	3.0	3.0	8.00
Progress - average km/year	9.2	5.1	14.5	11.5	13.8	8.3	22.8
Opening year Full Motorway	2017.5	2020.0	2021.0	2023.0	2023.0	2020.0	2023.0
EIRR* Full motorway	7.2%	7.5%	7.2%	9.6%	9.6%	3.0%	--
AADT in opening year	13,250	12,300	17,800	17,790	17,790	16,740	--
*Full Motorway Financial **Meur/km***	*€ 12.07*	*€ 12.07*	*€ 14.75*	*€ 9.14*	*€ 6.55*	*€ 11.83*	***€ 10.87***

Notes:-

Result for Farmaci-Smokovac (Podgorica Bypass) is not final - the traffic diversion analysis will be further refined.

Years 'xxxx.5' indicates end June. -- indicates not available

Based on estimates aboves, construction progress averages 15.2 km/year for 'half motorway' and 13.0 km/year for Full Motorway

EIRR* (economic internal rate of return) = considering openings in the given years

Costs by SIMM Engineering, except for Smokovac-Matesevo, estimated from Faculty of Civil Engineering data.

Costs include Design & Supervision & Environmental Mitigation, at 8% and 5% of works costs, respectively.

Costs are for Montenegrin design standards. For TEM standards, estimated costs would be < 2% different.

3 INFORMATION ON THE STATE OF PROJECT DOCUMENTATION FOR ADRIATIC – IONIAN MOTORWAY

The corridor of Adriatic – Ionian motorway is planned as two separate roads with two traffic lanes each and the appropriate emergency lanes. The previous speed was 100 km/h. On certain sections with complex relief, the Consultant will analyse the potential advantages of stage construction or realization of some other kind, which is a subject of approval by the Client. During the analysis of design options for motorway alignment, European standards were applied. The Clients will give their final approval for the alignment that the Consultant suggests.

The Consultant is expected to perform analysis of the proposed variants and to estimate at least three alternatives on motorway alignment by methods of multicriteria optimisation, and these are:

- construction of two separate roads with two lanes each and appropriate emergency lanes;
- construction of motorway in phases (2+1 traffic lane).

In previous planning documents the corridor of Adriatic - Ionian motorway is defined according to the route:

Nudo (border witha B&H) – Grahovo – Čevo – Podgorica (Mareza) – Smokovac (Podgorica) – Dinoša – Border with Republic of Albania

Section Mareza – Smokovac (in Podgorica zone) represents the common section with Bar – Boljari motorway.

The following was done regarding project documentation for route of Adriatic – Ionian motorway:

- ***Adriatic – Ionian motorway – digital maps in proportion 1:25 000 in corridor zone;***
- ***Analysis of the corridor of Adriatic- Ionian motorway- Albanian border – Komani;***
- ***Analysis of the corridor of Adriatic –Ionian motorway – Podgorica- Nudo.***

The Consultant analysed the above mentioned documentation and is in the process of preparing the necessary documentation with the accompanying studies for appropriate realization of feasibility study.

It was proposed that the Adriatic – Ionian motorway is treated by the following sections and priorities:

- section I: Mareza (Podgorica) – Smokovac (Podgorica) – Dinoša – Border with Republic of Albania
- section II: Mareza (Podgorica) – Čevo – Grahovo - Nudo (border with B&H).

As already stated the obligation of the Consultant is:

- to make the general design of the motorway (Bill of quantities and alignments)
  - the documentation is in the process of preparation and it will be done by the end of March depending on the feedback by the Client. This remark refers especially to the comments on the part of Podgorica bypass because in that part these two road ways overlap so the promptness of the feedback would be very important for the dynamics.
- To prepare draft report of traffic surveys
  - The draft study has already been delivered to the Client through Technical Memoranda and the drafting of final version is expected at the beginning of April.
- To make the strategic estimate of environmental impact
  - The document is done and delivered to the Client for approval and revison
- To do the economic and financial analysis
  - The document is in the process of preparation.

4 ANNEX – PRESENTATION OF ALIGNMENTS

TECHNICAL MEMORANDUM NO. 21

ASSESSMENT OF TRAFFIC, SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF THE PROPOSED ALIGNMENT FOR THE ADRIATIC-IONIAN MOTORWAY

TABLE OF CONTENTS

1 GENERAL INFORMATION

The first table summarizes traffic forecasts[1] in year 2027 for the Adriatic-Ionian motorway, under three demand scenarios: A) and B) assuming the full roads program under the Physical Plan of Montenegro (PPM) has been implemented; then A) is the motorway with no tolls; and B) with tolls at the equivalent of 6 eurocents per vehicle-km. In both these cases the proposed coastal expressway is assumed as completed. For ***scenario C*** tolls are included on the motorway (as in B), but the coastal expressway is absent. Traffic volume is expressed as average annual daily traffic (AADT). For traffic purposes, the motorway route consists of three main sections: i) from BiH border (near Nudo) to Cevo; ii) from Cevo to the Podgorica bypass; and iii) from Podgorica to the Albania border. In the summary below, local traffic from Podgorica to Tuzi (expected to be about 18,000 AADT in 2027) is excluded.

Table 1: Year 2027 Traffic on Adriatic-Ionian under 3 scenarios

A	**full PPM, no tolls**	Nudo >	4,120	<Cevo>	10,630	<Podgorica>	7,230	< Border
B	**full PPM, with tolls**	Nudo >	2,230	<Cevo>	3,870	<Podgorica>	6,910	< Border
C	**no coastal expressway, with tolls**	Nudo >	7,550	<Cevo>	13,160	<Podgorica>	6,970	< Border

The above shows that under ***scenario A*** - assuming no tolls, traffic in the Cevo-Podgorica sector would attain about 10,600 vehicles per day, and for the Nudo (BiH border) to Cevo sector, about 4,100 per day. However under ***scenario B***, with tolls, traffic volume in 2027 on this route would be very low, at the maximum about 4,000 vehicles per day. Under ***scenario C***, assuming no coastal expressway, traffic in the Cevo-Podgorica sector would attain about 13,000 vehicles per day, and for the BiH border (Nudo) to Cevo sector, about 7,500 per day. In assessing the traffic effects of this alignment, it is equally important to look at volumes on nearby and adjacent links. The table below gives forecast 2027 volumes for the adjacent links, under the same three scenarios as above.

[1] At the 'standard growth' estimate, see TM 13A.

Table 2: Year 2027 Traffic on adjacent links

Adjacent links:		A Full PPM, no tolls	B Full PPM with tolls	C No coastal expressway, with tolls
i	Tivat - Budva	37,500	39,200	28,600
ii	Cetinje -Podgorica	11,500	18,800	18,400
iii	Niksic -Danilovgrad	18,600	18,800	19,300
iv	Danilovgrad-Podgorica	23,900	23,800	24,300
v	Niksic - border BiH	2,400	2,900	3,500
vi	Niksic - Motorway jct.	3,900	4,600	3,800
vii	Motorway jct. - Cetinje	10,200	5,700	6,700

From the above table, it will be noted (row vii) that in the ‘no tolls’ case (A) a good proportion of the Cetinje traffic to and from Podgorica would use the motorway, but in the ‘with tolls’ case (B) this traffic would revert to the existing Podgorica-Cetinje road (ii). Thus, from Table 1 above, the traffic volume in the Cevo-Podgorica sector is 10,600 per day without tolls, but only 3,900 with tolls.

Traffic on the coastal routes would be almost unaffected by the Adriatic-Ionian motorway; only that, as shown in Table 2, without the coastal expressway there would be quite severe suppression of traffic because of high levels of congestion, especially in the summer season.

The North-South motorway will serve the majority of the Montenegro population, directly serving about 140,000 people, not including Podgorica. In the northern municipalities there is clearly some considerable socio-economic benefit from the N-S motorway. On the other hand the Adriatic-Ionian motorway will serve only (excluding Podgorica) some 35,000 people directly, at maximum.

In 2027 total traffic volume (in vehicle-km) on the Adriatic-Ionian motorway is estimated at about 15 percent of the 2027 volume on the N-S motorway, and thus, given such low traffic levels, it is clearly not feasible in social terms; and, if operated as a toll road, the overall financial return would certainly be strongly negative.

It is also clear that the present proposed alignment will not help to remove or alleviate traffic congestion from the coastal areas, i.e., Herceg Novi, Kotor, Tivat, Budva, Sveti Stefan, etc. Thus, the only real gainers would be those travellers from outside the country, to and from Bosnia and Albania, those travellers who do not wish to go to the coast; and these are comparatively few, even assuming a major element of generated traffic.

Possibly, the project concept could be transformed, into a high-standard non-tolled road from Herceg Novi and the Kotor Bay area to Podgorica. This might (for example) involve completion of the new road from Risan to Grahovo that is currently under construction, together with appropriate improvements for the Vilusi-Niksic-Podgorica corridor. Drive-through surveys by the study team have noted that dualizing (a four-lane road with median) the existing roads in this corridor is feasible in engineering terms.

Finally, there is a potentially serious environmental difficulty with the present concept; this is that the quiet and beautiful valleys of Grahovo and Cevo would be considerably disturbed, both in the construction phase and afterwards. Although comparatively few people live in these valleys, the amenity value of the area for tourism and leisure purposes would be greatly diminished.

1.1 Conclusion and recommendation

The results above show that the most heavily trafficked part of this motorway would be in the Cevo junction to Podgorica section, which would, if there were no tolls, carry 10,000 to 13,000 vehicles per day in 2027, but with tolls, would attract only about 4,000 vehicles per day. The sensitivity of traffic volume to tolls (i.e., overall journey cost) in this area is clearly apparent. This is because (unlike the N-S route) the road network is much denser than in the north, and, assuming the roads proposals in the PPM are implemented by 2027, there are various alternative routes.

In its present form the proposed alignment is not feasible, neither in socio-economic terms nor in financial terms. It is not considered worthwhile to proceed with further analysis and planning of this route in the foreseeable future.

APPENDIX A

Drive-through Survey: Adriatic–Ionian Highway route

31/10/2007

<u>Podgorica –Cevo</u>

Immediately after turning off from the main Podgorica – Niksic road, it was clear that the existing road to Cevo is simply a one lane road with width varying from 2 to 3 m. This road climbs uphill all the way to Cevo, gaining altitude from about 100m a.s.l. in Podgorica to circa 1000m a.s.l. in Cevo after some 30km travel. The road is so narrow that passing a car going in the opposite direction requires one of the two to stop and sometimes even to reverse to find the nearest passing place.

As shown in the picture below, the terrain is rocky with shrub and bushes, with steep hill sides and. The first impression is that, except for a good base, there are not too many advantages for the highway alignment in this area. If following the hill sides, a road construction will require a lot of viaducts and tunnels.

Some valleys can be used for the segments of the highway, but it should be borne in mind that the only settlements along this road are actually within those valleys, so external costs (in lost farmland other properties) may be high.

The area has very little arable land, and the only cultivation possible is either in the natural small valleys, or in terraced and semi-forest areas as shown in the picture below

Another type of farming is sheep and goat breeding

Cevo-Grahovo

This section is similar to the previous and maybe even more difficult for construction of the highway. The landscape is predominantly rocks and bushes with some forest areas.

From the environmental point of view no major water flows were seen along the route, apart from some water capture facilities as shown in the picture below.

The only easier area for construction of the highway would be in the Grahovo valley. However the valley floor is largely occupied with farmland and houses. See below.

Rock slides could be seen in places on the way.

In the vicinity of Grahovo there is a protection area for rare lizards, close to the existing road.

Grahovo-Nudo

This section was not visited, but it is believed to be similar to the previous two sections.

Marking of land and farm property - the result of TV campaigns related to highway project.

General

The trip from Podgorica via Cevo to Grahovo (circa 75km) lasted over 3 hours with an average speed of 30km/h. It was not possible to drive faster, due the terrain and road condition. Traffic was minimal, and is estimated as less than 50 per day; only five vehicles were encountered in the 3 hour trip. In contrast, the CGP traffic data for 2007 give 177 AADT for Grahovo-Resna, 135 AADT from Resna to Cevo, and 237 AADT Cevo-Danilovgrad.

TECHNICAL MEMORANDUM NO. 22

MOTORWAY BAR – BOLJARE
ANALYSIS: OPENING OF THE SECOND TUBE OF THE SOZINA TUNNEL

TABLE OF CONTENTS

1 BACKGROUND

The Sozina tunnel is on the section Bar - Tanki Rt. This toll tunnel of 4.2 km in length was constructed and opened for traffic in mid-2005. The table below shows results of a 7-day traffic survey by the LBG study team from 23rd October to 28th October 2007.

Table 1: Results of study traffic surveys

Sozina Tunnel

		29	23	24	25	26	27	28					
		Mon	Tue	Wed	The	Fri	Sat	Sun	**SUM**	**Total**	**ADT**	**ARHT**	**%**
1	P.Car (1,2,3)	3233	3422	3723	3722	3889	4043	3372	**25404**	**27281**	**3897**	**390**	**89%**
2	Light Delivery&Mikro bus (4,5)	252	292	292	300	334	254	153	**1877**				
3	Bus (more than 30 seats)(10,11,12)	40	34	39	37	44	34	42	**270**	**3529**	**504**	**50**	**11%**
4	Small truck (2-axle) (6,7)	130	106	146	104	132	108	57	**783**				
5	Medium truck (2-axle) (8)	100	148	145	162	185	72	37	**849**				
6	Heavy truck (5-axle art.) (9)	213	272	253	277	305	209	98	**1627**				
	TOT	**213**	**272**	**253**	**277**	**305**	**209**	**98**	**30810**		**4401**	**440**	
						Directional split		**I way**	**15405**	**50%**			
								II way	**15405**	**50%**			

Where:

ADT is Average Daily Traffic corresponding to the results of survey.

ARHT is Average Rush Hour Traffic corresponding to the 10% of the ADT.

Traffic forecasting – both general and using an assignment modeling process – was carried out by the study, and using the standard economic growth scenario, the forecast for Sozina tunnel is shown in Table 2 below.

Table 2: Results of traffic forecasting model for standard GDP/capita growth

Year	ADT	ARHT
2007	6,919	**692**
2015	11,620	**1,162**
2016	12,500	**1,250**
2017	13,380	**1,338**
2018	14,320	**1,432**
2019	15,320	**1,532**
2020	16,390	**1,639**

Where:

- ADT is an Average Daily Traffic from results of the survey.
- ARHT is an Average Rush Hour Traffic, corresponds to 10% of the ADT.

2 ROAD TRAFFIC CAPACITY OF SOZINA TUNNEL

In this memorandum, the objective is to find the year when the second tube of the tunnel will be necessary. There are various criteria on how to determine this year. The calculations in the present report are based on the road capacities.

The principal point of importance is that when Level of Service (LOS) descends to level E, traffic conditions start to become degraded very quickly. The average speed goes down and travel time increases rapidly. Inside the tunnel, the deterioration of traffic conditions could be particularly dangerous and such a low level of service should be avoided if at all possible.

For the above reasons construction of the second tube and open it for the traffic should intervene before the LOS changes from D to E value.

In order to find this year the Consultant used the HCS2000[1] model based on the HCM 2000.

In the tables below (following pages) results are provided from HCS2000. These are for the existing situation and also for future years.

Table 3: Inputs of HCM2000

Item	YEAR						
	2007	2015	2016	2017	2018	2019	2020
INPUT DATA							
Highway Class	2	2	2	2	2	2	2
Shoulder width	0.5 m	0.5 m	0.5 m	0.5 m	0.5 m	0.5 m	0.5 m
Lane width	3.5 m	3.5 m	3.5 m	3.5 m	3.5 m	3.5 m	3.5 m
Segment length	22 km	22 km	22 km	22 km	22 km	22 km	22 km
Terrain type	Level	Level	Level	Level	Level	Level	Level
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Trucks and buses	13%	11%	11%	11%	11%	11%	11%
Recreational vehicles	3%	3%	3%	3%	3%	3%	3%
No-passing zones	100%	100%	100%	100%	100%	100%	100%
Access points/km	0 km	0 km	0 km	0 km	0 km	0 km	0 km
Two-way hourly volume, V	440 veh/h	1,162 veh/h	1,250 veh/h	1,338 veh/h	1,432 veh/h	1,532 veh/h	1,639 veh/h
Directional split	50% / 50%	50% / 50%	50% / 50%	50% / 50%	50% / 50%	50% / 50%	50% / 50%

[1] HCM2000 by Mc Trans Center, University of Florida

AVERAGE TRAVEL SPEED							
Grade adjustment factor, fG	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PCE for trucks, ET	1.7	1.1	1.1	1.1	1.1	1.1	1.1
PCE for RVs, ER	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Heavy-vehicle adjustment factor	0.9170	0.989	0.989	0.989	0.989	0.989	0.989
Two-way flow rate,(note-1) vp	546 pc/h	1,335 pc/h	1,436 pc/h	1,537 pc/h	1,645 pc/h	1,760 pc/h	1,883 pc/h
Highest directional split proportion (note-2)	273 pc/h	668 pc/h	718 pc/h	769 pc/h	823 pc/h	880 pc/h	942 pc/h
Base free-flow speed, BFFS	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h
Adj. for lane and shoulder width, fLS	7.5 km/h	7.5 km/h	7.5 km/h	7.5 km/h	7.5 km/h	7.5 km/h	7.5 km/h
Adj. for access points, fA	0.0 km/h	0.0 km/h	0.0 km/h	0.0 km/h	0.0 km/h	0.0 km/h	0.0 km/h
Free-flow speed, FFS	62.5 km/h	62.5 km/h	62.5 km/h	62.5 km/h	62.5 km/h	62.5 km/h	62.5 km/h
Adjustment for no-passing zones, fnp	6.5 km/h	2.9 km/h	2.6 km/h	2.5 km/h	2.3 km/h	2.2 km/h	2.0 km/h
Average travel speed, ATS	49.2 km/h	42.9 km/h	41.9 km/h	40.8 km/h	39.6 km/h	38.3 km/h	37.0 km/h

Table 4: Outputs from HCM2000

Item	YEAR						
	2007	2015	2016	2017	2018	2019	2020
PERCENT TIME-SPENT-FOLLOWING							
Grade adjustment factor, fG	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PCE for trucks, ET	1.1	1.0	1.0	1.0	1.0	1.0	1.0
PCE for RVs, ER	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.987	1.0	1.0	1.0	1.0	1.0	1.0
Two-way flow rate,(note-1) vp	507 pc/h	1,320 pc/h	1,420 pc/h	1,520 pc/h	1,627 pc/h	1,741 pc/h	1,863 pc/h

Highest directional split proportion (note-2)	254	660	710	760	814	871	9324
Base percent time-spent-following, BPTSF	36%	68.7%	71.3%	73.7%	76.1%	78.4%	80.66%
Adj.for directional distribution and no-passing zones, fd/np	22.5	8.9	7.8	7.2	6.6	5.9	5.2
Percent time-spent-following, PTSF	58.5%	77.6%	79.1%	80.9%	82.6%	84.3%	85.8%
LEVEL OF SERVICE AND OTHER PERFORMANCE MEASURES							
Level of service, LOS	**C**	**D**	**D**	**D**	**D**	**D**	**E**
Volume to capacity ratio, v/c	**0.17**	**0.42**	**0.45**	**0.48**	**0.51**	**0.55**	**0.59**
Peak 15-min vehicle-kilometers of travel, VkmT15	**2,750 veh-km**	**7,263 veh-km**	**7,813 veh-km**	**8,363 veh-km**	**8,950 veh-km**	**9,575 veh-km**	**10,244 veh-km**
Peak-hour vehicle-kilometers of travel, VkmT60	**9,680 veh-km**	**25,554 veh-km**	**27,500 veh-km**	**29,436 veh-km**	**31,504 veh-km**	**33,704 veh-km**	**36,058 veh-km**
Peak 15-min total travel time, TT15	**55.9 veh-km**	**169.4 veh-km**	**186.4 veh-km**	**205.0 veh-km**	**226.0 veh-km**	**249.7 veh-km**	**277.0 veh-km**

Notes:

1. If vp >= 3200 pc/h, terminate analysis, since the LOS is F.

2. If highest directional split vp >= 1700 pc/h, terminate analysis, since the LOS is F.

3 SUMMARY & CONCLUSION

The results below show that until year 2019 the Level of Service in the single tube tunnel will be D. It should be noted that from year 2015 until 2019 the average travel speed (ATS) will decrease from 1.0 km/h per year to 1.3 km/h per year. In the year 2020 the Level of Service, in the single tube tunnel, passes to E.

It is our conclusion the second tube of the Sozina Tunnel should be open for the traffic not later than 2020.

ANNEX

Analysis Year 2007

HCS2000: Two-Lane Highways Release 4.1c

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Phone: Fax:
E-Mail:

_____Two-Way Two-Lane Highway Segment Analysis_____

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2007
Description Capacities of the two-lane one carriageway Sozina Tunnel

_____Input Data_____

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 13 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 440 veh/h
Directional split 50 / 50 %

_____Average Travel Speed_____

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.7
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.917
Two-way flow rate,(note-1) vp 546 pc/h
Highest directional split proportion (note-2) 273 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS	62.5	km/h
Adjustment for no-passing zones, fnp	6.5	km/h
Average travel speed, ATS	49.2	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.987	
Two-way flow rate,(note-1) vp	507	pc/h
Highest directional split proportion (note-2)	254	
Base percent time-spent-following, BPTSF	36.0	%
Adj.for directional distribution and no-passing zones, fd/np	22.5	
Percent time-spent-following, PTSF	58.5	%

Level of Service and Other Performance Measures

Level of service, LOS	**C**	
Volume to capacity ratio, v/c	0.17	
Peak 15-min vehicle-kilometers of travel, VkmT15	2750	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	9680	veh-km
Peak 15-min total travel time, TT15	55.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2015

HCS2000: Two-Lane Highways Release 4.1c

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Phone: Fax:
E-Mail:

_____Two-Way Two-Lane Highway Segment Analysis_____

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To **SOZINA TUNNEL**
Jurisdiction
Analysis Year 2015
Description Capacities of the two-lane one carriageway Sozina Tunnel

_____Input Data_____

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1162 veh/h
Directional split 50 / 50 %

_____Average Travel Speed_____

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1335 pc/h
Highest directional split proportion (note-2) 668 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.9	km/h
Average travel speed, ATS	42.9	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1320	pc/h
Highest directional split proportion (note-2)	660	
Base percent time-spent-following, BPTSF	68.7	%
Adj.for directional distribution and no-passing zones, fd/np	8.9	
Percent time-spent-following, PTSF	77.6	%

Level of Service and Other Performance Measures

Level of service, LOS	**D**	
Volume to capacity ratio, v/c	0.42	
Peak 15-min vehicle-kilometers of travel, VkmT15	7263	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	25564	veh-km
Peak 15-min total travel time, TT15	169.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2016

HCS2000: Two-Lane Highways Release 4.1c

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H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2016
Description Capacities of the two-lane one carriageway Sozina Tunnel

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1250 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1436 pc/h
Highest directional split proportion (note-2) 718 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.6	km/h
Average travel speed, ATS	41.9	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1420	pc/h
Highest directional split proportion (note-2)	710	
Base percent time-spent-following, BPTSF	71.3	%
Adj.for directional distribution and no-passing zones, fd/np	7.8	
Percent time-spent-following, PTSF	79.1	%

Level of Service and Other Performance Measures

Level of service, LOS	**D**	
Volume to capacity ratio, v/c	0.45	
Peak 15-min vehicle-kilometers of travel, VkmT15	7813	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	27500	veh-km
Peak 15-min total travel time, TT15	186.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2017

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2017
Description Capacities of the two-lane one carriageway Sozina Tunnel

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1338 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1537 pc/h
Highest directional split proportion (note-2) 769 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.5	km/h
Average travel speed, ATS	40.8	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1520	pc/h
Highest directional split proportion (note-2)	760	
Base percent time-spent-following, BPTSF	73.7	%
Adj.for directional distribution and no-passing zones, fd/np	7.2	
Percent time-spent-following, PTSF	80.9	%

Level of Service and Other Performance Measures

Level of service, LOS	**D**	
Volume to capacity ratio, v/c	0.48	
Peak 15-min vehicle-kilometers of travel, VkmT15	8363	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	29436	veh-km
Peak 15-min total travel time, TT15	205.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2018

HCS2000: Two-Lane Highways Release 4.1c

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H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2018
Description Capacities of the two-lane one carriageway Sozina Tunnel

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1432 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1645 pc/h
Highest directional split proportion (note-2) 823 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.3	km/h
Average travel speed, ATS	39.6	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1627	pc/h
Highest directional split proportion (note-2)	814	
Base percent time-spent-following, BPTSF	76.1	%
Adj.for directional distribution and no-passing zones, fd/np	6.6	
Percent time-spent-following, PTSF	82.6	%

Level of Service and Other Performance Measures

Level of service, LOS	**D**	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-kilometers of travel, VkmT15	8950	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	31504	veh-km
Peak 15-min total travel time, TT15	226.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2019

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2019
Description Capacities of the two-lane one carriageway Sozina Tunnel

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1532 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1760 pc/h
Highest directional split proportion (note-2) 880 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.2	km/h
Average travel speed, ATS	38.3	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1741	pc/h
Highest directional split proportion (note-2)	871	
Base percent time-spent-following, BPTSF	78.4	%
Adj.for directional distribution and no-passing zones, fd/np	5.9	
Percent time-spent-following, PTSF	84.3	%

Level of Service and Other Performance Measures

Level of service, LOS	**D**	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-kilometers of travel, VkmT15	9575	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	33704	veh-km
Peak 15-min total travel time, TT15	249.7	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Analysis Year 2020

HCS2000: Two-Lane Highways Release 4.1c

PPK
H&T

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst PPK
Agency/Co. Louis Berger SAS
Date Performed 23/03/08
Analysis Time Period 12h / 7 days
Highway M2
From/To SOZINA TUNNEL
Jurisdiction
Analysis Year 2020
Description Capacities of the two-lane one carriageway Sozina Tunnel

Input Data

Highway class Class 2
Shoulder width 0.5 m Peak-hour factor, PHF 0.88
Lane width 3.5 m % Trucks and buses 11 %
Segment length 22.0 km % Recreational vehicles 3 %
Terrain type Level % No-passing zones 100 %
Grade: Length km Access points/km 0 /km
Up/down %

Two-way hourly volume, V 1639 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.1
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, 0.989
Two-way flow rate,(note-1) vp 1883 pc/h
Highest directional split proportion (note-2) 942 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - km/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 70.0 km/h
Adj. for lane and shoulder width, fLS 7.5 km/h
Adj. for access points, fA 0.0 km/h

Free-flow speed, FFS 62.5 km/h

Adjustment for no-passing zones, fnp	2.0	km/h
Average travel speed, ATS	37.0	km/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1863	pc/h
Highest directional split proportion (note-2)	932	
Base percent time-spent-following, BPTSF	80.6	%
Adj.for directional distribution and no-passing zones, fd/np	5.2	
Percent time-spent-following, PTSF	85.8	%

Level of Service and Other Performance Measures

Level of service, LOS	**E**	
Volume to capacity ratio, v/c	0.59	
Peak 15-min vehicle-kilometers of travel, VkmT15	10244	veh-km
Peak-hour vehicle-kilometers of travel, VkmT60	36058	veh-km
Peak 15-min total travel time, TT15	277.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TECHNICAL MEMORANDUM NO. 23

OPTIMAL SOLUTION PROPOSAL FOR SELECTION OF THE ALIGNMENT ON NEWLY DESIGNED SECTIONS

TABLE OF CONTENTS

1 INTRODUCTION

Terms of Reference include a list of project documentation done so far. The Consultant's obligation is to make the general designs for the sections for which no documentation was done.

For the whole Bar - Boljare motorway the need has arisen to make the designs for two sectios and these are the following:

- For **Matesevo - Andrijevica** section no project documentation was done. The designs were done, but the route was treated as the road not a motorway and the adopted design speed value was 80 km/h. The possibility was left in the design (depending on the traffic load) for the road to turn into motorway and the designed road to be one carriegeway of the motorway;
- For **Virpazar - Smokovac** section the new Physical Plan of the Republic proposes the change of Podgorica bypass position on the part between junction „Farmaci“ and Velje brdo, so the two variants are done although the adopted general and conceptual designs exist.

According to the adopted draft new Physical Plan of the Republic, the direction of Podgorica bypass alignment is moved towards west, so the major part of the designed alignment is cancelled, of the motorway section Smokovac – crossing with the road Podgorica – Cetinje (Farmaci) included in the design.

The Consultant has made another two newly designed variants besides the existing, previously adopted Variant 1:

- Variant 2 – named “Komani“ and,
- Variant 3 – named „Zelenika“.

2 VIRPAZAR – SMOKOVAC SECTION

The section between grade-separated junctions “Virpazar” and “Smokovac” represents the first section according to the Terms of Reference. The section can be devided into three parts:

Data for the General design of the motorway, Virpazar-Smokovac section are taken up from the following designs:

1. The first part of the alignment, Virpazar-Tanki rt (first 3.0km), is taken up from the General design of motorway for Bar – Tanki rt section, of the Designer Saobraćaj inženjering and Faculty of Civil Engineering from Podgorica. The design was done in 1998, and the responsible design engineer was Ljubica Lazarević, B.Sc. in Civil Engineering;
2. The following part, Tanki rt - junction Farmaci, is taken up from the General design of motorway for Tanki rt – crossing with the road Podgorica – Cetinje section. The design was done by the company Put inženjering from Podgorica, and the responsible design engineer was Radenko Ostojić, B.Sc. in Civil Engineering;

   The combination of variants was taken up ‘’6’’, ‘’3’’ and ‘’1’’, in line with the conclusion of the Revision Commission, which also proposed variant ‘’2’’ for further elaboration. Variant ‘’2’’ has not been considered because it is situated on the other side of the railway line and is not in line with harmonization done between this general design and the conceptual design of Đurmani - Tanki rt section. The variant (6-3-1) is not completely harmonised and adopted, but there is a minor aberration here, and this could be solved during preparation of conceptual design. In conceptual design the alignment above watersource “Bole sestre” should also be modified, which is to be used for the purposes of regional water supply line for the coastal area. When the design was done as the water source for the purposes of regional water supply line, Karuč was actual, but in the meantime the situation changed. The alignment can and should bypass water protection zone, because bypassing of the zone is a much better solution than special protection measures and passing through the zone.
3. The remaining part of the alignment, on the existing alignment, between the junctions ‘’Farmaci’’ and ‘’Smokovac’’, is taken up from the general design of the section Smokovac – crossing with the road Podgorica - Cetinje. The design was done by the Republic Institute for Urban Planning and Design from Podgorica and the responsible design engineer was Branislav Canić, B.Sc. in Civil Engineering.

VARIANT 1 – PREVIOUSLY ADOPTED GENERAL DESIGN

In the Physical plan of the Republic, which was recently adopted, there was some moving of the bypass Podgorica alignment. In the previous Physical plan of the Republic – Changes and amendments (1997) and the adopted General and Conceptual design, the motorway alignment passed through Beri area, along the southeast side of Zelenika hill and eastwards, but in the direct vicinity of the electrical substation.

The misadvantages of the mentioned alignment are the following: it would partly pass through Beri and it would separate the remaining, biggest part of Beri area from the urban part of Podgorica.

Big conflicts, that is, the largest number of facilities to be wrecked along the alignment is situated along the edges of Velje brdo.

The alignment of this motorway Variant starts from Farmaci and descends into Bersko polje before Sutinska jama. Through Bersko polje the alignment has the shape of an arch. A traffic junction which connects Adriatic-Ionian and Bar-Boljare motorway is designed east from the local church. From this junction motorway alignment goes along the alluvial plain of Sitnica and it crosses it three times, and in slight arch passes over Tolosko polje from which it ascends gradually to the southern side of Velje brdo and continues further towards Smokovac.

The alignment of Adriatic-Ionian motorway from Komani continues towards southeast to the village Cafa where it starts descending into northwest area of Bersko polje. The alignment then passes along the north edge of Bersko polje and east from the local church, on the traffic junction it connects with the alignment of Bar-Boljare motorway.

Geologic terrain characteristics of the subject alignments are the same as for the other variants. The terrain made of limestone, dolomitic limestones and dolomites is favourable for construction of this kind of facilities and it forms around 50% of the alignment as. Other 50% of the alignment is made of terrace sediments which classify these terrains into conditionally favourable ones for construction of the road and road facilities.

From hydrogeologic aspect it is obvious that watersource Beri, considering the alignment position of the Adriatic-Ionian motorway, is potentially geopardised both during the construction and during motorway operations.

Proposal for protection measures against waters from the carriageway is the construction of sewage system which would collect all the waters from the motorway, they would be treated adequately and after the treatment they would be discharged into the recipient.

Based on the available details, it can be seen that variant 1, although it represents the shortest link compared to the other two, also foresees the correction of Sitnica river bed in the length of L=600m on km 52+500. Displacement of the river bed, although on relatively short length, can have extremely negative impact and disturb the habitation of the existing flora and fauna. Besides that, two main junctions on km 51+500 and km 53+000 where the first one foresees crossing with Adriatic – Ionian motorway, are situated in direct vicinity of river Sitnica, so the special care should be taken of drainage of surface waters from the road in order to avoid their direct contact with the river and contamination of water. Experiances from the region, Sarajevo bypass, tell us that big financial institutions which are usually involved in financial construction of such projects have great remarks on river streams correction which also deserves attention.

VARIANT 2 - KOMANI

The new PPR proposes the alignment to bypass Beri area and to pass along the northwest side of Zelenika hill.

This alignment is longer and somewhat more expensive, but it geopardises good quality agricultural land incomparably less, because it bypasses Beri area.

Because of protection of certain sources, which are on lower altitudes than the alignment, the collection and refinement of all the water coming down from the carriageway must be foreseen , which was done so far during the detailed elaboration of project documentation (Conceptual and Main design).

The alignments of Adriatic-Ionian and Bar-Boljare motorway are connected by the traffic junction in Komani.

Variant 3 and Variant 2 have the same alignment from Farmaci to Sutinska jama. From Sutinska jama the alignment of Variant 2 goes towards northwest to Rajkove strane where it turns towards area of Cafa village and farther to the traffic junction in Komani. From petlja in Komani the motorway alignment passes along northwest side of Zelenika hill, crosses river Matica nd Tolosko polje. It turns towards east near Crvena stijena and continues along the south side of Velje brdo towards Smokovac.

From Farmaci to traffic junction in Komani the terrain is made of limestone, dolomitic limestone and dolomites which, from hydrogeologic aspect, belong to waterporous rocks, and from engineering – geological aspect, to to the group of rocks and rock complexes favourable for construction of roads and road facilities. Rocks of this group form around 90% of this variant alignment. The remaining part of the alignment goes across Tolosko polje, which is made of terrace sediments classified in conditionally favourable terrains for construction of such facilities.

We can estimate as unfavourable the fact that the alignment from Rajkove strane to Cafa passes upstream from watersource Beri, that is, along the terrain which is waterporous and from which all surface waters flow off to the underground, which should be expected at watersource Beri.

The possible protection measure of watersource Beri is the construction of sewage system which would collect all the waters from the motorway, they would be treated properly and discharged into the recipient after the treatment

This variant,, although relatively longer than the other two (it increases the alignment Bar – Boljari for some 3Km=), from environmental aspect, presents maybe the best variant considering the fact that it doesn't foresee neither the displacement of riverbed, nor excavation of tunnel and the junction where this road crosses with Adriatic-Ionian motorway is dislocated regarding watercourses, while the other junction is distant enough from river Matica (Sitnica tributary). Even in this variant the biggest attention should be paid to the drainage of surface waters on the segment which follows river Matica on km 54+100 to km 55+200.

VARIANT 3 - ZELENIKA

At the request of the authorities from capital city of Podgorica variant (Zelenika tunnel) is also elaborated, which is situated, by position ad by length, between the two previously discussed variants.

The advantage of the variant with the tunnel through Zelenika is that is does not geopardise agricultural land southeast and northwest from Zelenika hill, but it passes virtually through the middle of Beri, and there is also the connection with Adriatic-Ionian motorway. There are several sources very close to the future grade-separated junction which must be protected.

It was already stated that this variant has the same alignment as variant 2 to Sutinska jama. From Sutinska jama the alignment is parallel with Variant 2, and after crossing over the local road for Krusi it turns northeast, crosses over Bersko polje beneath watersource Beri, continues along the tunnel through Zelenika hill, crosses over Tolosko polje to Crvena stijena and continues towards Smokovac along already described alignment. In front of the tunnel a traffic junction is designed which connects Bar-Boljare with Adriatic-Ionian motorway.

From Farmaci to Bersko polje the alignment of the terrain is made of limestones, dolomitic limestones and dolomites of the same geologic, hydrogeologic and engineering-geological characteristics as on the previously described alignment. The terrain of Bersko polje is made of terrace sediments – pebbles and sand. The major part of the terrain, over 80% where this alignment is designed, belongs to the terrains favourable for construction of roads and road facilities, and the remaining part belongs to the rerrains conditionally favourable for construction (Bersko and Tolosko polje).

From hydrogeologic aspect it is favourable that the motorway alignment passes downstream from watersource Beri. However, the alignment of Adriatic-Ionian motorway comes to the junction in Beri from the terrain which is a catchment area of watersource Beri.

Construction works in Beri should be beared in mind, works on tunnel excavation through Zelenika hill with the use of explosives and the real possibility, considering the specificities of karst aquifers, that these works could disturb the existing watersource regime.

Watersource protection measures agains pollution with waters from the carriageway, are proposed in the previous variants.

This variant, as it was already stated, foresees tunnel excavation, beneath Zelenika hill. The very process of tunnel excavation creates certain negative impact to the environment. In this variant, besides the measures that should be undertaken during the construction works, regarding mining, vibrations, disposal of excavation material and similar, it should be beared in mind that the tunnel presents an exceptional place of pollution because of concentration of various dangerous materials resulting from deposition of exhaust gases from the vehicles passing through the tunnel. It should especially be noted that on the very exit of the tunnel there is river Sitnica and thus, any possibility for the surface waters to reach the river must absolutely be stopped.

For Variants 2-Komani and 3-Zelenika, as well as for previously done variant 1 (previously adopted General design), design speed of 100km/h was taken up and the following elements:

- minimum horizontal radii R_{min} = 450 m
- maximum longitudinal gradient i_{max} = 5%
- minimum vertical radii (convex) R_{min} = 10 000 m
- minimum vertical radii (concave) R_{min} = 7 000 m
- traffic lane width t_s = 3,5 m
- emergency lane width t_z = 2,5 m
- right edge marking line width t_i = 0,2 m
- central reserve width R_t = 4,0 m
- shoulders width b = 1,0 m
- gutters width r = 0,75 m
- berm width b' = 1,0 m

Thus, the same elements were implemented while designing variants 2-Komani and 3-Zelenika due to unification of parameters for comparison.

Maksimum gradients are 4.30 % (1675m) for the existing alignment, 5% (669m) for variant Komani and 4.50 % (1123m) for variant with Zelenika tunnel.

Table 1

VIRPAZAR -SMOKOVAC					
SECTION	LENGTH	MAKSIMUM LONGITUDINAL GRADIENT	LENGTH WITH GRADIENT 0-2 %	LENGTH WITH GRADIENT 0-4%	LENGTH WITH GRADIENT 4-5 %
VARIANT-1- ACCORDING TO THE PREVIOUSLY ADOPTED GENERAL DESIGN	38.23	4.30%	26.117 km or 68.31% of the alignment length	10.439 km or 27.31% of the alignment length	1.675 km or 4.38% of the alignment length
VARIANT -2-''KOMANI'' PACCORDING TO THE NEW PHYSICAL PLAN OF THE REPUBLIC	40.98	5.00%	29.055 km or 70.90% of the alignment length	10.936 km or 26.69 % of the alignment length	0.978 km or 2.41% of the alignment length
VARIANT -3-''ZELENIKA'' – REQUEST BY THE CAPITAL CITY	39.54	4.50%	28.031 km or 70.90% of the alignment length	10.380 km or 26.26% of the alignment length	1.123 km or 2.84% of the alignment length

For the existing alignment, a minimum horizontal radius implemented is 450m and for the variants 500m, except that for variant Komani, in the grade-separated junction itself smaller radii are implemented (200m and 400m).

Within Bill of quantities the prices of construction are given for all three variants, separately for phase I (half motorway) and separately for final solution (full motorway). For Podgorica bypass it is planned to perform complete earthworksdate during phase I.

Table 2

VIRPAZAR -SMOKOVAC					
SECTION	LENGTH (km)	HALFMOTORWAY		FULL MOTORWAY	
		By km	Total	By km	Total
VARIANT 1 - ACCORDING TO THE PREVIOUSLY ADOPTED GENERAL DESIGN	38.23	€ 8,405,311.01	€ 321,343,445.24	€ 12,283,097.35	€ 469,595,094.89
VARIANT 2 - ''KOMANI'' ACCORDING TO THE NEW PHYSICAL PLAN OF THE REPUBLIC	40.98	€ 8,341,305.42	€ 341,810,013.47	€ 12,198,136.27	€ 499,855,228.20
VARIANT 3 - ''ZELENIKA'' – REQUEST BY THE CAPITAL CITY	39.54	€ 8,809,538.53	€ 348,285,105.72	€ 12,781,113.20	€ 505,301,310.22

Bill of quantities does not include junction Smokovac, since it is according to the authorities from the Transport Directorate included withinn the following section from Smokovac to Matesevo.

Table 3

VIRPAZAR -SMOKOVAC					
SECTION	LENGTH (km)	BRIDGES		TUNNELS	
		Length (km)	%	Lenght (km)	%
VARIANT 1 - ACCORDING TO THE PREVIOUSLY ADOPTED GENERAL DESIGN	38.23	3.980	10,41%	5.510	14,41%
VARIANT 2 - ‘’KOMANI’’ ACCORDING TO THE NEW PHYSICAL PLAN OF THE REPUBLIC	40.98	5.425	13,24%	5.510	13,45%
VARIANT - ‘’ZELENIKA’’ – REQUEST BY THE CAPITAL CITY	39.54	4.242	10,73%	7.080%	17.91%

Generally, it is not simple to choose one of the proposed variants. Each of them has its advantages but misadvantages as well. All the variants are partly passing along the border of General urban plan of Podgorica or in its direct vicinity, therefore it can be expected that there would be some facilities on the alignment to be wrecked. Based on the base map on which the design was done, this number of facilities can not be precisely stated because of the proportion (R 1:25000) and the year when this base map was done.

When choosing the optimal variant, Adriatic-Ionian motorway and crossing of these two roads should also be considered. If both motorways were considered, then it can be seen that the shortest variant (the alignment from the old PPR) requires the longest length of Adriatic-Ionian motorway, and for the longest variant (new PPR) the length of Adriatic-Ionian motorway is the shortest.

For Adriatic-Ionian motorway it is favourable for crossing with Bar-Boljare motorway to be on as higher altitude as possible, because the longitudinal gradient on that part of the motorway, before the junction, due to the terrain configuration, will be 4.50-5.00%.

From geologic, hydrogeologic and engineering-geological aspect, and for the need to protect aquifers in karst against pollution, it is necessary to chanell the waters from the carriageway, treat them properly and after that release them into the recipient. For that kind of approach, the Consultant considers variant 2 as the most favourable one.

Based on all above stated, variant Komani has the advantage among the three compared variants, that is, the variant from the recently adopted Physical Plan of the Republic.

3 MATESEVO – ANDRIJEVICA – BERANE SECTION

Matesevo – Berane –Andrijevica section is the third section of Bar-Boljare motorway according to the Terms of Reference.

The section can be devided into two stages and these are:

1. **Matesevo – Andrijevica**, the section that requires the preparation of General design within the Feasibility Study;
2. **Andrijevica – Berane**, the section for which project documentation was done within motorway General design for Andrijevica – Berane – Boljare section, done by company "Put inženjering" from Podgorica, and the responsible design engineer was Radenko Ostojić, B.Sc. in Civil Engineering.

For Matesevo – Andrijevica section two variants were elaborated and the basic difference is in the length of Trešnjevik tunnel, that is, in maximum elevation.

The mountain chain of Trešnjevik (1686m amsl) has a N-W direction, coverts the central part of corridor from Matesevo to Andrijevica.

Area of Tresnjevik and much wider is made of Permian shaley clay, marl, marly clay, quartz sandstones and subordinate conglomerates and black limestone with a lotof calcite wires.

The terrains made of these sediments, in hydrogeologic sense, represent a non-porous environment, and from the engineering-geological aspect they belong to the terrains conditionally favourable for construction of roads and road facilities.

Considering the fact that the terrain is water non-porouos, permanent and occasional surface streams are numerous, and it could be said for the occasional ones that they are of torrential character.

In such terrain conditions on location Han Drndarski two variants of motorway alignment are given, both of them with the construction of tunnel through mountain massif of Tresnjevik.

VARIANT 1

For variant ''1'' the tunnel length is 3600m, and input portal is at the altitude of 1165m amsl. Onsidering the fact that these are high altitudes, the difference in elevation of 50m, compared to variant ''2'', influences easier maintainance.

Maximum longitudinal gradient for both variants is 5%, for variant ''1'' at the length of 2307.01m (905.20+982.98+418.83).

VARIANT 2

For variant ''2'' the tunnel length is 2785m, but the maximum elevation is 1215 mnm.

Maksimum longitudinal gradient for variant ''2'' is 5%, at the length of 2932.13m (905.20+625.12+982.98+418.83).

Minimum horizontal radii, for both variants is 450m.

As well as for the other sections, the adopted design speed is 100km/h and the following elements:

- minimum horizontal radii R_{min} =450 m
- maximum longitudinal gradient i_{ma} i_{max} =5%
- minimum vertical radii (convex) R_{min} = 10 000 m
- minimum vertical radii (concave) R_{min} = 7 000 m
- traffic lane width t_k=3,5 m
- emergency lane width t_z=2,5 m
- right edge marking line width t_i = 0,2 m
- central reserve width R_t=4,00 m
- shoulders width b=1,0 m
- gutters width r = 0,75 m
- berm width b' = 1,0 m

Table 1

MATESEVO – ANDRIJEVICA					
SECTION	LENGTH	MAXIMUM LONGITUDINAL GRADIENT	LENGTH WITH THE GRADIENT 0-2 %	LENGTH WITH THE GRADIENT 0-4%	LENGTH WITH THE GRADIENT 4-5 %
VARIANT "1"	23.40	5.00%	10.785 km or 46.09% of the alignment length	3.472 km or 14.83% of the alignment length	9.143 km or 39.08% of the alignment length
VARIANT "2"	23.56	5.00%	5.336 km or 22.65% of the alignment length	8.871 km or 37.65 % of the alignment length	9.352 km or 39.70% of the alignment length

Table 2

MATESEVO – ANDRIJEVICA					
SECTION	LENGTH (km)	HALF MOTORWAY		FULL MOTORWAY	
		By km	Total	By km	Total
VARIANT "1"	23.40	€ 6,104,728.46	€ 142,850,645.95	€ 11,496,040.73	€ 269,007,353.13
VARIANT "2"	23.56	€ 6,003,512.37	€ 141,442,751.55	€ 11,323,23.09	€ 266,755,465.90

Table 3

MATESEVO – ANDRIJEVICA					
SECTION	LENGTH (km)	BRIDGES		TUNNELS	
		length (km)	% of the alignment	length (km)	% of the alignment
VARIANT "1"	23.40	2,900.00	12.39	5,735.00	24.51
VARIANT "2"	23.56	3,060.00	12.99	5,443.00	23.10

From the aspect of geologic, hydrogeologic and engineering- geological characteristics of the terrain, they are the same for both variants, as well as the conditions for construction.

Variant ''1'' is a little bit longer, it has smaller longitudinal gradient compared to variant ''2''. Tunnel portal of variant ''2'' is on 60m higher altitude than variant '1''. Besides, the alignment of variant ''2'' from chainage 10+820km to 11+800km (where the tunnel starts) passes down the valley of river Stavnjak and its tributaries (Crni potok and similar), that is, through the area of torrential streams.

From the environmental aspect, in both variants, this section is, as already stated, identical along the whole alignment except from km 9+300 to 15+400. In both situations tunnel portals are coming out close to waterstreams, so the special attention should be paid to drainage of surface waters from the tunnel, in order to prevent them from reaching the river beds. What should also be borne in mind in variant 2 is the drainage of waters from the carriageway which follows river Drcka from km 10+820 to the beginning of the tunnel km 11+800.

Considering the fact that the characteristics of this segment of the section in both variants are similar, variant 1 could be given a slight advantage over the another variant but in both cases care should be taken of possible environmental impacts during works and operations as it is stated in Environmental Impact Study.

Based on all above mentioned, in Consultant's opinion, variant 1 has a slight advantage.

4 SHORT SUMMARY

Taking into consideration the conducted comparative analysis for Virpazar – Smokovac section, as far as Consultant is concerned, **variant 2 – Komani** has the advantage, and as per Matesevo – Andrijevica section the Consultant considers that **variant 1** has the advantage.

However, it should be noted that the final decision on adoption of the most favourable solution brings the project team for monitoring of project implementation of motorway construction in Montenegro and Revision Commission within that team.

TECHNICAL MEMORANDUM NO. 24

REVIEW AND COMMENT ON THE LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES

TABLE OF CONTENTS

1 COMMENTS ON THE 2002 LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES

Private sector participation in the delivery of public services may take many forms and there are many permutations involving ownership and operation. Most choices regarding such private sector participation do not represent a simple dichotomy between public and private ownership but include a wide range of options related to the incurred risks. Nonetheless, the law must consider every option and weigh its advantages and disadvantages. The 2002 law on private sector participation in delivery of public services, was a useful step to enhance the private sector participation, but this law does not any longer meet the needs for private sector intervention in the field of public service.

2 GENERAL COMMENTS ON THE LAW

Limited scope of the provisions of this law on private sector participation in delivery of public services

According to its article 1, the purpose of the Law is «*to improve the participation of the private sector for the delivery of public services and, while taking into account the need for good governance and economic growth».*

Some other point could have been fixed as general objectives, such as the delivery of service at the best conditions of price and quality.

Further, article 2 «application» states that the Law shall apply to delivery of public services related to:

- Leasing and management contracts;
- Concessions;
- Built-operate transfer arrangements (hereinafter: BOT);
- Regulatory bodies defined under this Law.

One notes first that the law does not include public procurement in the private sector participation in the delivery of public services, since public procurement has its own rules. But also, at the time where this law was enacted, the legal framework of the new forms of Public Private Partnerships was not defined and even known (outside the case of very rare countries).

Objectives may not be the same (and often shall be different) in a lease formula and in a management contract on one side and in the Concession/BOT on the other side. The law should require, when public entity or a group of public entities together proposes a private sector partnership, that such entities demonstrate the specific needs for the kind of proposed partnership. It is indeed crucial that the entity gives the grounds for the proposed form of the private sector participation. The list of details mentioned in the background document submitted to the authorities, under article 4, is a mere description of what shall be the main clauses of the contract. As to the objectives listed in article 11, however interesting they are in terms of description of objectives and rationale, they do not answer the question: On which grounds, objectives and rationale is based the proposed choice between the three forms (lease, management, or concession/BOT) of private sector participation in the delivery of public services?

Some definitions raise question and may be confusing. Thus Build-Operate-Transfer, BOT": is defined as «*a contract arrangement, under a franchise, whereby a private investor and /or operator is obliged…*» It is needed to have a clear definition of one partner, which is committed for the whole contract, whatever are its own arrangments with other partners may (within a consortium, through subcontracting). A BOT can be contracted with an Investor <u>or</u> an operator.

The Law provides for a very general exception to its own precise rules. Thus an interesting provision is given in article 10, paragraph 1, which decides that public entity may propose a combination of arrangements provided for in article 4 and goes on in requiring that in this case such a combination must include conditions for each separate arrangement that is being proposed. That leaves room to public entities for flexibility and possible adaptation of arrangments to their specific needs, but subject to the condition of remaining in the framework of the law.

But the second paragraph of the same article 10 is very interesting in the sense that it has no legal effect in itself, but is an invitation to the Authorities to enact legislation. This paragraph states that the Government may decide to, in view of liberalization of the economy, permit the inclusion of private sector by applying different contractual arrangements than the ones provided for in the Law, and the paragraph goes on and requires that such different contractual arrangements should be entered into «*according to the conditions provided by a separate Law».*

The provisions of this 2002 law are hereafter examined. The rules on seeking of offers for the Concession or BOT do not raise major questions (1). More has to be said on the contractual vehicles of delivery of public services, who do not imply substantial investments (Leasing and management contracts) (2) and the ones who do need major investments (Concessions and BOT) (3) before viewing a new form of private provision of public service as the Public Private Partneships system (4).

3 PRE-QUALIFICATION OF INVESTORS AND SEEKING OF OFFERS FOR CONCESSIONS OR BOT

As far as the chapter IV bearing on «Pre-qualification of investors and seeking of Offers for concessions or BOT», is concerned, its article 19 prohibits an unsolicited offer and any form of direct agreement without pre-qualification or solicitation. It states that, therefore, to ensure transparency and fair competition, for concessions or BOT arrangements, any unsolicited offer or direct agreement shall, upon receipt, be rejected and not be considered further. But unsolicited offers are now accepted in many legal systems, since they are useful and a private enterprise may identify a need and responses to this need. The question is not to enact a prohibition, but on the contrary how, for a public authority, to take advantage of any private sector initiative, and how in such cases, to protect the public interest by ensuring that principles of transparency, competition and equal treatment with other potential competitors, are duly complied with. The law should include provisions to regulate such unsolicited proposals. Thus a set of procedural rules should be inserted in the law, as regards the criteria to admit unsolicited proposals, the procedures for determining this admissibility, the selection procedure in accordance with the other provisions of the law, the respective rules to be observed in case unsolicited proposals do involve or do not involve intellectual property, trade secrets or other exclusive rights.

Also, unclear provisions on dialogue should be amended. Thus, the undertaking of dialogue with investors before award, pursuant to Article 22, paragraph 6 of the Law, according to the subsequent article 24, is only for improvement of the understanding of the offer, before award. The law forbides for such a dialogue, to result in negotiation *«so as to alter substantially an offer or to render it substantially responsive to the solicitation documents».*But worded as it is, such a rule, being vague, is deprived of any efficiency. Precise and binding provisions should decide how such a dialogue is to be led, rules of transparency vis a vis the other investors…

Otherwise, Chapter IV on the pre-qualification of investors and seeking of offers for concessions or BOT provides for a set of rules, looking more as useful guidelines to be followed when drafting the bidding document or setting mere procedural rules to observe when proceeding to the bidding. But guidelines or implementing procedural rules, set out in a law as it is in this chapter may result in heavy, long lasting procedures for the awarding of contracts by the State or local governments. And a law, if its rules prove to be too complex, not flexible, not fitted with the necessity to provide public services thanks to fast administrative procedures, can not be changed as a mere decree, an order of the Minister or bidding instructions.

The institutional set up to grant concession and BOT

The law foresees the participation of various bodies in the contract awarding process, such as the Project Assesment Unit (PAU) established by the Public Body responsible for the project, and the ad-hoc Evaluation Committee for the prequalification phase, together with the PAU. The public entity responsible for the project is entitled to award the contract (subject to the approvals required under the Law)**.** But another ad-hoc Evaluation Committee is mentioned in the law (article 52) to undertake evaluation, whose recommendations for award are deemed to be final. In addition for granting a Concession, the recommendation to grant a concession has to be submitted to the government through the relevant Regulatory Body who has also to submit a reasoned recommendation to the government (article 77).

4 THE PROVISIONS OF THE LAW ON LEASING AND MANAGEMENT CONTRACTS

4.1 The leasing contract

According to the defintion given in article 3, a "leasing" is the *granting the possession of movable or immovable properties to another in return for rent».*

A lease contract is a contract under which a lessor delivers leased property to the lessee for the lessee's use or benefit and the lessee pays a rent. A lease contract is usually shorter than a concession or BOT contract (less than 10 or 15 years).

The conditions to select a lease to deliver public services as an alternative to public investment, is met according to article 6 where:

- *there is an evident situation of lack of funds for such public investment;*
- *the beneficiaries are suffering from lack of public services; and,*
- *the funds can be properly appropriated for the private investor or operator to meet its obligations under such contract arrangement*.

These cumulative conditions (the three conditions according to the text in the English version, must be satisfied) could form the basis for a Public Private Partnership system in a future legislation.

Unfortunately, they are not consistent, at least partially with the provisions of Chapter V on Leasing. Article 55 of the Law, provides for two kinds of leasing contract when stating that leasing shall be permitted:

1. for existing public facilities, to be rehabilitated or not, or for new public facilities (public facilities),
2. or for the use of an existing private facility to be utilized for public uses.

Therefore the three conditions to select a lease contract to deliver public services are only met in the case of an existing private facility as provided for in article 58 («*Use of existing private facility for public use»).* Inconsistency of the law does affect the possibility to grant a lease to a private party, in the case of existing public facilities (article 56) and new public facilities (article 57). Such leases of existing or new public facilities are the most common cases of lease. Anyway such inconsistency in the Law should be removed in any new law on delivery of public services by the private sector.

But more important is the fact that the Law (Chapter V) does not encompass rules on the regime of the lease, save some scarce provisions, for example on the insurance (article 59 according to which the insurance shall be borne by the private investor or operator), or on the maintenance. The provisions on the maximum leasing fees payable or on the subsidy may be challenged as inadequate in some cases, and should therefore be left to the contractual field.

The leasing fees viewed in the law are considered only as far as is concerned the increase of the fees payable for the renewal of the leasing agreement.

Although the regime of the lease is of crucial importance, the law does mention only procedural rules *(seeking the authorization… obtaining prior approval*…).

But lease arrangements can be a way to improve the delivery of public services by the private sector, where there is a lack of public funds. Concessions in the broad sense come in different forms. As well as pure concessions (concessions stricto sensu), there are arrangements such as leases or affermages. What really matters is not the the name (concession, lease or affermage) but the part played by and the respective responsabilities between the public and private persons. In a lease (or to be more precise an «affermage »), the concessionaire (or lessee in the case of lease-affermage) is not paid a fee by the government. The concessionaire's profits depend directly on the operating profits. Operating risk is thus fully transferred to the concessionaire or Lessee. The government still maintains responsibility for investment and thus bears investment risk. This more restrictive definition of a concession where asset ownership remains in public hands but also where the private operator is responsible for new investments as well as operating and maintaining existing assets, may be another form of private sector participation in the delivey of public services. In many countries, lease agreements are used as a sort of concession/BOT system but where no major investments are needed These agreements are therefore concluded for shorter periods. A facility and the related public service are managed by an operator (the Lessee) at its own risks. The lessee collects fees from the users and its profits depend directly on its operating profits,

Therefore in such a Law on private sector participation in the delivey of public services should take into account issues related to the design, award, implementing, monitoring, and financing of concessions.

4.2 The management contract

The management contract is, according to the definition given in the law, a contract to engage the services of the people in a company, or in a firm, who are responsible for its operation. The conditions to select a management contract to deliver public services as an alternative to public investment, in addition to the details to be given in the background document submitted to the approval of the competent authorities, is met according to article 7 where financial risks are too heavy for a private operator to provide services under a lease or concession/BOT system. The law mentions:

- Initial conditions not conducive to private sector investment and risk taking;
- Tariffs below cost recovery levels.

Another case, based on different grounds, provided for in the law is the need to administer and manage a complex arrangement, whether financial or technical.

In this latter case the management contract may be an adequate answer to this issue, but typically answers to such issues are now given in many jurisdictions, by Public Private Partneship (PPP) system. But even in this case, need to administer and manage a complex arrangement, whether financial or technical, delicate by definition, the law should mention conditions in selecting management contracts in such cases, and should also provides for benchmarks, criteria, and procedures to enter into such arrangements. . The provisions given in chapter six (articles 64 to 66) on standard use of terms of reference, monitoring of consultants, endorsement by relevant authorities, reports by consultants, are mere administrative guidelines to be detailed in an administrative manual of procedures, but don't bring elements to secure the delivery of public services in such "complex arrangement". Of course, rules on Public Private Partnership system, which will, one presumes, be adopted, will deal with the matter.

Another kind of management contract not viewed in the law but not excluded, if one considers article 10, leaving to the Government the possibility to use a combination of arrangements provided for in the law (lease, management, concession/BOT) or different contractual arrangements not provided for in the law, is the management contract with incentive payments. Management contracts with incentive payments provide for a performance-related payment. Part of the operating risk of the business may be transferred from the government to the private operator, since the operator's profits may vary with the operating performance of the company. But significant operating risk remains with the government as long as the government's financial returns still depend on the operator's operating profits.

5 CONCESSIONS

5.1 Provisions on concession show a strong unilateral public law approach

Pursuant to the law (article 79) a decree regulating the details and conditions for granting a concession has to be adopted by the government. Such a decree has to include items the list of which is given in the law (Article 78). Since the «details» are to be included in the decree and since any concession contract has to be concluded in conformity with the terms and conditions set out in the concession decree (article 80), one hardly sees the room left for negotiation on the content of the contract.

Limited scope of the concession under this law

The provisions on concession in this law are typically provisions of a mining code (Legislative stabilisation clause, article 90). Concession agreements are in this law, limited to natural resources exploitation, including tourism activities. This article is not consistent with the definition given in article 3, which has an even narower scope and does not include tourism activities since it applies only to «*the proper extraction or exploitation of natural resources or raw materials*» (it may be a gas exploration or exploitation contract). In this article « *revenues may be generated therefrom* ». In article 4, on the contrary, the *«local or foreign firm or company…. in return provide revenues to the Government of the Republic of Montenegro (hereinafter Government) or to a Self-Local Government*» In one case (the present article) the concession may raise revenue for the Public Authority, but also may not. In the second case (the definition), the revenue from the concession is a mandatory element of this contractual arrangement.

The revenues for the government are only provided for in the definition *«per unit exploited or extracted».*

When according to the definition *«such arrangement may include investment or rehabilitation by the private sector», article 8,* 3) rules that *«major private financial or technical inputs are necessary therefore».*

The mention in article 8, 5) according to which «*the quality level of services and the applicable tariffs*» may be controlled by «*a regulatory body*» is not really fitted for a concession limited to exploitation of natural resources.

Many provisions of the Chapter VII on Concession are detailed rules one expects to find in a bye-law or even in a mining or gas contract. Other rules could be joint provisions with the provisions on BOT contracts.

5.2 Contradictory or unclear provisions on concession

Article 75 states that a concession may be granted in order to provide for:….3) *technical and technological uniformity of systems in the field of infrastructure; 4) efficient operation and rational control of such systems; and, 5) protection and improvement of the environment in conformity with the environmental protection regulation.* Infrastructure, as such, is not related to the exploitation of natural resources or goods in general use. Even, the majority of infrastructure is not at all linked to the exploitation of natural resources.

6 THE BUILT OPERATE TRANSFER ARRANGEMENT

The provisions on BOT, contained in Chapter VIII relate first to the types of BOT and the eligible type of project, which cover a large number of sectors where infrastructure or projects and related facilities are permitted. Conditions for the BOT projects and the procedure to grant BOTs are also listed in the law (Conditions for prequalification, for bidding, feasiblity study). Some rules set usual obligations on the BOT company (establishment, registration, training of the personnel). Allocation of risks is mentioned in article 125 under the heading «changes in policy». Applicable law is, according to article 126, the law of Montenegro, but the reference to the best international practice, however interesting it may be, is rather vague and should be supplemented in the contracts. Provision on Court proceedings for BOT may raise difficulties in the sense that it states that if a settlement can not be reached through consultation after 30 days, such disputes shall be submitted to a Court of the Republic of Montenegro. The fact that the latest UNCITRAL Arbitration Rules, supplemented by the Supplemental Rules of the International Center for the Settlement of Investment Disputes (ICSID) shall be applied, does not prevent international investors in major investments to demand for international arbitration where the judicial system in a small country is weak and more subject to local influence. Thus parties will often want to agree on a dispute resolution mechanism in their concession agreement that will permit them to avoid the jurisdiction of the national courts as much as possible. In some cases, however, the parties can not totally avoid domestic courts (disputes arising from contracts with local employees, suppliers, and customers generally fall within the exclusive jurisdiction of local courts). But to provide in the law, as it is the case, that any dispute about the concession contract, shall be submitted to a national court, therefore forbidding international arbitration, is very damaging in terms of negotation, since a heavier legal risk has always financial consequencies.

While details vary, the key elements of cross-sectoral framework law on private Sector Participation in Delivery of Public Services should include clear rules on issues important to private infrastructure arrangements that are not dealt with adequately, and should include the treatment of security interests in private projects and rules on liquidated damages (that is rules regarding setting in advance of the amount of compensation to be paid in case of certain breaches of obligations), and rules on contract amendment and termination.

7 THE LACK OF PROVISIONS ON PUBLIC PRIVATE PARTNERSHIP

Different of the concession/BOT which can be described as a traditional and special form of Public Private Partnerships (PPP). PPPs bring public and private sectors together in a long term partnership under various forms. The PPP label covers a wide range of different types of partnership, where private sector expertise and finance are used to exploit the commercial potential of Government assets. PPP is also a procurement mechanism by which the public sector contracts to purchase quality services on a long term basis so as to take advantage of private sector management skills incentivised by having private finance at risk.

Many issues that are not to be dealt with at the legislative level (either because of sector-specific requirements or because of specific circumstances affecting a particular PPP) should however be identified in the Law without being given detailed consideration. Also some crucial principles must be enshrined in mandatory provisions of the law. Therefore the law should set out some compulsory rules on matters such as:

- Project documents, deliverables, schedules,
- General obligations and responsibilities of private party
- Project site clauses
- Duration and service commencement, services and availability
- Project assets (equipment and materials, replacement and upgrading, security over project assets)
- Payment and financial matters
- Insurance
- Relief events, compensation events, force majeure, step-in.
- Information and audit access
- Refinancing
- Intellectual property
- Assignment, subcontracting and changes in shareholding and control

The above mentioned rules of law, limited to what has to be legally binding for the public administration and the private partner, have to be developed in the contractual setting.

8 THE 2002 LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES AND THE DRAFT LAW ON CONCESSION

Compared with the 2002 Law on Private Sector Participation in the Delivery of Public Infrastructure, the draft law on concession is a comprehensive document, which covers a lot of useful points. But it has been pointed out that the nature of concession subjects to be dealt with in a concession arrangement are so sophisticated, so complex, need so many expertises in the technical, financial and legal fields, that a law being very detailed, as the draft concession law is, and therefore less flexible than a short one, faces the risk to miss some points that a future and different environment may bring. All concessions contain many project-specific details. In addition, some issues are unique to a particular industry and hence require attention on a sector-specific basis. Examples include technical, safety and environmental standards, as well as market structure arrangements. Cross references to sector law, in a cross- sectoral law as this 2002 Law, as well as in the draft law on concession, are needed but lacking.

The second point, specific to the draft concession law, arises out of the will to adress in this law most of the questions, therefore not leaving room for negotiations, and to the implementing tool which is the concession contract and its annexes. The risk is to block the subsequent building of the contractual set up. Some rules in the law designed to protect the public interest may be shown to be rigid and prevent a suitable negotiation. The third point in this draft law is the lack of articulation with applicable general legal principles or rules in force in Montenegro (arising out either of civil law, contract law, or of administrative law), with sector laws and public law (public procurement law). We do not see any mention of other Law of Montenegro.

On the basis of Article 88, item 2 of the Constitution of the Republic of Montenegro I hereby pass the

ENACTMENT
PROCLAIMING THE LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES

I hereby proclaim the Law on Private Sector Participation in Delivery of Public Services, adopted by the Parliament of the Republic of Montenegro at the fourth meeting of the first regular session in 2002, held on the 19th June 2002.

Number: 01-1894/2
Podgorica, 21st June 2002

President of the Republic of Montenegro
Milo Đukanović, signed

Law on Private Sector Participation in Delivery of Public Services

(Official Gazette of the RoM, number 31/02)

CHAPTER I
GENERAL PROVISIONS

Purpose of the Law
Article 1

The purpose of this Law is to improve the participation of the private sector for the delivery of public services and, while taking into account the need for good governance and economic growth.

Application
Article 2

This Law shall apply to delivery of public services related to:
- Leasing and management contracts
- Concessions
- Built-operate transfer arrangements (hereinafter: BOT)
- Regulatory bodies defined under this Law.

This Law shall apply to all public entities, as defined under this Law.

Interpretation and Definitions
Article 3

Where the context so permits words importing the singular shall be deemed to include the plural and vice versa and words importing the masculine shall be deemed to include the feminine and vice versa; words importing persons or parties shall include firms and companies and any person having legal capacity. The meanings which shall apply to this Law are:

"Build-Operate-Transfer, BOT": a contract arrangement, under a franchise, whereby a private investor and /or operator is obliged to build and operate a public utility and, after a determined period, transfer the ownership thereof to a public entity; BOT arrangements shall include build-lease and transfer, build-transfer-and-operate, develop-operate-and-transfer, rehabilitate-operate and transfer; tariffs payable by the clients shall be regulated by the contract entered into and shall be subject to the decision, after public hearings, of the regulatory body for the tariffs payable and the quality of the services delivered;

“concession": a repetitive contract arrangement offered under a license, to a private investor and / or operator for the proper extraction or exploitation of natural resources or raw materials for a determined period of time; such arrangement may include investment or rehabilitation by the private sector; in contract in which a public entity of the Republic of Montenegro transfers some rights to a local or foreign firm or company which then engages in an activity subject to the terms of the contract and in return provide revenues to the Government of the Republic of Montenegro (hereinafter Government) or to a Self-Local Government per unit exploited or extracted;

"contingency liability": a liability that may occur only if a specific event happens; a liability that depends on the occurrence of a future and uncertain event;

"franchise": a revocable right, under BOT arrangements, conferred by the Government of the Republic of Montenegro or in a similar manner by a self local government to a provider of services to engage in a specific business or to exercise corporate powers; the rights necessary for public utilities companies to carry on their operations shall be designated as a franchise, under wherewith substantial rights may be granted, contrary to a license wherewith less or limited rights are granted;

"Government-owned company or firm": refers to any company or firm, whether performing governmental or proprietary functions, owned at majority or otherwise controlled by the Government of the Republic of Montenegro;

"investor": a person, natural or corporate, who invests money with an expectation of earning profit;

"invitation for seeking offers": a solicitation for offers as a preliminary step to forming a contract;

"leasing": granting the possession of movable or immovable properties to another in return for rent;

"license"; a revocable permission granted by the regulatory body, established under this Law, to operate a concession;

"license fee": a monetary charge imposed by a public entity for the privilege of pursuing a particular occupation, business or activity; a charge of this type is accompanied by a requirement that the licensee takes some action or be subjected to regulation or restriction;

"management contract": a contract to engage the services of the people in a company, or in a firm, who are responsible for its operation;
"natural resource": any material from nature having potential economic value or providing for the sustenance of life, such as timber, minerals, oil, water and wildlife; features of nature that serves a community's well-being or recreational interests, such as parks;
"offer": a display of willingness to enter into a contract on specified terms, made in the way that would lead a reasonable person to understand that acceptance, having been sought, will result in a binding contract;
"operator": a company or a firm responsible to operate on behalf of an investor;
"privatization council": the council established under the article 2A of the Law on Privatization of Economy (Official Gazette of the Republic of Montenegro23/96, 6/99, and 59/00).
"public entity": public entities are courts, bodies of local government, all organizations designated as such by the Decree on organization and methods of works for public administration / Official Gazette of Montenegro no. 8/93, 39/93, 19/95, 13/96, 24/96, 7/97, 13/98, 27/98, 38/98, 18/99, 31/99, 59/00, 31/01, and 33/01 and public entities which performs social duties pursuant to the rules of Social Activity Law (Official Gazette of Montenegro No. 19/90, 25/90, 6/91, 27/91,21/95 as well as any other entity which will be established and will utilize public funds;
"public services": a project or any kind of services normally financed and operated by the public sector, such as power plants, highways, ports, airports, canals, dams, hydropower projects, water supply, irrigation, telecommunications, railroads and railways, transport systems, housing, government buildings, tourism projects, markets, solid waste management, education and health facilities and any others as may be determined by the Government;
"raw material": substances that are in their natural state before being processed or used in manufacturing;
"regulatory body": refers to an independent body established under this Law that is responsible for issuing licenses or authorizing franchises, regulating tariffs charged for public services and guaranties that the private operator and/or investor ensures the qualities level of services;
"rules": refer to the rules and the necessary forms made under this Law by the Privatization Council or by the regulatory body; where rules introduce a standard form, such form shall be mandatory.

CHAPTER II
SELECTING THE TYPE OF PARTNERSHIP

Background document
Article 4

For selection of any of the contractual arrangements authorized under this Law, leasing, management contract, concessions or BOT arrangements, that may be proposed to the private sector in compliance with this Law, a public entity shall prepare, as a first step, a background document, submitted to the approval of the authorities established under the Law on Privatization of the Economy, detailing:

1) the public entity who will be responsible for the project;
2) what will be the object and scope of the contract;
3) what will be the duration of such contract, and what circumstances will give rise to early termination;
4) what will be the obligations and rights of the parties;
5) where applicable, the key regulations that will be proposed;
6) who will manage identifiable key risks, such as design and development, construction, operating, revenue, financing, *force majeure*, insurance and environmental risks;
7) how will performance be measured and monitored;
8) where applicable, how will assets be transferred;
9) where applicable, who will be responsible for past or future environmental liabilities;
10) how disputes will be resolved; and,
11) for transparency, what kind of solicitation methods will be utilized and the type of contract to be offered.

Approval
Article 5

After having obtained license in compliance with the article 4 of this Law, contractual arrangements become the part of a privatization plan and are subject to all the duties which stem from this Law.

Selecting leasing
Article 6

A public entity, in addition to the requirements under the article 4 of this law may propose a leasing arrangement, as an alternative to public investment, where:
there is an evident situation of lack of funds for such public investment;
the beneficiaries are suffering from lack of public services; and,
the funds can be properly appropriated for the private investor or operator to meet its obligations under such contract arrangement.

Selecting management contract
Article 7

A public entity, in addition to the requirements under the Article 4 of this law may propose a management contract as an initial measure toward more private sector involvement in the Republic of Montenegro (hereinafter Republic) or in the cities where:
there is evidence made whereby initial conditions are not conducive to private sector investment and risk taking;
where tariffs are below cost recovery levels; or

where there is a need to administer and manage a complex arrangement, whether financial or technical.

Selecting Concessions
Article 8

A public entity, in addition to the requirements under the Article 4, may propose a concession agreement where:
1) natural resources such as minerals or such as any activity thereof such as for tourism activities, and potentialities thereon, are not exploited properly therein;
2) revenues may be generated therefrom;
3) major private financial or technical inputs are necessary therefore;
4) economic growth results are determined by a valuation made thereof;
5) a regulatory body can, under a license, control the quality level of services and the applicable tariffs.

Selecting BOT arrangements
Article 9

A public entity, in addition to the requirements under the Article 4, may propose a BOT arrangement, as defined under this Law, where:
1) major new capacity for public services is needed and based on expert estimate or elaborateness;
2) no divestiture of existing publicly owned companies or firms can permit hereunder proper investment for the new capacity required therein; and,
3) after a determined period of operation, enough for the private investor to recover the investment and the costs of operating, the transfer of the properties, movable or immovable, is made thereinafter.

Combination
Article 10

A public entity may propose a combination of arrangements provided for in article 4 of this Law, in which case such a combination must include conditions for each separate arrangement that is being proposed.

The Government may decide to, in view of liberalization of economy, permit the inclusion of private sector in performing public services by applying different contractual arrangements not provided for by article 4 of this Law, according to the conditions provided by a separate Law.

Objectives
Article 11

Pursuant to article 4, where proposing a private sector partnership, the public entity, or many public entities together, such as a group of self-local governments, shall, for any proposed partnership, demonstrate the need to -

1) bring technical, financial, or managerial expertise and new technology in the sector;
2) improve economic efficiency in the sector, operating performance and the use of capital investment;
3) inject large scale investment capital into the sector or gain access to private capital markets;
4) where applicable or otherwise doable, reduce public subsidies to the sector;
5) make the sector more responsive to consumers' needs and preferences;
6) the tentative schedule of tariffs to be paid;
7) competitive pressures deriving from markets for returns on the capital to be invested; and,
8) competitive pressures deriving from similar services.

Preparing the seeking of offers
Article 12

Upon approval, pursuant to article 4 of this Law a public entity shall prepare the solicitation documents in compliance with this Law, and shall, before initiating solicitation, obtain a prior endorsement by the authorized organs on the contents of the solicitation documents; after solicitation, the public entity shall examine, evaluate and compare offers and obtain approval from the same organs before awarding the contract; copy of the contract shall be made available to the relevant regulatory body.

Duration
Article 13

Any contract offered under a solicitation exercise or otherwise entered into under this Law shall be subject to maximum duration:

1) lease agreement shall not exceed a period of two years, but might be subject to renewal every year, in compliance with the terms and conditions of the contract, but the total period, including renewal, shall be subject to a maximum period of five years;
2) management contract shall not exceed a period of five years;
3) concessions or BOT. contracts shall not exceed a period of 30 years or, where the contract is based on recovery of investment, shall not exceed the period necessary for the recovery of investment only where the determined recovery is based thereunder on a determined percentage of the tariffs paid by the beneficiaries; nevertheless, where the period may exceed 30 years under such contract, the period shall be, at time of contract signature, based on a probable recovery not to exceed 30years; where an extension is necessary for recovery

and part of the terms and conditions of a contract, such extensions shall be permitted strictly on the terms and conditions stipulated in the contract entered into;
4) the period for which a concession or a BOT has been granted may be extended in exceptional case because of a substantial change in the conditions under which the concession or the BOT was granted;
5) the duration of preparatory work shall be specified in the concession as well as in a BOT agreement.

Commencement
Article 14

Pursuant to Article 13 of this Law, the commencement of the period shall not include the period for construction or rehabilitation; therefore, the period shall start, in any case, on the day the operations start; for avoidance of doubt, the day the operations start shall prevail on the date -
1) the contract was signed therefore and,
2) where applicable, of entering into effect of the contract.

CHAPTER III
SEEKING OFFERS FOR LEASING OR MANAGEMENT CONTRACT

Soliciting
Article 15

Subject to articles 4 and 12 of this law, a public entity or more public entities may enter into solicitation to seek offers from private sector in compliance with the law.

Proposals for management contracts and bids for leasing
Article 16

A management contract being a contract whereby consulting services are delivered, and a leasing contract being a public procurement activity, the relevant articles of the Public Procurement Law shall apply.

Rules and forms for management contract or leasing contract
Article 17

Subject to article 16 of this Law, for management contract, any request for proposals and, for leasing contract, any bids solicited, therefore any procurement undertaking thereof, shall be in compliance with the public procurement rules and the standard forms approved by the Public Procurement Commission.

Pre-investment Committee
Article 18

Pursuant to the articles 15, 16 and 17 of this Law where a construction or rehabilitation, resulting from such management or leasing contract, therefrom, therein, thereunder or thereinafter, is planned for a building in public property and where its design is delivered by the private sector, the prior approvals of the Pre-Investment Committee established in conformity with the Public Procurement Law.

CHAPTER IV
PRE-QUALIFICATION OF INVESTORS AND SEEKING OF OFFERS FOR CONCESSIONS OR BOT

Unsolicited offer or direct agreement for concession or BOT
Article 19

Except for and not including any fair dialogue between investors and public entities prior to a solicitation exercise or permitted dialogue before award of a contract not resulting in unfair advantage, no unsolicited offer and any form of direct agreement without pre-qualification or solicitation shall be permitted. Therefore, to ensure transparency and fair competition, for concessions or BOT arrangements, any unsolicited offer or direct agreement shall, upon receipt, be rejected and not be considered further.

Project assessment unit for concession or BOT
Article 20

Subject to Article 4 of this Law, for a concession or a BOT project, the public entity responsible for the project shall establish a project assessment unit of five members having the proper expertise whereby the combination of legal, technical, financial, environmental and other relevant expertise is made available; selection of the members shall be subject to endorsement by:

1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a Self-Local Government or organs of Self-Local Governments; or,
3) the parent ministry, for the publicly-owned companies or firms.

Solemn statement
Article 21

Subject to Article 20 of this Law, members shall not be elected persons and shall be subject to the solemn statement made by public procurement officers under the Public Procurement Law.

Authorities and responsibilities of the project assessment unit
Article 22

Subject to Articles 4, 12, 20 and 21 of this Law and to the rules made under this Law, the members shall be responsible to supervise and manage:
1) the pre-qualification of investors;
2) the seeking of offers from them;
3) the receiving and opening of offers;
4) the examination, comparison and evaluation of offers;
5) the preparation of an evaluation report;
6) the undertaking of dialogue with investors before award; and
7) the preparation of a final recommendation.

Use of consultants or consulting firms
Article 23

Pursuant to Article 22 of this Law, a project assessment unit may, where necessary, seek assistance from consultants to assist in the undertaking of any activity. The consultants shall be selected in compliance with the Public Procurement Law.

Dialogue
Article 24

The undertaking of dialogue, pursuant to Article 22, paragraph 6 of this Law hall be only for improvement of the understanding of the offer, before award, and shall not result in negotiation so as to alter substantially an offer or to render it substantially responsive to the solicitation documents.

Endorsement
Article 25

Before award the endorsement is given by:
1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a local self-government;
3) the parent ministry, for the state-owned companies or firms.

Pre-qualification of investors
Article 26

For concessions and BOT contracts, except for concessions and BOT based on Article 138 of this Law, open and international pre-qualification of investors shall be undertaken, prior to the seeking of offers, after international advertising is made, as per the rules and the standard forms approved by the Privatization Council under this Law.

Criteria for pre-qualification
Article 27

Evaluation for pre-qualification shall be effected strictly according to pass or fail criteria stipulated up-front in the pre-qualification documents.

Any pre-qualification exercise shall be completed within the period stipulated in the solicitation documents.

The investors shall furnish all such information, documents and provide such evidence as are required for the purpose.

Selection investors
Article 28

Shall be selected the investors on the basis of the information given by them in the request made pursuant to Article 26 of this Law, subject to verification before award.

The results of the pre-qualification exercise shall be determined by an ad-hoc Evaluation Committee, set up by the project assessment unit; members of the project assessment unit shall not be members of the ad-hoc evaluation committee.

The evaluation shall be undertaken as per the rules and forms approved under this Law by the Privatization Council.

Subject to any fresh verification of information, no investor who has met the criteria set out shall, at selection, be disqualified.

The criteria for selection shall be:
1) the cost and the magnitude of the financing offered;
2) the performance specifications of the facilities offered;
3) the cost chargeable to the users, beneficiaries or consumers;
4) other income generated for the public entity or the purchaser by the facility;
5) the period of facility depreciation;
6) in addition to the conditions to post-qualify, the investor shall evidence that its investment by its available capital will not be less than 25 % of the capital invested.

Report of the Ad-hoc Evaluation Committee
Article 29

The report of the ad-hoc Evaluation Committee shall be signed by all persons who formed part of the evaluation process; the report shall include: introduction to the project; copy of the opening report; details on investor examination and rejects; list of pre-qualified investors who pass all criteria and who will be, for a given period, eligible investors; copy of the pre-qualification documents; and the list of investors under conditional pre-qualification, as well as the criteria to be met within a set deadline.

Notice to pre-qualified investors
Article 30

An investor shall be notified in writing of the result of his pre-qualification; investors who have not been selected under a pre-qualification exercise shall be entitled to be given the reason for their disqualification and the criteria on which they failed.

Verification of information
Article 31

Verification of the information provided by investors in the submission for pre-qualification shall be confirmed at the time of award of contract; therefore, award shall be denied to an investor who no longer meet one or more of the criteria or resulting in a lack of capability or resources to successfully perform the contract; any substantial information found false with evidence made at verification shall result in disqualification of the investor or rejection of his offer.

Seeking offers from pre-qualified investors
Article 32

For seeking offers from pre-qualified investors, all project assessment units shall use the forms provided under the rules approved by the Privatization Council.

A non-reimbursable fee may be charged to investors for solicitation documents; the amount of the fee shall be solely determined by the cost of their production and delivery; the fee shall not be so high as to discourage a qualified investor.

Language
Article 33

Any response by investors and any kind of document provided by them shall be in one of the languages authorized by the solicitation documents. If another language is utilized the certified translation in one of the language authorized shall be submitted.

Request for additional information
Article 34

Where an investor requests additional information on the pre-qualification documents or on the solicitation documents, such information shall be communicated to all investors provided with the documents, without identification of the source of the request; any additional information, correction of errors or alteration of contents thereof shall be sent immediately and in the same manner by issuing an addendum made available to all those who requested the original documents.

Site visit
Article 35

Where a site visit is convened, minutes shall be prepared to record any request for additional information, and, without identifying the source thereof, the minutes shall be made available by an addendum issued to all those who requested the original pre-qualification or solicitation documents.

Binding addendum
Article 36

The additional information provided by addendum as stipulated in Articles 34 and 35 of this Law shall be binding on the investors and shall be communicated to all investors within the period specified under the rules, before the submission of pre-qualification or offers so as to enable the investors to make a timely pre-qualification or offer.

Time for pre-qualification and preparation of offers
Article 37

The time allocated to investors to prepare the pre-qualification documents shall be not less than forty-five working days, starting on the day the advertisement is published, and for the preparation of their offers, not less than sixty working days shall be allocated.

Receiving and opening of offers
Article 38

The time for opening of pre-qualification documents or offers shall be the same as for the deadline for receipt or promptly after the deadline for receipt, only to allow sufficient time to the ad-hoc opening committee to take the envelopes safely to the location stipulated for the opening; the solicitation documents shall indicate the location, the date and the time for the opening; envelopes received after the time stipulated for submission as well as those not opened and read out at the occasion of an opening shall not be considered; save in cases of *force majeure*, postponement of proceedings shall not be permitted.

Modification or withdrawal
Article 39

Where an investor wishes to amend his pre-qualification or his offer he shall not be allowed to retrieve his original sealed envelope, but shall only be allowed to send another envelope equally sealed, properly identified and linked to his original envelope and marked as "modification" or "withdrawal" as the case may be.

Receiving of pre-qualification documents or offers
Article 40

A pre-numbered receipt shall be given for any envelope or package containing pre-qualification documents or offers delivered by hand, after ensuring that it is correctly sealed; a member of the ad-hoc Opening Committee shall be responsible for the issuance of receipts and the safeguarding of all offers related to a solicitation exercise; the name of the member shall be stipulated in the solicitation documents.

Electronic communication shall be in compliance with the law and be permitted only where authorized in the solicitation documents.

Safeguarding of pre-qualification documents or offers
Article 41

Unless the solicitation documents require otherwise, ad-hoc opening committees shall use containers of a size and type capable of receiving pre-qualification documents or offers safe and sound therein, with a sleeve and a door with locks, of which could, for reasons of security and confidentiality, be suitably controlled by such number of different keys entrusted to senior officers.

Rejection of all offers
Article 42

Rejection of all offers shall be allowed only when there is lack of effective competition or when all offers are not substantially responsive; however, lack of competition shall not be determined solely on the basis of the number of investors; when all offers are rejected, the project assessment unit shall review the cause justifying the rejection and consider making revisions to the conditions of contract, design and specifications, scope of the contract, or a combination hereof, before inviting new offers; when the rejection of all offers is due to lack of competition, wider advertising shall be considered; when the rejection is due to most or all of the offers being substantially not responsive, new offers may be invited from the same investors who were originally invited.

In case of rejection of all offers, the notice of the overall rejection shall be given promptly to all investors who submitted offers and in all cases, before the end of the validity period; any public entity shall not thereby incur any liability nor assume any obligation to inform any investor of the grounds for the rejection or the cancellation of the process.

For a BOT, where the most responsive offer, offering the best business plan exceeds the estimate for payable tariffs, the project assessment unit shall investigate causes for the excessive tariffs and shall consider requesting new offers; alternatively and after the approval of the Privatization Council, the project assessment unit may, instead of calling for new offers and without changing the substance of the solicitation, offer to the winning investor a reduction on the scope and / or a reallocation of risk and responsibility which can be reflected in a reduction of the tariffs payable.

Securities
Article 43

To afford reasonable protection against irresponsible offers, bid security may be required, but it shall not be set too high as to discourage investors; the bid security shall be in the form of a manager’s or certified check, a letter of credit or a bank guarantee; the bid security shall remain valid for a period stipulated in the solicitation documents which period shall be beyond the validity period for the offers; the bid security shall be released to unsuccessful investors immediately upon determination that they will not be awarded with a contract.

Solicitation documents may require security in an amount sufficient to protect the interests of the Republic of Montenegro in case of breach of contract by an investor; this security shall be provided by a performance bond or a bank guarantee in an appropriate standard form and in an amount specified in the solicitation documents.

Force majeure
Article 44

The conditions of contract shall stipulate that failure on the part of the parties to perform their obligations under the contract shall not be considered a default if such failure is the result of an event of *force majeure* as defined in the conditions of contract.

No collusion
Article 45

The pre-qualification and the solicitation documents shall include a standard form to be signed by an investor certifying that his offer has been prepared independently and whereby he will accept to comply with any obligations under the law of the Republic for Montenegro, including anti-corruption.

Examination of offers
Article 46

All offers shall be first examined to determine if they: meet the minimum eligibility requirements stipulated in the solicitation documents; have been duly signed; are accompanied by a valid security, where requested in the solicitation documents; are substantially responsive to the solicitation documents; and are generally, otherwise, in order. The following shall not be sought, offered or permitted: changes in prices, subject to this Law; changes of substance in an offer; and changes to make an unresponsive offer responsive.

A major deviation shall result in a rejection of an offer while a minor deviation shall be subject to clarification.

The following shall be considered as major deviations:
1) with respect to clauses in an offer: improper arbitration; unacceptable sub-contracting, unacceptable time schedule, only where time is of essence; unacceptable tariffs adjustment mechanism;
2) with respect to the status of an investor: the fact that he is ineligible or not pre-qualified; the fact that he is uninvited;
3) with respect to documents of an offer: an unacceptable or missing security; or an unsigned offer;
4) with respect to time, date and location for submission: any offer received after the date and time for submission stipulated in the solicitation documents; any offer submitted at the wrong location.

In cases of major deviations, offers shall not be considered any further and, where unopened, shall be returned as such to the investor; in all cases of rejection, a letter stipulating the reasons for rejection shall be sent, and the investor shall not be permitted to amend his bid to become compliant.

The following shall be considered as minor deviations: the use of codes; the difference in standards; the difference in materials; alternative design; alternative workmanship; modified liquidated damages; limited liability and insurance; omission in minor items; discovery of arithmetical errors; sub-contracting that is unclear and questionable; different methods of construction; difference in final delivery date; difference in delivery schedule; completion period where these are not of essence; non-compliance with some technical local regulation; payment terms; and any other condition that has little impact on the offer in cases not mentioned above.

In case a doubt exists as to whether a particular condition in a bid is a major or a minor deviation, the following rules shall apply: where the impact on the tariffs is major, it shall be regarded as a major deviation; and where the impact on the tariffs is minor, it shall be regarded as a minor deviation.

In cases of minor deviations, written clarification may be obtained from the investor and, where applicable, a counter offer made for the correction of the minor deviation;

where an investor does not accept the correction of a minor deviation under the counter offer, his offer shall be rejected; at the stage of evaluation and comparison, all minor deviations shall be quantified in monetary terms.

For the rejection of an offer, a written notice shall be given promptly to the investor.

Validity period of offer and extension validity period
Article 47

When determining the duration of the validity period of an offer, a project assessment unit shall ensure that it is sufficient to enable the investors to respond to the solicitation, to allow time for evaluation and comparison of offers and, where applicable, for any authorized organ to review the recommendation of award and give the necessary approval so that the contract can be awarded within that period.

All reasonable steps shall be taken to avoid any situation where an extension of the initial period of validity becomes necessary; a project assessment unit may extend the validity period, if justified by exceptional circumstances, by requesting in writing such extension from all investors before the expiry date; where given, the extension shall be for a minimum period required to complete the evaluation, obtain the necessary approvals and award the contract; whenever an extension of validity period is requested, investors shall not be allowed to change the quoted price or conditions of the offer.

Investors shall have the right to refuse to grant such an extension without forfeiting their security; those investors who are willing to extend the validity of their offer shall be required to provide a suitable extension of security.

Evaluation and comparison of offers
Article 48

The purpose of evaluation of offers shall be to determine the best business plan that permits comparison on the basis of calculated costs; subject to any verification of the capabilities of the investor, the offer with the best business plan, but not necessarily the lowest submitted tariffs shall be selected for award.

For the evaluation and comparison of offers that have been adjudged as valid for the purposes of evaluation and comparison, no other methods or criteria shall be used except those stipulated in the solicitation documents; all relevant factors, in addition to tariffs, that will be considered for the purposes of evaluation and the manner in which such factors will be applied shall be stipulated in the solicitation documents.

When bid prices are expressed in two or more currencies, the prices of all offers shall be converted in the official currency of the Republic of Montenegro, according to the rate and date of rate and source specified in the solicitation documents.

Confidentiality
Article 49

After opening of offers, information relating to the examination, clarification and evaluation of offers and recommendations concerning the award shall not be disclosed to the investors or to persons not officially concerned with the process until the successful investor is notified of the award.

Evaluation report
Article 50

Any evaluation and comparison of offers shall be reported in the manner and in the format laid down in the rules provided that the report shall always be signed by all evaluators and the supervisor confirming the correctness of the report and the compliance with this Law.

Contract award and entry into force of the contract
Article 51

Subject to the approvals required under this Law*,* the public entity responsible for the project shall award the contract within the period of the validity of offers, to the investor who met the appropriate standards of capability and resources and his offer has been determined to be substantially responsive to the solicitation documents and to offer the best business plan.

The investor shall not be required, as a condition of award, to undertake responsibilities not stipulated in the solicitation documents or otherwise to modify substantially the offer as originally submitted.

The signatory of the contract, on behalf of the public entity, shall be provided with all offers, the reports on opening and evaluation and shall examine them to determine their compliance with this Law; the signatory shall verify the validity of the offer recommended for award and refuse to sign a contract with a supplier if his offer is not valid; the signatory shall have immediate access to any document of the solicitation exercise that are directly or indirectly related to the contract to be signed.

The signatory shall be responsible to ensure that he is officially granted with the authority to sign such a contract on behalf of a public entity.

Undertaking evaluation
Article 52

Any evaluation exercise undertaken under this Law shall be made by an ad-hoc Evaluation Committee. Chairperson of the project assessment unit shall appoint the members of the Ad Hoc Evaluation Committee.

An ad-hoc evaluation committee shall be comprised of a Supervisor and five evaluators, who shall not have been involved in the opening of offers to be evaluated and shall not be members of the project assessment unit.

The Supervisor and any member shall be public servants selected on the basis of their necessary specialized expertise.

The Supervisor and the members shall not be elected persons.

When deemed necessary by the Supervisor, he may seek to obtain the following preliminary information: a preliminary assessment report on the offers received from any expert in the area; and a preliminary examination of the offers; where the necessary expertise is not available in the public entity responsible for the project, such expertise may be sought from any other public entity or from any other sources.

The members of an ad-hoc evaluation committee shall continue in their functions until the evaluation report is submitted.

The Supervisor shall be solely responsible for the supervision and co-ordination of the evaluation process but, in any case, shall not be involved directly in the evaluation process or in rejection of offers.

The Supervisor shall be responsible to take any action necessary to ensure the confidentiality of the offers, their evaluation and of the overall process until completion.

All offers and any documents related thereto, which shall be transferred together with the evaluation report to the authorized organs, shall be safeguarded.

Each evaluator shall make his own individual evaluation without undue influence; thereafter, the supervisor shall determine the average, in the presence of the evaluators from individual results obtained.

The evaluation shall be completed within the validity period so as to leave enough time for contract award.

Any recommendation for award made thereof, under any evaluation undertaken, shall be final; therefore, an evaluation exercise cannot be re-conducted, except where there is an evident situation of non compliance with this Law; after evidence is made on non compliance, another similar evaluation shall be conducted by another ad-hoc evaluation committee; the second committee shall not be provided with the first evaluation report which shall remain secret until the second evaluation exercise and report thereof completed.

Joint venture
Article 53

Investors established in the Republic of Montenegro shall be encouraged to participate to any solicitation whereon the Republic of Montenegro encourages the development of the economy; they may offer independently or in joint venture with other investors established in the Republic of Montenegro or abroad, but such joint venture shall not be, under any solicitation exercise, mandatory or be a condition for eligibility.

Article 54
Eligibility

Natural persons, companies or firms shall not be eligible for the award of contracts for concessions or BOT where: they are under bankruptcy; payments to them have been suspended in accordance with the judgment of a court other than a judgment declaring bankruptcy and resulting, in accordance with their national laws, in the total or partial loss of the right to administer and dispose of their property; legal proceedings have been instituted against them involving an order suspending payments and which may result, in accordance with their national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of their property; save after the completion of any punishment upon them, they have been convicted, by a final judgment, of any crime or offence concerning their professional conduct, except after the enforcement of the punishment against them; they are guilty of serious misrepresentation with regard to information required for participation in an invitation to offer; they are in breach of contract on another contract with the contracting public entity, only where a final judgment by a court is made that the breach of contract is the responsibility of the investors; they are found guilty of bribery or kickbacks under international treaties or conventions or, they are ineligible on the same grounds and evidence by any bank, institution or organization providing funds for general development, public investment or reconstruction; and they have engaged in corrupt or fraudulent practices in competing for the contract in question.

To be eligible for participation in invitations to pre-qualify or to offer and thereinafter to be a contracting party, participating investors shall provide evidence satisfactory to the authorized organ of their eligibility under this Article, proof of compliance with the necessary legal, technical and financial requirements and of their capability and adequacy of resources to carry out the contract effectively.

To this end, any offer submitted shall include the following information:

a document, dated less than 90 days previously, drawn up in accordance with the investors' national law or practice certifying that the investor meets the conditions laid down in this Article, and none of the situations referred to in this Article applies to him;

copies of original documents defining the legal status, and establishing the place of registration and/or statutory seat and, if it is different, the place of central administration of the company, firm or partnership or, if a joint venture, of each party thereto constituting the participating investor;

details of the experience and past performance of the investor (or of each party to a joint venture) on contracts of a similar nature within the past five years, and details of other contracts in hand including details of the actual and effective participation in each such contract;

where applicable, the major items of equipment proposed for use in carrying out the contract;

the qualifications and experience of key personnel proposed for administration and performance of the contract, at and away from the place of performance of the contract;

information relating to the nature, conditions and modalities of subcontracting wherever the subcontracting of any elements of the contract amounting to more than 10 % of the offer price is envisaged;

reports on the accounting and financial standing of the investor (or of each party to a joint venture) such as profit and loss statements, balance sheets and auditor's reports for the past five years, an estimated financial projection for the next two years, and an authority from the participating investor (or authorized representative of a joint venture) to seek references from the bank of the investor;

information regarding any current legal or arbitration proceedings or dispute in which the investor is involved; the information referred to shall be confined to matters of direct interest to the award or performance of the contract; and,

for companies or firms established in the Republic of Montenegro, evidence that previous payments were made or in process to be made for any taxes, customs duties and any other payment due to the Government or to a Self-Local Government.

CHAPTER FIVE
LEASING

Leasing of public facilities
Article 55

Subject to the Articles 6, 11 and to Chapter Three of this Law, leasing shall be permitted for existing public facilities, to be rehabilitated or not, or for new public facilities, or for the use of an existing private facility to be utilized for public uses.

Existing public facilities
Article 56

Pursuant to Article 55 of this Law, where a public entity prefers leasing to the owning a public facility, the public entity shall -

1) determine the market value of the facility by using the service of an independent valuator who shall be selected in compliance with the law;
2) clarify property titles;

3) seek the authorization, in compliance with the law, to dispose the existing public facilities, by public offer, whereby the disposal is accompanied by an offer from the seller to lease for a given period the public facilities that are offered;
4) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder; and,
5) where a rehabilitation is needed resulting in an investment needed prior to the leasing, detailed drawings and budget estimates shall be prepared and be part of the solicitation documents.

New public facilities
Article 57

Pursuant to Article 55 of this Law, where a public entity prefers leasing to building a public facility, the public entity shall, prior to any solicitation, in compliance with the law:

1) obtain prior approval of the design by the Pre-Investment Committee of the Department for public works; where applicable, clarify land titles where the new facility is needed;
2) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder.

Use of existing private facility for public use
Article 58

Pursuant to Article 55 of this Law, where a public entity prefers leasing a private facility for public use, the public entity shall, prior to any solicitation, in compliance with the law:

1) stipulate in the solicitation documents the standards for public facilities as approved by the Pre-Investment Committee of the Department for public works;
2) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder.

Insurance costs
Article 59

Under any leasing agreement, all insurance costs shall be on the private investor or the private operator; copy of the insurance contract shall be part of the leasing contract, and evidence of payment for renewal shall be conditional to the maintaining in force of the contract.

Maintenance costs
Article 60

Under any leasing agreement, the maintenance costs of the facilities, other than daily cleaning of interior shall be a responsibility on the private investor or of the operator.

Maximum leasing fees payable
Article 61

Under any leasing agreement, the increase of the fee payable, for renewal, shall not be higher than the yearly inflation as per indices on inflation published by an official statistic office; the name thereof shall be stipulated in the solicitation documents and thereinafter be part of the leasing contract.

Subsidy and contingent liability
Article 62

Under the provisions of this Chapter, the private sector investor or operator shall not be allowed to obtain any kind of benefits, directly or indirectly, from any kind of subsidy, or otherwise obtained by the use of any public funds for reconstruction or rehabilitation, or otherwise requires guarantees other than usual guarantees under a normal leasing agreement in the private sector; except in the case of gross negligence, or under a court decision, any provisions of a leasing agreement entered into, whereby any contingent liability is created on any public entity, shall be deemed to be null and void.

Procurement by the private sector
Article 63

For avoidance of doubt, for investment made by a private sector investor or operator under this chapter, the procurement activities by him shall be undertaken as per the best recognized procurement practices in the private sector.

CHAPTER SIX
MANAGEMENT CONTRACT

Consultants or consulting firms
Article 64

Subject to the Articles 7, 12, 13 and to the Chapter Three of this Law, management contract may be entered into, whereby the management, legal, financial, technical or supervisory services are delivered by private consultants or private consulting firms.

Terms of reference
Article 65

Pursuant to Article 64 of this Law, management contracts being utilized under this Law for preparatory actions or control of activities for the privatization of the economy, any public entity, in addition to all requirements of the Public Procurement Law, shall utilize the standard format for terms of reference as approved by the privatization Council for:

1) Economic consultants;
2) Experts for formulating policy in the adequate field of expertise;
3) Legal counsel;
4) Technical (Civil Engineering) Consultants;
5) Financial Advisors;
6) Procurement expert;
7) Management, supervision expert;
8) Experts for corporate governance;
9) Expert for environmental protection; and,
10) Any adviser for privatization, as may be determined by the Privatization Council.

Monitoring of consultants under management contract
Article 66

Any public entity entering into management contract under this Law whereby the services are linked to a privatization exercise, shall appoint a monitoring committee of three members, subject to Articles 67 and 68 of this Law.

Endorsement
Article 67

Selection of the members of the monitoring committee shall be endorsed by:

1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a Self-Local Government or group of Self-Local Governments;
3) the parent ministry, for the publicly-owned companies or firms.

Membership and powers
Article 68

The members of a Monitoring Committee shall not be elected persons and shall be public servants having the relevant expertise to make decision, made on majority, on behalf of the public entity to determine if services are delivered timely and satisfactorily or otherwise in compliance with the terms of reference and the contract entered into.

Reports by consultants
Article 69

Under the provisions of this Chapter, any report made by consultants under management contracts shall be in the format approved by the Monitoring Committee, and copies thereof shall be made available to the Privatization Council.

CHAPTER SEVEN
CONCESSIONS

Usage compensation
Article 70

Besides the particular set under this Law for taking part in the preparation of offers, the application for taking part in the solicitation exercise shall:

1) be filed together with particulars relating to the duration of usage conditions and modality of usage compensation for the use of the natural resources of goods in general use;
2) conditions for the hand-over at the termination of usage;
3) credit rating of the investor or operator;
4) particulars about other conditions concerning the rights and as particulars about other conditions concerning the rights and duties of the contracting parties.

Special conditions
Article 71

Subject to issuance of a license, a concession may be granted on the condition that the utilization of the natural resources or goods in general use or performance of activity provides for:

1) the maintenance of the technical and technological unity for the system;
2) its efficient operation and rational management; and,
3) protection of the environment.

Contract offered
Article 72

A Concession Contract shall especially include:
1) contracting parties;
2) subject matter on concession;
3) duration of preparatory operations;
4) duration of concession;
5) modality of and time-limits for securing funds for financing;
6) conditions of usage;
7) compensation for usage;
8) rights and duties concerning the application of measures for general safety and protection of the environment;
9) conditions for terminating the contract;
10) settlement of disputes; and,
11) other matters the contracting parties may agree upon.

Transfer
Article 73

Subject to Article 74 of this Law, alternatively to re-seeking offers, a concession may be transferred to another person, foreign or not, partly or wholly, with the approval of the authorized organ.

Validity of contract
Article 74

Any contract of concession transfer as referred to in Article 73 of this Law which is concluded without approval of the grantee of concession, without publication in the Official Gazette of the Republic of Montenegro, without public hearings and without any requirements for award under this Law, shall be null and void.

Conditions for the granting of the concession
Article 75

A concession may be granted in order to provide for:
1) rational exploitation of natural resources or goods in general use;
2) technical and technological advancement of the business constituting the subject matter of a concession;
3) technical and technological uniformity of systems in the field of infrastructure;
4) efficient operation and rational control of such systems; and,
5) protection and improvement of the environment in conformity with the environmental protection regulation;

Natural resources and goods in general use as well as building devices and installation exploited by public enterprise founded by the state or a self-local government unit may be conceded to another person provided that such public enterprise are unable to provide for the rational exploitation or trouble-fee operation in conformity with the regulation governing the conduct of the business of such enterprise.

Subject Matter
Article 76

The Subject matter of a concession may be:

1) prospecting or exploitation of natural resources or raw materials with the aim to create employment opportunities and to generate revenues to an investor / operator and to the Government, or otherwise, as the case may be, to the self-local governments;
2) construction, maintenance and exploitation of facilities for prospecting or extracting, natural resources or raw materials;
3) construction of facilities, remodeling, modernization or rehabilitation of existing facilities, for exploitation of water having natural curative properties and other similar item for the purpose of their exploitation;
4) construction, maintenance, exploitation of facilities, or rehabilitation of existing facilities, on natural sites, wildlife, or national parks in the view to attract more tourists;
5) any other raw material or natural resource of the Republic of Montenegro, where improved exploitation by a private sector investor or operator results in a possibility to generate revenues therefrom for the Government or to the Self-Local Governments, whereon there is an evident situation resulting in financial, social, environmental or economical improvement, or any combination thereof.

Recommendation for awarding a concession contract
Article 77

The recommendation for granting a concession shall be submitted to the Government through the relevant Regulatory Body (hereinafter regulatory organ) established under this law and shall include the following:

1) the subject matter of the concession;
2) the size of investment;
3) the duration of the recommended concession;
4) the basic conditions for the utilization of the concession;
5) compensation purpose of exploiting the subject matter of concession;
6) the information on the interested contracting parties; and,
7) any other information as may be requested by the Government.

Prior to submitting a recommendation to the Government, a Regulatory Body shall ensure that inputs were already obtained from any other public entity, wherefrom improvement of a concession may result.

A Regulatory body shall notify the investor or the operator of the position taken by the Government on the presented recommendation.

Decision to grant of the concession
Article 78

Pursuant to the recommendation to grant a concession the Government adopts a decision on the granting of a concession.

Decision to grant a concession especially includes the following:
1) reasons wherewith the concession should be granted thereunder;
2) where applicable, in addition to any private sector investment or involvement, the necessary funds, resources and time limits for raising them, that are necessary thereto;
3) anticipated income and expenditure associated with the concession for the whole duration, resulting therefrom;
4) the technological capacity of parties for the utilization of concession, and the risks thereafter;
5) particulars on the effects on the overall infrastructure and other economic areas, as well as on the uniformity of technical and technological systems, their efficient operation and control to be rational thereinafter;
6) duration of concession thereat;
7) modality of payment and issuance of guarantees or other sureties for the performance of duties and the amount therefore;
8) environmental impact studies undertaken and responsibilities resulting therefrom;
9) employment estimates, number of employees and qualifications needed thereto; and,
10) any relationships for property, movable or immovable, thereunder;
11) permits, licenses, registration or any other requirements by law, whereby operation is to be permitted theretofore.

Enactment of a concession decree
Article 79

The Government shall adopt a decree regulating the details and conditions for granting a concession.

Concession contract
Article 80

Any concession contract shall be:
1) made in writing;
2) concluded in conformity with the terms and conditions set out in the concession decree; and,
3) in compliance with this Law.

Contents of the contract
Article 81

Where authorized by a concession decree, any concession contract shall be concluded by the public entity responsible of the concession, shall be subject to endorsement by a regulatory body and, shall include provisions relating to, but not limited to, the following:

1) the name of the contracting parties;
2) the subject matter of concession;
3) the duration of preparatory operations and the duration of the concession;
4) the conditions under which the duration of concession may be extended or modified;
5) modality of a time-limit for raising funds;
6) the schedule of investment;
7) the amount and modality for guarantees on the performance of the activities;
8) where applicable, standards of the products or services as well as the criteria for setting the prices, rates or tariffs payable by the end-users;
9) compensation paid for the concession license, terms and conditions for payment;
10) rights and duties concerning the application and consequences thereof;
11) modality for disputes settlement;
12) the application law;
13) time and modality of handling over the building installation or plant and state in which it has to be application of ruling law;
14) modalities of mutual reporting;
15) modalities for monitoring by the regulatory body;
16) rights and duties of contracting parties;
17) determination of risks and responsibilities resulting from the contract;
18) any other matters mutually agreed upon by the contracting parties or otherwise stipulated in the concession decree.

Registration
Article 82

Any concession contract concluded with a foreign party shall be reported and registered in the manner provided by the law governing foreign investment.

Payment obligation
Article 83

The compensation for any concession granted, hereinafter the concession compensation, shall be payable in conformity, in order of precedence, with the concession decree, the concession contract, the license issued by the regulatory body and any decision made by the regulatory body after public hearings, in compliance with this Law.

Criteria for setting the concession compensation
Article 84

The concession compensation shall be determined by taking into account, but not limited to:

1) the kind, category or quality of the natural resource of the raw material;
2) the market price of the natural resource or raw material;
3) the general market conditions and trends;
4) the duration of concession;
5) the contracted risks;
6) the coverage of investment costs;
7) the anticipated profit;
8) any other item governing the contract entered into.

Allocation of the concession compensation
Article 85

Concession compensation shall be regarded as revenues for the Republic of Montenegro except where revenues shall be on a public entity, as defined under this Law.

Conditions for and modality of pursuing a concession activity
Article 86

Any concessionaire shall build, maintain and exploit facilities and pursue the concession activities and exploit natural resources or raw materials in compliance with:

1) the regulations governing the regional and town planning;
2) the terms and conditions stipulated under the concession contract;
3) the standing environmental protection regulations;
4) the concession decree;
5) the law in force *infra civitatem*.

Concession assignment
Article 87

Any concessionaire shall not assign to some other party the concession; therefore any such assignment shall be null and void.

Increase in the value of the subject matter of concession
Article 88

Except as otherwise stipulated in the concession decree, any increase in the value of a publicly owned installation of any type, exploited as the subject matter of a concession or which is contributing to the exploitation which has arisen in the performance of the concession activity shall be the property of the Republic of Montenegro or the public entity, as the case may be.

Discoveries
Article 89

Anything of historical, cultural, natural value, or other interest or of significant value unexpectedly discovered on a site shall be public property; therefore, the concessionaire shall notify, upon discovery, the regulatory body and carry out instructions for dealing with them.

Protection of the concessionaire rights
Article 90

In addition to rights, absolute and accessory, any concessionaire shall be guaranteed the rights stipulated under:
1) the concession contract;
2) the concession decree;
3) where applicable, the co- financing agreement.

Where no specific provisions are made under the law of the Republic of Montenegro for specific rights of the concessionaires, provisions made under international treaties or otherwise the best international practices shall be applied.

In the event of a change in the Republic of Montenegro law or regulations on the basis of which a concession contract has been concluded, the law and regulations which were in force on the contract conclusion date shall apply to the relations, or otherwise the most favorable to the concessionaire shall apply.

Where in any concession contract under this Law, investment is required for prospecting before exploiting, the same concession agreement shall include the exploitation of the result of the prospecting.

The contractual rights of any concession enterprise shall include the following:
1) Performance of all operations associated with opening, development and exploitation for the construction of facilities necessary for the exploitation of raw materials or natural resource;
2) Exploitation of all of the mineral raw materials or natural resources specified in the concession contract;
3) Utilization of other natural resources and conditions in conformity with the concession contract and the applicable law; and,
4) Sale of the mineral raw materials or natural resources, produced from the exploitation of a concession, in local and international markets in conformity with law.

Other rights and duties
Article 91

Should it be necessary to expropriate and/or develop building or land in connection with the granting of a concession, the costs for any expropriation and/or development of building or land shall be charged to the concessionaire and the concession contract shall provide the costs thereof and the terms and conditions for the payment of such costs.

In a case as that referred to in sub-article 1 of this article, the determination of public interest and the expropriation shall be carried out in compliance with the law.

If a public entity or the regulatory body issues, pursuant to the expropriation regulations, any legal instrument forfeiting or limiting any right of use in relation to built any facility constituting, directly or indirectly, the subject matter of a concession, the concessionaire concerned shall be entitled to a compensation which may not be lower than the market value, as determined by an independent financial adviser to be paid by the public entity.

Formation, organization and operation
Article 92

For the purpose of pursuing a concession activity, the concessionaire concerned shall establish an enterprise within 60 days from the date of the concession contract and the head office of such enterprise shall be in the Republic of Montenegro, unless the concessionaire concerned has already an enterprise established and registered for activities of a similar nature; therefore, the enterprise shall be operated and be otherwise organized and operated in conformity with the law of the Republic of Montenegro.

Changes
Article 93

The head office or status of a concession enterprise may be changed only after a prior approval by the regulatory body issuing the license for concession.

Dissolution of a concession activity
Article 94

In the event of dissolution of a concession enterprise, any private assets, property, movable or immovable, for the concession shall be offered to the public entity at the fair market value determined by a financial adviser; where, after sixty days of such offer, the public entity did not proceed with the buying, the private assets may be liquidated, or otherwise disposed by the concession enterprise in compliance with the law.

Expiration of a concession
Article 95

Any concession partnership may be terminated, as per the terms and conditions of the concession contract and by issuance of a decree, in the following cases:
1) Expiration of the concession contract;
2) Redemption of the concession;
3) Forfeiture of the concession;
4) For any other reason stipulated in the concession contract;
5) By mutual agreement.

Decision on the conditions for and modality of letting mineral raw material deposit
Article 96

For the purposes of this Law, the deposits shall be classified as follows:
1) Deposits whose exploitation was under way on the effective date of the concession agreement;
2) Deposit existing in the exploitation was under way on the effective date of this decision but not subjected to exploitation;
3) Investigated deposits in the exploitation fields which are not being exploited;
4) Deposits which have not been subjected to geological prospecting and which in the opinion of the ministry responsible for mining are suitable for being prospected and exploited on the basis of a concession contract.

The subject matter of any concession contract may be granting of the right of exploitation of the mines in which the exploitation of mine waste dumps has ceased.

The ministry responsible for mining shall present to interested legal entities and to the regulatory body the particulars about the deposits.

Where of public interest and where initiated by the regulatory organ, decision on sites may be subject to public hearings in compliance with this Law.

Crude oils or gas, under land or sea
Article 97

In the case of prospecting for, exploitation of crude oil and gas in the land and seabed exploratory location within the territory of the Republic of Montenegro, the special character of these types of operations, the operating continuity and the specific conditions necessary to result in investment, local or foreign, shall be taken into consideration.

Deposit under way
Article 98

In case of deposits whose exploitation was under way or deposits existing in the exploitation fields of mining enterprises, but not exploited on the effective date of this Law, the ministry responsible for mining shall have the right of offering mineral raw material to obtain offers for concession in compliance with this Law.

Geological prospective
Article 99

The ministry in charge of mining shall open competition for award of concessions in compliance with this Law, for the investigated deposits located outside the existing exploitation fields and for the deposits which have not been subjected to derailed geological prospective, which in the opinion of the ministry responsible for mining, may be suitable for prospecting, exploitation on the basis of concession contract.

Approval for deposit site
Article 100

In addition to the requirements under this Law, approval for deposit site shall be obtained from the ministry responsible for mining, prior to any seeking of offers, and the request for approval shall include the technical and financial information on the deposit constituting the subject matter of the concession to be offered.

Technical requirements for deposits
Article 101

In any technical report on any deposit that may constitute the subject matter of a concession, shall be included the following:

1) indication of the mineral raw materials involved;
2) name of the locality;
3) indication of the deposit together with a layout of the exploitation field involved at the scale of 1;10,000 delineated by control points;
4) coordinates and area particulars, proprietary situation particulars, on the infrastructure surrounding and any building located in the exploitation field;
5) deposit evidence of basic and detailed geological field;
6) deposit evidence of basic and detailed geological prospecting;
7) particulars on the quality and quantity of the mineral raw materials appraisal;
8) the cost effectiveness of exploitation;
9) duration of planned prospecting, exploitation;
10) expected compensation to be paid by the private investor or operator;
11) any requirements for any public entity to participate in the construction of infrastructure and acquisition of equipment;

The report on the deposit constituting the subject matter of concession shall be prepared by the ministry responsible for mining; where a concession is offered for prospecting and exploitation, the same report requirements shall apply, but shall be based on preliminary findings that are available before prospecting.

Technical commission
Article 102

The ministry responsible for mining shall establish a special technical commission responsible of examining the technical information submitted by participating investors and prepare a technical assessment report to be made available to all evaluators, prior to their undertakings of the examination, evaluation and comparison of offers in compliance with this Law.

Technical and financial reports
Article 103

In addition to the requirements under this Law and under the concession contract, any concession enterprise shall report by 15th March of each year a status report on technical and financial results of the concession.

CHAPTER EIGHT
BUILT-OPERATE-TRANSFER (BOT) ARRANGEMENT

Build-Operate-Transfer, BOT
Article 104

Any natural or corporate person, national or foreign, may be permitted to build-operate and transfer (BOT) a specified facility, installation or plant or infrastructure set out under a franchise regulated by the regulatory body established under this Law.

Type of permitted arrangements for BOT
Article 105

Are hereby permitted under this Law, Build, Operate and Transfer, BOT contract arrangement, under a franchise authorized by a regulatory body, whereby a private investor and /or operator is building and operating a public utility and, after a determined period, is transferring the ownership thereof to a public entity; BOT arrangements shall include Build-Lease and Transfer (BLT), Build-Transfer-and-Operate (BTO), Develop-Operate-and-Transfer (DOT), Rehabilitate-Operate and Transfer (ROT); tariffs payable by the clients shall be regulated by the contract entered into and shall be subject to the decision, after public hearings, of the regulatory body for the tariffs payable and the quality of the services to be delivered.

BOT System
Article 106

For the purpose of this Law BOT arrangements shall be understood to mean the letting of the construction of building, installation or plant on the basis of the BOT system (build-operate- transfer) under an agreement concerning the construction and financing of a complete building installation or plant, its operation and transfer to a public entity of the Republic of Montenegro within the contracted term.

Eligible types of project
Article 107

The construction, rehabilitation, improvement, betterment, expansion, modernization, operation, financing and maintenance, of the following type of projects which are normally financed and operated by the public sector which may be, under this Law, wholly or partly financed, constructed and operated by the private sector, including other infrastructure and development projects as may be authorized in compliance with this Law.

The following infrastructure or projects and related facilities shall be permitted:

1) highways including expressways, roads, bridges, interchanges, tunnels;
2) railways or rail-based projects packaged with commercial development opportunities;
3) non-rail mass transit;
4) port infrastructures like piers, wharves, quays, storage, handling, ferry services;
5) power generation and transmission;
6) telecommunications;
7) information technology;
8) water supply, sewerage and drainage;
9) education and health infrastructure;
10) tourism facilities and sites;
11) government or self-local government buildings;
12) housing projects for social security;
13) public markets;
14) warehouses and post-harvest;
15) environmental and solid waste management including collection equipment, composting plants, recycling and, incinerators.

Transfer
Article 108

After the expiration of the franchise period and upon recovery of the investment, the project company shall transfer, in compliance with the terms and conditions of the BOT contract, the entire facilities of such BOT project to the public entity in good condition and without any claim.

Payments from beneficiaries
Article 109

Within the BOT contract period or otherwise extended sufficiently for the recovery of investment, the project company shall operate lawfully and independently, and recover and obtain returns on its investment through payments received from the beneficiaries.

Minimum capital of an investor
Article 110

The registered capital of an investor shall not be less than 25% of its total investment.

The project company shall be entitled to the ownership and management rights of such facilities during the franchise period as determined under the BOT contract.

Examination and prior approval of projects
Article 111

Subject to Article 4 of this Law, prior to initiating any seeking of offers, a feasibility study report of a BOT project shall be proposed by the public entity for the examination and approval by the Privatization Council.

Preparation of documents
Article 112

Pursuant to Article 111 of this Law, upon obtaining approval for a BOT project, the public entity authorized to issue such BOT project shall start to prepare the pre-qualification documents and the bidding documents and submit such documents, for examination and approval, by the Privatization Council.

Pre-qualification of investors
Article 113

Before the seeking of offers, a pre-qualification of investors, local or foreign, or in joint venture, shall be conducted to invite investors intending to submit offers. For pre-qualification, an investor intending to submit an offer shall provide, in addition to the requirements under this Law, at least the following documents:

1) A legal background on their on-going operations;
2) Certification of experience and performance of similar contracts in nature and complexity;
3) Ability to organize and manage the BOT project; and,

4) Financial and credit status and evidence of available assets for the project.

Bidding for BOT
Article 114

In addition to the requirements under this Law for solicitation documents, shall be include herewith at least:

1) Feasibility study report of the BOT project;
2) Proposed schedule of the construction of the project;
3) Proposed billing standards and adjustment formula.

Feasibility study report
Article 115

Subject to Article 111 of this Law, the feasibility study report of the project shall include:

1) Survey of the project and target;
2) Assessment of the effects of the project on the environment;
3) Market demand for the project, as well as its costs and charges;
4) Description of project engineering and technical index, including the technology to be adopted;
5) Description of the project company, including engineering, construction and operation plans;
6) Financial analysis, including total investment, cost of labor and materials, financing scheme and cost, cash flow, internal rate of return, inflation rate, supposed foreign exchange rate and interest rate, analysis of risks and sensitivity; and,
7) Other items included in the feasibility study report.

Examination before award
Article 116

The BOT agreement shall be concluded in accordance with this Law; therefore, the public entity shall submit the outcome of the evaluation of offers and the BOT agreement, with the feasibility study report of the investor's project attached thereto, to the Privatization Council for examination and approval; after approval of the privatization Committee, the same documents along with the recommendation of the Privatization Council shall be made available to Government for final approval before award of the contract.

The BOT contract agreement
Article 117

BOT agreement shall be in compliance with the laws and other regulations in force and should at least include the following:

1) the names, places of residence and representatives of the legal persons of the relevant parties of the BOT agreement;
2) The content, conditions and terms of the BOT;
3) The duration of the BOT and the terms for the recovery of investment by the investor;
4) Project design, construction, operation and maintenance standards;
5) The schedule and extension of the project, and the outcome of termination;
6) The construction price of the project and the billing plan;
7) The criteria and procedure for handing the project over to the Government after the expiration of the term of the BOT;
8) The rights and responsibilities of the governmental organs;
9) The rights and responsibilities of the BOT project company;
10) The risk-sharing by category of risks;
11) The transfer of the rights and responsibilities of the project company.

Establishment of the BOT project company
Article 118

The investor approved to win the contract shall establish the BOT project company in accordance with the relevant laws and regulations of the Republic of Montenegro.

Franchise registration
Article 119

The Public Entity shall carry out franchise registration with the regulatory body for all BOT project agreements concluded pursuant to the provisions herein. To be a registered BOT agreement, a franchise shall be issued by the regulatory body; therefore an investor issued with the franchise shall be protected by the laws and regulations of the Republic of Montenegro.

Market demands
Article 120

Except in cases where the existing BOT project is unable to satisfy market demands, the governmental organs shall not approve any new competitive projects.

Supervision, examination and auditing
Article 121

The regulatory body shall be entitled to conduct supervision, examination and auditing of the BOT project company's operational activities.

Guarantees
Article 122

Except in the case of public private co-financing scheme, any governmental organ or any public entity shall provide any form of guarantee regarding the rate of return of the project investment. BOT contract arrangements shall be based on identified returns sufficient to reimburse investment, and where such returns are insufficient at expiration, extension shall be allowed for full recovery of the investment made by the private investor.

Customs and taxes
Article 123

The BOT project company shall pay customs and taxes in accordance with the provisions of laws.

Training, technology and data
Article 124

The project company shall be responsible for the training of the personnel required to assume independent responsibility for the operation and maintenance of the project after the transfer of the project. After the expiration of the term of BOT agreement, the project company shall, without reservation, hand over the technology and data of the operation and maintenance of the project to the government organs without any compensation.

Changes in policy
Article 125

The BOT project company shall be responsible of commercial risks such as project financing, construction, operation and maintenance through methods such as adjustment of the billing standards and the extension of the BOT term, authorized by the regulatory body; the public entity shall be responsible of the risks of the BOT project that are directly due to material effects resulting from changes in policy.

Applicable law and the settlement of disputes for BOT
Article 126

The BOT agreement's execution, performance, and interpretation, as well as the settlement of disputes, shall be in accordance with the laws of the Republic of Montenegro; in issues not yet regulated by the laws of the Republic of Montenegro, the best international practices such as the ones made under international convention or the latest "Acquis Communautaire" of the European Union shall prevail.

Court proceedings for BOT
Article 127

Any disputes arising during the performance of the BOT agreement or having connection with the this agreement shall be settled through consultation between the parties to the agreement in the presence of the regulatory body. If a settlement cannot be reached through consultation after 30 days, such disputes shall be submitted to a Court of the Republic of Montenegro and the latest UNCITRAL Arbitration Rules shall be applied, supplemented by the Supplemental Rules of the International Center for the Settlement of Investment Disputes (ICSID).

CHAPTER NINE
REGULATORY BODY

Powers
Article 128

Pursuant to this law the Government shall establish a regulatory body as an organ having powers to:

1) issue license for concession;
2) authorize franchise for BOT arrangements;
3) determine allowable increases, decreases or no change in tariffs payables;
4) determine and control quality standards of public services delivered;
5) promote operating efficiency of investment made by private investors;
6) monitor the private company performance and contractual compliance;
7) ensure public satisfaction of clients, receive complaints;
8) arbitrate disputes with consumers and ensure responsiveness to final customer needs;
9) impose sanctions on private investors for failure to meet regulated quality standards;
10) ensure assets serviceability;
11) organize and monitor public hearings.

For BOT or Concessions contract arrangements entered into under this Law, all functions and powers of the regulatory body herein established shall be, *mutatis mutandis*, on the regulatory body established by law to regulate for a specific sector.

Where no such regulatory body for a specific sector is established by law, the regulatory body herein established shall exercise all the powers and duties as imposed under this Law.

Members
Article 129

The members of the regulatory body shall ensure that the licenses and franchises permit the conduct of activities for development with the up-most transparency and integrity in full compliance with this Law.

The regulatory body shall comprise four permanent members and one ad-hoc member:

1) a Chairperson who shall represent the Government and who shall be a judge or an ex-judge;
2) a member who shall represent the Ministry of Finance;
3) two members who shall represent the Self-Local Governments; and,
4) an ad-hoc member from the public entity initiating a BOT or concession project

Decision shall be made on majority of votes, each member having one vote; quorum for decision and public hearings shall be 3 members; in case of equality of vote, the Chairperson shall have a casting vote.

Except for the ad-hoc member from the public entity initiating a project who shall be appointed by the head of the public entity, the members of the Regulatory Body, who shall not be elected persons, shall be appointed by the Government, in consultation with the President of the Republic and with the leader of the opposition parties, and on such terms and conditions as may be determined by the Prime Minister. Every member shall hold office for a period not exceeding 3 years and shall be eligible for one re-appointment.

The Government may, in consultation with the President of the Republic and with the leader of the opposition parties, at any time terminate the appointment of a permanent member who has been guilty of: any misconduct, default or breach of trust in the discharge of his duties; and an offence of such nature as renders it desirable that his appointment should be terminated.

The Regulatory Body may engage in compliance with the law, such number of persons as may be necessary, capable of assisting it with expert advice; such expert shall not have, in any matter, right to vote.

The Regulatory Body shall meet at such time and place, as the Chairperson deems fit and undertake public hearings in compliance with this Law and the rules made under.

Subject to Article 132 of this Law, the Government of the Republic of Montenegro shall determine the remuneration of the members of the Regulatory Body, for carrying out their duties under this Law.

Harmonization
Article 130

To maintain national harmonization, fair competition and for proper governance on decisions made, the regulatory body shall:
1) train regulatory staff;
2) publish local and regional performance indicators;
3) publish locally monitored activities and regulatory decisions;
4) report and monitor guidelines for comparable reports.

Criteria for selection
Article 131

Members and staff of the regulatory body shall be impartial and criteria for their selection shall be determined by the Government; the selection shall be made so as to ensure:
1) the protection of the legitimate interests of investors and freedom from political influence;
2) the protection of consumers' rights to receive public services from the operation at the level of quality expected and to complain when services are not delivered as expected;
3) that regulators be devoted to the responsible discharge of their regulatory functions;
4) that the regulatory body remains true to its mandate and fully accountable; tenure may be given for a fixed period and provide protection from arbitrary removal from office.

Funds and personal financial interests
Article 132

Except as otherwise authorized by the Government, the regulatory body shall be funded through direct levies on concession and BOT operations and not from public budgets; regulators shall have no personal, directly or indirectly, financial interest in any of the operations to be regulated; in addition, members shall have no personal interests for a period of three years on any BOT or concession contracts, after termination of contract and for a period of two years after termination of office.

Minimum tariffs payable by clients
Article 133

Notwithstanding any mutual agreement resulting to the contrary, for BOT arrangements, the tariffs payable by the clients or the consumers shall not be less than the tariffs determined under the BOT contract.

Notwithstanding any mutual agreement resulting to the contrary, for concession contract, the compensation payable by the investor or operator shall not be less than the compensation determined under the concession contract.

Accountability
Article 134

Any person may participate in the public hearings organized by the regulatory body; the public hearings shall be organized to permit the investors, the operators and the consumers to express their views before determining tariffs charged by the investors and operators for the public services provided to the consumers.

The regulatory body shall report annually to the Government on all their activities, including outcomes of public hearings.

Public hearings
Article 135

After a license or a franchise is authorized under this Law, public hearings shall be conducted in compliance with the rules made under this Law for tariffs or fees under BOT and Concession arrangements and for the compliance with standards on the quality of the services delivered, as determined by the contracting arrangements.

Appeal on decision
Article 136

Any investor, operator, consumer, client, group of clients or group of consumers may appeal a decision made by the regulatory body by a written request to the regulatory body for a final public hearing; where such request for appeal is made, the proceedings of the final public hearing shall be held not later than one month after receipt of such appeal request; decision made under such appeal shall not limit in any manner any decision made by a court.

Co-financing schemes for investment
Article 137

This article shall refer to major infrastructure projects BOT or Concession by a private sector investor and / or operator co-financed by a public entity, on prior approval of the Minister responsible for finance and the Regulatory body.

For co-financing schemes, the public entity shall collaborate with the Regulatory Body and the Ministry responsible for finance who shall be the organs for the preparation and approval of any co-financing scheme.

Where appropriate, the Ministry responsible for finance and the regulatory body may seek the participation of development banks or any other financial institutions for loans, credits or grants to be offered to a private investor without governmental or public entity guarantee.

Where risk capital is to be made available by a public entity or by the Government in the form of shares for a corporate body to be established for such a project, the Ministry of Finance and the Regulatory Body shall also seek the approval of the Government and ensure appropriation is made by the public entity or by the government to meet obligations.

Notwithstanding any conditions under loan, credit or grant of a banking institution or any condition under any co-financing agreement, the investor or the operator shall be authorized by a regulatory body to procure the goods, works and services required for the facility, using its own procurement procedures applicable by the private sector.

Where the goods, works or services required for the facility and to be financed partly by public or wholly by local, regional or international public funds, such goods, works or services shall be procured in accordance with the provisions of the public procurement law or of any treaty or agreement entered into with a co-financing development institution.

Where, exceptionally and after approval of the Government, a public entity contributes directly by risk capitals to own shares of an enterprise created for BOT or concession, a divestiture plan not exceeding fifteen years shall be proposed by the investor, as part of his offer, in the view that only the investor or the operator will own shares at time of the transfer of the facilities for BOT and at termination of the concession.

Competition for small projects
Article 138

Where projects of low complexity are prepared by a public entity and approved in compliance with this Law, with the aim to promote the participation of the private sector for the delivery of public services of such low complexity, competitive licenses, concession or competitive franchises for BOT may be offered by the regulatory body under open and fair competition, and after advertising for pre-qualification and offering in compliance with this Law, among investors and / or operators, only where the value of the total investment for such low complexity projects does not exceed 1 million DEM and the duration does not exceed ten years.

Competitive tariffs and fees for services
Article 139

Tariffs or fees for public services delivered shall be competitive with tariffs in force in the territory of the Republic of Montenegro.

Costs of licenses offered shall not be higher than licenses issued for similar services obtained in the territory.

Except in co-financing scheme, the project shall not create or result in public debt or any contingent liability on the part of the public entity and / or the Government.

Priority for project approval
Article 140

Special priority shall be given by the public entities and the regulatory body to not serviced localities and to indispensable public services contributing to economic stability or growth; for local development projects, the regulatory body and the self-local governments shall promote the use and the development of small scale BOT or Concession enterprise; under this section; in addition, any offer for any concession or BOT contract shall include subcontracting arrangements using such small scale enterprises for at least ten per cent (10 %) of the estimated total value of the contract.

CHAPTER TEN
FINAL PROVISIONS

Rules, regulations and forms
Article 141

The Privatization Council and the Regulatory Body pursuant to provisions of this law shall make such public solicitation rules, regulations under the guiding principles of accountability and transparency for purposes of this Law.

Article 142
Transparency

Any person who directly or indirectly, in any manner influences, or attempts to influence any officer or member taking part in any seeking of offers, whether or not his role is critical to the decision-making, with the object of obtaining an unfair advantage under this Law, shall commit an offence; any evaluator, supervisor of an ad-hoc evaluation committee, members of the regulatory body who directly or indirectly, in any manner influences, or attempts to unduly influence a supervisor, an evaluator, shall commit an offense.

The permanent members of the Regulatory Body, on assumption of duty shall take their respective solemn statement of office specified in the form set out in the regulations made under this Law; all experts or consultants engaged to deliver services that include access to confidential information shall comply with confidentiality obligations as set out in the contract documents and under this Law; all persons involved in seeking of offers shall be guided by the rules and by the code of ethics as laid down under this Law; the solemn statement taken under this article shall include an undertaking to be bound by the Code of Ethics under this Law.

The permanent members of the Regulatory Body shall file with the State Prosecutor a written statement of assets and liabilities not later than 30 days after appointment and upon termination of appointment; where, subsequent to a declaration made therefore, the state of assets and liabilities is so altered as to be reduced or increased in value by a prescribed amount, as set out by the State Prosecutor, a up-dated declaration shall be made; no declaration of assets and liabilities filed shall be disclosed to any person except with the express consent of the person concerned or by order of a Judge on reasonable cause shown.

Subject to a reasonable administrative fee, the public shall be given prompt access by the Regulatory Body to this Law, to up-dated provisions of this Law, to any legal instruments made under, to standard documents and forms, and to the annual reports; accessibility shall also be made possible by electronic mode of communication.

The Regulatory Body shall publish in the Official Gazette, not later than 45 days after such authorization or any changes made thereof:

1) information on Concession license and on BOT franchise being authorized,
2) any change made on tariffs or fees,.

Any public entity and the regulatory body involved in any seeking of offers or in any activity under this Law shall record and safeguard all relevant documents issued and received where they directly or indirectly relate to any activity undertaken under this Law; any person who, willfully or negligently, by any action or omission resulting in the non availability of any document or evidence shall commit an offense; all documents, of any type, shall be kept in safe condition for a minimum period of ten years after completion and payment of contracts and, be available instantaneously for review or audit or by any expert hired therefore in compliance with this Law; except for records, directly or indirectly, related to the national security, contractual documents for which the obligations are fully fulfilled, shall be made accessible to any person interested within two weeks from receipt of a written request; where the request concerns viewing only the documents, it shall be in the presence of an officer; where the request is to obtain copies thereof, it shall be subject to payment of reasonable fee.

Consultants, or any of their affiliates, shall not be hired for any assignment that would be in conflict with their previous and current assignment, and prior obligations to other clients, or that may place them in a position of not being able to carry out the assignment in the best interest of the public entity.

All private investors and operators, shall, under this Law, include in their offers a declaration that the content of their offers have been independently raised and prepared by certifying that no consultation has been made by other investors or operators and consequently that no unfair advantage is taken from unfair and non equitable competition.

For information, the regulatory body shall make available, at least once a year, a technical and financial report to the Government of the Republic of Montenegro on the implementation of each of any concession or BOT agreement, on any investment related thereto, and the any activities initiated by the Regulatory Body, including its own activities, and financial results therefrom.

Code of ethics
Article 143

The prime concern of all persons involved in solicitation activities shall be governed by principles of transparency and accountability.

All persons shall handle public solicitation by: ensuring adequate time for preparing offers; complying with this Law; maintaining strict confidentiality as requested under this Law; and maintaining ethical practices by developing and maintaining honest and professional relations with investors and third parties, by having an attitude that shall reflect this Law.

No person involved, directly or indirectly, in public solicitation shall accept any type or form of advantage from an individual or any type of organizations; any person, organization, entity, association or any other group of persons who is offered or received such gratuities shall refuse it and return it to the giver in a dignified manner, advising him in writing that this Law prohibits such reward or gift.

All persons involved, directly or indirectly, in matters of public solicitation shall be expected to be free from interests or relationships which are actually or potentially inimical or detrimental to the best interests of the Republic of Montenegro and shall not engage or participate in any commercial transaction involving the Government or a public entity in which they have any kind of financial interest.

A conflict of interest exists where a person:

1) possesses an interest outside his official duties that materially encroaches on the time or attention which should otherwise be devoted to affairs of Government;
2) possesses a direct or indirect interest in or relationship with an outsider which is inherently unethical or that may be implied or inferred to be, or make possible gain or advantage due to the person’s ability to influence dealings;
3) entertains relations which are unethical, rendering his attitude partial toward the outsider for personal reasons or otherwise inhibit the impartiality of the person’s business judgments;
4) presents, by acts or omissions, the public entity he represents or the Government in an equivocal, embarrassing or ethically questionable position;
5) entertains relations compromising the reputation on the integrity of the public entity he represents or the Government;
6) receives benefits by taking advantage of an opportunity that properly belongs to the public entity he represents or the Government;
7) creates a source of revenue or advantage by using public property which comes into his hands either in course of his work or otherwise; and,

8) discloses confidential information of his public entity to a supplier or to unauthorized persons.

Repeal
Article 144

The law on concession (Official gazette of the SRoM 13/91) shall be repealed as of the application date of this law.

Transitory provisions
Article 145

Any right or obligation subsisting at the commencement of this Law in favor of, or against any of the public entities shall, on commencement of this Law, be a right or obligation in favor of the same public entities.

Any situation which came into being but were not exercised before the entry into effect of this Law, shall remain in full force in conformity with the old legislation; but their exercise, duration and procedure to enforce them shall be regulated by this Law and by the Rules of Court; if the exercise of the right or of the action was commenced under the old laws, but is pending on the date this Law takes effect, and the rules and regulations were different from that established in this Law, the rules and regulations made under this Law shall apply.

Rules and regulations laid down or made under this Law which may prejudice or impair vested or acquired rights in accordance with the repealed legislation shall have no retroactive effect.

Commencement
Article 146

This Law shall take effect after eight days following its publication in the Official Gazette of the Republic of Montenegro, and shall be applied as of 1st July 2002.

TECHNICAL MEMORANDUM NO. 25

OPTIONS FOR TOLLING STRATEGIES

TABLE OF CONTENTS

1 INTRODUCTION

This Technical Memorandum describes the background behind the establishment of a possible strategy for tolling in Montenegro. The project currently under study looks at two new routes (namely, Bar to Boljare and The Adriatic-Ionian Highway) and the final objective should be to integrate both future toll roads with a view to complete a Toll Road network covering the two main axes in the Country. When completed, the high speed Motorway[1] network will link the major towns and activity centres and will complete major Corridors, which pass through from North to South and from East to West linking with neighbouring Countries.

At this time, the strategy covers only the Bar to Boljare Motorway, since this is viewed as the top priority project. As the Adriatic-Ionian Motorway is added later, the tolling strategy will be expanded.

The paper discusses the following main aspects:-

a) Definition of terms used in the paper;
b) A description of the existing toll road system, which is operating at the present time;
c) A description of the preferred future system when fully complete; and
d) A description of the gradual expansion of the network on the basis of a possible phased implementation programme.

The concepts provided here form inputs to the on-going financial assessments and thus provide a basis for deciding on the likely viability of the toll road network or parts thereof.

[1] The term “Motorway” is used to designate a fully access-controlled highway with a minimum of two lanes in each direction designed and built to TEM standards or similar, and intended for operation as a Toll Road. The term is defined in Article #3 of the Law on Public Roads, 1996.

2 SYSTEMS DEFINITIONS

2.1 Introduction

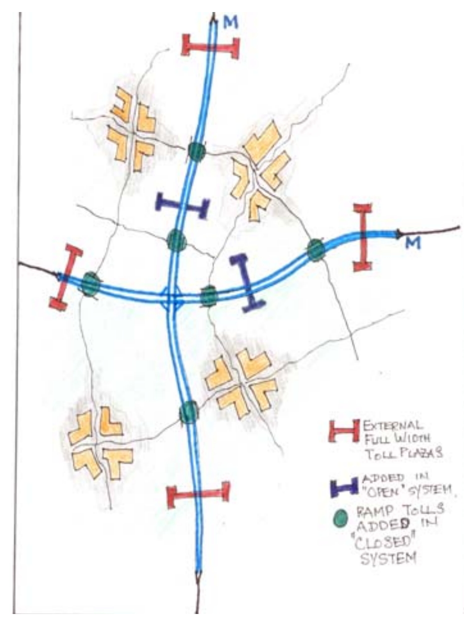
This section provides a series of definitions of the terms used in the specification and designs of toll systems. It covers the subjects of the Tolling Strategy and the methods of Toll Collection.

2.2 Tolling Strategies

The design of the tolling system takes into account items such as continuity of the network, the number of interchanges, the spacing of interchanges, the traffic volumes and the trip patterns. Where there is a simple network of Toll Roads in place, the toll strategy can also be simple. As the network becomes more and more extensive and as traffic volumes increase, the tolling strategy should reflect and respond to this more complicated network. Although there are variations within either of the two main methods, the tolling strategy can be divided into the so-called "Open" system and "Closed" system.

a) The Open System

The essential difference between this and a closed system is that there is the possibility for some journeys to take place without the payment of a toll. Usually in most cases, the numbers of such "free" journeys is a relatively small percentage of the total journeys taking place. In a pure closed system, all intermediate entry and exit ramps between the ends of each section should also be controlled with toll collection/distribution booths; in practice it is often the case that small local roads are not controlled and this leaves the system "open" for non-payment of tolls for some journeys.



Comparison of Open and Closed Systems showing multiple Toll Plazas for the Open System and full tolling on all entry and exit ramps for the Closed system.

A second important feature of open systems is the number of times when a driver is required to stop to pay a toll or collect a ticket. Unlike closed systems, longer distance journeys often require multiple stops which create time wasting and frustration on the part of drivers.

b) The Closed System

The essential difference between this and the open system is that <u>all</u> journeys are intercepted and <u>all</u> journeys therefore pay a toll. In a typical closed system the driver of any vehicle would only need to stop twice[2] – the first time to collect a ticket and the second time to pay his toll fee. In a normal approach to a closed system, there would be an external cordon at which all vehicles entering and leaving the network would be intercepted. These main external Toll Plazas would define the network and all entry and exit ramps would also be controlled. Other existing toll plazas would become superfluous and vehicles would pass through without stopping. This closed system therefore, requires that every entry and exit ramp must be controlled.

c) Directional Tolling

Directional tolling can be cost-effective in certain layouts. It is most suitable for a single link or series of links in which any alternative route is such a long diversion that the return trip is virtually captive traffic. A typical example is a Bridge. The diagram shows the two newest crossings (1966 and 1996) of the Severn river in England. (The alternative is a 100km trip via the previous lowest crossing, a stone bridge built by Telford in 1829). In this circumstance, tolls may be placed in one direction of travel and the fee levied would be typically twice the normally expected fee. Clearly this removes the need for half the toll booths and reduces land acquisition and personnel considerably.

A layout for a river crossing in South-West England where tolls are collected in one direction only. If the driver were to try to avoid the non-tolled return, there would need to be a very long diversion.

2.3 Toll Collection Systems

One of the most important aspects to be decided at the outset is the likely volume of traffic passing through any and all of the toll plazas or ramps. This will have a major effect on the decision about the type of toll collection method. Low traffic volumes can be easily handled with manual methods; high volumes require more advanced technology if long delays are to be avoided.

The following three terms (a, b, and c below) are used constantly, to describe the main options available[3] but it should be appreciated that there are many variations within each of the definitions.

a) Manual Collection Systems

As the name suggests these collection methods are done by hand. Conventionally, the toll fees are posted at the toll gate or, better still, a kilometre or so in advance of the toll collection booth. The motorist stops at the booth window and pays the prescribed fee to the booth operator. The driver receives a receipt as proof of payment. This approach is the common practice in Montenegro at the Sozina Tunnel.

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[2] This relates to semi-automatic systems which are very common. In a fully automatic system, drivers do not stop at all and fees are collected automatically.

[3] As an example the system currently in use in Austria uses a "Vignette" which is a permit bought and displayed on a vehicle and is valid for a pre-determined period. There are thus no toll barriers and all the fee collection is completed at a roadside booth on entrance to the Toll Road network. However, the use of Vignettes goes against the current trend in setting tolling systems which pursue the idea of User Pays.

b) Semi-Automatic Collections Systems

As traffic levels increase, the need to speed up the toll collection methods becomes more urgent. The move away from manual systems of collection can achieve some reduction in delays. Semi-automatic means reducing the intervention by personnel in some of the transactions. It is not a complete removal (this would be a fully automatic system). Semi-automatic systems can have wide variations in their approach all of which speed up the process and reduce the reliance on human intervention including the following:

- Issuance of a ticket from a machine on entrance to the Toll Road, thereby lifting a barrier;
- Use of credit/debit cards or loyalty cards for toll fee payment; and
- Use of pre-paid tokens or tickets.

This last method also allows marketing options for frequent users to be introduced.

c) Fully Automatic Collection Systems

The ultimate, high technology collection systems virtually eliminate the need for human intervention on the Toll Road itself. There is always a need for administrative staff but these are housed remotely from the Toll Road itself. In these fully automated systems, vehicles are usually pre-registered and/or drivers establish bank accounts from which the toll fees may be debited. Other systems use transponders which carry a sum of money embedded in the chip in the transponder and which the toll collection system debits as vehicle pass across a beacon. A pre-requisite of such systems is that there is a data base of drivers, vehicles and addresses in existence which can be used reliably to identify and prosecute violators.

Below are two illustrations from a modern fully automated system in use in Ontario in Canada. The system is established on Highway 407 north of Toronto. The left picture shows a transponder used on Highway 407, which identifies the vehicle and applies the necessary charges to the account. The right picture shows a typical ramp to the highway with overhead gantries[4] bearing cameras and detection equipment. All vehicles passing the gantries are recorded and their entry and exit points used to calculate the toll. For further information see the website - [www.407etr.com]

An example of a Transponder

An example of a fully automated system showing the access ramp and overhead gantry with detector beacons.

[4] It should be clear from this that there is no need for Toll Plazas a acquisition other than that for the Motorway itself.

2.4 Toll Rates

The Toll Rate is conventionally considered to be calculated using a cost per kilometre. This is then translated into a price at each toll collection point to act as a proxy for the distance travelled on the particular journey. In open systems, an approximate average value for distance travelled is estimated and the rate applied giving a price at the toll booths. The selected rate will be set in consideration of various parameters as noted below:-

- Payback Levels. Often the rate is fixed to reflect the capital cost of construction. In this system, the rate will become a function of the cost and traffic volumes coupled with the time perceived over which the costs should be paid back;
- Harmonization. The standardization of rates for the payment of tolls has merit in that motorists feel that they have been treated equitably as they travel around long distances. In the case of the Trans European Network for example, these Trans European Motorways occur in many European countries and a reasonably constant toll rate is aimed at. For Montenegro therefore, there will be pressure to create a similar rate to that which exists in the surrounding countries;
- Ability to Pay. The rate which is payable needs to be set at a level at which the local people can afford (sometimes referred to as “social rates”). As economies vary, the ability of drivers to pay a toll will also vary. Hence there are usually surveys undertaken which will be planned to identify that rate which is acceptable to a reasonably large number of people. In this study, the Consultants undertook a Stated Preference survey which was (in part) designed to establish the acceptable level for toll rates[5];
- Free Market Rates. This approach to tolling allows the operator to vary the toll charges to suit traffic levels and hence balance traffic volumes by time of day or day of the week. The objective is to maximise the revenues by optimising the rate and traffic flows. As the rate increases, the diversion away will increase and the revenue might drop; conversely, as the rate drops more traffic will divert to the Motorway thereby increasing revenue. Although it is possible to activate the system using manual methods, the use of electronic tolling systems will enable the operator to vary the rate much more easily.

As an illustration of the variability of rates, the Toll Roads in Croatia use a rate of approximately 5 eurocents per kilometre; rates in Macedonia are lower at 4 eurocents per kilometre; the recently opened M6 Motorway in United Kingdom has a single charge, equivalent to approximately 13 eurocents per kilometre; finally, values of 6 eurocents per kilometre are frequently encountered in the south eastern Europe region.

5 The Stated Preference survey and results are found in Technical Memorandum No: 6 November 2007

3 EXISTING TOLLING SYSTEM

The only system of tolling currently in operation in Montenegro can be observed at the Sozina Tunnel.

There is a single set of booths located at the northern end of the tunnel serving traffic in both directions. This is a full width barrier toll plaza with 4 booths although at most times only two (one in each direction) booths are in operation.

The system of toll collection is manual with the operator making a visual identification of the vehicle classification. The operator records this vehicle by pressing a key on the till and a visual display shows the fee to be paid. The fee transaction is completed by a cash payment which is deposited in the operator's till by the operator.

Other payment methods such as Credit Cards for example could be better used since these are in common usage in Montenegro. Although the possibility exists to use such cards and could speed up the toll collection process and also remove the build-up of cash at the booths and tolling plaza, there is no evidence that they are in use.

Although prepaid accounts are available for payments, we are not aware of any efforts in place to use marketing techniques to increase sales of toll tickets. Examples of these could be discounts for frequent travellers realised via their accounts or by sale of multiple tokens at a discount or special rates for off peak travel and weekend usage. Use of such techniques could increase revenue by relevant amounts.

4 PROPOSED SYSTEM BASED ON A FULLY CLOSED TOLL ROAD NETWORK

4.1 Introduction

The proposed tolling method for the Toll Roads system in Montenegro is based on a “Closed System”. Initially, the fee collection is recommended to be by semi-automatic methods but this should be gradually developed until full automation is achieved. This section describes the initial system, and the gradual development through time leading up to the final system.

4.2 Assumptions on Project Phasing

A study was undertaken partly by the team’s Engineers and partly by our Economists. The purpose was to investigate the likely construction sequences which would be most appropriate for the implementation of the project highways. Both disciplines had a major influence on the phasing:-

- From an economic point of view, the sequencing was chosen in order to maximise the rates of return. The economic assessment investigated the effects on the EIRR of the variations in timing investment in sections or variations in lateral and longitudinal phasing[6].
- From an engineering viewpoint, the investigation looked into items such as costs, ease of construction, difficult structural elements and need for accessibility.

Following these investigations, there was a consensus view on a logical implementation sequence.

[6] In this context, Longitudinal phasing means starting at one end and progressively building and opening sections until the complete Motorway is constructed. Lateral Phasing means building a half Motorway to begin with and then adding the second two lanes at a later date.

The table shows the assumptions which have been derived from the considerations of engineering and economics. These assumptions have been made in order to structure a phased sequence for construction and also to develop an evolving toll system.

Phase	Section	Opening year Half Motorway	Opening year Full Motorway
①	Smokovac to Matesevo	2012½	
②	Virpazar to Bar	2014	
③	Virpazar to Smokovac	2016	
④	Matesevo to Berane & Boljare	2016	
⑤	Virpazar to Bar[7]		2020
⑥	Virpazar to Smokovac		2020
⑦	Smokovac to Matesevo		2021
⑧	Matesevo to Berane & Boljare		2023

4.3 Phasing of Toll Collection

Figures A and B below show how the tolling system should evolve through time. The following points of explanation should be noted:-

a) In Phase ① [Smokovac to Matesevo] toll booths would be built on the access and exit ramps at each end of the section. The section will be open to traffic in mid-2012. It has been assumed that there will be no intermediate interchanges due to minimal local access requirements. If, however, an intermediate access were to be provided, this would need to have toll booths placed on the ramps.

b) In Phase ② [Bar to Virpazar] it is anticipated that the section to Bar from the Sozina Tunnel access road would be constructed first and a full width barrier would be erected somewhere suitable on the section between Bar and the Sozina Tunnel. There would also be a need to construct booths on access roads at E851 at Susanj and Durmanj. However, footnote 7 above shows that it is possible that the section Bar to Sozina Tunnel Access road may not be a full Motorway. In this event, the first full width barrier toll area could remain as it is presently, at the north end of the Sozina Tunnel. Following this section, the Motorway would be extended from the Sozina Tunnel to Virpazar and toll booths would be built on the access and exit ramps at Virpazar. The section will be open to traffic in 2014. Once these toll areas have been opened, and if the Bar to Sozina section is tolled, the toll collection facilities at Sozina tunnel would be removed, salvaged and used elsewhere. If however, the Bar to Sozina section is not tolled, the toll collection facilities at Sozina will remain and will be upgraded.

[7] At the time of writing, it is uncertain whether this section will be a full motorway or an Expressway. If the later is decided upon, then the phasing will be slightly altered to make Phase 5 from Virpazar to Sozina Tunnel as a Motorway and the extension of the Sozina access road to Bar as the wider four lane section.

c) In Phase ③ [Virpazar to Smokovac] the new access ramps at Virpazar and Smokovac would be tolled and there would be a need to construct booths on access roads at the Bistrica, with Cetinje Road near Farmaci and with the Niksic road near Gorica. At this point, there will be a complete half-Motorway operational between Bar and Matesevo operating as a closed system open to traffic in mid-2016.

d) In Phase ④ [Matesevo to Berane and Boljare] a full width barrier would be constructed to the south of Boljare. There would be a need to construct booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca. At this point, there will be a complete half-Motorway operational between Bar and Boljare operating as a closed system open to traffic in mid-2016.

e) In Phase ⑤ [Bar to Virpazar] the second two lanes would be built (or the widening to four lanes from bar to Sozina Tunnel Access road) and the ramps at E851 at Susanj and Durmanj would be modified. There would also be modifications to the ramps at Virpazar. The full Motorway would be open to traffic in 2020.

f) In Phase ⑥ [Virpazar to Smokovac] the second two lanes would be built on the By-pass and the booths on access roads at the Bistrica Road, with Cetinje Road near Farmaci and with the Niksic Road near Gorica would be modified. The full Motorway would be open to traffic in 2020.

g) In Phase ⑦ [Smokovac to Matesevo] the second two lanes would be built and the booths on the access roads at Smokovac and Matesevo would be modified. The full Motorway would be open to traffic in mid-2021.

h) In Phase⑧ [Matesevo to Berane and Boljare] the second two lanes would be built and booths on access roads at the Kolasin-Pec Road near Matesevo, at Andrijevica, at the E80 near Berane, and at the E80 near Crnca would be modified. The full Motorway would be open to traffic in 2023.

4.4 Re-organisation of Interchanges

In proposing this closed system of tolling, it will be of advantage to make some adjustments to the interchanges as designed. These interchanges have configurations which are wasteful of land and could be re-organised to require less land acquisition while at the same time be more conducive to tolling designs. The sketches in Annex A show recommendations for the general locations of toll booths.

Figure A Motorway Phasing

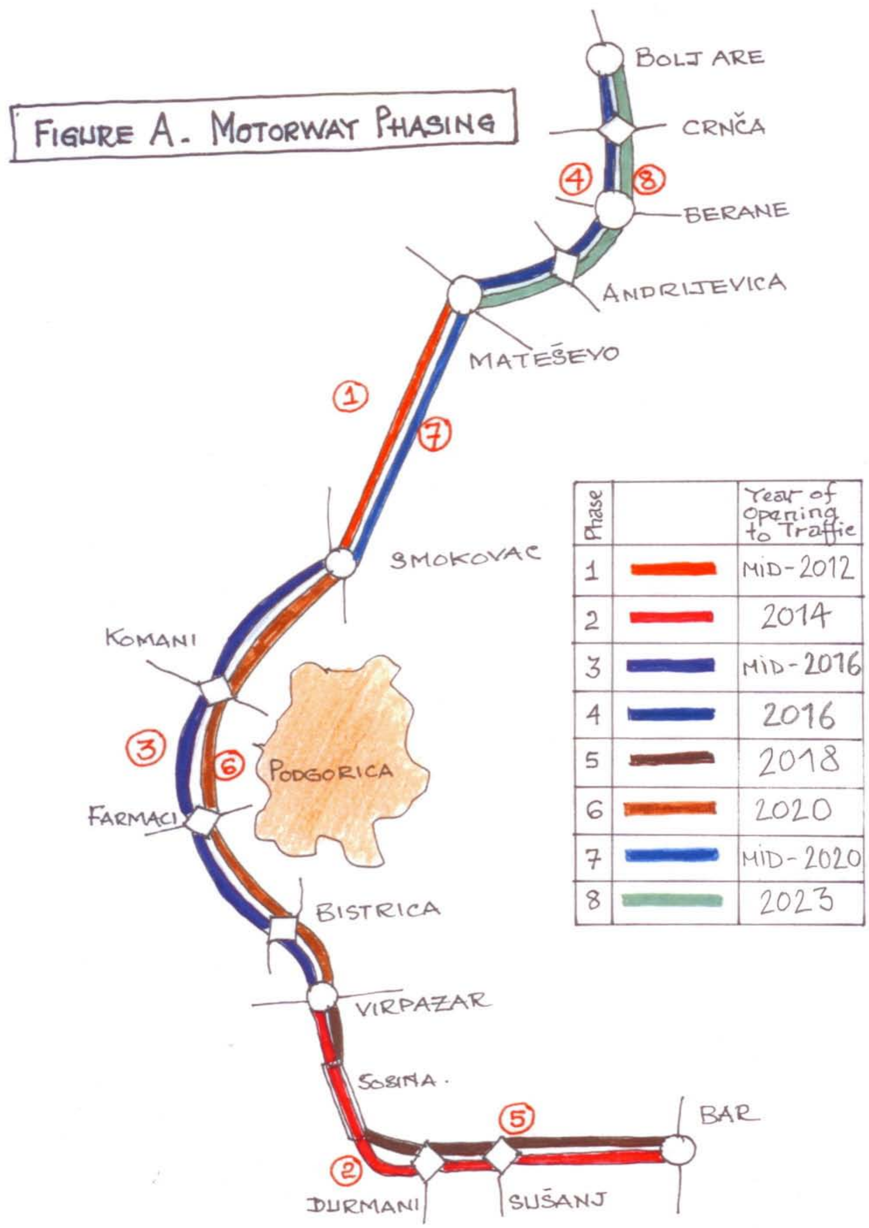
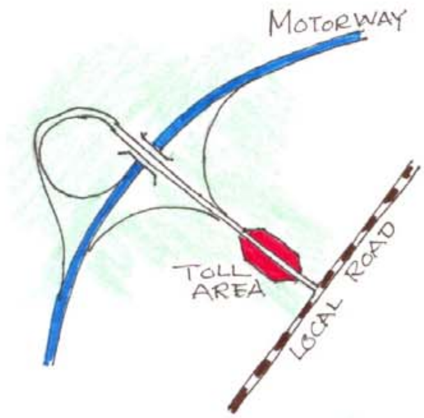


Figure B: Staging of Construction and Tolling Implementation

Description	Half-Motorway				Full-Motorway			
	2012½ Open Smokovac to Matesevo	2014 Open Virpazar to Bar	2016 Open Virpazar to Smokovac	2016 Open Matesevo to Boljare	2020 Open Virpazar to Bar	2020 Open Virpazar to Smokovac	2021 Open Smokovac to Matesevo	2023 Open Matesevo to Boljare
Existing Toll System includes Full Barrier Width Toll Gate at North end of Sozina Tunnel	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps south of Smokovac	☑	☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps north of Matesevo	☑	☑	☑	☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Bar		☑	☑	☑	Remove	Remove	Remove	Remove
Construct Toll Booths on Access Ramps with E851 at Durmanj		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E851 at Susanji		☑	☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Smokovac			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Virpazar			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Niksic Rd at Komani			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Cetinje Rd at Farmaci			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with E80 at Bistrica			☑	☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo				☑	☑	☑	☑	☑
Construct Toll Booths on Access Ramps with Kolasin-Pec Road at Andrijevica				☑	☑	☑	☑	☑
Construct Full Barrier Width Toll Plaza at Boljare				☑	☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E851 at Durmanj					☑	☑	☑	☑
Exoand Toll Booths on Access Ramps with E851 at Susanji					☑	☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Smokovac						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Virpazar						☑	☑	☑
Expand Toll Booths on Access Ramps with Niksic Rd at Komani						☑	☑	☑
Expand Toll Booths on Access Ramps with Cetinje Rd at Farmaci						☑	☑	☑
Expand Toll Booths on Access Ramps with E80 at Bistrica						☑	☑	☑
Expand Toll Booths on Access Ramps south of Smokovac							☑	☑
Expand Toll Booths on Access Ramps north of Matesevo							☑	☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Matesevo								☑
Expand Toll Booths on Access Ramps with Kolasin-Pec Rd at Andrijevica								☑

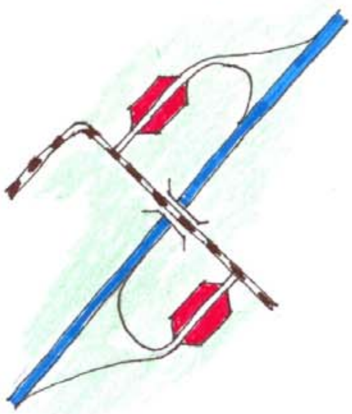
ANNEX A

Interchange Toll Areas

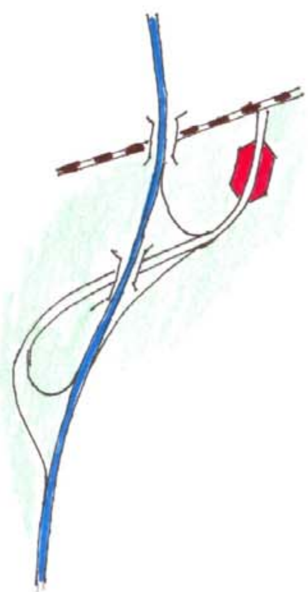


INTERCHANGE AT

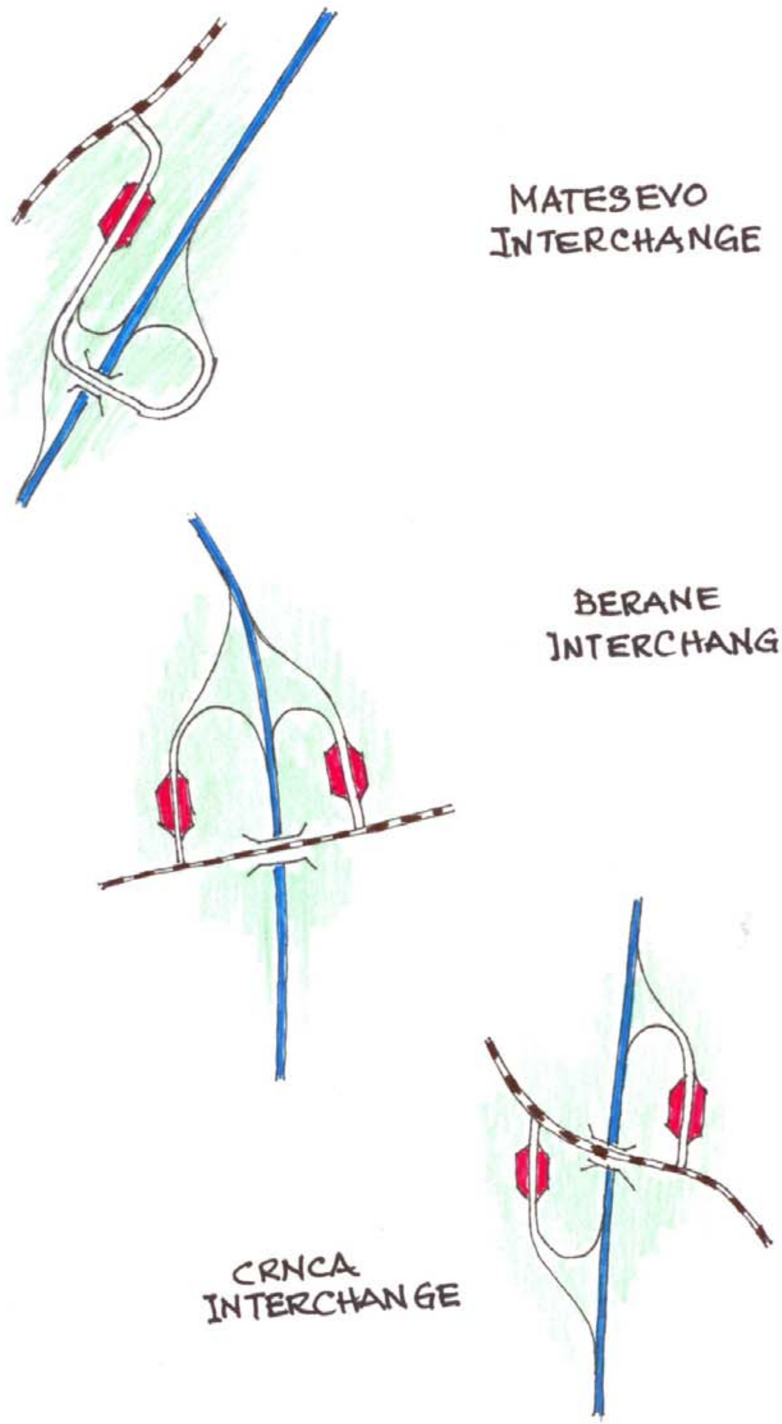
SUSANJ
DURMANI
BISTRICA



VIRPAZAR
INTERCHANGE



FARMACI
INTERCHANGE


MATESEVO
INTERCHANGE
BERANE
INTERCHANGE
CRNCA
INTERCHANGE

TECHNICAL MEMORANDUM NO. 26

FINANCIAL ANALYSIS
BAR – BOLJARE MOTORWAY

TABLE OF CONTENTS

1 INTRODUCTION

This chapter presents details of the financial model used and analysis undertaken for the Feasibility Study for the Highway Bar-Boljare Project. The objective of this analysis is to evaluate the financial feasibility of the investment program for the two motorways.

The financial projections developed as part of this analysis are based on the traffic forecasts prepared by The Louis Berger Group. Current and historical financial information on existing rate structures, revenues and operating expenditures was not available or not provided, and therefore it was not used as input to the financial model.

The analysis involved the use of a financial model to simulate the cash flow of the motorways for a 30-year period between 2007 through 2037, with the objective of identifying the financial impact of the program under different investment scenarios.

The primary results of this analysis are presented in terms of the following indicators:

- Net Present Value (NPV) of the annual net cash flows
- Internal Rate of Return (IRR)

Although much important data was obtained from HDM to use as input to the model, this analysis was conducted without obtaining audited financial statements. In conducting the analysis, wherever data was lacking, it was necessary to include a series of assumptions based on the Consultant's experience in other similar road projects.

1.1 Financial Analysis Methodology

The methodology involved in conducting this financial feasibility analysis included:

- Estimating revenues of the highway over the various development phases, based on traffic projections and the price of tolls for different categories of vehicles as well as the source of other revenues;
- Project annual Operating Costs (OPEX) for the highway, including labor, operations and maintenance;
- Prepare preliminary cost estimates (CAPEX) for investment requirements for the various sections of highway and facilities;
- Prepare annual cash flows for the established planning horizon (30 years); and
- Determine the financial viability of the highway, in terms of its Net Present Value and Internal Rate of Return (IRR) - For this purpose, an appropriate discount rate was calculated that takes into account the risk-free rate, the commercial profit margin, the investment risk, the sovereign risk[1], exchange rate risks, etc.

[1] Risk that a foreign-owned company would take by investing in Montenegro

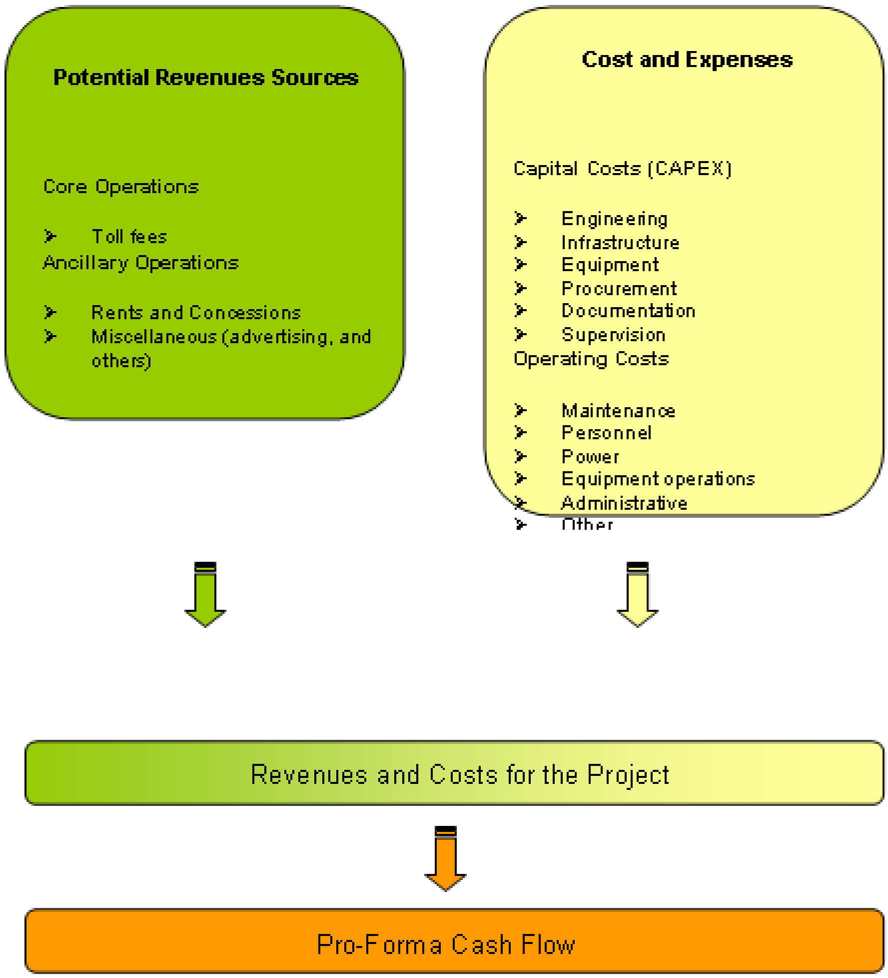
The Consultant identified the potential tolls per km and different services that will take place at the highway. Based on this, the potential revenues were estimated, taking into consideration future tariff structures:

- Revenues from tolls - fees paid by vehicles for use of the highway. They are the main source of revenue;
- Revenues from rents and concessions - fees paid by concessionaires to operate shops (gift shops, restaurant, cafeterias, banks automated machines, etc.) and facilities in rest areas, and gas stations.
- Other miscellaneous revenues including among the others, advertising fees for billboards along the highway, or possible use of the highway to build hotels or install cell phone towers or other equipment.
- In line with other highways standards, the revenues other than tolls are estimated to be in the range of 3% to 5% of toll revenues.

The Project's cost estimates for the financial analysis include capital investments, operations and maintenance costs. The investment costs include engineering, infrastructure construction, procurement, documentation, and supervision costs. Operating costs include, among other items, personnel, power, road maintenance, equipment operation, insurance, administrative services, and other costs such as security. Maintenance costs include the daily expenses for maintaining equipment as well as costs for repair of the runway and other facilities.

To undertake the analysis, models based on several assumptions have been developed. The impact of depreciation, interest payments and tax payments has not been considered in this analysis. Please note that the analysis conducted is not an "investment" grade analysis and the results of this analysis should not be used for making investment decisions.

Figure 1: Main Income and Cost Items for Financial Evaluation (Illustrative)



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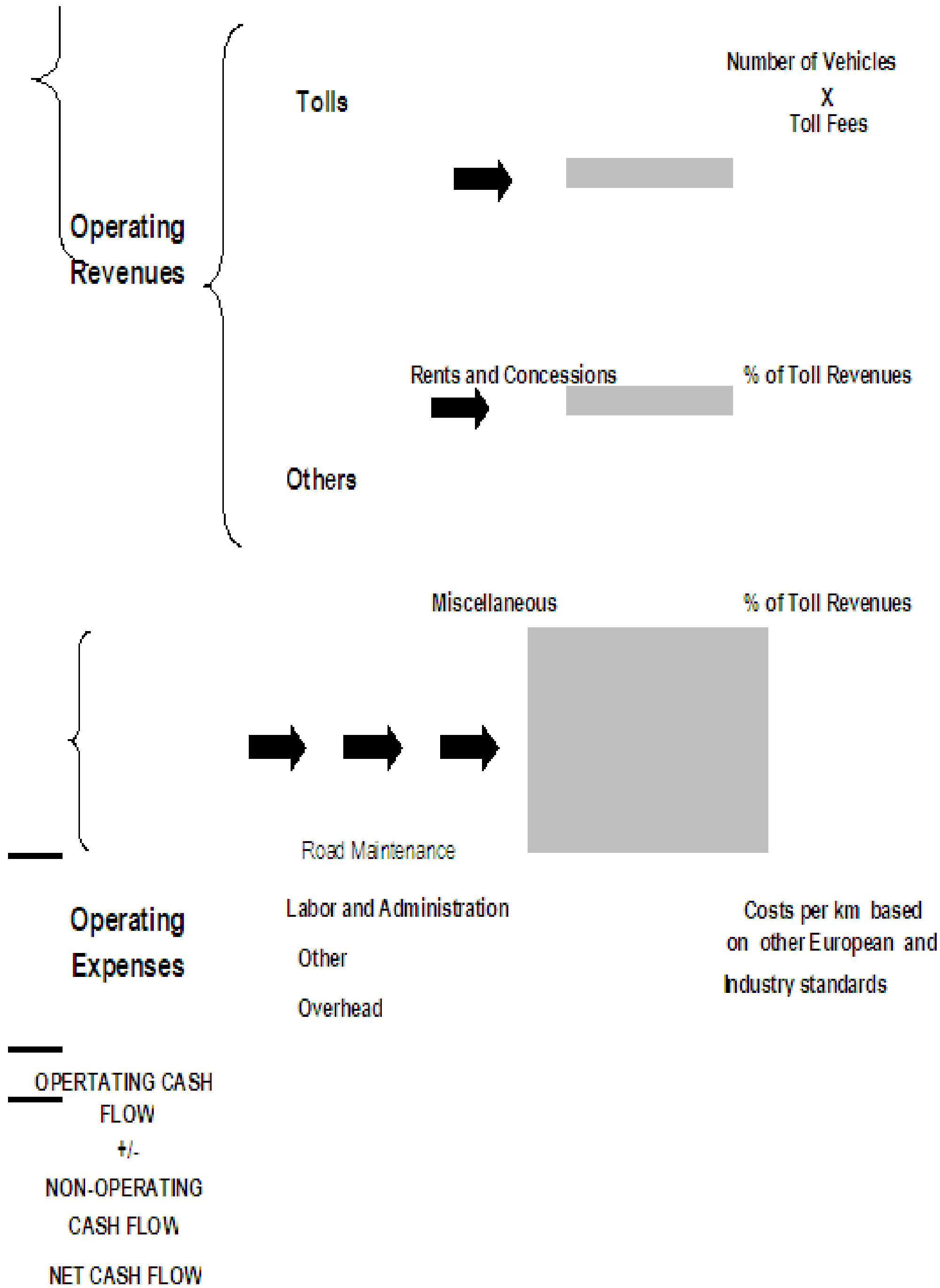

1.1.1 Development of a Financial Model

As part of the financial feasibility study, developed a computerized financial evaluation model (in MS Excel) was developed, specially designed for the needs of the Project.

The model serves as a tool to help evaluate various scenarios and to conduct sensitivity analyses and test. Note however that the model was not designed to undertake analysis of potential financing structures that might be available to private entities (debt, equity, etc.).

The financial model uses the Discounted Free Cash Flow methodology, in which total income and expenses were estimated annually over the defined planning horizon, and the cash flows were discounted at an appropriate discount rate, from which the present value in monetary terms was determined. The discount rate, 8 percent annually, was calculated based on the Project's characteristics and by applying internationally accepted methodologies The methodology essentially involves a mathematical model which simulates operations on the motorway, as well as their ability to generate future cash flows.

The key metric used to estimate the Net Present Value (NPV) of the highway is the EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). The reasons for using the EBITDA as the key metric for the analysis are:

- EBITDA is the best operational metric to use since it only looks at the revenues from core operations and the costs incurred to support the core operations.
- Detailed financial information that identifies the long term assets (property, plant and equipment) held by the highway and the depreciation schedule for these long term assets was not available for this study. Therefore, the depreciation schedule for the upcoming years for the existing assets can not be projected. Since depreciation is a non-cash expense, it does not impact on the net free cash flow of the highway. Thus, by using EBITDA as the metric, the problem of estimating depreciation of existing assets is avoided.

The cash flows are then estimated for each year using the following relationship:
Free Cash Flow = EBITDA – Capital Investments

The Net Present Value (NPV) of the free cash flow stream is then estimated using an appropriate discount rate.

The objective is to estimate the value of the highway to a potential private sector operator who will get the right to operate the highway for 30 years after which the highway is returned to the Government of Montenegro at no cost.

1.2 Principal Assumptions

In developing the financial model and conducting the feasibility analysis, the Consultant has set parameters and made assumptions which include the following:

1) The evaluation horizon is 30 years, from 2008 to 2037.
2) The Traffic Forecast Scenario utilized in the model is the 'Most Likely' growth scenario presented in previous Technical Memorandums.
3) The model was developed and results are expressed in Euros with constant purchasing power of January 2008.
4) Breakdown of Construction Costs:
   i) Alignment
   ii) Tunnels
   iii) Bridges
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   vi) Illumination, Communication
   vii) Connection with Motorway A1
5) Construction costs include documentation, examination, and supervision costs.
6) The discount rate is 8% in real terms (no inflation).
7) Toll revenues were estimated based on current comparable European tariffs and forecast assumptions in terms of traffic.
8) Other Operating revenues were estimated based on comparable experiences with similar highways.
9) Operating costs were estimated using information provided by HDMI for the different highway sections.

1.3 Operating Revenues

Current operating revenues come from two major sources: toll revenues and, in much smaller amounts, from other operating revenues. The highway toll revenue is a function of the following:

- Starting forecast traffic tolls;
- Volume of traffic and category of vehicles;
- Increasing toll factor per category of vehicles;

The following assumptions have been made in the process of projecting toll revenues:

- The traffic and generated traffic are defined using the LBG Traffic Forecasts. The methodology and assumptions for the traffic forecasting are explained in detail in Technical Memorandum no. 14.

- The amount of generated traffic is assumed for different ranges of years. It increases with time as it takes some time for commercial developments to grow around the highway.
- Miscellaneous operating revenues are assumed at 2% of total toll revenues. Rent and Concessions revenues are assumed at 3% of total toll revenues
- An elasticity of -0.3 is assumed for an increase in toll real value (excluding inflation) where the toll increases and the traffic decreases proportionally.
- The toll fees are estimated using the rates shown in Table 1-1. Toll fees are collected by highway operator each vehicles using the highway. Note that the toll is charged per km.

Table 1-1 Toll Rates (Euros) from 2008 Onwards

Categories of Vehicles	Starting Toll Rate Euro/ km
Cars/Motorcycles	0.06
Light Delivery Vehicle	0.09
Micro-Bus	0.12
Small Truck	0.15
Medium Truck	0.18
Bus	0.21
Articulated Trucks	0.24

Note: Toll rates are increased by 2% every year in real terms

1.4 Cost Estimates for Capital Expenditures (CAPEX)

Infrastructure and equipment investments required have been presented in detail elsewhere in this draft report. A yearly schedule of the investments has been prepared and included in the financial model. It is assumed that the half motorway will be constructed first, and then at a later stage the full motorway will be implemented.

The investment required for each phase is presented in Table 1-2.

Table 1-2 Capital Investments

	Half Motorway		Full Motorway	
Section	Total - Euros	Construction Years	Total - Euros	Construction Years
Bar - Virpazar	115.469.353	2012-2014	300.425.876	2016-2019
Motorway Central	435.800.550	2009-2012	640.814.500	2018-2021
Matesevo-Berane-Boljare	337.854.185	2013-2015	545.009.192	2020-2023

Varpazar-Smokovac	321.343.445	2012-2014	469.595.094	2018-2021
Total costs	**1.210.467.533**		**1.955.844.662**	

1.5 Operating Expenses (OPEX)

The operating expenses for the highway were estimated using road maintenance costs and other general expenses from European standards and operators. The data was used to determine the labor, material and fuel, maintenance and other costs. For maintenance, it is estimated that an overlay and/or patching will be needed every 5 years in order to keep the highway at the same standards

Additionally, salaries and other costs are estimated according to comparable European operators as a function of total expense per km, adjusted to reflect the economic and infrastructure condition of Montenegro.

1.6 Principal Results

The following table is the Net Present Value (NPV) and Internal Rate of Return (IRR) of cash flows obtained from the Financial Evaluation Model. – note that the Internal Rate of Return cannot be computed because of a negative NPV. The present value of cash flow is discounted at an 8 percent rate.

Table 1-3 Summary of the Financial Feasibility Analysis

Year:	2012	2017	2022	2027	2032	2037
Demand (000s vehicles)						
Cars	7.544	11.307	16.044	21.049	24.474	28.456
Articulated Trucks	323	484	687	901	1.048	1.219
Buses	131	196	279	365	425	494
Light Delivery Vehicle	201	301	427	560	652	758
Medium Truck	166	249	353	463	538	626
Micro-Bus	210	314	446	585	680	790
Small Truck	157	236	334	439	510	593
Total demand 000s	8.732	13.087	18.569	24.362	28.326	32.936
Revenues (Eur 000s)						
Toll Revenues	5.019	73.320	111.872	162.827	207.834	265.527
Other Operating Revenues	251	3.666	5.594	8.141	10.392	13.276
Total revenues	5.270	76.985	117.466	170.968	218.226	278.804
Operations costs	-2.981	-7.618	-15.645	-7.618	-7.618	-12.868
Operating Margin	2.289	69.367	101.821	163.350	210.607	265.935

Discount Rate	8,0%	
Project NPV (negative)		-239.275

Note: NPV estimated using a discount rate of 8%. For the IRR estimates, it is assumed that a private investor will pay 100% of the NPV for the rights to a concession for the highway.
Source: Consulant's estimates

As seen above, the NPV for the project is negative which would make the project not financially feasible. However, a subsidy from the government of an average 25 million Euros per year would make the project feasible showing an IRR of 8% for the concessionaire as seen in the table below:

Table 1-4 Summary of Financial Feasibility Analysis with Subsidy

Year:	2012	2017	2022	2027	2032	2037
Demand (000s vehicles)						
Cars	7.544	11.307	16.044	21.049	24.474	28.456
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Discount Rate	8,0%		
Project NPV (negative)		-239.275	
Govt Payment to Concessionaire (000s)			25.000 €
NPV to concessionaire		6.026 €	
Concessionaire's IRR	8,05%		

Sensitivity Analysis

Sensitivity analysis was run with different discount rates and different base toll rates:

Test 1)
NPV (000 of Euros) - effect of changing Discount Rate

Discount rate	NPV 000s
8,0%	- 239.275 €

10,0%	-	378.518 €
12,0%	-	444.683 €
14,0%	-	469.041 €
18,0%	-	457.315 €

Test 2)
NPV (000 of Euros) - Effect of changing base Toll Rate

Toll Rate (eur)		NPV 000s
0,040 €	-	510.786 €
0,060 €	-	239.275 €
0,080 €		32.237 €
0,100 €		303.748 €

Prima facie therefore it appears that the basic toll rate for cars would need to be raised to about 8 eurocents per kilometer to achieve positive NPV. However, it is important to note that the sensitivity analysis for the base toll rate is valid assuming that the increase of the base toll rate would not have a considerable impact on the traffic forecast, i.e. that demand is relatively inelastic.

1.7 Financing Strategy and Options

The results of the analysis discussed earlier provide us with different options in terms of private sector participation in the operations and maintenance of the highway. It is clear that the highway is not sustainable on its own i.e. will not be able to support its cost structure and generate reasonable returns for the investors.

It is important to comment that the financial analysis conducted is only a financial assessment of possible scenarios, the actual profitability of the project will depend on the other commercial, economic and political factors beyond the scope of this analysis. Also, note that the financial metrics used (such as NPV and IRR) reflect the current value of the highway given the future traffic and revenue projections and future investment program. The financial analysis of the highway from a private investor's point of view is beyond the scope of work for this assignment.

The key results of this analysis can be summarized as:

- The traffic / revenue potential for the highway is not high enough to justify the proposed capital investments from a financial basis. However, the capital investment program should not be just viewed from a financial basis – other factors such as social, political and economic should also be considered prior to making a decision on whether to go ahead with the proposed program.
- There are certain conditions in which the Bar–Boljare highway may be attractive to private entities for concession. The use of a subsidy would be beneficial and attractive for potential concessionaires. This is a very preliminary assessment and as noted above this analysis is not intended as an investor's financial analysis.

TECHNICAL MEMORANDUM NO. 26A

FINANCIAL ANALYSIS
BAR – BOLJARE MOTORWAY
REVISED

TABLE OF CONTENTS

1 INTRODUCTION

This chapter presents details of the financial model used and analysis undertaken for the Feasibility Study for the Highway Bar-Boljare Project. The objective of this analysis is to evaluate the financial feasibility of the investment program for the two motorways.

The financial projections developed as part of this analysis are based on the traffic forecasts prepared by The Louis Berger Group. Current and historical financial information on existing rate structures, revenues and operating expenditures was not available or not provided, and therefore it was not used as input to the financial model.

The analysis involved the use of a financial model to simulate the cash flow of the motorways for a 30-year period between 2007 through 2037, with the objective of identifying the financial impact of the program under different investment scenarios.

The primary results of this analysis are presented in terms of the following indicators:

- Net Present Value (NPV) of the annual net cash flows
- Internal Rate of Return (IRR)

Although much important data was obtained from HDM to use as input to the model, this analysis was conducted without obtaining audited financial statements. In conducting the analysis, wherever data was lacking, it was necessary to include a series of assumptions based on the Consultant's experience in other similar road projects.

1.1 Financial Analysis Methodology

The methodology involved in conducting this financial feasibility analysis included:

- Estimating revenues of the highway over the various development phases, based on traffic projections and the price of tolls for different categories of vehicles as well as the source of other revenues;
- Project annual Operating Costs (OPEX) for the highway, including labor, operations and maintenance;
- Prepare preliminary cost estimates (CAPEX) for investment requirements for the various sections of highway and facilities;
- Prepare annual cash flows for the established planning horizon (30 years); and
- Determine the financial viability of the highway, in terms of its Net Present Value and Internal Rate of Return (IRR) - For this purpose, an appropriate discount rate was calculated that takes into account the risk-free rate, the commercial profit margin, the investment risk, the sovereign risk[1], exchange rate risks, etc.

[1] Risk that a foreign-owned company would take by investing in Montenegro

The Consultant identified the potential tolls per km and different services that will take place at the highway. Based on this, the potential revenues were estimated, taking into consideration future tariff structures:

- Revenues from tolls - fees paid by vehicles for use of the highway. They are the main source of revenue;
- Revenues from rents and concessions - fees paid by concessionaires to operate shops (gift shops, restaurant, cafeterias, banks automated machines, etc.) and facilities in rest areas, and gas stations.
- Other miscellaneous revenues including among the others, advertising fees for billboards along the highway, or possible use of the highway to build hotels or install cell phone towers or other equipment.
- In line with other highways standards, the revenues other than tolls are estimated to be in the range of 3% to 5% of toll revenues.

The Project's cost estimates for the financial analysis include capital investments, operations and maintenance costs. The investment costs include engineering, infrastructure construction, procurement, documentation, and supervision costs. Operating costs include, among other items, personnel, power, road maintenance, equipment operation, insurance, administrative services, and other costs such as security. Maintenance costs include the daily expenses for maintaining equipment as well as costs for repair of the runway and other facilities.

To undertake the analysis, models based on several assumptions have been developed. The impact of depreciation, interest payments and tax payments has not been considered in this analysis. Please note that the analysis conducted is not an "investment" grade analysis and the results of this analysis should not be used for making investment decisions.

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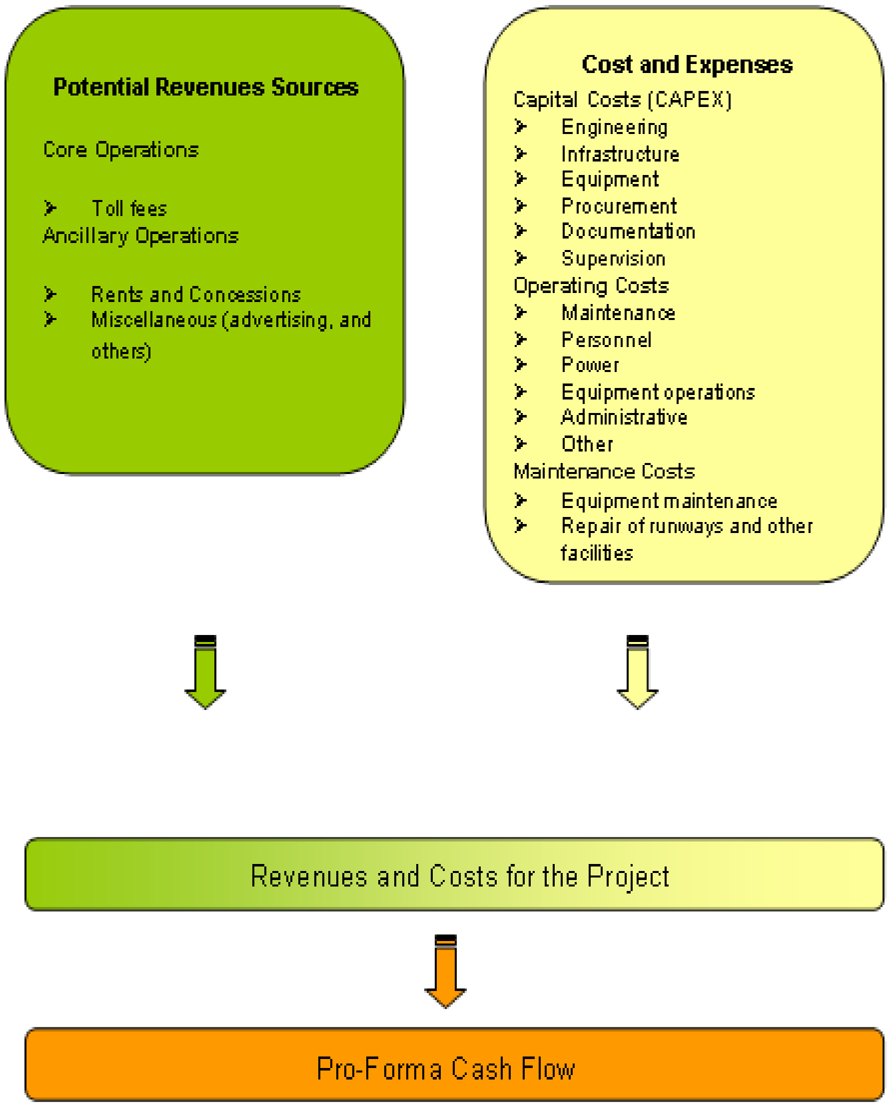
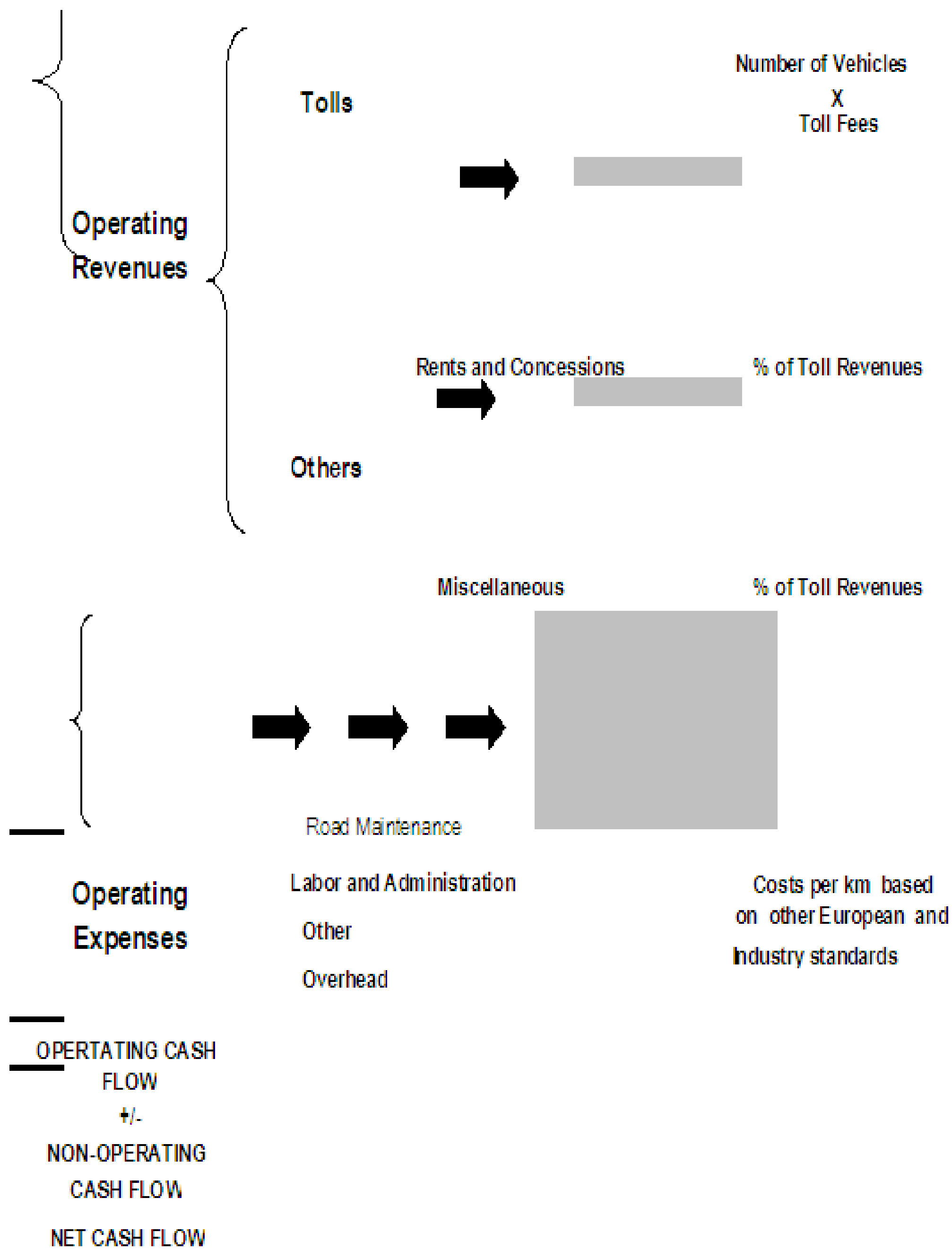


Figure 2: Simplified Structure of an Operating Cash Flow (OCFn) Formula (Conceptual)



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As part of the financial feasibility study, developed a computerized financial evaluation model (in MS Excel) was developed, specially designed for the needs of the Project.

The model serves as a tool to help evaluate various scenarios and to conduct sensitivity analyses and test. Note however that the model was not designed to undertake analysis of potential financing structures that might be available to private entities (debt, equity, etc.).

The financial model uses the Discounted Free Cash Flow methodology, in which total income and expenses were estimated annually over the defined planning horizon, and the cash flows were discounted at an appropriate discount rate, from which the present value in monetary terms was determined. The discount rate, 8 percent annually, was calculated based on the Project's characteristics and by applying internationally accepted methodologies The methodology essentially involves a mathematical model which simulates operations on the motorway, as well as their ability to generate future cash flows.

The key metric used to estimate the Net Present Value (NPV) of the highway is the EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). The reasons for using the EBITDA as the key metric for the analysis are:

- EBITDA is the best operational metric to use since it only looks at the revenues from core operations and the costs incurred to support the core operations.
- Detailed financial information that identifies the long term assets (property, plant and equipment) held by the highway and the depreciation schedule for these long term assets was not available for this study. Therefore, the depreciation schedule for the upcoming years for the existing assets can not be projected. Since depreciation is a non-cash expense, it does not impact on the net free cash flow of the highway. Thus, by using EBITDA as the metric, the problem of estimating depreciation of existing assets is avoided.

The cash flows are then estimated for each year using the following relationship:
Free Cash Flow = EBITDA – Capital Investments

The Net Present Value (NPV) of the free cash flow stream is then estimated using an appropriate discount rate.

The objective is to estimate the value of the highway to a potential private sector operator who will get the right to operate the highway for 30 years after which the highway is returned to the Government of Montenegro at no cost.

1.2 Principal Assumptions

In developing the financial model and conducting the feasibility analysis, the Consultant has set parameters and made assumptions which include the following:

1) The evaluation horizon is 30 years, from 2008 to 2037.
2) The Traffic Forecast Scenario utilized in the model is the 'Most Likely' growth scenario presented in previous Technical Memorandums.
3) The model was developed and results are expressed in Euros with constant purchasing power of January 2008.
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5) Construction costs include documentation, examination, and supervision costs.
6) The discount rate is 8% in real terms (no inflation).
7) Toll revenues were estimated based on current comparable European tariffs and forecast assumptions in terms of traffic.
8) Other Operating revenues were estimated based on comparable experiences with similar highways.
9) Operating costs were estimated using information provided by HDMI for the different highway sections.

1.3 Operating Revenues

Current operating revenues come from two major sources: toll revenues and, in much smaller amounts, from other operating revenues. The highway toll revenue is a function of the following:

- ❖ Starting forecast traffic tolls;
- ❖ Volume of traffic and category of vehicles;
- ❖ Increasing toll factor per category of vehicles;

The following assumptions have been made in the process of projecting toll revenues::

- ❖ The traffic and generated traffic are defined using the LBG Traffic Forecasts. The methodology and assumptions for the traffic forecasting are explained in detail in Technical Memorandum no. 14.

- The amount of generated traffic is assumed for different ranges of years. It increases with time as it takes some time for commercial developments to grow around the highway.
- Miscellaneous operating revenues are assumed at 2% of total toll revenues. Rent and Concessions revenues are assumed at 3% of total toll revenues
- An elasticity of -0.3 is assumed for an increase in toll real value (excluding inflation) where the toll increases and the traffic decreases proportionally.
- The toll fees are estimated using the rates shown in Table 1-1. Toll fees are collected by highway operator each vehicles using the highway. Note that the toll is charged per km.

Table 1-1 Toll Rates (Euros) from 2008 Onwards

Categories of Vehicles	Starting Toll Rate Euro/ km
Cars/Motorcycles	0.06
Light Delivery Vehicle	0.09
Micro-Bus	0.12
Small Truck	0.15
Medium Truck	0.18
Bus	0.21
Articulated Trucks	0.24

Note: Toll rates are increased by 2% every year in real terms

1.4 Cost Estimates for Capital Expenditures (CAPEX)

Infrastructure and equipment investments required have been presented in detail elsewhere in this draft report. A yearly schedule of the investments has been prepared and included in the financial model. It is assumed that the half motorway will be constructed first, and then at a later stage the full motorway will be implemented. The investment required for each phase is presented in Table 1-2.

Table 1-2 Capital Investments

	Half Motorway		Upgrading to Full Motorway	
Section	Total - Euros	Construction Years	Total - Euros	Construction Years
Bar - Virpazar	115,469,353	2012-2014	184,956,523	2016-2019
Motorway Central	435,800,550	2009-2012	205,013,950	2018-2021
Matesevo-Berane-Boljare	337,854,185	2013-2015	207,155,007	2020-2023
Varpazar-Smokovac	321,343,445	2012-2014	148,251,649	2018-2021
Total costs	**1,210,467,533**		**745,377,129**	

1.5 Operating Expenses (OPEX)

The operating expenses for the highway were estimated using road maintenance costs and other general expenses from European standards and operators. The data was used to determine the labor, material and fuel, maintenance and other costs. For maintenance, it is estimated that an overlay and/or patching will be needed every 5 years in order to keep the highway at the same standards

Additionally, salaries and other costs are estimated according to comparable European operators as a function of total expense per km, adjusted to reflect the economic and infrastructure condition of Montenegro.

1.6 Principal Results

The following table is the Net Present Value (NPV) and Internal Rate of Return (IRR) of cash flows obtained from the Financial Evaluation Model. – note that the Internal Rate of Return cannot be computed because of a negative NPV. The present value of cash flow is discounted at an 8 percent rate.

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Year:	2012	2017	2022	2027	2032	2037
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Cars	7.544	11.307	16.044	21.049	24.474	28.456
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Discount Rate	8,0%	
Project NPV (negative)		-239.275

Note: NPV estimated using a discount rate of 8%. For the IRR estimates, it is assumed that a private investor will pay 100% of the NPV for the rights to a concession for the highway.
Source: Consulant's estimates

As seen above, the NPV for the project is negative which would make the project not financially feasible. However, a subsidy from the government of an average 25 million Euros per year would make the project feasible showing an IRR of 8% for the concessionaire as seen in the table below:

Table 1-4 Summary of Financial Feasibility Analysis with Subsidy

Year:	2012	2017	2022	2027	2032	2037
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Discount Rate	8,0%	
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NPV to concessionaire	6.026 €	
Concessionaire's IRR	8,05%	

Sensitivity Analysis

Sensitivity analysis was run with different discount rates and different base toll rates:

Test 1)
NPV (000 of Euros) - effect of changing Discount Rate

Discount rate	NPV 000s
8,0%	- 239.275 €
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NPV (000 of Euros) - Effect of changing base Toll Rate

Toll Rate (eur)	NPV 000s
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Prima facie therefore it appears that the basic toll rate for cars would need to be raised to about 8 eurocents per kilometer to achieve positive NPV. However, it is important to note that the sensitivity analysis for the base toll rate is valid assuming that the increase of the base toll rate would not have a considerable impact on the traffic forecast, i.e. that demand is relatively inelastic.

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The results of the analysis discussed earlier provide us with different options in terms of private sector participation in the operations and maintenance of the highway. It is clear that the highway is not sustainable on its own i.e. will not be able to support its cost structure and generate reasonable returns for the investors.

It is important to comment that the financial analysis conducted is only a financial assessment of possible scenarios, the actual profitability of the project will depend on the other commercial, economic and political factors beyond the scope of this analysis. Also, note that the financial metrics used (such as NPV and IRR) reflect the current value of the highway given the future traffic and revenue projections and future investment program. The financial analysis of the highway from a private investor's point of view is beyond the scope of work for this assignment.

The key results of this analysis can be summarized as:

- ❖ The traffic / revenue potential for the highway is not high enough to justify the proposed capital investments from a financial basis. However, the capital investment program should not be just viewed from a financial basis – other factors such as social, political and economic should also be considered prior to making a decision on whether to go ahead with the proposed program.
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TECHNICAL MEMORANDUM NO. 26B

FINANCIAL ANALYSIS
BAR – BOLJARE MOTORWAY
(REVISION)

TABLE OF CONTENTS

1 INTRODUCTION

This chapter presents details of the financial model used and analysis undertaken for the Feasibility Study for the Highway Bar-Boljare Project. The objective of this analysis is to evaluate the financial feasibility of the investment program for the two motorways.

The financial projections developed as part of this analysis are based on the traffic forecasts prepared by The Louis Berger Group. Current and historical financial information on existing rate structures, revenues and operating expenditures was not available or not provided, and therefore it was not used as input to the financial model.

The analysis involved the use of a financial model to simulate the cash flow of the motorways for a 30-year period between 2007 through 2037, with the objective of identifying the financial impact of the program under different investment scenarios.

The primary results of this analysis are presented in terms of the following indicators:

- Net Present Value (NPV) of the annual net cash flows;
- Internal Rate of Return (IRR).

Although much important data was obtained from HDM to use as input to the model, this analysis was conducted without obtaining audited financial statements. In conducting the analysis, wherever data was lacking, it was necessary to include a series of assumptions based on the Consultant’s experience in other similar road projects.

1.1 Financial Analysis Methodology

The methodology involved in conducting this financial feasibility analysis included:

- Estimating revenues of the highway over the various development phases, based on traffic projections and the price of tolls for different categories of vehicles as well as the source of other revenues;
- Project annual Operating Costs (OPEX) for the highway, including labor, operations and maintenance;
- Prepare preliminary cost estimates (CAPEX) for investment requirements for the various sections of highway and facilities;
- Prepare annual cash flows for the established planning horizon (30 years); and
- Determine the financial viability of the highway, in terms of its Net Present Value and Internal Rate of Return (IRR) - For this purpose, an appropriate discount rate was calculated that takes into account the risk-free rate, the commercial profit margin, the investment risk, the sovereign risk[1], exchange rate risks, etc.

[1] Risk that a foreign-owned company would take by investing in Montenegro

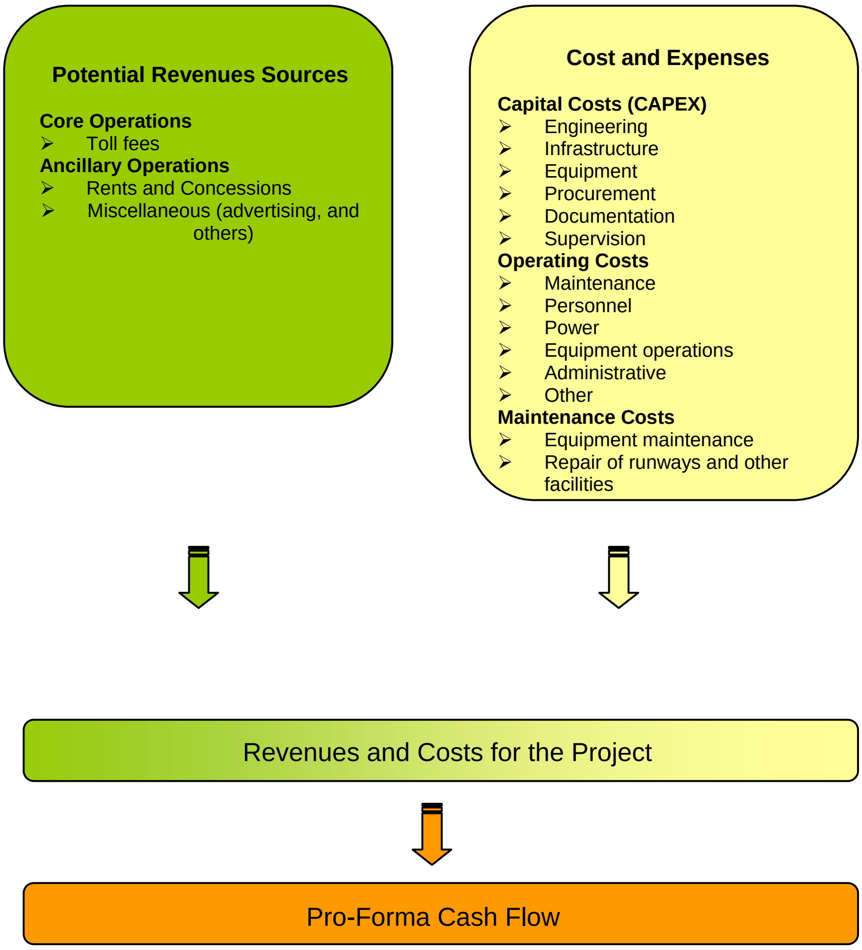
The Consultant identified the potential tolls per km and different services that will take place at the highway. Based on this, the potential revenues were estimated, taking into consideration future tariff structures:

- Revenues from tolls - fees paid by vehicles for use of the highway. They are the main source of revenue;
- Revenues from rents and concessions - fees paid by concessionaires to operate shops (gift shops, restaurant, cafeterias, banks automated machines, etc.) and facilities in rest areas, and gas stations.
- Other miscellaneous revenues including among the others, advertising fees for billboards along the highway, or possible use of the highway to build hotels or install cell phone towers or other equipment.
- In line with other highways standards, the revenues other than tolls are estimated to be in the range of 3% to 5% of toll revenues.

The Project's cost estimates for the financial analysis include capital investments, operations and maintenance costs. The investment costs include engineering, infrastructure construction, procurement, documentation, and supervision costs. Operating costs include, among other items, personnel, power, road maintenance, equipment operation, insurance, administrative services, and other costs such as security. Maintenance costs include the daily expenses for maintaining equipment as well as costs for repair of the runway and other facilities.

To undertake the analysis, models based on several assumptions have been developed. The impact of depreciation, interest payments and tax payments has not been considered in this analysis. It should be noted that the analysis conducted is not an "investment grade" analysis and the results of this analysis should not be used for making investment decisions.

Figure 1: Main Income and Cost Items for Financial Evaluation (Illustrative)



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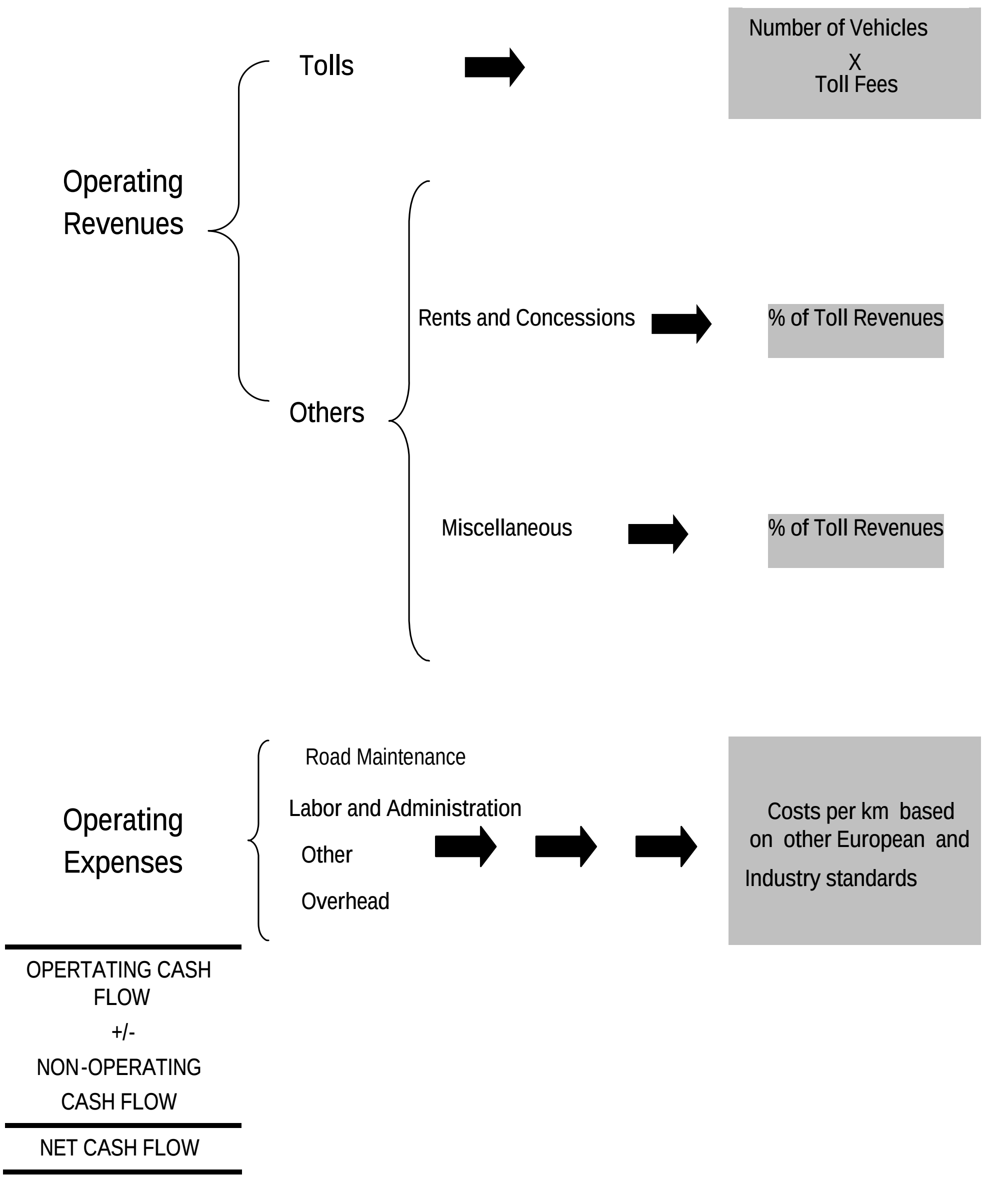

1.1.1 Development of a Financial Model

As part of the financial feasibility study, a computerized financial evaluation model (in MS Excel) was developed, specifically designed for the requirements of the Project.

The model serves as a tool to help evaluate various scenarios and to conduct sensitivity analyses and test. Note however that the model was not designed to undertake analysis of potential financing structures that might be available to private entities (debt, equity, etc.).

The financial model uses the Discounted Free Cash Flow methodology, in which total income and expenses were estimated annually over the defined planning horizon, and the cash flows were discounted at an appropriate discount rate, from which the present value in monetary terms was determined. The discount rate, 8 percent annually, was calculated based on the Project's characteristics and by applying internationally accepted methodologies The methodology essentially involves a mathematical model which simulates operations on the motorway, as well as their ability to generate future cash flows.

The key metric used to estimate the Net Present Value (NPV) of the highway is the EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). The reasons for using the EBITDA as the key metric for the analysis are:

- EBITDA is the best operational metric to use since it only looks at the revenues from core operations and the costs incurred to support the core operations;
- Detailed financial information that identifies the long term assets (property, plant and equipment) held by the highway and the depreciation schedule for these long term assets was not available for this study. Therefore, the depreciation schedule for the upcoming years for the existing assets can not be projected. Since depreciation is a non-cash expense, it does not impact on the net free cash flow of the highway. Thus, by using EBITDA as the metric, the problem of estimating depreciation of existing assets is avoided.

The cash flows are then estimated for each year using the following relationship:

Free Cash Flow = EBITDA – Capital Investments

The Net Present Value (NPV) of the free cash flow stream is then estimated using an appropriate discount rate, as noted above.

The objective is to estimate the value of the highway to a potential private sector operator who will be given the rights to operate the highway for 30 years, after which the highway is returned to the Government of Montenegro at no cost.

1.2 Principal Assumptions

In developing the financial model and conducting the feasibility analysis, the Consultant has set parameters and made assumptions which include the following:

1) The evaluation horizon is 30 years, from 2008 to 2037.

2) The Traffic Forecast Scenario utilized in the model is firstly the 'Most Likely' growth scenario presented in Technical Memorandum 13A.. Secondly the 'median traffic growth' and low traffic growth were examined and results obtained. (see results tables below)

3) The model was developed and results are expressed in Euros with constant purchasing power of January 2008.

4) Breakdown of Construction Costs:

    i) Alignment

    ii) Tunnels

    iii) Bridges

    iv) Junctions

    v) Other Works

    vi) Illumination, Communication

    vii) Connection with Motorway Adriatic-Ionian

5) Construction costs include documentation, examination, and supervision costs.

6) The discount rate is 8% in real terms (no inflation).

7) Toll revenues were estimated based on current comparable European tariffs and forecast assumptions in terms of traffic.

8) Other Operating revenues were estimated based on comparable experiences with similar highways.

9) Operating costs were estimated using information provided by HDM-4 for the different highway sections.

1.3 Operating Revenues

Current operating revenues come from two major sources: toll revenues and, in much smaller amounts, from other operating revenues. The highway toll revenue is a function of the following:

- Starting forecast traffic tolls;
- Volume of traffic and category of vehicles;
- Increasing toll factor per category of vehicles.

The following assumptions have been made in the process of projecting toll revenues:

- The traffic and generated traffic are defined using the LBG Traffic Forecasts. The methodology and assumptions for the traffic forecasting are explained in detail in Technical Memorandum no. 13A;
- The amount of generated traffic is assumed for different ranges of years. It increases with time as it takes some time for commercial developments to grow around the highway;
- Miscellaneous operating revenues are assumed at 2% of total toll revenues. Rent and Concessions revenues are assumed at 3% of total toll revenues;
- An elasticity of -0.3 is assumed for an increase in toll real value (excluding inflation) where the toll increases and the traffic decreases proportionally;
- The toll fees are estimated using the rates shown in Table 1-1. Toll fees are collected by highway operator each vehicles using the highway. Note that the toll is charged per km.

Table 1-1 Toll Rates (Euros) from 2008 Onwards

Categories of Vehicles	Starting Toll Rate Euro/ km
Cars/Motorcycles	0.06
Light Delivery Vehicle	0.09
Micro-Bus	0.12
Small Truck	0.15
Medium Truck	0.18
Bus	0.21
Articulated Trucks	0.24

Note: Toll rates are increased by 2% every year in real terms

1.4 Cost Estimates for Capital Expenditures (CAPEX)

Infrastructure and equipment investments required have been presented in detail elsewhere in this draft report. A yearly schedule of the investments has been prepared and included in the financial model. It is assumed that the half motorway will be constructed first, and then at a later stage the full motorway will be implemented. The investment required for each phase is presented in Table 1-2.

Table 1-2 Capital Investments

	Half Motorway		Upgrading to Full Motorway	
Section	**Total - Euros**	**Construction Years**	**Total - Euros**	**Construction Years**
Bar - Virpazar	115,469,353	2012-2014	184,956,523	2016-2019
Motorway Central	435,800,550	2009-2012	205,013,950	2018-2021
Matesevo-Berane-Boljare	337,854,185	2013-2015	207,155,007	2020-2023
Varpazar-Smokovac	321,343,445	2012-2014	148,251,649	2018-2021
Total costs	**1,210,467,533**		**745,377,129**	

1.5 Operating Expenses (OPEX)

The operating expenses for the highway were estimated using road maintenance costs and other general expenses from European standards and operators. The data was used to determine the labor, material and fuel, maintenance and other costs. Maintenance costs used here were output from the HDM-4 files, in financial cost terms. For maintenance, it is estimated that overlay and patching etc. will be needed roughly every 6-7 years in order to keep the highway at the same standards. Maintenance in the HDM-4 model is set to be responsive to road conditions.

Additionally, salaries and other costs are estimated according to comparable European operators as a function of total expense per km, adjusted to reflect the economic and infrastructure condition of Montenegro.

1.6 Principal Results

The following table is the Net Present Value (NPV) and Internal Rate of Return (IRR) of cash flows obtained from the Financial Evaluation Model. Note that the Internal Rate of Return cannot be computed because of a negative NPV. The present value of cash flow is discounted at an 8 percent rate.

Table 1-3: Summary of the Financial Feasibility Analysis

Standard Traffic growth assumption

Year:	**2012**	**2017**	**2022**	**2027**	**2032**	**2037**
Annual Demand (000s vehicles)						
Cars	7.544	11.307	16.044	21.049	24.474	28.456
Articulated Trucks	323	484	687	901	1.048	1.219
Buses	131	196	279	365	425	494
Light Delivery Vehicle	201	301	427	560	652	758
Medium Truck	166	249	353	463	538	626
Micro-Bus	210	314	446	585	680	790
Small Truck	157	236	334	439	510	593
Total demand 000s	8.732	13.087	18.569	24.362	28.326	32.936
Revenues (Eur 000s)						
Toll Revenues	5.019	73.320	111.872	162.827	207.834	265.527
Other Operating Revenues	251	3.666	5.594	8.141	10.392	13.276
Total revenues	5.270	76.985	117.466	170.968	218.226	278.804
Operations costs	-2.981	-7.618	-15.645	-7.618	-7.618	-12.868
Operating Margin	2.289	69.367	101.821	163.350	210.607	265.935

Discount Rate	8,0%
Project NPV (negative)	-239.275

Note: NPV estimated using a discount rate of 8%. For the IRR estimates, it is assumed that a private investor will pay 100% of the NPV for the rights to a concession for the highway.

Source: Consulant's estimates

As seen above, the NPV for the project is negative which would make the project not financially feasible. However, a subsidy from the government of an average 25 million Euros per year would make the project feasible showing an IRR of 8% for the concessionaire as seen in the table below:

Table 1-4: Summary of Financial Feasibility Analysis with Subsidy

Year:	2012	2017	2022	2027	2032	2037
Demand (000s vehicles)						
Cars	7.544	11.307	16.044	21.049	24.474	28.456
Articulated Trucks	323	484	687	901	1.048	1.219
Buses	131	196	279	365	425	494
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Operating Margin	2.289	69.367	101.821	163.350	210.607	265.935

Discount Rate	8,0%
Project NPV (negative)	-239.275
Govt Payment to Concessionaire (000s)	25.000 €
NPV to concessionaire	6.026 €
Concessionaire's IRR	8,05%

Sensitivity Analysis (Standard traffic growth case)

Sensitivity analysis was run with different discount rates and different base toll rates:

Test 1)

NPV (000 of Euros) - effect of changing Discount Rate

Discount rate	NPV 000s
8,0%	- 239.275 €
10,0%	- 378.518 €
12,0%	- 444.683 €
14,0%	- 469.041 €
18,0%	- 457.315 €

Test 2)

NPV (000 of Euros) - Effect of changing base Toll Rate

Toll Rate (eur)	NPV 000s
0,040 €	- 510.786 €
0,060 €	- 239.275 €
0,080 €	32.237 €
0,100 €	303.748 €

Prima facie therefore it appears that the basic toll rate for cars would need to be raised to about 8 eurocents per kilometer to achieve positive NPV. However, it is important to note that the sensitivity analysis for the base toll rate is valid assuming that the increase of the base toll rate would not have a considerable impact on the traffic forecast, i.e. that demand is relatively inelastic.

1.7 Financing Strategy and Options

The results of the analysis discussed earlier provide us with different options in terms of private sector participation in the operations and maintenance of the highway. It is clear that the highway is not sustainable on its own i.e. will not be able to support its cost structure and generate reasonable returns for the investors.

It is important to comment that the financial analysis conducted is only a financial assessment of possible scenarios, the actual profitability of the project will depend on the other commercial, economic and political factors beyond the scope of this analysis. Also, note that the financial metrics used (such as NPV and IRR) reflect the current value of the highway given the future traffic and revenue projections and future investment program. The financial analysis of the highway from a private investor's point of view is beyond the scope of work for this assignment.

The key results of this analysis can be summarized as:

- The traffic / revenue potential for the highway is not high enough to justify the proposed capital investments from a financial basis. However, the capital investment program should not be just viewed from a financial basis – other factors such as social, political and economic should also be considered prior to making a decision on whether to go ahead with the proposed program;
- There are certain conditions in which the Bar–Boljare highway may be attractive to private entities for concession. The use of a subsidy would be beneficial and attractive for potential concessionaires. This is a very preliminary assessment and as noted above this analysis is not intended as an investor's financial analysis.

2 TESTS FOR THE THE 'MEDIAN' AND LOW TRAFFIC GROWTH SCENARIOS

Tests were carried out for the traffic gowth cases as considered in Technical Memorandum no 13A. Traffic growth was related to the Central Bank forecasts of GDP, being 'most likely' – which is the standard traffic growth scenario, 'pessimistic' which is the low traffic growth, and a median case for income growth which is the midway point between standard and low (pessimistic).

In quantity terms, the median and lower growth forecasts can be expressed as follows:

- aggregate traffic in the 2012 -2017 period will be 7.4% lower for the median growth case and 14.8% lower for the low growth case;
- aggregate traffic in the 2012 -2022 period will be 10.7% lower for the median growth case and 20.7% lower for the low growth case;
- aggregate traffic in the 2012 -2027 period will be 15.7% lower for the median growth case and 27.4% lower for the low growth case.

The results for the median growth case are given in Table 1-6 below. Table 1-7 gives results for the lower (pessimistic) traffic growth case.

A summary results for the three traffic growth case is given below. Clearly, for lower quantities of total traffic the project NPV becomes more negative than the standard or 'most likely' case and consequently annual subsidy payments (in whatever form) to concessionaires will need to be increased.

Table 1-5: Summary for 3 traffic growth cases:

NPV and annual payments in Eur millions

Trafffic growth scenario	Net Present Value	Annual payment
Standard	-239.3	25.0
Median	-336.8	35.5
Low growth	-460.6	48.0

Table 1-6: Summary of Financial Feasibility with Subsidy – median growth case

Median traffic growth scenario		Year	2012	2017	2022	2027	2032	2037
Annual Demand in '000s	Articulated Trucks		463	652	877	1,102	1,253	1,424
	Buses		188	264	356	447	508	577
	Cars		10,818	15,224	20,486	25,732	29,256	33,262
	Light Delivery Vehicle		288	405	545	685	779	885
	Medium Trucks		235	331	446	560	637	724
	Micro-Buses		300	423	569	715	813	924
	Small Trucks		225	317	427	536	610	693
	TOTAL		**12,518**	**17,617**	**23,706**	**29,777**	**33,855**	**38,490**
Revenues (000s of Euros)	Toll Revenues		4,746	68,003	100,364	140,111	175,877	220,772
	Other Operating Revenues		237	3,400	5,018	7,006	8,794	11,039
	Total		**4,984**	**71,403**	**105,382**	**147,117**	**184,671**	**231,811**
Costs (000s of Euros)	Operations		(2,981)	(7,618)	(15,645)	(7,618)	(7,618)	(12,868)
Operating Margin			**2,003**	**63,784**	**89,737**	**139,499**	**177,053**	**218,942**
Discount Rate		8%						
NPV		**(336,761)**						
Concessionaire								
Govt Payment	**35,500** per year							
NPV	**17,904**							
Concessionaire IRR	**8.15%**							

Table 1-7: Summary of Financial Feasibility with Subsidy – lower growth case

Low traffic growth scenario		Year	2012	2017	2022	2027	2032	2037
Annual Demand	Articulated Trucks		438	578	734	889	981	1,083
in '000s	Bus		178	234	298	360	398	439
	Cars		10,231	13,486	17,137	20,748	22,907	25,291
	Light Delivery Vehicles		272	359	456	552	610	673
	Medium Trucks		223	293	373	452	498	550
	Micro-Buses		284	375	476	576	636	703
	Small Trucks		213	281	357	432	477	527
	TOTAL		**11,839**	**15,605**	**19,831**	**24,009**	**26,508**	**29,266**
Revenues	Toll Revenues		4,489	60,236	83,957	112,971	137,711	167,865
(000s of Euros)	Other Operating Revenues		224	3,012	4,198	5,649	6,886	8,393
	Total		**4,713**	**63,248**	**88,155**	**118,620**	**144,596**	**176,258**
Costs	Operations		(2,981)	(7,618)	(15,645)	(7,618)	(7,618)	(12,868)
(000s of Euros)								
Operating Margin			**1,732**	**55,630**	**72,510**	**111,001**	**136,978**	**163,390**
Discount Rate		8%						
NPV		**(460,652)**						
Concessionaire								
Govt Payment	**48,000** per year							
NPV	**23,582**							
Concessionaire IRR	**8.21%**							

TECHNICAL MEMORANDUM NO. 26C

FINANCIAL ANALYSIS
BAR – BOLJARE MOTORWAY
(3RD REVISION)

MAY 2008

TABLE OF CONTENTS

1 INTRODUCTION

Note: This revised Technical Memorandum presents an entirely new financial analysis based on the revision of phasing and scheduling for construction works that was carried out recently. In the original financial analysis, it was assumed that construction would take place under a two-phase programme starting in 2009 and ending in 2022, with 2-lane motorways being completed in the first phase or stage (2009-2015) and later upgraded to 4-lane motorways in a second phase (2016-2022).

In this analysis, capital investments are scheduled according to a one-phase only construction programme that runs from 2011 (or 2009) for 4-lane motorways. The reasons for this change are given in Technical Memorandum No. 30 which explains the engineering complexities of two-phase construction and concludes with recommending one-phase only. A second important difference from the previous analysis is that the section from Bar to Durmani (13.30km long) is now excluded from financial analysis since, although traffic capacity will be expanded, this section will not be designated as a toll road.

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The financial projections developed as part of this analysis are based on the traffic forecasts prepared by the LB project team. Since at present there is no toll road in the country, no information is available on existing or historical toll rate structures, toll revenues, or road operating expenditures.

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The primary results of this analysis are presented in terms of the following indicators:

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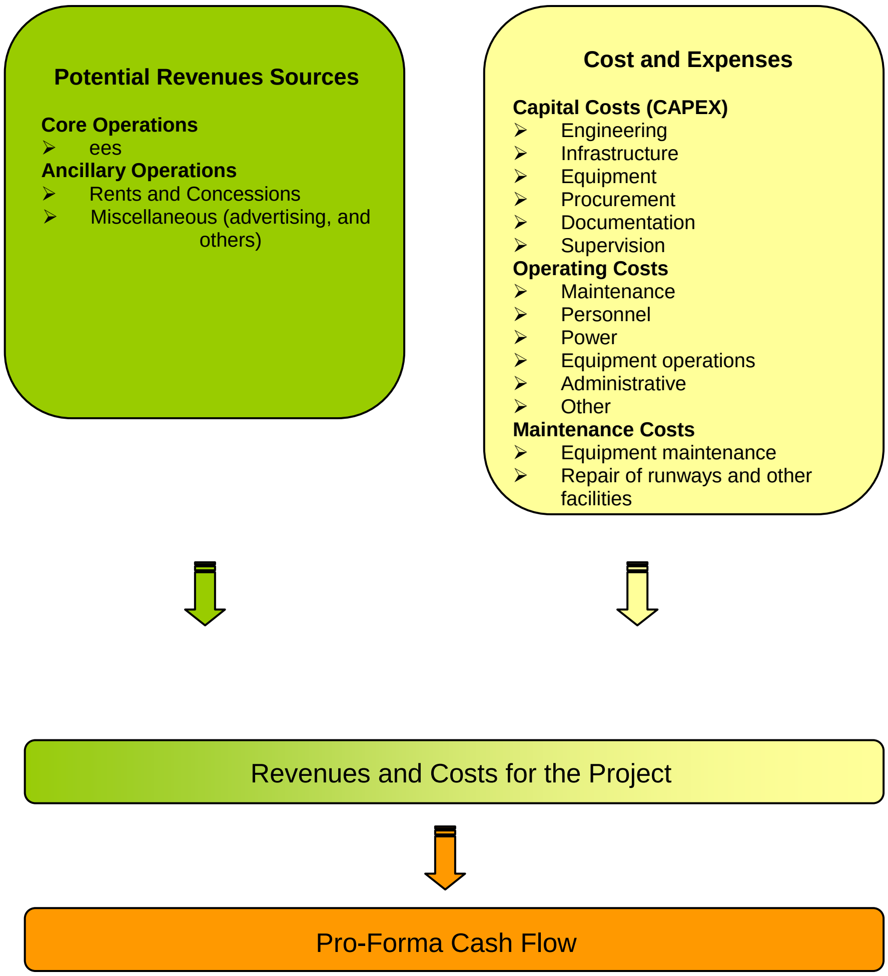

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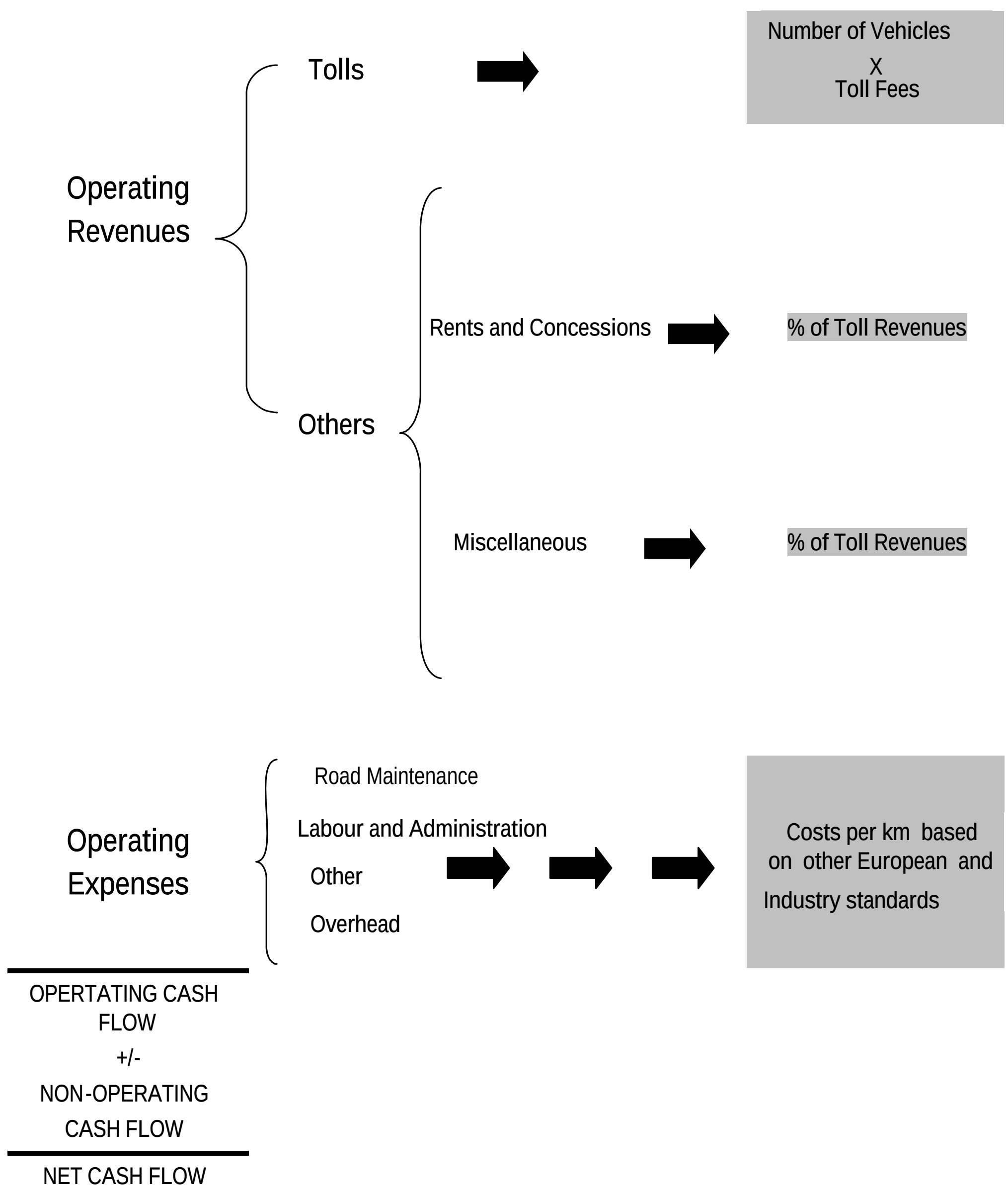

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3) The model results are expressed in Euros with constant purchasing power of January 2008.

4) Breakdown of Construction Costs:

   i) Alignment

   ii) Tunnels

   iii) Bridges

   iv) Junctions

   v) Other Works

   vi) Illumination, Communication

Construction costs include documentation, surveying, and supervision costs at 8% of works costs, and environmental protection / mitigation at 5% of works costs.

5) The discount rate is 8% in real terms (net of inflation) and further tests are using 10%.

6) Toll revenues were estimated based on current comparable European tariffs and forecast assumptions in terms of traffic.

7) Other Operating revenues were estimated based on comparable experiences with similar highways.

8) Operating costs - routine & periodic maintenance costs, snow clearance etc., were estimated using information output from HDM-4 analyses for the different highway sections.

1.3 Operating Revenues

Current operating revenues come from two major sources: toll revenues and, in much smaller amounts, from other operating revenues. The highway toll revenue is a function of the following:

- Starting forecast traffic tolls;
- Volume of traffic and category of vehicles;
- Increasing toll factor per category of vehicles.

The following assumptions have been made in the process of projecting toll revenues:

- The traffic volumes and generated traffic are defined using the study's prepared forecasts. The methodology and assumptions for the traffic forecasting are explained in detail in Technical;
- Memoranda nos. 4, 13 and 13A. However in this analysis there are some variations (compared with the economic analysis) in total traffic; this is because there is some diminution of traffic growth resulting from real increases assumed for toll rates, see below;
- An elasticity ratio of -0.3 is assumed for an increase in real value of the toll (excluding inflation) where the toll increases and the traffic decreases proportionally;
- Miscellaneous operating revenues are assumed at 2% of total toll revenues. Rent and Concessions revenues are assumed at 3% of total toll revenues;
- The toll fees are estimated using the rates shown in Table 1-1. Toll fees are collected by the highway operator on all vehicles using the facility. The toll rates below are shown per km, although in practice, for given sections, the cost per km to the user would vary slightly.

Table 1-1: Toll Rates (Eur/km) from 2008 onwards

Categories of Vehicles	Toll Rate (Eur/km)
Cars/Motorcycles	0.06
Light Delivery Vehicle	0.09
Micro-Bus	0.12
Small Truck	0.15
Medium Truck	0.18
Bus	0.21
Articulated Trucks	0.24

Note: Toll rates in model increase by 2% per year in real terms

1.4 Cost Estimates for Capital Expenditures (CAPEX)

According to the now recommended one-phase only construction method, an annual schedule of the investments has been included in the financial model. The proposed investment schedule is shown in Table 1-2.

Table 1-2: Capital Investments (Eur million)

Sections	km	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total (Meur)
Smokovac - Matesevo	43.5	160.2	160.2	160.2	160.2						640.8
Matesevo-Berane-Boljare	75.7				116.9	116.9	116.9	116.9	116.9		584.6
Virpazar-Smokovac	38.3					115.4	115.4	115.4	115.4		461.4
Durmani - Virpazar	11.65								127.2	127.2	254.3
Totals	169.2	160.2	160.2	160.2	277.1	232.3	232.3	232.3	359.4	127.2	1,941.1

It should be noted that in this revision sensitivity tests for financial feasibility take account of construction schedules starting in year 2009 and 2010. These are given below in section 1.7.

1.5 Operating Expenses (OPEX)

The operating expenses for the highway were estimated using road maintenance costs and other general expenses from European standards and operators. The data was used to determine the labor, material and fuel, maintenance and other costs. Maintenance costs used here were output from the HDM-4 files, in financial cost terms. For maintenance, it is estimated that overlay and patching etc. will be needed roughly every 6-7 years in order to keep the highway at the same standards. Maintenance in the HDM-4 model is set to be responsive to road conditions.

Additionally, salaries and other costs are estimated according to comparable European operators as a function of total expense per km, adjusted to reflect the economic and infrastructure condition of Montenegro.

1.6 Principal Results

The following table is the Net Present Value (NPV) and Internal Rate of Return (IRR) of cash flows obtained from the Financial Evaluation Model. Note that the Internal Rate of Return cannot be computed for a negative NPV. The present value of cash flow is discounted at 8 percent, see also sensitivity tests (below).

Table 1-3: Summary of the Financial Feasibility Analysis

(Standard traffic growth scenario)

	Vehicle type	Year	2012	2017	2022	2027	2032	2039
Annual Demand in '000s	Articulated Trucks		487	680	978	1,268	1,464	1,740
	Bus		197	276	396	514	594	706
	Cars/Motorcycles		11,375	15,877	22,836	29,616	34,187	40,641
	Light Delivery Vehicle		303	423	608	788	910	1,082
	Medium Truck		250	349	502	651	752	894
	Micro-Bus		316	441	634	823	950	1,129
	Small Truck		237	331	476	617	712	847
	TOTAL		**13,166**	**18,376**	**26,430**	**34,278**	**39,568**	**47,038**
Revenues (Eur 000s)	Toll Revenues		0	17,227	104,283	149,344	190,577	255,465
	Other Operating Revenues		0	861	5,214	7,467	9,529	12,773
	Total		**0**	**18,088**	**109,497**	**156,811**	**200,106**	**268,238**
Costs (Eur 000s)	Operations		0	(2,225)	(28,004)	(8,715)	(12,128)	(8,715)
Operating Margin			**0**	**15,863**	**81,493**	**148,095**	**187,978**	**259,523**
Discount Rate	8%							
		NPV 000s	**(320,935)**					

Concessionaire		
Govt Payment	**40,000**	000s per year
NPV	**133,057**	
IRR	**9.16%**	

Note: NPV is here estimated using a discount rate of 8%. For the IRR estimates, it is assumed that a private investor will pay 100% of the NPV for the rights to a concession for the motorway.

As shown above, the NPV for the project is negative which would make the project financially feasible only with subsidy or some form of annual external payment. A subsidy from the government of an average 40 million Euros per year would make the project feasible, showing an IRR of just over 9% for the concessionaire. Some sensitivity analyses are given in next section.

1.7 Sensitivity Analysis

Sensitivity analyses – for the standard traffic growth forecast - were run with different discount rates and different base toll rates, as shown below.

Table 1-4: Sensitivity Tests

NPV (Eur 000s) - Changing Discount rate			
		8% =	**€ 320.935**
	Discount rate	10%	**-450.291**
	(base = 8%)	11%	**-484.633**
		12%	**-505.325**
		15%	**-516.002**

NPV (000 of Euros) - Changing Base Toll Rate			
	0,06	**base toll rate**	**-320.935**
		0,040 €	**-565.896**
		0,060 €	**-320.935**
		0,070 €	**-198.454**
		0,090 €	**46.507**

Therefore it might appear that the toll rate for cars would need to be raised to about 8.5 or 9 eurocents per kilometer to achieve a positive NPV. However, it is important to note that the sensitivity analysis for the base toll rate is valid only assuming that the increase of toll rates to this level would not have a considerable impact on the traffic volume, i.e. that demand is relatively inelastic.

Note that for a discount rate of 10% if such were assumed as the risk hurdle, then the annual government subsidy would be in the range of 50 – 55 million euros.

Sensitivity Tests for lower traffic growth

The median and low growth forecasts can be expressed as follows:

- aggregate traffic in the 2012 -2017 period will be 7.4% lower for the median growth case and 14.8% lower for the low growth case, compared to the standard growth case.
- aggregate traffic in the 2012 -2022 period will be 10.7% lower for the median growth case and 20.7% lower for the low growth case.
- aggregate traffic in the 2012 -2027 period will be 15.7% lower for the median growth case and 27.4% lower for the low growth case.

Precise calculations using the financial model were not made, however the NPV and annual subsidy in these lower growth cases was estimated - using the 8% discount rate, as follows:

	Median growth	Low growth
NPV	-450,0	-615,0
Annual payment	57,0	77,0

Additional tests were carried out for a building programme starting in 2009, and 2010. Results are shown in the table below.

Table 1-5: Sensitivity tests for earlier start years

Amounts in Eur million	**2009**	**2010**
Discount rate = 8%		
NPV	-448.0	-380.5
Annual payment	45.0	45.0
Discount rate = 10%		
NPV	-608.0	-524.0
Annual payment	65.0	58.0
Discount rate = 12%		
NPV	-686.0	-589.4
Annual payment	85.0	74.0

It can be seen above that the effect of earlier construction starts is generally to induce a more negative NPV and consequently higher annual payments to the concessionaire would be required. Naturally also, as the discount rate (the 'hurdle' rate for a concessionaire) increases annual payments would increase very sharply.

1.8 Financing Strategy and Options

The results of the analysis discussed earlier provide us with different options in terms of private sector participation in the operations and maintenance of the motorway. It is clear that the motorway is not sustainable on its own, i.e., will not be able to entirely support its cost structure and generate reasonable returns for the investors.

It is important to comment that the financial analysis conducted here is only a financial assessment of possible scenarios. The actual profitability of the project will depend on other commercial, economic and political factors beyond the scope of this analysis. Also, note that the financial metrics used (principally NPV and IRR) reflect the current value of the highway, given the future traffic and revenue projections and future investment program. The financial analysis of a highway from a private investor's point of view is beyond the scope of work for this assignment.

The key results of this analysis can be summarized as:

- The traffic / revenue potential for the highway is not high enough to justify the proposed capital investments from a financial basis. However, the capital investment program should not only be viewed from a financial basis – other factors, such as social, political and economic should also be considered before making a decision on whether to go ahead with the proposed program;
- There are certain conditions in which the Bar–Boljare highway may be attractive to private entities for concession. The use of a subsidy would be beneficial and attractive for potential concessionaires. This is a preliminary assessment and as noted above this analysis is not intended as an investor's financial analysis.

TECHNICAL MEMORANDUM NO. 27

CHANGING CONSTRUCTION SCHEDULES AND THEIR MAIN EFFECTS

TABLE OF CONTENTS

1 CHANGING CONSTRUCTION SCHEDULES AND THEIR MAIN EFFECTS

Different types of construction schedules can be devised, as shown in tables **a**, **b**, and **c** below. The first one is as set out in the draft final economic and financial[1] analyses, issued on 02 April and 06 April respectively.

a) Schedule as originally set out

1,000	Virpazar-Farmaci	Farmaci-Smokovac	Smokovac-Uvac Matesevo	Matesevo Berane	Berane-Boljare	**Durmani-Virpazar**	**Total length** (km)
^progress factor ^ / length >	22,9	15,4	43,5	34,4	41,3	14,7	172,0
Half motorway							**START/FINISH**
start construction year	2015,0	2014,0	2009,5	2013,0	2013,0	2012,0	2009,5
Progress - average km/year	11,4	7,7	14,5	13,7	16,5	12,5	
new constr. time (years)	2,00	2,00	3,00	2,50	2,50	1,17	
opening in year:	2017,00	2016,00	2012,50	2015,50	2015,50	2013,17	2017,00
cuts constr. time by (months)	0,0	0,0	0,0	0,0	0,0	9,9	
Full motorway							**START/FINISH**
start construction year	2015,0	2017,0	2018,0	2020,0	2020,0	2017,0	2015,0
Progress - average km/year	9,2	5,1	14,5	11,5	13,8	8,3	
new constr. time (years)	2,500	3,000	3,000	3,000	3,000	1,762	
cuts constr. time by (months)	0,0	0,0	0,0	0,0	0,0	14,9	
opening in year:	2017,50	2020,00	2021,00	2023,00	2023,00	2018,76	2023,00
Overall progress rates:	years	km per year					
Half motorway	7,50	22,9					
Full motorway	8,00	21,5					

The second option is to consider construction progress (km/year) at a significantly quicker rate, say, progress increased by 50% over the first schedule.

[1] Financial analysis as in Technical Memorandum no. 26

b) Construction progress faster by 50% (x 1.5)

1.500 ^progress factor ^ / length >	Virpazar-Farmaci 22.9	Farmaci-Smokovac 15.4	Smokovac-Uvac Matesevo 43.5	Matesevo Berane 34.4	Berane-Boljare 41.3	**Durmani-Virpazar** 14.7	**Total length** (km) 172.0
Half motorway							**START/FINISH**
start construction year	2015.0	2014.0	2009.5	2013.0	2013.0	2012.0	2009.5
Progress - average km/year	17.2	11.5	21.7	20.6	24.8	18.7	
new constr. time (years)	1.33	1.33	2.00	1.67	1.67	0.78	
opening in year:	2016.33	2015.33	2011.50	2014.67	2014.67	2012.78	2016.33
cuts constr. time by (months)	8.0	8.0	12.0	10.0	10.0	14.6	
Full motorway							**START/FINISH**
start construction year	2015.0	2017.0	2018.0	2020.0	2020.0	2017.0	2015.0
Progress - average km/year	13.7	7.7	21.7	17.2	20.7	12.5	
new constr. time (years)	1.667	2.000	2.000	2.000	2.000	1.174	
cuts constr. time by (months)	10.0	12.0	12.0	12.0	12.0	21.9	
opening in year:	2016.67	2019.00	2020.00	2022.00	2022.00	2018.17	2022.00
Overall progress rates:	years	km per year					
Half motorway	6.83	25.2					
Full motorway	7.00	24.6					

The third scenario could be: halve the times given in the original schedule, i.e., to double the rate of construction progress on given contracts, in terms of length of roadway completed per month or per year. This is shown in the table c) below.

c) Speed up pace of construction by a factor of 2.0

2.000 ^progress factor ^ / length >	Virpazar-Farmaci 22.9	Farmaci-Smokovac 15.4	Smokovac-Uvac Matesevo 43.5	Matesevo Berane 34.4	Berane-Boljare 41.3	**Durmani-Virpazar** 14.7	**Total length** (km) 172.0
Half motorway							**START/FINISH**
start construction year	2015.0	2014.0	2009.5	2013.0	2013.0	2012.0	2009.5
Progress - average km/year	22.9	15.4	29.0	27.5	33.0	25.0	
new constr. time (years)	1.00	1.00	1.50	1.25	1.25	0.59	
opening in year:	2016.00	2015.00	2011.00	2014.25	2014.25	2012.59	2016.00
cuts constr. time by (months)	12.0	12.0	18.0	15.0	15.0	17.0	
Full motorway							**START/FINISH**
start construction year	2015.0	2017.0	2018.0	2020.0	2020.0	2017.0	2015.0
Progress - average km/year	18.3	10.2	29.0	22.9	27.5	16.6	
new constr. time (years)	1.250	1.500	1.500	1.500	1.500	0.881	
cuts constr. time by (months)	15.0	18.0	18.0	18.0	18.0	25.4	
opening in year:	2016.25	2018.50	2019.50	2021.50	2021.50	2017.88	2021.50
Overall progress rates:	years	km per year					
Half motorway	6.50	26.5					
Full motorway	6.50	26.5					

It is noted that, because the sections of motorway will 'overlap' in timing, total progress (km/year) is greater than the average of the parts. The following table summarizes the three above; and shows also that the scheduled years of starting for given sections have an important impact on overall progress, such that doubling rates of construction progress on individual sections would have an overall impact of only about 16% on overall km/year - although 18 months might be cut from the schedule, i.e., for full motorway, 6½ years instead of 8 years to get the works completed.

Progress rates	Time in years		Full Mway
	Half	**Full**	(km/year)
Original	7.50	8.00	22.9
x 1.5	6.83	7.00	24.6
x 2.0	6.50	6.50	26.5

1.1 Effects on economics

From the economic analysis viewpoint, tests show that – assuming a given year for the start - speeding up construction progress on individual contracts will have only a very small impact on the result, that is: the NPV of social costs and benefits. However, economic analysis also shows that moving a start year forward (to an earlier date) will have a major impact on NPV, which would in most cases be negative. This is because, under the start year scenarios as currently presented, the EIRR (internal rates of return) are only slightly greater than the discount rate of 7 percent. As start years are moved forward earlier, less benefits are realized because after opening there is less traffic than would be in a later year. The social impact of opening year traffic and traffic in the first few years after opening is of major importance: future benefits are worth less, as result of the discounting effect. Typically, at 8% discount rate, about 30% of the total present value (NPV) of user benefits is realized in the first 5 years after opening the facility. It is thus that timing of construction becomes of critical importance for optimizing the social-economic benefit.

1.2 Financial effects

From the financial viewpoint, it is very likely that construction costs will be measurably higher for faster schedules. This is clearly the case to the north of Podgorica. The terrain is very mountainous, meaning that access to the construction sites is going to be difficult. The number of works sites that are able to be run in parallel will also be limited. For instance, in the Smokovac-Matesevo sector, it may be possible to have two separate works contracts starting from each end. However, limited access points, and narrow steep roads (temporary works roads) will also mean that even if extra equipment (trucks, bulldozers, tunneling machinery etc.,) is brought in order to speed up works, it will be difficult to utilize or deploy all the extra equipment quickly enough to be effective.

Another factor to be carefully considered in all areas only a short distance north of Podgorica is that works will be constricted in wintertime by snowfalls, and bad weather (rain, wind) conditions generally, although that would not apply when actually within the tunnels.

The most effective means to determine the additional cost of a faster schedule would be to ask for two separate tenders: tender process 1, calling for a three year schedule for the Smokovac-Matesevo section, and another, process 2, calling for bids on a two-year construction schedule. It is considered almost certain that the value of bids in the two year case would be considerably higher, but it is not possible to say 'how much higher' without going through the process.

TECHNICAL MEMORANDUM NO. 28

REVIEW AND COMMENT ON THE SECOND DRAFT LAW ON CONCESSION

TABLE OF CONTENTS

1 COMMENTS ON THE NEW DRAFT LAW ON CONCESSION

This legislation on concessions has to be seen as bearing only on concessions (or BOT system) a classical form of Public Private Partnership, different from the so-called PPP. Indeed, this so-called PPP is a recent and different system of partnership, now embedded in specific legislation and used in Western European countries. It is a legal framework for the intervention of private partners in the delivery of public services, different of the concession scheme.

It remain crucial, however to rule on this (concession or BOT), form of Public private partnership since it is, by far, the main tool for the development of public infrastructures, using private funds and expertise. Some countries have developed a long lasting experience of concession and have a strong contractual practice based on case law and institutions used to deal with concession matters. This may not be the case of Montenegro who, as other countries in transition, needs to lay down a clear legislation on concession and subsequent by-laws, institutional set up, to attract important financial investments. PPP legislation is another matter, which has also to be dealt with, but in another set of legislation.

Most of remarks contained in the previous memo on the concession law first draft, remain. This draft law is a good document, which covers a lot of useful points, it needs more flexibility and comprehensive provisions which can meet all the variety and complexity of concessions, or answer the questions that a future and different environment may bring. The second point still to be outlined is the need to design, in a more precise manner, the questions to be encompassed in the crucial implementing tool which is the concession Agreement and its annexes. The third point in this draft law is the need to articulate the concession law with applicable general legal principles or rules in force in Montenegro (arising out of either civil law, contract law, or administrative law…), with sector laws and public law (public procurement law). We don't see any mention of other precise Law of Montenegro (or domain of law, for exemple the" law on public procurement") in this draft. If there is no precise law to whom it can be referred, that implies to elaborate the needed rules in the Concession law itself.

Points such as participation of Consortia and rules protecting the State interests, easements, the transfer of controlling interests, which may be an important element of the control of the concession, are not considered in the new draft. The question of the protection of confidential data, in addition to the remarks made on the first draft law, is only mentioned in article 33 "Right of insight and complaint". This article excludes the right of insight documents which represents "confidential information as determined by the law". But one does not know if such a law does exist or is to be taken.

The first draft of Article 4, bearing on definitions, was giving the definition of five terms. Two definitions have been added **("Concession contract" and "Concession Act"** which is the basic document". This latter definition is somehow unclear and articulation with the definition of the "Concession contract" should appear more clearly.

As stated in the comments on the first draft, one guess that some others definitions, used in the draft, are already defined in some general law. For example, one concludes that, the following terms, not defined, in this second draft, are already given in general laws of Montenegro:

- "property in general use",
- "property of general interest",
- "activities of general interest",
- "Natural resources",
- "Concession Commission" (in line with articles 10 to 12),
- "Unsolicited proposal" (in line with article 19),
- "facility and infrastructure facility".

The suggestion according to which '*The definition of the Tenderer does not make the difference between an economic operator who has submitted a tender and the one which has just sought an invitation to take part in a restricted or negotiated procedure or a competitive dialogue. It is suggested to make the difference as in the EU law, and to designate the latter as a "candidate"*has not been taken into consideration.

Article 5 "Conditions for granting concession" has limited the granting to Tenderer(s) to the manner and under conditions stipulated by the Law, and deleted the reference to Concession Act and Public Announcement.

Article 6 "Concession subject", it was suggested that a general umbrella provision should be inserted in this article such as: "*The concession subject may be any facility or service which is used by and/or provided for the benefit of members of the public (or any section of the public) and, when appropriate, shall include, without limitation…. ».*

It was suggested that Items 8, 9, 13, 14, 15 and in fact the whole article could be rephrased. That has not been the case. Should have been inserted at least for item 7 (an important one, since it covers the main infrastructures) at the end an extensive definition stating " **and related infrastructures, facilities and services".**

In article 16 "Concession Contract Register", a new paragraph has been added and states that "*All interested parties have the right of insight into the Concession Contract Register*". But since the foregoing paragraph mentions that "*Concession contract register is to be published on the internet website of the Commission*." one does not see the usefulness of such an amendment.

The rationale mentions that "*Members of the Commission are appointed for the period of five years. The following issues are regulated: conflict of interests, …"*

One does not see any mention of that in Section II "Institutional structure" (articles 9 to 16). If article 12 mentions the conflict of interest, but without any criteria or qualification, without any reference to a general law which could define the concept of conflict of interest and provide for procedure to solve such conflict and penalties in case of serious breach of such regulations.

In article 7. a third paragraph has been added.

"*Plan includes areas of concession granting, details of concession subjects, deadline for issuing public announcement for granting concessions".*

Such requirements, may be very useful in terms of transparency, may also reveals difficult to be be attained. Concession Practice shows that details and deadlines published the previous year, are usually not respected. One should avoid, when drafting a law to state requirement.

Article 8 on the Duration of the Concession Period, lays down two options. The question raised in our previous comment, stays. Especially if there is no limit for the duration of the concession period, the law should define a procedure, which could be based on Section III "**Procedure for Granting of Concessions"**.

In article 9: "Competence for the granting of concessions", paragraph (3) providing that for all concession subjects located in the area of sea and national parks' property, the Concessionaire is obliged to pay the fee for using sea property, i.e. natural resources and national parks' property to public enterprises" has happily been be removed.

Paragraph 4 of the same article lays down the rule according to which the "*Parliament of Montenegro …., awards Concessions for the Concession Subjects above the value established by the law"*. It is supposed that reference is made to article 22 "Public announcement" which mentions value for public works, based on EC 2004/18 and 2005/51 directives. But the aim of the directive, when fixing this amount is different: ensuring competition above a certain amount, which may not be the only purpose of this law.

Article 13 on conflict of interest, mentions the conflict of interest without any precision or criteria, without any reference to a general law which could define the concept of conflict of interest, without any provision or reference to a procedure on how to solve the case when a conflict of interest appears, or when and how infringements of rules are considered as serious enough to be subjet to provisions of criminal law. Nothing in the law entitled the Commission (or any other Body) to draft a set of rules on conflict of interest.

Article 19 on unsolicited proposal is rather unclear, for example paragraph (1) states that: "*Interested party may submit to the Competent Authority an initiative for starting process of granting concession…".* No procedural rules are provided on such "initiative". Written as it is, a bit short, this article could endanger the effectiveness of the principles of fair competition and transparency.

A set of procedural rules should be inserted in the law, as regards the criteria to admit unsolicited proposals, the procedures for determining this admissibility, the selection procedure in accordance with the other provisions of the law, the respective rules to be observed in case unsolicited proposals do involve or do not involve intellectual property, trade secrets or other exclusive rights.

Article 41 (42 in the first draft) bearing on **"*Consulting Dialogue*"** elsewhere called "*Competitive dialogue*", just raises the principle of consultative dialogue in para. 1. Such a delicate procedure should encompass rules on how to ensure transparency, fair competition. If such rules are already contained in the public Procurement Law, a reference should be made to this law or, better, provisions similar and consistent with this concession law should be adopted. Anyway, in public tender, PFI or PPP procedures, precise rules on "consulting dialogue" are strongly needed, since this procedure is both useful and full of risks in terms of equal treatment and transparency requirements.

DRAFT

March 28th, 2008

LAW ON CONCESSIONS

I.BASIC PROVISIONS

Subject of the law

Article 1

(1) The present Law shall determine the planning of, conditions, modes and the procedure for granting concessions, the concession subject, forming of the Concession Commission, duration of the concession period, Concession Contract, practice of concessionary rights and duties and other matters of significance for the realization of concession.

(2) This law is obligatory for the granting of all concessions.

Purpose of the Law

Article 2

(1) The aim of the law is to determine general, transparent and nondiscriminatory conditions under which concessions may be granted for the utilization of natural resources, goods in general use and other goods of general interest and the performance of activities of general interest, ensure development and operation of infrastructure, by establishing special procedures for granting concession contracts.

(2) Concessions are granted in order to:

1) enable efficient, proper and rational exploitation of natural resources, goods in general use and other goods of general interest;

2) provide technical and technological improvement of activities which are the subject of concession, i.e. the technical-technological unity of system in the field of infrastructure;

3) provide revenues for the Concession Grantor or achieve adequate public interest, higher employment, introduction of new technologies and secure increased economic development;

4) provide financial resources for the construction, rehabilitation, modernization of the projects relevant for rendering public services;

5) strengthen the competition in the sector in which the concessions are granted;

6) provide environmental protection and improvement.

Principles

Article 3.

Principle of non-discrimination

All the Tenderers have equal treatment in the procedure for the granting of concession.

Principle of freedom of will

The principle of freedom of will includes the freedom of contracting parties to arrange, in accordance with the law and other regulations and good faith, the mutual rights and obligations at their own discretion.

Principle of transparency

In the procedure for granting concessions it must be ensured that all the interested parties will be provided with equal, complete, timely and correct information on the procedure, standards and criteria for the selection of the concessionaire, information on the Tenderer selected as the concessionaire, on the execution of the Concession Contract in terms of payment of the concession fee by the Concessionaire, and that persons included in the procedure for granting concession will be provided with reasoned information on the Tenderer which was awarded the Concession Contract and the terms of his proposal.

Definitions

Article 4

Terms used in this Law shall have the following meaning:

1) **“Concession”** means the right established by the Concession Contract:

- to exploit natural resources, goods in general use and other goods of general interest or to perform activities of public interest, whereby the payment of the concession fee by the Concessionaire or the provision of financial fees or other support to the Concessionaire for the realization of adequate public interest may be agreed,

- to build, operate and transfer facility, installation or plant (hereinafter referred to as: BOT system) including all forms of this system (reconstruction, financing, operation and transfer; building, renting and transfer; building, transfer and operation; development, operation and transfer; sanitation, operation and transfer, etc.), in the contracted period, to the property of Concession Grantor;

2) **“Concession Contract”** means a written contract establishing mutual rights and obligations between the Concession Grantor and the Concessionaire.

3) **“Concession Grantor”** means the Government of the Republic of Montenegro (hereinafter: Government), Administrative Center, Capital City and local self-government unit (hereinafter: Municipality);

4) **“Concessionaire”** means a domestic or foreign legal entity, an entrepreneur or a physical entity to which the concession is granted, including consortium or other form of business association with mutual relationships regulated by special contract;

5) **“Competent Authority”** means the ministry and authority, for concessions in the competence of Government, i.e. a body of local authority, for concessions in the competence of municipality, depending on the concession subject and the law regulating the concession subject, i.e. in compliance with regulations determining the competences of authorities;

6) **“Tenderer”** or **“Tenderers”** means domestic or foreign, legal or physical entity, entrepreneur, consortium or other form of business association for the purpose of concession ventures, participating in the process of selection concerning the granting of concession;

7) **“Concession Act”** is the basic document.

Conditions for granting concession

Article 5

Concession may be granted to Tenderer(s) in the manner and under conditions provided by this Law.

Concession Subject

Article 6

(1) The concession subject may be:

1) Research, or research and exploitation, or exploitation of all kinds of mineral resources;

2) Utilization of watercourses and other waters, i.e. their parts or certain quantity of water for purposes specified by a special law;

3) Construction, rehabilitation, maintenance and utilization of water facilities;

4) Utilization of forests;

5) Utilization of radio-frequency spectrum;

6) Construction of hydro-melioration systems and extraction of materials from water areas;

7) Construction, maintenance and operation or reconstruction/modernization, maintenance and operation or operation of:

   - roads,
   - railway lines,
   - air traffic facilities and airports,
   - water traffic facilities and ports,
   - telecommunication facilities,
   - oil pipelines, gas pipelines, facilities for storage, transport and distribution of oil and gas,
   - medical institutions,
   - public utility facilities for the performance of public activities;

8) Construction, maintenance and operation of energy-related and other facilities for the purpose of generation, transfer and distribution of electricity and heat or their reconstruction, modernization, maintenance and operation;

9) Development, enhancement and exploitation of sea assets and national parks' assets, riverbanks and lake shores;

10) Performance of public proper education program;

11) Organization of games of chance;

12) Construction, maintenance and operation of sports and recreational facilities, sport fields and areas for sports, recreation and cultural activities;

13) Construction of facilities, reconstruction, modernization and operation of existing facilities in localities with natural curative capacities and other natural values, for the purpose of their exploitation;

14) Construction, maintenance and operation of tourist infrastructure facilities or their reconstruction, modernization, maintenance and operation.

(2) Besides the subject of concession as referred to in the paragraph 1 of this article, in accordance with the law, the subject of concession may also be the exploitation of other natural resources, goods in general use and other goods of general interest, in state ownership, as well as the performance of other activities specified by law as activities of general interest.

(3) A special law may determine what is not and cannot be the concession subject.

Notification on the subjects and regions of concessions

Article 7

(1) At the recommendation of the Competent Authority, the Concession Grantor provides, publishes and updates the plan for granting concessions on its internet website.

(2) Plan referred to in the paragraph 1 of this Article shall be issued per sectors, upon carrying out of public discussion by the competent authority, at latest by the end of the year for the following year.

(3) Plan includes areas of concession granting, details of concession subjects, deadline for issuing public announcement for granting concessions.

Duration of the Concession Period

Article 8

Option 1

(1) The duration of the concession period is determined depending on the concession subject, public interest, period of investment return and realization of reasonable profit on the basis of concession activity and shall not be longer than 60 years.

(2) Duration of the concession period may be longer than the period determined in the paragraph 1 of this article upon consent of the Parliament of Montenegro.

(3) Concession Contract may be extended at most by up to half of the agreed duration, but not to a total period longer than 60 years.

(4) In the case of paragraph 3 of this Article contracting parties conclude the Annex to the Concession Contract, which is to be registered and published as a part of the basic contract.

Option 2

(1) The duration of the concession period shall be determined depending on the concession subject, public interest, period of investment return and realization of reasonable profit on the basis of concession activity.

(2) Concession Contract may be extended at most by up to half of the agreed duration, in which case contracting parties conclude the Annex to the Concession Contract, which is to be registered and published as a part of the basic contract.

II. INSTITUTIONAL STRUCTURE

Competence for granting concessions

Article 9

(1) The government makes the decision on the granting of concessions for the concession subject for which Montenegro has the rights of ownership and authorizations.

(2) The Municipality issues the decision on the granting of the concession for the concession subject for which the ownership rights and authorizations are held by the municipality.

(3) Parliament of Montenegro, at the recommendation of the Government, after the conducted procedure in compliance with this Law, grants concessions for the Concession Subjects above the value established by the law.

Establishing and Competence of Concession Commission

Article 10

(1) By virtue of this Law, a Concession Commission of the Republic of Montenegro (hereinafter: Commission) shall be established.

(2) The competence of the Commission is:

1) Resolving complaints related to violation of the evaluation process and the ranking of the proposals;

2) Making recommendations for the control of Concession Contract execution, the content and structure of reports submitted by the holder of the concessionary rights;

3) Maintaining Concession Contracts Register;

4) Recommending modifications and additions, i.e. termination of the Concession Contract in cases of severe contract violations.

5) Performing other work determined by this law.

(3) Sublegal acts regulating issues from the paragraph 2, items 6 and 7, of this Article shall be issued by the Government, at the recommendation of the Commission.

Composition of the Commission

Article 11

(1) The Commission is a permanent body appointed by the Government and composed of the Chairperson and four members.

(2) The Chairperson and the members of the Commission shall be citizens of Montenegro.

(3) Members of the Commission include:

- three representatives of the Government;
- representative recommended by associations of employers;
- representative proposed by the Association of Municipalities.

(4) A person effectively convicted of a criminal act against property, economy, constitutional order and for abuse of official position may not be appointed in the Commission.

(5) A member of the Commission may be appointed for the period of five years and may once be reappointed.

(6) In case the position of a member of the Commission becomes vacant before the expiry of the mandate, the Government shall appoint a new member for the time before the expiry of the mandate.

(7) The Commission may engage experts and institutions specialized in certain fields if, by the estimate of the Commission, such help is necessary.

(8) The Government shall determine the authority for performance of professional and administrative operations for the Commission or it shall form a special service for the performance of such operations.

(9) Commission shall provide rules of conduct for its operation.

Conflict of Interest

Article 12

(1) The member of the Commission must not have direct or indirect interests in the concession subject which might cause a conflict between his/her personal interests and his/her official duties in the concession granting.

(2) In case the work of the Commission is disabled as a result of the conflict of interest, the Government, exceptionally in the actual case, appoints deputy members for the members who stand in the conflict of interest.

Expiry of Terms of Office and Dismissal

Article 13

The terms of office of a member of the Commission may expire, i.e. he/she may be relieved from duty:

- upon proposal of the entity which recommended his/her appointment in the Commission;
- in the case he/she submits a written resignation;
- in the case he/she becomes effectively convicted to a prison sentence for a criminal act which makes him/her unfit for the performance of duties;
- in the case he/she permanently looses the capacities for the performance of duties;
- in the case he/she performs poorly and inefficiently the functions of Commission member;
- in case he/she is unjustifiably absent on three consecutive sessions of the Commission.

Financing of the Commission

Article 14

(1) Funds needed for the operation of the Commission shall be secured from the budget of Montenegro.

(2) The utilization of the funds by the Commission is subject to auditing in accordance with the regulations.

Concession Contract Register

Article 15

(1) Commission shall maintain and regularly update Concession Contract Register.

(2) Concession contracts register contains the following data: name of the concessionaire, concession subject, date of the conclusion of the Concession Contract, duration of the concession period, agreed and finally calculated annual amount of the concession fee and the extent of realization of the payment of annual concession fee by the Concessionaire, i.e. the type and extent of financial support provided to the Concessionaire by the Concession Grantor.

(3) Concession contract register is to be published on the internet website of the Commission.

Annual work report

Article 16

(1) The Commission submits to the Government, at latest by March 31st in the current year, the annual report on its work during the previous year, with the report on the performed auditing.

(2) The Commission is obliged to submit to the Government, at latest by June 30th, the report on the realization of obligations from the Concession Contract in the previous year.

(3) Reports from paragraphs 1 and 2 of this Article the Commission shall also submit for insight to the municipalities.

III. PROCEDURE FOR GRANTING OF CONCESSIONS

Initiative for the starting of the procedure

Article 17

The procedure for the granting concessions is started by the competent authority, and for concessions in the competence of municipalities also by the president of the municipality, in compliance with the Plan as referred to in the Article 7 of this law, or at the initiative of the interested party.

Initiative of interested party

Article 18

(1) Interested party may submit to the Competent Authority an initiative for starting process of granting concession for which a public announcement hasn't been issued.

(2) Initiative is submitted to the competent authority and contains information necessary for making a decision on the preparation of the Concession Act as referred to in the Article 20 of this Law.

(3) If the competent authority estimates the initiative as acceptable it will determine a deadline by which the submitter of the initiative is obliged to deposit the estimated funds for the production of the Concession Act, including development of tender documentation and draft Concession Contract, costs of the operation of the Concession Commission and the costs of conducting public discussion.

(4) Competent authority is obliged to start the preparation of Concession Act within 15 days from the date of the deposited funds.

(5) In case the Concession should be granted to a Tenderer which is not the submitter of the initiative for granting of the concession, the competent authority shall immediately return the deposited funds to the submitter of the initiative.

Concession Act

Article 19

(1) The Concession Act forms the basis for granting a Concession.

(2) The Concession Act is produced by the competent authority and submitted to the Concession Grantor for adoption.

(3) Along with the Concession Act, the competent authority shall also submit to the Concession Grantor:

- Analysis of alternative options for providing services;
- Indicators that the planned concession shall ensure adequate value for the invested money;
- Indicators that the concession ensures public interest;

- Analysis, assessment and balance of risks between the Concession Grantor and the Concessionaire.

(4) Prior to sending the Concession Act to the Concession Grantor, the competent authority organizes and conducts public discussion within the period not longer than 20 days, whereby the comments and suggestions from the public discussion shall be discussed during the course of the production of the Concession Act.

(5) In case of complex and big projects the period as referred to in the paragraph 4 of this Article may be extended.

(6) The competent authority may engage external advisors, legal or physical entities, for the performance of work and the rendering of technical assistance for the production of the draft Concession Act. Persons from this paragraph cannot be Tenderers as referred to in this Law.

(7) Concession Grantor may offer financial assistance to the concessionaire, including, but not limited to, the payment for performance of activities of public interest, giving guarantees, material giving, giving of donations, provided such a possibility is envisaged by the public announcement.

Article 20

(1) As a rule, the Concession Act contains the following:

1) detailed description of the subject of concession and specification of area, region and location where the Concession Activity shall be conducted;

2) basic parameters for the assessment of economic feasibility of investment;

3) minimal or maximal concession period;

4) list of required technical documentation, with conditions for its production if that is envisaged by a special law, necessary licenses, permissions and approvals which should be obtained prior to the start of the conduction of Concession Activity;

5) data from spatial-planning and town-planning documentation, data on the need for solving property-legal relationships, data on infrastructural and other facilities located in the region for conduction of concession activity, as well as the opinions of competent authorities, professional institutions or companies, in compliance with special laws;

6) conditions which the concessionaire must satisfy in terms of technical capacities, financial capability and other references and proofs of which the Tenderer must submit on that basis;

7) tender documentation (announcement, documentation related to the proposal);

8) Draft Concession Contract and other accompanying contracts necessary for the realization of the concession;

9) criteria for the selection of the most preferred proposal;

10) conditions and modes of performing concession activities, especially conditions, modes and desired quality of providing services to users;

11) measures for environmental protection and improvement of energy efficiency as established by regulations;

12) recommendation of the type and level of guarantee or other securities for irresponsible proposals and securities for the performance of concession activity;

13) minimum Concession Fee;

14) modes for determination of rates;

15) proposition of mechanism for supervision of rendering services from the Concession Contract;

16) other elements of significance for the granting of concession.

(2) If the concession subject is the exploitation of mineral resource, the Concession Act also contains the data on conducted geological research and the data on established quantity and quality of mineral resources.

(3) If the concession subject is the reconstruction or the modernization of existing facilities, the Concession Act also contains the assessment of the level of investment determined in relation to the value of facilities for which the reconstruction or modernization is the subject of concession, as well as the desired status of resources which are the subject of the transfer after the expiration of the deadline.

Modes of Granting Concession

Article 21

(1) Concessions are granted on the basis of:

1) public competition in an open procedure (hereinafter: open procedure),

2) public competition in a two-tier procedure (hereinafter: two-tier procedure).

(2) Exceptionally, the public competition procedure may be excluded in the case of extension of concession as referred to in the Article 8, paragraph 4, of this law (for option 2 Article 8, paragraph 2) or of the expansion of region for the performance of concession activity, which due to technical-technological causes cannot be confirmed as a special exploitation field for conducting concession activity by other concessionaires.

(3) Without issuing public announcement the concession may also be granted for the exploitation of other mineral resources as a follow-up of the approved exploitation field provided that the duration of the concession period may not be longer than the period determined by the Concession Contract for the exploitation of primary mineral resource on that exploitation field.

(4) The procedure for granting concession without the announcements as referred to in the paragraphs 2 and 3 of this article, may be conducted upon consent by the Commission.

(5) On the basis of requirements as referred to in the paragraphs 2 and 3 of this article, the annex of the Concession Act is produced which also provides the explanation of the need for the conducting of the granting of concession with exclusion of the public competition.

Open procedure

Public announcement

Article 22

(1) Upon adoption of the Concession Act, the Competent Authority, except in the case referred to in the Article 21, paragraphs 2 and 3 of this law, issues Public Announcement.

(2) Announcement shall be published in the “Official Gazette of Montenegro”, in, at least, one daily printed media, printed and distributed on the territory of entire Montenegro and on the internet website of the Competent Authority, and when the subject of concession is of strategic significance for Montenegro, as well as in one representative international economic printed media.

(3) Text of the public announcement especially contains:

1) subject of the public announcement;

2) relevant parts of the Concession Act;

3) address and deadline for submitting of the proposal for public announcement;

4) criteria for the participation in public announcement and the possibility of submitting the joint proposal;

5) rules of conducting public announcement;

6) modes for deliverance of the proposal (under code or under the full title of the Tenderer);

7) criteria for evaluation of proposals;

8) possible time of visit to the location for the performance of concession activity; date, time and place of the opening of received proposals for public announcement;

9) time period during which the proposal for public announcement may be withdrawn;

10) establishing the form of the proposal, technical and financial or just financial proposal;

11) data on the level and the form of tender bond and guarantee and the period for which they are required;

12) possible relieves and aids for the Concessionaire:

13) conditions, terms and modes for return of tender bond and guarantee;

14) stipulations on subcontracting;

15) name of the person in charge for presenting relevant information in the procedure of public announcement;

16) redemption price for tender documentation in the level of costs of its production.

(4) Deadline for submitting proposals as referred to in paragraph 3, item 3, of this Article must be sufficient for the proposal preparation and, counting from the day of publishing of the public announcement, it cannot be shorter than:

- 52 days for concession subjects, i.e. investments in BOT system, with the value of at least 5.278.000 EUR, not including the value added tax;

- 30 days for concession subjects, i.e. investments in BOT system, with the value less than 5.278.000 EUR, not including the value added tax.

(5) Costs of issuing public announcement are borne by the Competent Authority.

Modifications

Article 23

(1) Competent Authority may, upon the issuing of the Public Announcement, modify the Public Announcement, with exception to the elements determined by the Concession Act.

(2) In the case as referred to in the paragraph 1 of this article, the Competent Authority shall, under the same procedure by which the Public Announcement was published, make modifications to the Public Announcement, provided that the deadline for the submitting of proposals must be extended for the number of days elapsed since the day of the issuing of announcement.

Submitting of the proposals

Article 24

A legal or physical entity or an entrepreneur may submit only one proposal, which he shall submit independently, in a consortium, or in some other form of business association.

Security

Article 25

For the purposes of protection from irresponsible proposals, the security may be required in a form of pecuniary deposit, or in a form of guarantee, in the amount which will ensure the protection of Concession Grantor's interests, but will not repulse persons interested in the participation in the procedure of public announcement, and within the period not longer than necessary to protect the Concession Grantor from irresponsible proposals.

Subcontracting

Article 26

The public announcement may determine the minimal percent of the total value of project works the Tenderer is obliged to assign through public competition to companies and entrepreneurs registered in Montenegro.

Tender Commission

Article 27

(1) The procedure of opening of the proposals, verification of the proposals in terms of their validity, proposal evaluation and ranking of Tenderers, in compliance with the act brought by the Government, is conducted by the tender commission, comprised of an odd number of members, and formed by the Competent Authority.

(2) For concessions in the competence of the Government a member of the Tender Commission shall also be a representative of the municipality on the territory where the concession is realized.

(3) In case the Concession as referred to in the paragraph 2 of this Article is realized on the territory of more than two municipalities, the representative in the Tender Commission is proposed by the Association of Municipalities, through consultation with representatives of municipalities on the territory where the concession is realized.

(4) Costs of the operation of the tender commission are borne by the Competent Authority.

(5) A member of the tender commission may not have direct or indirect interests which would, during the operation of the tender commission, cause a conflict of his/her personal or business interests in the evaluation of proposals and the recommendation for the ranking of Tenderers.

(6) In case the member of the Tender Commission stands in conflict of interests, the Competent Authority shall appoint another member.

Operation of tender commission

Article 28

(1) Tender commission, based on criteria from the Public Announcement and submitted proposals, makes a recommendation for the ranking of the Tenderers.

(2) Tender commission shall make decisions by a majority of votes of the total number of members.

Right of priority

Article 29

(1) During the course of preparation of the recommendation for the ranking of the Tenderers, as well as during the course of selection of the

concessionaire for the exploitation of natural resources, under the conditions of equally evaluated proposals, the priority goes to the person that conducted previous research in the region envisaged for the exploitation.

(2) If the submitter of the proposal in the public announcement or the initiative for the granting of the concession is the owner of the land which is the concession subject, under conditions of equally evaluated proposals, he shall have the priority over other Tenderers, except in relation to the persons as referred to in the paragraph 1 of this article.

(3) With exception to paragraphs 1 and 2 of this article, under the conditions of equally evaluated proposals, the submitter of the unsolicited proposal has the right of priority in the granting of the concession.

Verification of Proposals

Article 30

(1) Prior to proposal evaluation, proposals shall be verified in order to identify the possible insufficiencies and variations in terms of requirements of the Public Announcement.

(2) Invalid proposals shall be rejected, and valid proposals shall be evaluated based on criteria established by the act as referred to in the paragraph 1 of the Article 27 of this Law.

Proposal Evaluation Criteria

Article 31

(1) Criteria for evaluation of proposals, depending on the concession subject these, are:

1) Period for which the concession is requested;

2) Proposed Concession Fee;

3) Proposed price, i.e. rate for rendering services;

4) Tenderer’s references (technical and/or financial terms, previous experience in performing concession activities and other);

5) Quality of services;

6) Degree of achieving public interest;

7) Degree of utilization of natural resources;

8) Effects on employment, infrastructure and economic development;

9) Degree of subcontracting;

10) Program and degree of conservation of environment and measures for improvement of energy efficiency;

11) Extent and degree of relieves and aids expected from the Concession Grantor;

12) Other criteria determined by the Concession Grantor.

2) Public Announcement determines the value of points based on the selected evaluation criteria, whereby the total sum of points is 100.

Recommended ranking of Tenderers

Article 32

(1) Tender Commission ranks proposals by assigning certain points based on each criterion stated in the Public Announcement.

(2) Tender Commission shall, within 30 days from the day of the opening of the proposals, submit to the Competent Authority the recommended ranking of Tenderers, a report on the conducted procedure with explanation of the recommended ranking of the Tenderers, the minutes from the proceedings of the procedure and excerpts from proposals of Tenderers.

(3) In extraordinary complicated cases, at the recommendation of the Tender Commission, the Competent Authority may extend the deadline as referred to in the paragraph 2 of this Article.

Right of insight and complaint

Article 33

(1) Tenderers, after the publishing the ranking of Tenderers proposed by the Tender Commission, upon written request, have the right of insight into the complete tender documentation as referred to in the Article 32, paragraph 2, of this Law, including the submitted proposals, except for the one which represents confidential information as determined by the law.

(2) The Tenderer has the right to file a complaint concerning the lawfulness of the conducted procedure. A complaint may be filed to the Commission within 15 days from the publishing of the recommended ranking by Tender Commission on the notice-board of the Competent Authority, i.e. on the internet website of the Competent Authority, counted at latest from the

mentioned publishing. A copy of a complaint should also be submitted to the Competent Authority.

(3) Upon filing the complaints, the Commission makes decisions within a period of up to 30 days from the end of the deadline as referred to in the paragraph 2 of this article.

Complaint

Article 34

(1) Commission, upon complaint by the Tenderer:

1) Evaluates whether the tendering procedure was properly conducted by the Tender Commission;

2) Establishes whether the determined evaluation criteria were properly applied by the Tender Commission.

(2) In case the Commission establishes a violation of the procedure or improper application of criteria, the recommended ranking is returned to the Tender Commission for removal of irregularities.

Recommendation for Granting Concession

Article 35

(1) Competent Authority, after the expiration of the deadline for filing complaints, i.e. after the receipt of the act with which the Commission rejects the complaint of the Tenderer or gives consent to the submitted recommended ranking with corrected irregularities, submits to the Concession Grantor the recommendation for the ranking of Tenderers, the report on the conducted procedure with explanation of the recommended ranking of the Tenderers, minutes from the proceedings, Draft Concession Contract and excerpt from proposals.

(2) Upon request of the Concession Grantor, the Competent Authority is obliged to provide other required documentation.

Decision on selection of the Concessionaire

Article 36

(1) Concession Grantor makes a decision on the granting or withdrawing from granting of the concession within 30 days from the date of the receipt of the proposal. Exceptionally, if it is required by the complexity of the concession, Concession Grantor may extend the deadline by a maximum

of 30 days, which is communicated to the Tenderers in an appropriate manner.

(2) In case of withdrawal from granting of the concession, the Concession Grantor is obliged to compensate reasonable expenses to the first ranked Tenderer for participation in the Public Announcement, unless envisaged otherwise by the Public Announcement.

Withdrawal from concluding Concession Contract

Article 37

If the first ranked Tenderer withdraws from the contract conclusion or he doesn’t conclude the Concession Contract within time determined by the decision on the selection of the Concessionaire, the Concession Grantor may invite the subsequently ranked Tenderers in order of precedence to conclude the Concession Contract or may decide to revoke the public announcement.

Notification of the results of the Public Announcement

Article 38

(1) Upon making of the decision on the selection of the Concessionaire, the Competent Authority delivers, in a written form, a reasoned notification of the results of the Public Announcement to all participants in the Public Announcement.

(2) Decision of the Concession Grantor on the selection of the Concessionaire or the decision on the revocation of the Public Announcement is published in “The Official Gazette of Montenegro”

Procedure in the case of a single proposal for the public announcement

Article 39

If only one Tenderer applies for the public announcement, and the Commission establishes that it satisfies the conditions and criteria of the public announcement, the Competent Authority may decide to revoke the public announcement or continue the procedure for the granting of the concession.

Two-tier procedure

Conducting procedure

Article 40

(1) In case the Competent Authority expects the tender to be:

- complicated in technical, legal, financial or other aspect, or
- expects a large number of Tenderers

it may decide to apply a two-tier procedure.

(2) In the case of the two-tier procedure, the Competent Authority determines prequalification criteria which must be satisfied by the persons applying for prequalification, in order to qualify for the tendering procedure. Those criteria must be established in an impartial, non-discriminatory and a transparent way.

(3) Prequalification criteria is established depending on the concession subject, and especially includes:

- The ablity for concession realization (technical and/or financial requirements, previous experience in performing concession activities, etc.);
- Proposed terms of realization of the concession (deadlines, financial requirements, guarantee requirements, maintenance, repair);
- proposed solutions (conceptual, technical, financial, legal, economical) for the realization of the project.

(4) Two-tier procedure consists of:

- Public announcing,
- Prequalification stage, when the Tender Commission appointed by the Competent Authority assesses applications for prequalification and accepts or rejects applications based on previously established prequalification criteria,
- Provision of Concession Act to the qualified Tenderers and Invitation for Proposals,
- Evaluation and ranking of proposals recieved from qualified Tenderers;

- Recommendation for the selection and the selection of the Concessionaire.

(5) During the prequalification procedure, Tenderers submit documents required by the prequalification announcement, in order to confirm the satisfaction of prequalification criteria. Deadline for submitting prequalification documents cannot be shorter than 30 days for concession subjects, i.e. investments in BOT system, as stated in the Article 22, paragraph 4, item 1 of this Law, and 20 days for concession subjects, i.e. investments in BOT system, as stated in the Article 22, paragraph 4, item 2 of this Law.

(6) Stipulations of Article 27, paragraph 1 of this Law shall regulate the procedures of opening, reviewing and verification of submitted documentation and the selection of the Tenderers which shall be qualified for the submitting of proposals.

(7) In the procedure as referred to in the paragraph 4 of this article, stipulations provided by the articles 22-39 of this Law shall be applied accordingly, unless otherwise established by this article.

(8) If only one Tenderer who satisfies the prequalification criteria appears at the public tender, the Competent Authority may continue or terminate the procedure for the granting of concession.

Consulting dialogue

Article 41

(1) In the case of technically, legally, financially or otherwise complicated projects, the Competent Authority shall prepare the competition stage in a consultative way, wherein the Tenderers and the Competent Authority engage in a dialog with the aim of determining the best technical, legal, financial or other solution.

(2) Competent authority must not reveal to other tenderers the information reached during the consulting dialogue and being a business secret of the tenderer, without the prior consent from the tenderer.

(3) Upon consultative dialogue, in the competition stage, the Competent Authority provides all qualified Tenderers with the Concession Act containing the final Tender Documentation, including Draft Concession Contract, technically, legally, financially or otherwise finalized concept, on the basis of which all of the Tenderers submit their proposals.

IV. PROTECTION OF RIGHTS OF PARTICIPANTS IN TENDER

Rights of the Participants in the Procedure of Public Announcement

Article 42

(1) A participant in the public announcement, its representative or agent, has the right to attend the opening of the proposals.

(2) A participant in the public announcement has the right, upon written request, to withdraw the proposal at latest upon expiration of the time period determined by the public announcement. The proposal is considered to be withdrawn upon receipt of a written request for the withdrawal of the proposal. In case of withdrawal of the proposal, the same is returned to the Tenderer unopened.

(3) A Tenderer has the right to file a complaint to the Commission concerning the lawfulness of the conducted procedure in accordance with this law.

(4) A law suit may be filed against the decision of the Concession Grantor on the granting of concession.

(5) Participants in the public announcement have the right of refund of the deposit, i.e. other guarantees securing against irresponsible proposals, in a manner determined by the public announcement.

(6) If the Tenderer selected as the concessionaire withdraws from concluding the Concession Contract he shall not have the right of refund of the deposited funds, i.e. other guarantees as referred to in the paragraph 5 of this Article.

V. CONCESSION CONTRACT

Conclusion and the Contents of the Concession Contract

Article 43

(1) Unless otherwise determined by the public announcement, the Concession Contract shall be finalized by the Competent Authority and the Tenderer with the highest ranking in accordance with provisions of the Concession Act, Public Announcement, Draft Concession Contract, as it is finally provided to the Tenderers prior to the expiry of the deadline for submitting of proposals, the submitted proposal and the decision on the granting of the concession.

(2) Concession Contract as per a rule contains the following:

1) contracting parties;
2) rights and obligations of the contracting parties;
3) concession subject;
4) conditions and modes of utilization of the Concession Subject;
5) duration of the utilization of Concession Subject;
6) levels, deadlines, conditions and modes of payment of concession fee;
7) operations related to obtaining necessary authorizations for conducting activities in accordance with the Concession Contract, as well as the right of the Competent Authority to monitor works performed and services rendered by the Concessionaire;
8) modes and deadlines for securing funds for financing concession activities (financial plan) and the time schedule of investment;
9) duration of preparatory operations;
10) product and service standards, transfer of technology;
11) relieves and help which, in compliance with the regulations, shall be provided by the Concession Grantor to the Concessionaire, as well as the participation of the Concession Grantor in the payment to the Concessionaire for the performance of concession activity;
12) means and assets given for use by the Concession Grantor;
13) amount and modes of securing guarantees for the execution of the Concession Contract;
14) obligations of the Concessionaire regarding environmental protection and application of measures for improvement of energy efficiency;
15) Concessionaire's handling of objects of value, with historical, cultural or natural value, found during the operation of the Concession Subject.
16) obligation towards revitalization of renewable energy sources, i.e. the rehabilitation – recultivation of surfaces degraded by the performance of concession activity;
17) conditions for the modification or termination of contract and the consequences thereof, changed circumstances and force majeure;
18) description of events considered force majeure;

19) sanctions and compensations due to non-performance of obligations of contracting parties;

20) conditions for the performance of concession activity, criteria and ways of determination of end user prices, i.e. rates for products and services;

21) rights and obligations in terms of taking measures of general security, health and environmental protection as well as the responsibility for the compensation for damage incurred by threatening general security and environmental protection;

22) right to contractual fees on the basis of the increase to the concession value;

23) provisions on timing and modes of the transfer of immovable property, facilities, installations or plants to Concession Grantor and the state they must be transferred in.

24) modes of settlement of disputes and application of the ruling law;

25) other elements significant to the concession subject.

(3) The contract also determines the modes of mutual reporting on the performance of contractual obligation, modes of controlling that performance and the practice of rights and obligations of contracting parties.

(4) The contract is signed by the senior officer of the Competent Authority, upon authorization from the Concession Grantor, and by the authorized person of the Concessionaire.

Expropriation

Article 44

(1) If, in relation to the operation of the concession, expropriation of immobile property, i.e. establishment of the construction site, needs to be undertaken, then the costs, modes and deadlines for payment of the expropriation, i.e. establishment of the construction site, are regulated in accordance with the Law.

(2) In case the owner of the land as referred to in the paragraph 1 of this article is the Concession Grantor, no expropriation shall be undertaken, but it is considered that the concessionaire has the consent for its use by the granting of the concession.

Registering Immovable Property Concession Contract

Article 45

Concession Contract related to immovable property shall be registered in the Cadastre of Real Estates in accordance with the law.

Obligation of reporting

Article 46

The Competent Authority shall submit the original of the concluded Concession Contract to the Commission and the body competent for the collection of public revenues.

Increase of the Concession Subject value

Article 47

Unless otherwise specified by the Concession Contract, every increase to the value of devices and facilities in state property, which stand in function of the performance of concession activity, and occurring on the basis of performance of concession activity, is a state property.

Findings

Article 48

(1) Every finding made on location of performance of concessionaire’s activity which is the concession subject contract, having historical, cultural or natural value, and not being the subject of concession, is considered to be state property and the concessionaire is obliged to notify a competent state authority about the same, and immediately terminate or limit the concession activity if this may threaten the objects found as referred to in this paragraph, until further instruction from that authority.

(2) Competent state authority as referred to in the paragraph 1 of this article is obliged to immediately, and at latest within ten days from the receipt of the notification, issue instructions to the concessionaire on the management of the concession subject as referred to in the paragraph 1 of this article, namely on the need for the termination or limitation of the performance of concession activity on the location where the objects as referred to in the paragraph 1 of this article have been found.

(3) During the period of termination or limitation of concession activities the time periods as determined by the Concession Contract are not elapsing.

Monitoring of the execution of contractual obligations

Article 49

(1) Competent authority shall monitor the execution of contractual obligations of the Concession Contract.

(2) For the purposes of monitoring the execution of contractual obligations by the Concessionaire, the Competent Authority may engage experts or professional institutions.

(3) Annual concession fee shall be calculated by the Competent authority.

(4) Collection of Concession revenues shall be performed by the authorities competent for the collection of public income.

(5) Authorities as referred to in the paragraphs 3 and 4 of this Article shall submit data to the Commission.

(6) Competent Authority has the right to, at least once per year, appoint certified experts for purposes of establishing compliance with the rights and obligations determined by the Concession Contract. Costs of work of the competent professional authority shall be borne by the Concessionaire, in case it should be proven that the data provided by the Concessionaire is incorrect.

(7) Report as referred to in the paragraph 6 of this article forms a part of the report in Article 16, paragraph 2 of this Law.

Rights of the concessionaire

Article 50

(1) The concessionaire has the right to utilize resources and property of the Concession Grantor in accordance with the Concession Contract.

(2) In case of change of regulations, the Concession Contract remains effective unless agreed otherwise by the contracting parties.

(3) In case the Concession Contract provides for the necessity of investment in investigation prior to exploitation, that contract may also include the exploitation of the subject of investigation.

Obligations of the Concessionaire

Article 51

(1) The Concessionaire is obliged to meet the conditions prescribed for the performance of concessionary activity.

(2) The Concessionaire is obliged to perform activity determined as the concession subject and may not extend it beyond the scope as determined by the contract.

Transfer of the contract

Article 52

(1) The Concession Contract may be transferred to another Concessionaire with previous consent of the Concession Grantor, provided that the new concessionaire satisfies at least the same conditions as the concessionaire.

(2) Transfer of concession without the consent of the Concession Grantor is legally void.

Termination of the Concession Contract

Article 53

(1) The concessionary relationship is terminated:

1) by expiration of the period for which the Concession Contract has been concluded;

2) by revocation of the concession;

3) by breaking of Concession Contract in accordance with the legislation regulating obligatory relationships.

4) by an agreement between the Concession Grantor and the Concessionaire.

(2) Concessionary relationship is terminated by revocation of concession, due to severe violation and repeating of material violations of the Concession Contract related to the obligations of the Concessionaire in case:

1) Concessionaire isn't performing the concession activity longer than a year, except in the case of force majeure, i.e. if the concession activity isn't performed in compliance with the time schedule and within the scope determined by the Concession Contract;

2) Concessionaire didn’t perform preparatory operations within the contracted period or didn’t start the concession activity within the contracted period;

3) Concessionaire didn’t pay the Concession Fee; the process of insolvency or liquidation of the concessionaire is initiated, except in the case of the process of reorganization under the law regulating the insolvency of companies.

4) the concession was granted on the basis of falsely stated data relevant to the making of the decision on the granting of the concession;

5) the performance of concession activity jeopardizes the life environment and health of people or the areas and objects protected by law, which couldn’t be foreseen at the time of granting of concession, and the measures proposed by special regulations are not sufficient for the prevention;

6) concessionaire makes a transfer of concession without consent of the Concession Grantor.

(3) In cases as referred to in items 1,2 and 3, paragraph 2 of this Article, prior to initiating the procedure of revocation of concession, the Competent Authority shall warn the Concessionaire with written notice and provide him with a deadline for the carrying out the contracted responsibility.

(4) In case of revocation of concession as referred to in the paragraph 2 of this Article, the Concessionaire has no right of compensation for the damage.

Hand-over of facilities

Article 54

(1) Upon the expiry of the concession relationship under BOT system, the Concessionaire hands over to the Concession Grantor the facilities, equipment and plants which were built and engaged in the performance of activities, in good operational shape, in compliance with the Concession Contract.

(2) In case the Concessionaire intends to sell the property which remained in its ownership after the expiry of Concession Contract, and which was in function of the concession activity, the Concession Grantor has the right of priority for purchasing within 120 days from the date of receipt of the concessionaire’s offer.

(3) Concessionaire which constructed facilities for the operation of concession shall remove the same upon the expiry of the Concession Contract, unless determined otherwise by the Concession Contract.

Article 55

The concession cannot be the subject of insolvency or liquidation process.

Temporary interruption of Concession Contract

Article 56

In case of force majeure or an extraordinary event which couldn't be foreseen at the time of conclusion of the Concession Contract and which is disabling the performance of concession activity, the Concession Contract shall be temporarily interrupted until the end of the effect of force majeure, i.e. extraordinary event. The decision shall be made by the competent authority in association with the Commission, on the basis of written request from the concessionaire.

VI. CONCESSION FEE

Payment of the Concession Fee

Article 57

Concession Contract may determine the payment of the Concession Fee, which is to be paid for the granted concession in accordance with the Concession Act and the Concession Contract.

Allocation of a Part of the Concession Fee

Article 58

Part of the Concession Fee, assigned by the Government, shall be allocated to the municipality on the territory where natural resources, which are the subject of the concession, are located, in the percentage as determined by a special law.

Relief from Payment of the Concession Fee

Article 59

Concessionaire may, in compliance with the contract, partially or entirely be relieved from the payment of the concession fee in cases of unpredicted circumstances, i.e. force majeure. The decision, based on the written and reasoned request from the Concessionaire, shall be made by the Concession Grantor.

Minimum Concession Fee Determination Criteria

Article 60

(1) If the payment of the Concession Fee is applicable, the minimum Concession Fee shall be determined depending on the concession subject, based on criteria, and especially:

1) the type, category, quantity, quality and the market price of the resource which is the subject of the Concession Contract;

2) the type of activity which is the subject of the Concession Contract and the market conditions for its performance;

3) Concession Period;

4) time for the return of investment;

5) anticipated profit;

6) other criteria.

(2) Government regulations shall elaborate in more detail the criteria as referred to in the paragraph 1 of this Article.

VII. SETTLEMENT OF DISPUTES

Arbitration Competence

Article 61

For the settlement of disputes arising from the practice of other international rights and obligations between the Concession Grantor and the Concessionaire, domestic arbitration competence may be agreed and also international arbitration competence in case the Concessionaire is a foreign person.

VIII. TRANSITIONAL AND CONCLUDING PROVISIONS

Transitional Provisions

Article 62

(1) Sublegal acts for the enforcement of this law shall be issued within six months from the effective date of this law.

(2) The concession commission of the Republic o Montenegro shall be established within 90 days from the effective date of this law.

(3) Until the establishing of the Commission as referred to in the paragraph 2 of this Article its activities shall be performed by the Commission for

Concessions and BOT arrangements, founded by the Decision on founding Commission for Concessions and BOT arrangements (“The Official Gazette of the Republic of Montenegro”, no. 48/03).

(4) The Commission is obliged to establish the Concession Contract Register, as referred to in the Article 15 of this law, within 90 days from the date of the sublegal acts regulating the maintenance of this Register.

(5) Procedures for the granting of concessions which started before the effective date of this Law shall be completed according to regulations of the law which was valid at that time.

(6) Valid contracts on granting of concessions, concluded prior to effectiveness of this law, shall be submitted to the Commission within 60 days from the date of establishing of Concession Contract Register.

(7) Concession contracts concluded after the effective date of this law, shall be submitted to the Commission by ministries or bodies of local authorities within 15 days from the date of the conclusion of Concession Contract.

(8) Concession contracts concluded prior to coming into force of the present law shall remain effective.

Concluding provisions

Article 63

The present Law shall supersede on its effective date the provisions of the Law on Participation of Private Sector in the Delivery of Public Services (“The Official Gazette of the Republic of Montenegro”, No. 30/02) in chapters IV, VII, VIII and IX, as well as other chapters referring to concessions and BOT arrangements, and provisions of other laws regulating the procedure for granting concessions shall not be applied in case they contradict the regulations of this law.

Article 64

Prior to issuing of more detailed regulations on the basis of this law, the regulations based of the Law on Participation of Private Sector in the Delivery of Public Services (“The Official Gazette of the Republic of Montenegro”, No. 30/02) shall be applied, unless in opposition to this law.

Article 65

The present Law shall come into force on the eighth day after its publication in

“The Official Gazette of Montenegro”.

Rationale

I Constitutional frame for the passing of the law

Constitutional frame for the passing of the Law on concessions is stated in the article 16, paragraph 5 of the Constitution of Montenegro, which specifies that matters of interest for the Republic, among which is the granting of the concessions, are to be regulated by law.

II Reasons for the passing of the law

The Law on Participation of Private Sector in the Delivery of Public Services ("The Official Gazette of the Republic of Montenegro", No. 30/02) is applied since July 1st, 2002. The purpose of the law is to increase the extent of participation of the private sector in the delivery of public services through contracts on leasing, management, concessions and BOT arrangements. In the previous application of this law problems have been perceived in terms of complexity of specified procedures for granting of concessions, with the participation of numerous bodies in the course of contract awarding and of the long lasting procedure, whereupon it was concluded of the necessity for passing of a new law which shall resolve the aforementioned issues in a simpler and faster way, which is of interest for all the potential concessionaires and the authorities themselves which conduct the procedure for the granting of concessions.

The Draft Law on Concessions determines the Government of Montenegro and the municipalities (Administrative Center, Capital City, local self-government units) as Concession Grantors, i.e. subjects which, under the conditions stipulated by this law, may grant concessions for the utilization of natural resources, goods in general use, other goods in general use and performance of activities of public interest. The Law makes it possible for the risk of investment and operation to be transferred to the private sector, i.e. in cases when the Concession Grantor undertakes certain responsibilities for financing services and activities which are the subject of the concession, to be distributed between public and private sector, as the case may be. After being granted a concession, the concessionaire shall provide funds for the reconstruction, upgrade or construction of infrastructural facilities and on that basis the delivery of services which have previously been mainly delivered by the state, i.e. local administration, through their institutions or public enterprises. It is expected that the private sector will raise the level of efficiency, achieve greater employment and higher quality of services. On the other hand, the private sector expects in the sufficiently long term of concession operation to return the invested funds with a profit, as well as to have a secure investment. The state should primarily be oriented towards setting goals for achievement of public interest, quality of public services and prices for their rendering, as well as supervision of entire procedure, and leave the mere realization of goals to private investors. By securing financing of public services by the private sector, the Concession

Grantor ensures additional funds for other purposes, ensures additional tax and other revenues from performance of concession activity, and the model of concession financing (in a broader sense) will ensure the funds for the construction of large infrastructure, for which there are insufficient budget funds.

The law makes it possible for the inclusion of private sector in the delivery of public services to be done in a transparent way, without discrimination among the Tenderers, in accordance with previously clearly established criteria and procedures which need to ensure open competition and granting of concession to the one who proposed the best conditions in relation to the established criteria for evaluation of proposals. With the aim of ensuring compliance with the procedure for granting of concession, it is envisaged to establish the Concession Commission, which, among other things, makes decisions on claims of tenderers in relation to the legality of the procedure conducted by the Tender Commission, formed by the Competent Authority for the purposes of conducting procedures of opening of proposals, verification of proposals in terms of their validity, evaluation of proposals and making a recommendation for the ranking of tenderers.

UNCITRAL Model Legislative Provisions on Privately Financed Infrastructure Projects, prepared by the UN Commission on International Trade Law, was used in the development of the draft law.

European legislation insufficiently addresses concessions. Due to perceived vagueness and non-homogeneity of the way of addressing the issue of concessions in the legislation of certain EU member states, the European Commission prepared the Green Paper on Public Private Partnerships in 2004. The aim of this document is to discuss the need for adopting directive for establishing standardized rules for the concession sector and other forms of public private partnerships.

III Compliance with European legislation and confirmed international conventions

Primary sources:

The European Union Treaty lacks the definition of concessions and there is not a single paragraph mentioning concessions. Starting with the purposes and the contents of the law, the law has been conformed to the provisions of articles 2, 3, 10, 16, 31, 43 – 55, 81 – 89, 95 and 296 of the Treaty, which in essence also refers to concessions.

Secondary sources:

Directive 2004/18/EC of the European Parliament and of the Council of 31 March, 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (OJ L 134/04)

-partially conformed

The Directive mainly refers to public procurement and by a minor part (Chapter III) to concessions. The Directive determines rules applying to concessions for public works with values equal or greater than 6.242.000 € (the draft law used the value 5.278.000 € established by the Regulation of the Commission ref. no. 2083/2005, which altered this Directive). It regulates the modes of announcing concessions, deadlines for the submitting of applications, provisions on subcontracting, and also introduces a so called competitive dialog for the granting of concessions. The law is conformed to the provisions of the Directive, whereby it doesn't make a difference between the concessions of lesser value than the value proposed by the Directive, which means that the application of basic principles from the Directive is secured: transparency, forbidding discrimination and principle of equal treatment for all types of concessions. The law envisages the possibility of introducing provisions on subcontracting, while the directive further elaborates it in terms of conceding a part of works to third parties and defines who could be a third party. The draft law doesn't envisage the obligation stated in the Directive for submitting notification on the granting of the concession to the Commission for the purposes of publishing in the official gazette of the Commission at the expense of the Commission.

Directive 2005/51/EC of 7 September 2005 amending Annex XX to Directive 2004/17/EC and Annex VIII to Directive 2004/18/EC of the European Parliament and the Council on public procurement (OJ L 257/05)

-not conformed because the Directive alters the provisions of the previous Directive on the obligation of members to submit notifications on the granting of concessions to the Commission for the purposes of publishing in the official gazette of the Commission.

Commission Regulation (EC) No 2083/2005 of 19 December 2005 amending Directives 2004/17/EC and 2004/18/EC of the European Parliament and of the Council in respect of their application thresholds for the procedures for the award of contracts (OJ L 333/05)

– completely conformed

IV Explanation of the basic legal institutes

The Law regulates conditions and modes of granting concessions for the utilization of natural resources, goods in general use and other goods of general interest which are in state ownership, and for the performance of activities of general interest.

The law includes eight chapters: Basic Provisions, Institutional Structure, Procedure for Granting of Concessions, Protection of rights of participants in the tender, Concession Contract, Concession Fee, Settlement of Disputes and Transitional and Concluding Provisions.

Chapter I – Basic provisions (Articles 1 – 8)

The concession subject (exploitation of natural resources, goods in general use and other goods of general interest, and the performance of activities of general interest), the purpose of the law and principles which make the basis for the procedure for granting concessions are determined.

Definitions and terms used in the law are provided.

Concessionaire may be a domestic or a foreign legal entity, an entrepreneur or a physical entity, also including a consortium or other form of business association with mutual relationship regulated by a special contract, and the Concession Grantor may be: Government of Montenegro, Administrative Center, Capital City and local self-government unit.

Period for the granting of concession is determined according to Concession Subject, public interest and the period of return of the investment. Option 1: Period may be extended by up to half of the agreed duration, but not exceeding a total period longer than 60 years. Concession may be granted with period exceeding that limit only with the consent of the Parliament of Montenegro. Option 2: The law doesn’t determine the time period for granting the concession.

There is a provision on the obligation of the Concession Grantor to publicly announce and update the subjects and areas for which the concession is to be granted, which is supposed to animate parties interested in obtaining a concession.

Chapter II – Institutional structure (Articles 9 – 17)

The Parliament of Montenegro, at the recommendation of the Government of Montenegro, grants concessions for concession subjects exceeding the value established by a special law.

The Concession Commission of Montenegro is established, with competence for resolving complaints related to the violation of procedures for evaluation and ranking of proposals, suggesting modifications and additions, i.e. termination of Concession Contract in cases of severe violations of contractual obligations, keeping a register of concession contracts and performing other operations regulated by the law.

Commission is appointed by the Government of Montenegro as a permanent body and comprised of three members representing the Government of Montenegro, a representative recommended by associations of employers and a representative recommended by the Association of Municipalities. Members of the Commission are appointed for the period of five years. The following issues are regulated: conflict of interests, the expiration of terms of office and the dismissal of member of the Commission.

Funds for the operation of the Commission are secured from the budget of Montenegro. The Commission submits a report on its work to the Government, as well as the report on realization of obligations from the Concession Contract. The disposal of funds by the Commission is subject to audit.

Commission maintains Concession Contract Register as a public book and will have it published on the internet website.

Chapter III – Procedure for granting concessions (Articles 18 – 41)

Procedure for granting concession is started at the initiative of the competent authority, and in case of municipal concessions also at the initiative of the president of the municipality, or an interested party. Competent Authority is obliged to start the preparation of the Concession Act within the period of 15 days after the day when the interested party deposited funds estimated for its development, costs of the work of Tender Commission and conducting of the public discussion.

The basis for the granting of concession is the Concession Act. The detailed content of the Concession Act is determined. Prior to submitting the Concession Act to the Commission, the Competent Authority arranges and conducts a public discussion within the time period not longer than 20 days.

The procedure for granting concession is started upon obtaining consent from the Concession Grantor on the basis of the Concession Act provided by the Competent Authority.

Concessions are granted in public tender with an open procedure (open procedure) and public tenders with a two-tier procedure. The procedure of public competition may be excluded in the case of concession extension or the extension of region for the performance of concession activity, which due to technical-technological conditions cannot be established as a special exploitation field, with prior consent of the Commission.

The Competent Authority publishes the public announcement in “The Official Gazette of Republic of Montenegro”, one daily printed media distributed on the territory of the Montenegro, its internet website and, if the concession has strategic significance, also in one representative international economic printed media, wherewith it is secured that a larger number of interested subjects shall receive the information of the public announcement. Depending on the value of the concession, i.e. BOT arrangement, the deadline for submitting proposals by the Tenderers is determined.

The procedure of opening of proposals, verification of proposals in terms of their validity, evaluation of proposals and ranking of Tenderers is conducted by a special tender commission formed by the Competent Authority. A more detailed way of performing aforementioned activities of the tender commission shall be regulated by a Government regulation.

Tenderers have the right of complaint about the legality of the procedure conducted by the Tender Commission, which is resolved by the Commission. In case irregular application of criteria by the Tender Commission or a violation of the procedure is established, the Commission returns the recommended ranking to the Tender Commission for the purpose of removing irregularities.

Concession Grantor makes the decision on the granting of the concession within 30 days from the day of the receipt of recommendation, except in case when the complexity of the concession requires a longer period.

The decision is published in “The Official Gazette of the Republic of Montenegro”, and the Competent Authority is obliged to notify all the participants in the public announcement of its decision, in written form with explanation.

By including a special Tender Commission in the procedure for granting concessions and the Concession Commission, the principle of impartiality is realized in the granting of concession due to their competence for the procedure of opening and evaluation of proposals and ranking of the Tenderers, as well as for the resolution of complaints from Tenderers. The operation of the Tender Commission also includes the representative of the municipality on the territory where the concessionary activity is to be performed.

In case the competent authority estimates that the tender will be complex in technical, legal or financial aspect or that a great number of tenderers will apply, it can decide to use a two-tier procedure. According to the current law this is an obligatory stage, and in most cases it leads to unnecessary prolongation of granting of concessions. The Competent authority, in an objective, nondiscriminatory and transparent way, establishes the prequalification criteria which must be satisfied by parties applying for the prequalification. The two-tier procedure is comprised of the following stages: public announcement, prequalification, application assessment and selection of the qualified tenderers, providing the concession act to the qualified tenderers, submitting of proposals by the prequalified Tenderers, after which the procedure is conducted in the same way as in the case of public tender with an open procedure. In the case of a technically, legally, financially or otherwise complex project, the Competent Authority prepares the competition stage in a consultative way, whereby Tenderers and the Competent Authority engage in a dialog with the aim of determining the best technical, legal, financial or other solution, after which Tenderers are provided with Concession Act, containing the tender documentation, Draft Concession Contract, based on which the tenderers submit their proposals.

Chapter IV – Protection of rights of participants in the tender (Article 42)

Article 42 regulates the rights of participants in the public announcement: to be present on the opening of proposals, to withdraw proposal upon written demand, to file a complaint to the Commission on the lawfulness of the conducted procedure, for refunding of deposited funds.

Chapter V – Concession Contract (Articles 43 – 56)

The content of the Concession Contract is regulated. Unless otherwise specified by the public announcement, the Concession Contract is concluded by the Senior Officer of the Competent Authority, by authorization from the Concession Grantor, and the Concessionaire within 15 days from the day of making of the decision by the Concession Grantor. The issue of proceedings in case of finding of an object with historical, cultural or natural value is also regulated. Performance of contractual obligations is supervised by the Competent Authority, also making the calculation of the Concession Fee. The rights and obligations of the concessionaire are determined, the termination of Concession Contract and the possibility of transferring the Concession Contract based solely upon Concession Grantor's consent.

Concessionary relationship is terminated by expiry of the period for which the concession contract was concluded, by revocation of the concession due to severe breach and repeated material violation of the contract, by termination of contract and by agreement between the Concession Grantor and the Concessionaire.

Chapter V - Concession Fee (Articles 57 – 60)

Obligation of payment of concession fee may be determined for particular concession contracts in accordance with regulations, the Concession Act and the Concession Contract. A part of the concession fee determined by the Government of Montenegro is allocated to the municipality on which territory the natural resource which is the concession subject is located, in accordance with special regulation. It provides a list of criteria for the determination of Concession Fee, and the criteria will be elaborated with more details in an act by the Government.

Chapter VI – Settlement of disputes (Article 61)

It is specified that for the purposes of settlement of disputes between the Concession Grantor and the Concessionaire, the competence of domestic arbitration, and, in case the concessionaire is a foreign person, also the competence of international arbitration, may be contracted.

Chapter VII – Transitional and concluding provisions (Article 62 – 65)

The following deadlines are determined: deadline for issuing of sublegal acts for the enforcement of laws, for the establishing of the Commission, the establishing of the Concession Contracts Register, effective date of the law and the termination of validity of the Law on Participation of Private Sector in the Delivery of Public Services in the part which relates to concessions and BOT arrangements, which has previously regulated the issues of granting of concessions, and it is also determined that provisions of other laws regulating the procedure of granting concessions shall not be applied in case they contradict the provisions of this law.

IV The need for securing funds from the Budget of Montenegro

For the enforcement of this law it is necessary to secure funds for the operation of the Concession Commission of Montenegro. The Commission consists of a Chairperson and four members. The Government of Montenegro shall appoint an authority for the performance of professional and administrative functions for the Commission or it will form a special service for the performance of such operations.

TECHNICAL MEMORANDUM NO. 29

PUBLIC-PRIVATE PARTNERSHIPS
POTENTIAL CONTRIBUTIONS OF THE PRIVATE AND PUBLIC SECTORS IN THE IMPLEMENTATION STAGE

TABLE OF CONTENTS

1. INTRODUCTION

The European road sector has consistently increased the stake of privately financed and managed road infrastructure. The whole of the Austrian and Greek networks are under concession, and many of the most important roads in Norway, Italy, Portugal, and France also have a private component. However, there are different methods with regards to the economic and legal framework.

Traditional models for the building and management of infrastructure, including financing, need to be distinguished. Some models include financing directly out of the government's budget, using tax revenues and general borrowing. In most countries, the majority of infrastructure financing is derived directly from government budgets. However, due to budget constraints an increasing number of governments are looking at the private sector for building, operating, and/or maintaining their highways.

1.1 Public Private Partnerships

Public Private Partnerships (PPP) are contracts between governments and private entities to provide the public sector infrastructure, facilities, or services for a specified term.

PPP generally involve the shift of some financial risk and responsibility to the private sector. These partnerships attempt to optimize the efficiency and effectiveness of products and services by leveraging the operational strengths of the private sector. In particular, governments may want to consider PPPs especially, if:

1) The jurisdiction does not have the financial capabilities for completing the project;
2) The quality of the project or the service would benefit;
3) Having a private partner would complete the project sooner (especially in the case of time constraints);
4) The legal framework is conducive to private sector involvement (in particular no prohibitions of private involvement); and
5) Citizens favor private sector involvement.

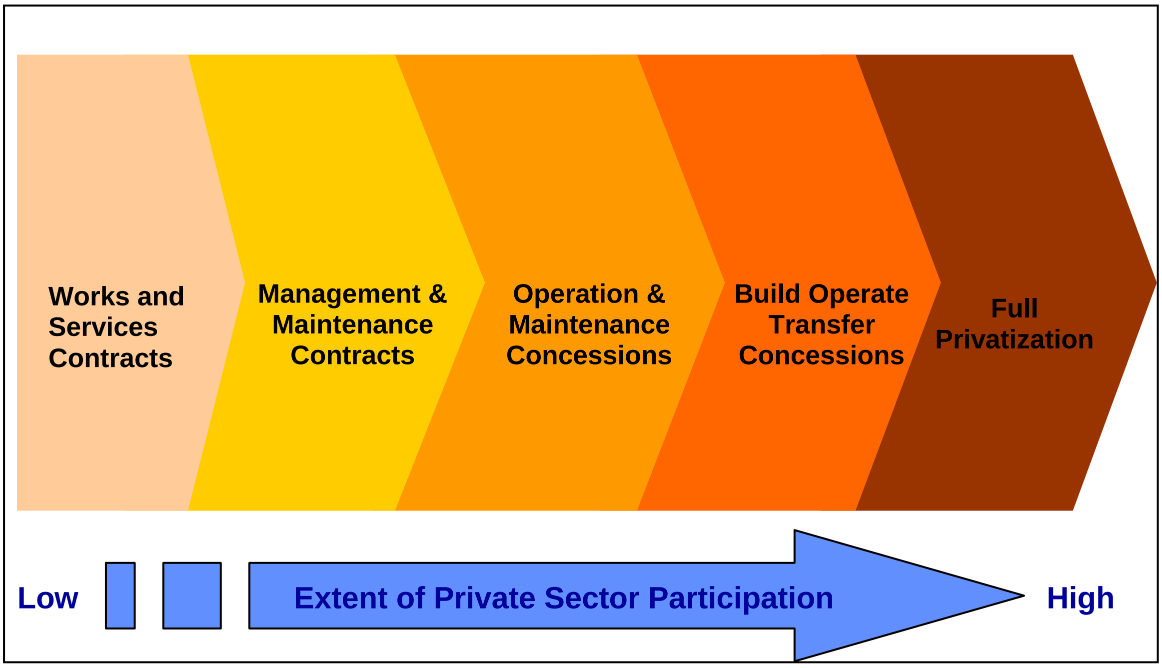
Governments sometimes face, from public or other agencies, opposition to proposed PPPs. Some governments may fear a decline in quality. There may also be resistance from unions, which fear that changes in structure would lead to job losses. For this reason, it is important to perform a feasibility study that involves a true cost assessment and cost-benefit analysis. This includes assessing the true cost of building the facility and operating it, as well as the loss of control that would follow. The benefits should also be analyzed, including non-market benefits like the transfer of risk.

Governments should keep in mind that the private sector is interested in projects with revenue generating capabilities, project viability, and strong local government support. This means that such a governmental entity must offer an attractive proposition to the private sector.

The role of the private sector can vary, depending on the nature of the projects, but it is ultimately the government's responsibility to ensure the integrity of the motorway. In writing contracts with private firms, the government must try to balance its obligations to protect firms' need to run its operations efficiently and effectively. If a government imposes too few regulations, the firm may have an incentive to act contrary to the government's interest; if it imposes too many regulations, it may be too costly for the firm to operate.

As Figure 1 shows, private firms operate under various types of contractual arrangements with the public sector with varying degrees of private sector involvement. The left-hand side of the exhibit denotes full public ownership, with limited private sector involvement while the right-hand side denotes full private ownership. Details of the type of contract and the extent of partnership are described below.

Figure 1: Public-Private Partnerships



Thus it can be seen that there is not a single definition of a road PPP, and in fact a wide range of transaction types are covered in which the private sector takes some responsibility and accepts some financial risk in return for adequate reward. The key aspect is, as noted above, to leverage the operational and management strengths of the private sector.

Works and Services Contracts

A works and services contract is a public standard contract with a private firm to design, build, and maintain a public road which is operated by a country or local government. All revenues and expenses are the responsibility of the public sector. It is a fixed term contract and does not bear any risk by the private sector. Once the contract is completed, the firm does not have any interest or duties in the ownership or the operation of the facility.

Management and Maintenance Contracts

A management and maintenance contract is a contract with a private firm to operate and/or maintain a publicly-owned road and typically lasts 1-5 years. The public sector bears the operational risks, except for emergencies and *force majeure* (frees both parties from liability or obligation when an extraordinary event or circumstance beyond the control of the parties, such as war, strike, riot, crime, or an act of God prevents one or both parties from fulfilling their obligations under the contract). However, the longer the duration of the contract, the more the risk shifts to the private entity. The private firm has the freedom to choose the appropriate management and maintenance work methods which satisfy the quality level specified under the contract. There are three primary types of Management and Maintenance Contracts, including:

- ***Quantity Based Maintenance Contracts***

  The public sector supervises maintenance and pays the private firm accordingly to maintenance performed using unit prices.

- ***Performance Contracts***

  The private firm has more freedom because performance specifications are pre-defined for the duration of the contract. The private firm can utilize any reasonable methodologies or equipment to undertake the work.

- ***Management Contracts***

  Operation and maintenance of the facility is contracted for a fixed fee.

Operation and Maintenance Concessions

Operation and maintenance concessions involve the transfer of the operation and maintenance of the motorway to the private sector, which, in turn collects a toll user fee. This is a full PPP in which operational risk shifts from the government provider to the private entity. The private entity must also upgrade the facilities or infrastructure, which can result in service quality improvement for users.

This kind of PPP can be attractive to governments because of potential increased efficiency. However, the inability to respond quickly to changing demand needs and the partial loss of control in the operations can cause disadvantages.

Build-Operate-Transfer (BOT)

Under a build-operate-transfer PPP, private firms finance, build, and operate the motorway but the road is owned by the government and will return to its owner at the end of a fixed term lease. The private firm also collects toll fees as a partial return on the investment.

The public sector maintains ownership of the asset, meaning that it continues to control the service standards, the toll fees charged, and maintenance. The government has the ability to terminate agreements if the service or performance levels are below standard. This type of PPP could also bring operational savings if the private entity develops efficient ways to operate the road, in addition to savings on the build and design components.

The government identifies the projects that are eligible for BOT and the checklist given below must be followed:

- Develop a Feasibility Study

  A feasibility study involves a variety of tasks that help the state government understand the financial fundamentals of the project. Details about the facility and cost estimates as well as an environmental assessment can help state governments understand whether the overall project is appropriate for a public-private partnership.

- Issue a Request for Information (RFI)

  The Montenegrin government should issue an RFI in order to notify potential bidders of the available contract. The RFI outlines the potential terms of the contract and the rules for proposal submission.

- Issue a Request for Proposals (RFP)

  The government should then issue an RFP. This document is more refined than the RFP and outlines technical specifications and the selection criteria for potential bidders. RFPs should also clearly define the required service and give providers a timeline for proposal submission.

- Select Private Concessionaire and Secure Necessary Approvals

  After receiving proposals, the government should set up an appropriate selection process to evaluate each offer and select the best one according to the parameters in the RFP. The government should then secure the necessary approvals to develop the contract.

- Seek Legal Counsel

  Legal counsel will generally be required for contract development and/or contract negotiations with the selected firm.

- Develop a Contract Monitoring Program

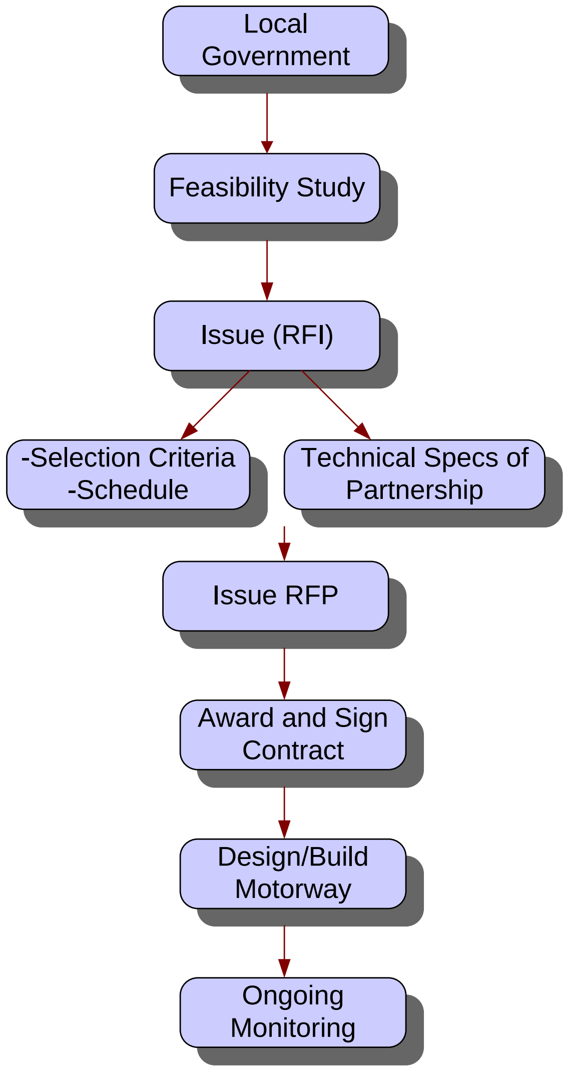
  The government should also develop a contract monitoring program to track for the correct execution of the contract from design to operation. This could include the use of inspectors and quality parameters to monitor satisfactory progress by the firm.

Below in Figure 2 is a description of the typical process of securing a BOT:

Figure 2: Build-Operate-Transfer

Build Operate Transfer

Private Firms finance, build and operate the highway, but the highway is owned by the Montenegro Government and will return to the owner at the end of the lease. The Private entity also collects a toll fee.



Checklist of Information Needed to Move Ahead

- ☐ Identify Projects that can be amenable to BOT
- ☐ Develop a Feasibility Report
  - ☐ Demand Projections
  - ☐ Select Location
  - ☐ Layout of Facility
  - ☐ Preliminary Design
  - ☐ Establish a Schedule
  - ☐ Financing Alternatives
  - ☐ Environmental Analysis
  - ☐ Cost Estimate
- ☐ Issue a Request for Information (RFI)
  - ☐ Objective of PPP
  - ☐ Rules for Submission
- ☐ Seek Legal and Financial Advice
  - ☐ Legislative Framework
  - ☐ Establish Communication Protocol
  - ☐ Taxation Framework
  - ☐ Structure of PPP and Financing Plan
- ☐ Complete Technical Specifications and Scope of Work
- ☐ Identify Evaluation Parameters to Select Private Firm

Establish a Selection Panel
  - ☐ Government Technical Experts
  - ☐ Independent Members

- ☐ Select Private Partner and Secure Necessary Approvals
- ☐ Negotiate Contract
  - ☐ Outline Responsibilities and Liabilities
  - ☐ Insurance
  - ☐ Legislative Requirements
  - ☐ User Fees and Financing Arrangements
- ☐ Design/Build Motorway
- ☐ Develop Monitoring Program

Full Privatization

Some governments are trying to transfer their role from financers and operators of highways to facilitators and regulators of services provided by private firms. This can lower the government risk allocation, while still providing a needed service. Private firms independently own and operate highways and contract directly with the government. They make their revenue from the user fees. The Montenegrin government may write performance provisions into their contracts, but financing and operational risk is allocated to the private sector.

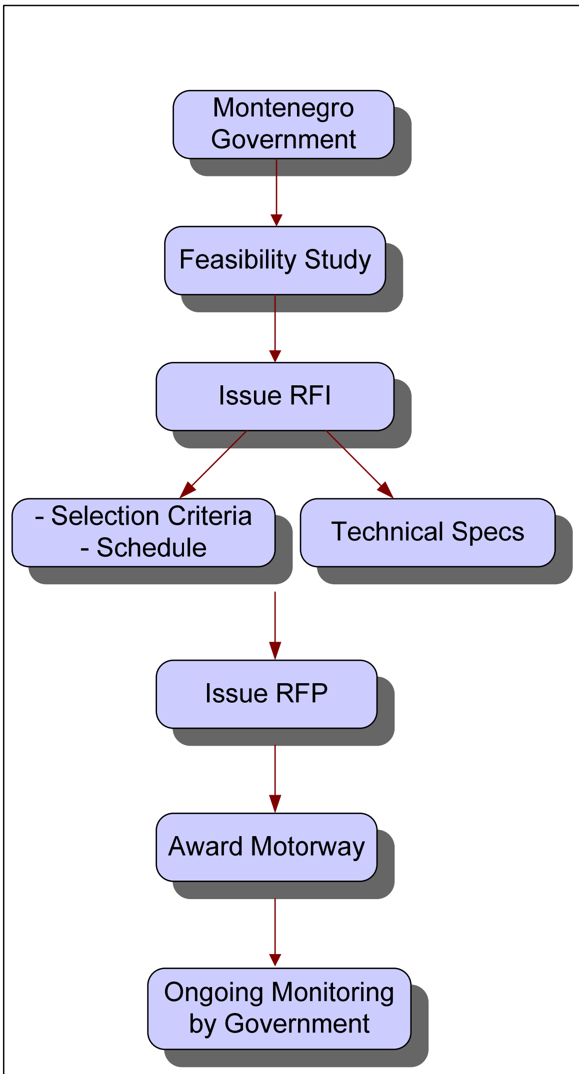
In addition, private firms have less financing constraints than the government. Many firms can raise substantial amounts of capital fairly quickly through capital markets and commercial banks.

As full privatization denotes, private firms make their own financing decisions based-on their analysis of how and where a highway would be most profitable. However, the Government of Montenegro - if involved in attracting a private firm to own and operate a motorway, can take the steps illustrated in Figure 3:

Figure 3: Full Privatization

Privatization

Private Firms own, finance, build, and operate the motorway



Checklist of Information Needed to Move Ahead

- ☐ Identify Projects that can be amenable to Privatization
- ☐ Develop a Feasibility Report
  - ☐ Demand Projections
  - ☐ Select Location
  - ☐ Layout of Motorway
  - ☐ Preliminary Design
  - ☐ Establish a Schedule
  - ☐ Financing Alternatives
  - ☐ Environmental Analysis
  - ☐ Cost Estimate
- ☐ Issue a Request for Information (RFI)
  - ☐ Objectives of Concession
  - ☐ Rules for Submission
- ☐ Seek Legal and Financial Advice
  - ☐ Legislative Framework
  - ☐ Establish Communication Protocol
  - ☐ Taxation Framework
  - ☐ Structure of Concession and Financing Plan
- ☐ Complete Technical Specifications and Scope of Work
- ☐ Identify Evaluation Parameters to select private firm
  Establish a selection Panel
  - ☐ Government Technical Experts
  - ☐ Independent Members
- ☐ Select Private Partner and Secure necessary approvals
- ☐ Negotiate Contract
  - ☐ Outline Responsibilities and Liabilities
  - ☐ Insurance
  - ☐ Legislative Requirements
- ☐ Award Facility
- ☐ Develop Monitoring Program

Choosing Financing Options

The choice among private financing depends on a variety of characteristics unique to each country and government. Before choosing any of these financing options, the Government should review how it delivers all services, finances projects, and builds infrastructure. If a country has consistently provided efficient services to the community, there may be a resistance to private sector involvement. New infrastructures are often seen as an economic vehicle providing new jobs and economic linkages. In such cases, communities may not be opposed to private sector involvement.

In this way, how the government delivers services, as well as how those services are perceived, influence financing options. These are, in turn, shaped by local laws and regulations which may make it easier or more difficult to involve the private sector. Thus, local officials should consider the following when choosing financing options:

- Financial Status
- Long-Term Community Objectives
- Tax Framework
- Legal Framework

The long-term objectives in terms of economic development, land use, employment, and social cohesion should all be considered when choosing a financing option. While some options may make sense economically, significant political or social opposition to any one option may have negative impacts on the community.

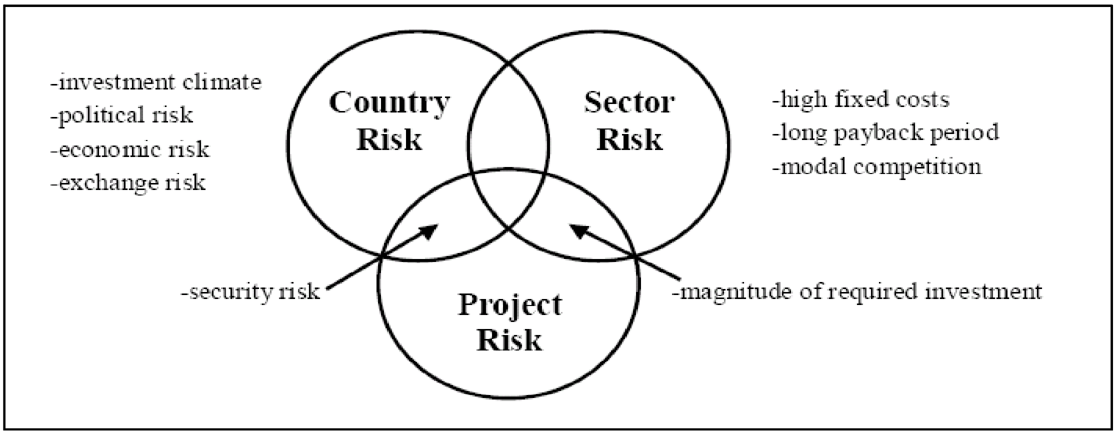
Individual state tax and legal frameworks can make private finance or the use of PPPs easier or more difficult, which will influence which options communities choose. In jurisdictions in which the tax and legal requirements are fairly restrictive for PPPs, there will generally be public financing.

In the case of the Bar-Boljare motorway, financial analysis has showed that the project would not generate enough revenue to sustain by itself, as the capital and operating costs are great. However, an annual subsidy by the government of Montenegro could make the project feasible and profitable for any private entities. A subsidy would be an attractive means for private firms interested in building and/or operating the motorway.

2 OUTLINE OF INHERENT RISKS

The identification and management of risks is of central importance in the design[1] of any PPP. Each project faces a different set of risks and these must be identified at the outset and allocated to appropriate parties. Risks may be classified as country risks, sector specific risks, and project specific risks, as shown below in diagram form.

Figure 4: PPP Risk classifications



Source: CPCS Transcom presentation, MENA June 2007.

In the construction phase the major risks are:

- delays in start up and /or completion and hence delay in starting revenue flows;
- as result of delayed completion, higher total interest /debt service charges;
- cost overruns and increased capital needed to complete the road;
- insolvency or lack of experience of contractors;
- exceeding initial construction cost estimates, e.g., from inadequate engineering and design, escalation of materials and /or labour costs, etc.; and
- defects in construction, failure to conform with detailed designs, e.g., for bridges, or any other detailed aspects.

Cost overruns may be covered by a fixed price and fixed term contract, or incentives can be devised for meeting pre-specified completion dates. To cover this, contingency funds might be established, or some provisions made in advance for additional equity inflows, or 'standby' agreements made for additional debt financing. As for defects, the construction contract (between concessionaire/contractor) would have a liquidated damages clause under which a contractor would be obliged to repair or make good any kind of defects.

Another form of construction phase risk is that environmental impact or damage may be greater than originally assessed and consequently costs for mitigation become considerably higher than first estimated.

1 Antonio Estache et al. "Public Private Partnerships in Transport" (World Bank Policy Research Working Paper no. 4436, December 2007)

In the operating phase, risks will arise from principally, the traffic and revenue not reaching anticipated levels. There are also: possible legal and regulatory changes, interest rate risks, and technology changes making existing arrangements obsolete. An example of the latter item, in this case, might be the technology used for customs processing at the Serbian border. However, the main risk is clearly that of traffic and revenue.

A further risk in the operating phase is that (in some periods or circumstances) there may be inadequate institutional capacity to efficiently monitor the contract.mnj

TECHNICAL MEMORANDUM NO. 30

DIFFICULTIES OF STAGE CONSTRUCTION (TWO PHASES) FOR THE SMOKOVAC – MATESEVO - BOLJARE MOTORWAY

TABLE OF CONTENTS

1 GENERAL

The actual final cost of any mountain motorway will be particularly site specific. Extensive engineering studies will be required to confirm the feasibility of stage construction for the Smokovac–Matesevo and Matesevo-Boljare. There are a number of practical engineering factors to be considered which have significant effects on the final cost of each stage, and these are described below.

Tunnels - If doing stage construction, new tunnels would have to be well-distanced from the operating original tunnel because of rock disturbance in nearby construction, and safety concerns, or if they were appended to existing tunnels, a total road closure would be unacceptable. In stage construction, since the original tunnels would take the most economic and geometrically acceptable alignment, it can be assumed that later tunneling would be more expensive, due to a longer, more difficult alignment; and thus, cost is likely to be about 25 percent higher for each tunnel, at minimum. In this case also, the depreciation costs of tunnel boring machinery (TBM) must be considered, since depending on phasing, it may not be worthwhile to move such equipment to a new construction site. In fact, a TBM is usually purchased for only one job, dismantled at the end, and sold as scrap, and the investment is written off. This is another good reason for doing all the tunneling at one time. It may be somewhat cheaper to bore two 2-lane tunnels than one 4-lane tunnel. It is also safer and more practical.

Bridges or viaducts - There may be some marginal saving in appending new bridges to old, depending on the complexity of each structure. The first bridge would provide ready-made 'false-work' to launch the new structure, which is cost positive; however, the original bridges would need to be designed for any extra construction loading associated with Stage 2.

If a two phase (or stage) solution is recommended, a variation is to construct four lane tunnels and four-lane bridges (or at least full 4- lane bridge foundations) at the outset; and then later, widen the earthworks and complete the bridges. However there may still be some traffic disturbance during the second construction phase, namely from rock blasting, etc. In any event everything should be designed in detail at once, for both 1st and 2nd stages.

Roadways in general - In theory, a half-motorway should cost about 60% of Full Motorway, because most of the fixed costs (design, quarries and borrow areas, temporary detours, utility relocation, etc.) are much the same, while the quantities of materials are just about 50% lower. In practice however, there are many other variables to take into account. All junctions would probably have to be built in the first phase. The economic costs (extra costs in delays to road users) of the period of disruption during 2nd stage construction operations would also need to be calculated or considered in some way, because these will be quite significant.

There are also some ‘hidden’ costs that may apply. For example upgrading the first half to current standards at the time of the widening, modifying the existing crown and super-elevation, changing all the signs & markings, etc. Many interchanges, toll plazas and rest areas may need to be modified and extended. Modifying or relocating drainage structures may also be very costly.

Conclusions - Among the panel of construction engineers consulted, there is consensus that in mountainous terrain such as northern Montenegro, if stage construction is considered, then 4-lane bridges and tunnels should be built in full in the first phase. That being so, in the case of the Smokovac-Matesevo section where tunnels and bridges will make up a large proportion of total cost, it would be logically better to construct the complete 4-lane motorway in one phase only. See table below for roughly estimated proportions of full motorway cost accounted for by tunnels and bridges. This also applies for the Matesevo–Andrijevica–Berane section, and can further be applied for Berane-Boljare, since it is assumed that Serbia will build a 4-lane motorway in any event.

The only factor in favor of a two-stage construction is that toll revenues will have been already collected for several years by the time of the second phase. However in practice, for a 2x1 lane toll road, it may be that toll fees per vehicle would need to be lower than for a 2x2 toll road. This would depend on the level of service provided in the first 6-7 years, especially with respect to average vehicle speeds actually attainable.

The stage construction option was contemplated by COFIROUTE in France on the A28 autoroute (Alençon-Le Mans-Tours) toll road in the 1990's. However, it was found to be impractical, and it should be noted, this A28 road follows rolling terrain with very few rock cuts.

With the A28 autoroute experience in mind, and in view of technical issues considered above, it is concluded as highly probable that a potential concessionaire would not consider a two-stage construction option for the motorway sections from Smokovac to Matesevo and then to Boljare.

Tunnels & bridges: as % of motorway length, and % total cost (full motorway case)

	Length (m)	T&B % of length	T&B % of cost
Bar - Virpazar	24,951	50%	72%
Virpazar -Smokovac	38,231	26%	47%
Smokovac-Matesevo	43,500	41%	65% (est.)
Matesevo-Berane	34,352	24%	58%
Berane-Boljari	41,300	12%	42%
Full Motorway	182,334	29%	56%

T & B = tunnels and bridges or viaducts

TECHNICAL MEMORANDUM NO. 31

ECONOMIC ANALYSIS
BAR (ĐURMANI) – BOLAJRE MOTORWAY
REVISION

MAY 20, 2008

TABLE OF CONTENTS

1 GENERAL

The preliminary economic analysis presented in the Draft Final report was completely revised based on advice from a panel[1] of experienced construction engineers. The unanimous advice from the panel is that the full motorway should be built in one stage only. The original analysis assumed it would be possible to construct in two stages: building a ‘half motorway’ with two lanes first, and later, adding a second carriageway with two more lanes. Such a strategy would be possible in many countries where there are no special terrain difficulties. However in Montenegro the mountainous terrain for most of the route Đurmani-Boljare is particularly severe, such that well over half of construction cost will consist of building tunnels (38,000m) and bridges (17,000m) which together extend for more than one-third of the total length. Therefore engineering logistics, safety considerations, and traffic disruption in a second (upgrading) phase of construction, all mean it is better and less costly to build the full motorway in one stage. The phasing strategy was therefore revised to take these considerations into account, and consequently both the financial and economic analyses.

2 TRAFFIC VOLUMES

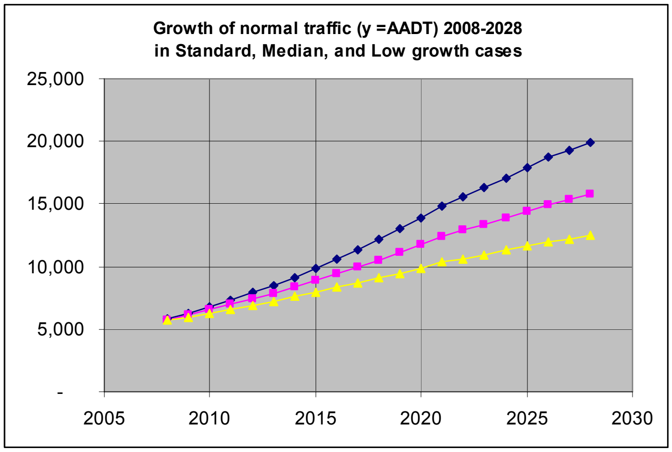
Projected traffic volumes (AADT) for each section are given in the table below. The volumes (rounded to 00s below) are for the standard economic growth case, and include the estimated 20 percent in generated traffic (new traffic that will flow only as result of motorway completion) that is expected to arise.

Table 1: Approximate traffic volumes by section and by year

Year	Smokovac-Matesevo	Matesevo-Boljare	Durmani - Virpazar-Farmaci	Bypass Farmaci-Smokovac	Mean - All sections
2015	11,500	10,300	14,000	--	11,900
2020	16,300	14,600	19,700	12,400	15,700
2025	20,900	18,700	25,300	20,900	21,500
2030	24,700	22,100	29,800	27,200	26,000
2035	28,800	25,800	34,600	33,100	30,600
2040	33,400	29,900	40,100	40,200	35,900

For the median economic growth case, and in the ‘low’ growth scenario, aggregate traffic volumes in the period 2012–2027 would be lower by 17% and 29% respectively, as illustrated in the graphic[2] below.

[1] Panel: J-M. Baryla, J. Horta, D. Jarrett, W. Curtis, I. Cross-Martin, P. Hassett, P. Pecenik, W. Chatterton, and L. Sharma. The panel advice is summarized in Technical Memorandum No. 30.
[2] The graph is for illustration purposes only, it does not represent a particular section.



3 CONSTRUCTION SCHEDULES

The construction schedules and financial costs by section, are the same as utilized for the financial analysis (TM 26-C), and are shown in the table below.

Table 2: Construction schedules and financial costs (Meur)

Sections ..	km	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total (Meur)
Smokovac - Matesevo	43.5	160.2	160.2	160.2	160.2						640.8
Matesevo-Berane-Boljare	75.7				116.9	116.9	116.9	116.9	116.9		584.6
Virpazar-Smokovac	38.3					115.4	115.4	115.4	115.4		461.4
Durmani - Virpazar	11.71							84.8	84.8	84.8	254.4
Totals	169.2	160.2	160.2	160.2	277.1	232.3	232.3	317.1	317.1	84.8	1,941.2

4 ECONOMIC ANALYSIS

Principal details of the economic analysis are given in the table below, showing economic costs, lengths (in km) the start and end years of construction, the net present values (NPV) at the test discount rate of 5 percent, and the economic internal rate of return (EIRR).

Table 3: Economic analysis by section & combined analysis
Costs in million Euros (Meur)

sections	Durmani Virpazar	Virpazar Farmaci	Farmaci Smokovac	Smokovac Matesevo	Matesevo Boljare	**Combined analysis**
Economic cost	€ 203.5	€ 221.0	€ 148.1	€ 512.6	€ 467.7	€ 1,552.9
Length km	11.71	22.90	15.35	43.50	75.70	169.16
Cost /km	€ 17.38	€ 9.65	€ 9.65	€ 11.78	€ 6.18	€ 9.18
Start constr.	2017	2015	2015	2011	2014	2011
End constr.	2019	2019	2019	2014	2018	2019
NPV	€ (1.4)	€ 205.9	€ 50.2	€ 3.7	€ 188.4	€ 340.6
EIRR	4.95%	15.70%	7.30%	5.10%	7.81%	6.73%
Components of benefit (%)						
Vehicle costs	18.9%	17.5%	19.7%	24.1%	24.2%	22.4%
Travel time savings	44.0%	51.2%	40.1%	47.7%	50.1%	48.5%
Generated traffic	6.3%	6.9%	12.0%	7.2%	7.4%	7.1%
Accident savings	30.9%	24.4%	28.2%	21.0%	18.2%	22.0%
memo items						
Financial cost	€ 254.4	€ 276.3	€ 185.1	€ 640.8	€ 584.6	€ 1,941.1
Financial cost/km	€ 21.7	€ 12.1	€ 12.1	€ 14.7	€ 7.7	€ 11.5

As shown above, the overall net present value (NPV) for the combined analysis is Eur 340 million and the EIRR is 6.7 percent. For the combined analysis the NPV for individual sections are not additive (they add to about Eur 445 million) because of the different years for starting and ending construction. A summary of the sensitivity tests carried out is given below.

5 SUMMARY OF SENSITIVITY TESTS

For the tests shown in the table below, the NPV (€ million) is shown, the change (%) in NPV in the second column, and lastly the economic internal rate of return (EIRR).

Table 4: Summary of sensitivity tests

Summary of sensitivity tests	**NPV (Meur)**	**Δ NPV (%)**	**EIRR (%)**
Standard growth case (r =5%)	**€ 340.60**	--	**6.73%**
All traffic benefits lower by 33.3%	€ (166.83)	-149%	4.03%
Switch value for costs = + 29.4% (*)	€ 0.00	-100%	5.00%
Switch value for traffic benefits = -22%	€ 0.00	-100%	5.00%
All traffic benefits lower by 20%	€ 33.40	-90%	5.18%
Capital cost increase of 25% (**)	€ 50.55	-85%	5.22%
Value of travel time reduced by 33.3%	€ 82.44	-76%	5.45%
Accident savings reduced by 33.3%	€ 233.76	-31%	6.22%
Generated traffic = zero	€ 237.59	-30%	6.24%
Median traffic growth case	€ 61.11	-82%	5.34%
Low traffic growth scenario	€ (205.93)	-160%	3.73%
Discount rate r = 10%	€ (313.00)	-192%	6.73%
Discount rate r = 7%	€ (38.80)	-111%	6.73%

(*) (**) = Eur 2.51 and Eur 2.42 billion in financial terms

The two primary fields of sensitivity are: capital costs, and the expected level of opening year traffic flows, as in any road analysis. As shown above, the value for costs that reduces (or ‘switches’) the net present value (NPV) to zero or slightly negative is 29.4% - meaning, total financial cost rising to some Eur 2,511 million from the estimated Eur 1,941 million. Should capital costs increase by 25 percent, NPV would still be positive at about Eur 50.5 million.

The ‘switch’ value for traffic benefits is minus 22 percent in the standard growth case. For the median growth scenario, there would be a much lower but still positive benefit, at about Eur 61 million NPV. However, in the ‘low economic growth’ case initial (opening year) traffic flows would be much lower, growth thereafter would be less, and there would be a substantially negative NPV at minus Eur 206 million (EIRR 3.7%) implying that the project start might be postponed for several years. However, the low economic growth scenario is considered very unlikely - it is a decidedly ‘pessimistic’ outlook in the view of the Central Bank.

On the basis of Article 88, item 2 of the Constitution of the Republic of Montenegro I hereby pass the

ENACTMENT
PROCLAIMING THE LAW ON PRIVATE SECTOR PARTICIPATION IN DELIVERY OF PUBLIC SERVICES

I hereby proclaim the Law on Private Sector Participation in Delivery of Public Services, adopted by the Parliament of the Republic of Montenegro at the fourth meeting of the first regular session in 2002, held on the 19th June 2002.

Number: 01-1894/2
Podgorica, 21st June 2002

President of the Republic of Montenegro
Milo Đukanović, signed

Law on Private Sector Participation in Delivery of Public Services

(Official Gazette of the RoM, number 31/02)

CHAPTER I
GENERAL PROVISIONS

Purpose of the Law
Article 1

The purpose of this Law is to improve the participation of the private sector for the delivery of public services and, while taking into account the need for good governance and economic growth.

Application
Article 2

This Law shall apply to delivery of public services related to:
- Leasing and management contracts
- Concessions
- Built-operate transfer arrangements (hereinafter: BOT)
- Regulatory bodies defined under this Law.

This Law shall apply to all public entities, as defined under this Law.

Interpretation and Definitions
Article 3

Where the context so permits words importing the singular shall be deemed to include the plural and vice versa and words importing the masculine shall be deemed to include the feminine and vice versa; words importing persons or parties shall include firms and companies and any person having legal capacity. The meanings which shall apply to this Law are:

"Build-Operate-Transfer, BOT": a contract arrangement, under a franchise, whereby a private investor and /or operator is obliged to build and operate a public utility and, after a determined period, transfer the ownership thereof to a public entity; BOT arrangements shall include build-lease and transfer, build-transfer-and-operate, develop-operate-and-transfer, rehabilitate-operate and transfer; tariffs payable by the clients shall be regulated by the contract entered into and shall be subject to the decision, after public hearings, of the regulatory body for the tariffs payable and the quality of the services delivered;

“concession": a repetitive contract arrangement offered under a license, to a private investor and / or operator for the proper extraction or exploitation of natural resources or raw materials for a determined period of time; such arrangement may include investment or rehabilitation by the private sector; in contract in which a public entity of the Republic of Montenegro transfers some rights to a local or foreign firm or company which then engages in an activity subject to the terms of the contract and in return provide revenues to the Government of the Republic of Montenegro (hereinafter Government) or to a Self-Local Government per unit exploited or extracted;

"contingency liability": a liability that may occur only if a specific event happens; a liability that depends on the occurrence of a future and uncertain event;

"franchise": a revocable right, under BOT arrangements, conferred by the Government of the Republic of Montenegro or in a similar manner by a self local government to a provider of services to engage in a specific business or to exercise corporate powers; the rights necessary for public utilities companies to carry on their operations shall be designated as a franchise, under wherewith substantial rights may be granted, contrary to a license wherewith less or limited rights are granted;

"Government-owned company or firm": refers to any company or firm, whether performing governmental or proprietary functions, owned at majority or otherwise controlled by the Government of the Republic of Montenegro;

"investor": a person, natural or corporate, who invests money with an expectation of earning profit;

"invitation for seeking offers": a solicitation for offers as a preliminary step to forming a contract;

"leasing": granting the possession of movable or immovable properties to another in return for rent;

"license"; a revocable permission granted by the regulatory body, established under this Law, to operate a concession;

"license fee": a monetary charge imposed by a public entity for the privilege of pursuing a particular occupation, business or activity; a charge of this type is accompanied by a requirement that the licensee takes some action or be subjected to regulation or restriction;

"management contract": a contract to engage the services of the people in a company, or in a firm, who are responsible for its operation;
"natural resource": any material from nature having potential economic value or providing for the sustenance of life, such as timber, minerals, oil, water and wildlife; features of nature that serves a community's well-being or recreational interests, such as parks;
"offer": a display of willingness to enter into a contract on specified terms, made in the way that would lead a reasonable person to understand that acceptance, having been sought, will result in a binding contract;
"operator": a company or a firm responsible to operate on behalf of an investor;
"privatization council": the council established under the article 2A of the Law on Privatization of Economy (Official Gazette of the Republic of Montenegro23/96, 6/99, and 59/00).
"public entity": public entities are courts, bodies of local government, all organizations designated as such by the Decree on organization and methods of works for public administration / Official Gazette of Montenegro no. 8/93, 39/93, 19/95, 13/96, 24/96, 7/97, 13/98, 27/98, 38/98, 18/99, 31/99, 59/00, 31/01, and 33/01 and public entities which performs social duties pursuant to the rules of Social Activity Law (Official Gazette of Montenegro No. 19/90, 25/90, 6/91, 27/91,21/95 as well as any other entity which will be established and will utilize public funds;
"public services": a project or any kind of services normally financed and operated by the public sector, such as power plants, highways, ports, airports, canals, dams, hydropower projects, water supply, irrigation, telecommunications, railroads and railways, transport systems, housing, government buildings, tourism projects, markets, solid waste management, education and health facilities and any others as may be determined by the Government;
"raw material": substances that are in their natural state before being processed or used in manufacturing;
"regulatory body": refers to an independent body established under this Law that is responsible for issuing licenses or authorizing franchises, regulating tariffs charged for public services and guaranties that the private operator and/or investor ensures the qualities level of services;
"rules": refer to the rules and the necessary forms made under this Law by the Privatization Council or by the regulatory body; where rules introduce a standard form, such form shall be mandatory.

CHAPTER II
SELECTING THE TYPE OF PARTNERSHIP

Background document
Article 4

For selection of any of the contractual arrangements authorized under this Law, leasing, management contract, concessions or BOT arrangements, that may be proposed to the private sector in compliance with this Law, a public entity shall

prepare, as a first step, a background document, submitted to the approval of the authorities established under the Law on Privatization of the Economy, detailing:
1) the public entity who will be responsible for the project;
2) what will be the object and scope of the contract;
3) what will be the duration of such contract, and what circumstances will give rise to early termination;
4) what will be the obligations and rights of the parties;
5) where applicable, the key regulations that will be proposed;
6) who will manage identifiable key risks, such as design and development, construction, operating, revenue, financing, *force majeure*, insurance and environmental risks;
7) how will performance be measured and monitored;
8) where applicable, how will assets be transferred;
9) where applicable, who will be responsible for past or future environmental liabilities;
10) how disputes will be resolved; and,
11) for transparency, what kind of solicitation methods will be utilized and the type of contract to be offered.

Approval
Article 5

After having obtained license in compliance with the article 4 of this Law, contractual arrangements become the part of a privatization plan and are subject to all the duties which stem from this Law.

Selecting leasing
Article 6

A public entity, in addition to the requirements under the article 4 of this law may propose a leasing arrangement, as an alternative to public investment, where:
there is an evident situation of lack of funds for such public investment;
the beneficiaries are suffering from lack of public services; and,
the funds can be properly appropriated for the private investor or operator to meet its obligations under such contract arrangement.

Selecting management contract
Article 7

A public entity, in addition to the requirements under the Article 4 of this law may propose a management contract as an initial measure toward more private sector involvement in the Republic of Montenegro (hereinafter Republic) or in the cities where:
there is evidence made whereby initial conditions are not conducive to private sector investment and risk taking;
where tariffs are below cost recovery levels; or

where there is a need to administer and manage a complex arrangement, whether financial or technical.

Selecting Concessions
Article 8

A public entity, in addition to the requirements under the Article 4, may propose a concession agreement where:

1) natural resources such as minerals or such as any activity thereof such as for tourism activities, and potentialities thereon, are not exploited properly therein;
2) revenues may be generated therefrom;
3) major private financial or technical inputs are necessary therefore;
4) economic growth results are determined by a valuation made thereof;
5) a regulatory body can, under a license, control the quality level of services and the applicable tariffs.

Selecting BOT arrangements
Article 9

A public entity, in addition to the requirements under the Article 4, may propose a BOT arrangement, as defined under this Law, where:

1) major new capacity for public services is needed and based on expert estimate or elaborateness;
2) no divestiture of existing publicly owned companies or firms can permit hereunder proper investment for the new capacity required therein; and,
3) after a determined period of operation, enough for the private investor to recover the investment and the costs of operating, the transfer of the properties, movable or immovable, is made thereinafter.

Combination
Article 10

A public entity may propose a combination of arrangements provided for in article 4 of this Law, in which case such a combination must include conditions for each separate arrangement that is being proposed.

The Government may decide to, in view of liberalization of economy, permit the inclusion of private sector in performing public services by applying different contractual arrangements not provided for by article 4 of this Law, according to the conditions provided by a separate Law.

Objectives
Article 11

Pursuant to article 4, where proposing a private sector partnership, the public entity, or many public entities together, such as a group of self-local governments, shall, for any proposed partnership, demonstrate the need to -

1) bring technical, financial, or managerial expertise and new technology in the sector;
2) improve economic efficiency in the sector, operating performance and the use of capital investment;
3) inject large scale investment capital into the sector or gain access to private capital markets;
4) where applicable or otherwise doable, reduce public subsidies to the sector;
5) make the sector more responsive to consumers' needs and preferences;
6) the tentative schedule of tariffs to be paid;
7) competitive pressures deriving from markets for returns on the capital to be invested; and,
8) competitive pressures deriving from similar services.

Preparing the seeking of offers
Article 12

Upon approval, pursuant to article 4 of this Law a public entity shall prepare the solicitation documents in compliance with this Law, and shall, before initiating solicitation, obtain a prior endorsement by the authorized organs on the contents of the solicitation documents; after solicitation, the public entity shall examine, evaluate and compare offers and obtain approval from the same organs before awarding the contract; copy of the contract shall be made available to the relevant regulatory body.

Duration
Article 13

Any contract offered under a solicitation exercise or otherwise entered into under this Law shall be subject to maximum duration:

1) lease agreement shall not exceed a period of two years, but might be subject to renewal every year, in compliance with the terms and conditions of the contract, but the total period, including renewal, shall be subject to a maximum period of five years;
2) management contract shall not exceed a period of five years;
3) concessions or BOT. contracts shall not exceed a period of 30 years or, where the contract is based on recovery of investment, shall not exceed the period necessary for the recovery of investment only where the determined recovery is based thereunder on a determined percentage of the tariffs paid by the beneficiaries; nevertheless, where the period may exceed 30 years under such contract, the period shall be, at time of contract signature, based on a probable recovery not to exceed 30years; where an extension is necessary for recovery

and part of the terms and conditions of a contract, such extensions shall be permitted strictly on the terms and conditions stipulated in the contract entered into;

4) the period for which a concession or a BOT has been granted may be extended in exceptional case because of a substantial change in the conditions under which the concession or the BOT was granted;
5) the duration of preparatory work shall be specified in the concession as well as in a BOT agreement.

Commencement
Article 14

Pursuant to Article 13 of this Law, the commencement of the period shall not include the period for construction or rehabilitation; therefore, the period shall start, in any case, on the day the operations start; for avoidance of doubt, the day the operations start shall prevail on the date -

1) the contract was signed therefore and,
2) where applicable, of entering into effect of the contract.

CHAPTER III
SEEKING OFFERS FOR LEASING OR MANAGEMENT CONTRACT

Soliciting
Article 15

Subject to articles 4 and 12 of this law, a public entity or more public entities may enter into solicitation to seek offers from private sector in compliance with the law.

Proposals for management contracts and bids for leasing
Article 16

A management contract being a contract whereby consulting services are delivered, and a leasing contract being a public procurement activity, the relevant articles of the Public Procurement Law shall apply.

Rules and forms for management contract or leasing contract
Article 17

Subject to article 16 of this Law, for management contract, any request for proposals and, for leasing contract, any bids solicited, therefore any procurement undertaking thereof, shall be in compliance with the public procurement rules and the standard forms approved by the Public Procurement Commission.

Pre-investment Committee
Article 18

Pursuant to the articles 15, 16 and 17 of this Law where a construction or rehabilitation, resulting from such management or leasing contract, therefrom, therein, thereunder or thereinafter, is planned for a building in public property and where its design is delivered by the private sector, the prior approvals of the Pre-Investment Committee established in conformity with the Public Procurement Law.

CHAPTER IV
PRE-QUALIFICATION OF INVESTORS AND SEEKING OF OFFERS FOR CONCESSIONS OR BOT

Unsolicited offer or direct agreement for concession or BOT
Article 19

Except for and not including any fair dialogue between investors and public entities prior to a solicitation exercise or permitted dialogue before award of a contract not resulting in unfair advantage, no unsolicited offer and any form of direct agreement without pre-qualification or solicitation shall be permitted. Therefore, to ensure transparency and fair competition, for concessions or BOT arrangements, any unsolicited offer or direct agreement shall, upon receipt, be rejected and not be considered further.

Project assessment unit for concession or BOT
Article 20

Subject to Article 4 of this Law, for a concession or a BOT project, the public entity responsible for the project shall establish a project assessment unit of five members having the proper expertise whereby the combination of legal, technical, financial, environmental and other relevant expertise is made available; selection of the members shall be subject to endorsement by:

1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a Self-Local Government or organs of Self-Local Governments; or,
3) the parent ministry, for the publicly-owned companies or firms.

Solemn statement
Article 21

Subject to Article 20 of this Law, members shall not be elected persons and shall be subject to the solemn statement made by public procurement officers under the Public Procurement Law.

Authorities and responsibilities of the project assessment unit
Article 22

Subject to Articles 4, 12, 20 and 21 of this Law and to the rules made under this Law, the members shall be responsible to supervise and manage:
1) the pre-qualification of investors;
2) the seeking of offers from them;
3) the receiving and opening of offers;
4) the examination, comparison and evaluation of offers;
5) the preparation of an evaluation report;
6) the undertaking of dialogue with investors before award; and
7) the preparation of a final recommendation.

Use of consultants or consulting firms
Article 23

Pursuant to Article 22 of this Law, a project assessment unit may, where necessary, seek assistance from consultants to assist in the undertaking of any activity. The consultants shall be selected in compliance with the Public Procurement Law.

Dialogue
Article 24

The undertaking of dialogue, pursuant to Article 22, paragraph 6 of this Law hall be only for improvement of the understanding of the offer, before award, and shall not result in negotiation so as to alter substantially an offer or to render it substantially responsive to the solicitation documents.

Endorsement
Article 25

Before award the endorsement is given by:
1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a local self-government;
3) the parent ministry, for the state-owned companies or firms.

Pre-qualification of investors
Article 26

For concessions and BOT contracts, except for concessions and BOT based on Article 138 of this Law, open and international pre-qualification of investors shall be undertaken, prior to the seeking of offers, after international advertising is made, as per the rules and the standard forms approved by the Privatization Council under this Law.

Criteria for pre-qualification
Article 27

Evaluation for pre-qualification shall be effected strictly according to pass or fail criteria stipulated up-front in the pre-qualification documents.

Any pre-qualification exercise shall be completed within the period stipulated in the solicitation documents.

The investors shall furnish all such information, documents and provide such evidence as are required for the purpose.

Selection investors
Article 28

Shall be selected the investors on the basis of the information given by them in the request made pursuant to Article 26 of this Law, subject to verification before award.

The results of the pre-qualification exercise shall be determined by an ad-hoc Evaluation Committee, set up by the project assessment unit; members of the project assessment unit shall not be members of the ad-hoc evaluation committee.

The evaluation shall be undertaken as per the rules and forms approved under this Law by the Privatization Council.

Subject to any fresh verification of information, no investor who has met the criteria set out shall, at selection, be disqualified.

The criteria for selection shall be:
1) the cost and the magnitude of the financing offered;
2) the performance specifications of the facilities offered;
3) the cost chargeable to the users, beneficiaries or consumers;
4) other income generated for the public entity or the purchaser by the facility;
5) the period of facility depreciation;
6) in addition to the conditions to post-qualify, the investor shall evidence that its investment by its available capital will not be less than 25 % of the capital invested.

Report of the Ad-hoc Evaluation Committee
Article 29

The report of the ad-hoc Evaluation Committee shall be signed by all persons who formed part of the evaluation process; the report shall include: introduction to the project; copy of the opening report; details on investor examination and rejects; list of pre-qualified investors who pass all criteria and who will be, for a given period, eligible investors; copy of the pre-qualification documents; and the list of investors under conditional pre-qualification, as well as the criteria to be met within a set deadline.

Notice to pre-qualified investors
Article 30

An investor shall be notified in writing of the result of his pre-qualification; investors who have not been selected under a pre-qualification exercise shall be entitled to be given the reason for their disqualification and the criteria on which they failed.

Verification of information
Article 31

Verification of the information provided by investors in the submission for pre-qualification shall be confirmed at the time of award of contract; therefore, award shall be denied to an investor who no longer meet one or more of the criteria or resulting in a lack of capability or resources to successfully perform the contract; any substantial information found false with evidence made at verification shall result in disqualification of the investor or rejection of his offer.

Seeking offers from pre-qualified investors
Article 32

For seeking offers from pre-qualified investors, all project assessment units shall use the forms provided under the rules approved by the Privatization Council.

A non-reimbursable fee may be charged to investors for solicitation documents; the amount of the fee shall be solely determined by the cost of their production and delivery; the fee shall not be so high as to discourage a qualified investor.

Language
Article 33

Any response by investors and any kind of document provided by them shall be in one of the languages authorized by the solicitation documents. If another language is utilized the certified translation in one of the language authorized shall be submitted.

Request for additional information
Article 34

Where an investor requests additional information on the pre-qualification documents or on the solicitation documents, such information shall be communicated to all investors provided with the documents, without identification of the source of the request; any additional information, correction of errors or alteration of contents thereof shall be sent immediately and in the same manner by issuing an addendum made available to all those who requested the original documents.

Site visit
Article 35

Where a site visit is convened, minutes shall be prepared to record any request for additional information, and, without identifying the source thereof, the minutes shall be made available by an addendum issued to all those who requested the original pre-qualification or solicitation documents.

Binding addendum
Article 36

The additional information provided by addendum as stipulated in Articles 34 and 35 of this Law shall be binding on the investors and shall be communicated to all investors within the period specified under the rules, before the submission of pre-qualification or offers so as to enable the investors to make a timely pre-qualification or offer.

Time for pre-qualification and preparation of offers
Article 37

The time allocated to investors to prepare the pre-qualification documents shall be not less than forty-five working days, starting on the day the advertisement is published, and for the preparation of their offers, not less than sixty working days shall be allocated.

Receiving and opening of offers
Article 38

The time for opening of pre-qualification documents or offers shall be the same as for the deadline for receipt or promptly after the deadline for receipt, only to allow sufficient time to the ad-hoc opening committee to take the envelopes safely to the location stipulated for the opening; the solicitation documents shall indicate the location, the date and the time for the opening; envelopes received after the time stipulated for submission as well as those not opened and read out at the occasion of an opening shall not be considered; save in cases of *force majeure*, postponement of proceedings shall not be permitted.

Modification or withdrawal
Article 39

Where an investor wishes to amend his pre-qualification or his offer he shall not be allowed to retrieve his original sealed envelope, but shall only be allowed to send another envelope equally sealed, properly identified and linked to his original envelope and marked as "modification" or "withdrawal" as the case may be.

Receiving of pre-qualification documents or offers
Article 40

A pre-numbered receipt shall be given for any envelope or package containing pre-qualification documents or offers delivered by hand, after ensuring that it is correctly sealed; a member of the ad-hoc Opening Committee shall be responsible for the issuance of receipts and the safeguarding of all offers related to a solicitation exercise; the name of the member shall be stipulated in the solicitation documents.

Electronic communication shall be in compliance with the law and be permitted only where authorized in the solicitation documents.

Safeguarding of pre-qualification documents or offers
Article 41

Unless the solicitation documents require otherwise, ad-hoc opening committees shall use containers of a size and type capable of receiving pre-qualification documents or offers safe and sound therein, with a sleeve and a door with locks, of which could, for reasons of security and confidentiality, be suitably controlled by such number of different keys entrusted to senior officers.

Rejection of all offers
Article 42

Rejection of all offers shall be allowed only when there is lack of effective competition or when all offers are not substantially responsive; however, lack of competition shall not be determined solely on the basis of the number of investors; when all offers are rejected, the project assessment unit shall review the cause justifying the rejection and consider making revisions to the conditions of contract, design and specifications, scope of the contract, or a combination hereof, before inviting new offers; when the rejection of all offers is due to lack of competition, wider advertising shall be considered; when the rejection is due to most or all of the offers being substantially not responsive, new offers may be invited from the same investors who were originally invited.

In case of rejection of all offers, the notice of the overall rejection shall be given promptly to all investors who submitted offers and in all cases, before the end of the validity period; any public entity shall not thereby incur any liability nor assume any obligation to inform any investor of the grounds for the rejection or the cancellation of the process.

For a BOT, where the most responsive offer, offering the best business plan exceeds the estimate for payable tariffs, the project assessment unit shall investigate causes for the excessive tariffs and shall consider requesting new offers; alternatively and after the approval of the Privatization Council, the project assessment unit may, instead of calling for new offers and without changing the substance of the solicitation, offer to the winning investor a reduction on the scope and / or a reallocation of risk and responsibility which can be reflected in a reduction of the tariffs payable.

Securities
Article 43

To afford reasonable protection against irresponsible offers, bid security may be required, but it shall not be set too high as to discourage investors; the bid security shall be in the form of a manager's or certified check, a letter of credit or a bank guarantee; the bid security shall remain valid for a period stipulated in the solicitation documents which period shall be beyond the validity period for the offers; the bid security shall be released to unsuccessful investors immediately upon determination that they will not be awarded with a contract.

Solicitation documents may require security in an amount sufficient to protect the interests of the Republic of Montenegro in case of breach of contract by an investor; this security shall be provided by a performance bond or a bank guarantee in an appropriate standard form and in an amount specified in the solicitation documents.

Force majeure
Article 44

The conditions of contract shall stipulate that failure on the part of the parties to perform their obligations under the contract shall not be considered a default if such failure is the result of an event of *force majeure* as defined in the conditions of contract.

No collusion
Article 45

The pre-qualification and the solicitation documents shall include a standard form to be signed by an investor certifying that his offer has been prepared independently and whereby he will accept to comply with any obligations under the law of the Republic for Montenegro, including anti-corruption.

Examination of offers
Article 46

All offers shall be first examined to determine if they: meet the minimum eligibility requirements stipulated in the solicitation documents; have been duly signed; are accompanied by a valid security, where requested in the solicitation documents; are substantially responsive to the solicitation documents; and are generally, otherwise, in order. The following shall not be sought, offered or permitted: changes in prices, subject to this Law; changes of substance in an offer; and changes to make an unresponsive offer responsive.

A major deviation shall result in a rejection of an offer while a minor deviation shall be subject to clarification.

The following shall be considered as major deviations:
1) with respect to clauses in an offer: improper arbitration; unacceptable sub-contracting, unacceptable time schedule, only where time is of essence; unacceptable tariffs adjustment mechanism;
2) with respect to the status of an investor: the fact that he is ineligible or not pre-qualified; the fact that he is uninvited;
3) with respect to documents of an offer: an unacceptable or missing security; or an unsigned offer;
4) with respect to time, date and location for submission: any offer received after the date and time for submission stipulated in the solicitation documents; any offer submitted at the wrong location.

In cases of major deviations, offers shall not be considered any further and, where unopened, shall be returned as such to the investor; in all cases of rejection, a letter stipulating the reasons for rejection shall be sent, and the investor shall not be permitted to amend his bid to become compliant.

The following shall be considered as minor deviations: the use of codes; the difference in standards; the difference in materials; alternative design; alternative workmanship; modified liquidated damages; limited liability and insurance; omission in minor items; discovery of arithmetical errors; sub-contracting that is unclear and questionable; different methods of construction; difference in final delivery date; difference in delivery schedule; completion period where these are not of essence; non-compliance with some technical local regulation; payment terms; and any other condition that has little impact on the offer in cases not mentioned above.

In case a doubt exists as to whether a particular condition in a bid is a major or a minor deviation, the following rules shall apply: where the impact on the tariffs is major, it shall be regarded as a major deviation; and where the impact on the tariffs is minor, it shall be regarded as a minor deviation.

In cases of minor deviations, written clarification may be obtained from the investor and, where applicable, a counter offer made for the correction of the minor deviation;

where an investor does not accept the correction of a minor deviation under the counter offer, his offer shall be rejected; at the stage of evaluation and comparison, all minor deviations shall be quantified in monetary terms.

For the rejection of an offer, a written notice shall be given promptly to the investor.

Validity period of offer and extension validity period
Article 47

When determining the duration of the validity period of an offer, a project assessment unit shall ensure that it is sufficient to enable the investors to respond to the solicitation, to allow time for evaluation and comparison of offers and, where applicable, for any authorized organ to review the recommendation of award and give the necessary approval so that the contract can be awarded within that period.

All reasonable steps shall be taken to avoid any situation where an extension of the initial period of validity becomes necessary; a project assessment unit may extend the validity period, if justified by exceptional circumstances, by requesting in writing such extension from all investors before the expiry date; where given, the extension shall be for a minimum period required to complete the evaluation, obtain the necessary approvals and award the contract; whenever an extension of validity period is requested, investors shall not be allowed to change the quoted price or conditions of the offer.

Investors shall have the right to refuse to grant such an extension without forfeiting their security; those investors who are willing to extend the validity of their offer shall be required to provide a suitable extension of security.

Evaluation and comparison of offers
Article 48

The purpose of evaluation of offers shall be to determine the best business plan that permits comparison on the basis of calculated costs; subject to any verification of the capabilities of the investor, the offer with the best business plan, but not necessarily the lowest submitted tariffs shall be selected for award.

For the evaluation and comparison of offers that have been adjudged as valid for the purposes of evaluation and comparison, no other methods or criteria shall be used except those stipulated in the solicitation documents; all relevant factors, in addition to tariffs, that will be considered for the purposes of evaluation and the manner in which such factors will be applied shall be stipulated in the solicitation documents.

When bid prices are expressed in two or more currencies, the prices of all offers shall be converted in the official currency of the Republic of Montenegro, according to the rate and date of rate and source specified in the solicitation documents.

Confidentiality
Article 49

After opening of offers, information relating to the examination, clarification and evaluation of offers and recommendations concerning the award shall not be disclosed to the investors or to persons not officially concerned with the process until the successful investor is notified of the award.

Evaluation report
Article 50

Any evaluation and comparison of offers shall be reported in the manner and in the format laid down in the rules provided that the report shall always be signed by all evaluators and the supervisor confirming the correctness of the report and the compliance with this Law.

Contract award and entry into force of the contract
Article 51

Subject to the approvals required under this Law*,* the public entity responsible for the project shall award the contract within the period of the validity of offers, to the investor who met the appropriate standards of capability and resources and his offer has been determined to be substantially responsive to the solicitation documents and to offer the best business plan.

The investor shall not be required, as a condition of award, to undertake responsibilities not stipulated in the solicitation documents or otherwise to modify substantially the offer as originally submitted.

The signatory of the contract, on behalf of the public entity, shall be provided with all offers, the reports on opening and evaluation and shall examine them to determine their compliance with this Law; the signatory shall verify the validity of the offer recommended for award and refuse to sign a contract with a supplier if his offer is not valid; the signatory shall have immediate access to any document of the solicitation exercise that are directly or indirectly related to the contract to be signed.

The signatory shall be responsible to ensure that he is officially granted with the authority to sign such a contract on behalf of a public entity.

Undertaking evaluation
Article 52

Any evaluation exercise undertaken under this Law shall be made by an ad-hoc Evaluation Committee. Chairperson of the project assessment unit shall appoint the members of the Ad Hoc Evaluation Committee.

An ad-hoc evaluation committee shall be comprised of a Supervisor and five evaluators, who shall not have been involved in the opening of offers to be evaluated and shall not be members of the project assessment unit.

The Supervisor and any member shall be public servants selected on the basis of their necessary specialized expertise.

The Supervisor and the members shall not be elected persons.

When deemed necessary by the Supervisor, he may seek to obtain the following preliminary information: a preliminary assessment report on the offers received from any expert in the area; and a preliminary examination of the offers; where the necessary expertise is not available in the public entity responsible for the project, such expertise may be sought from any other public entity or from any other sources.

The members of an ad-hoc evaluation committee shall continue in their functions until the evaluation report is submitted.

The Supervisor shall be solely responsible for the supervision and co-ordination of the evaluation process but, in any case, shall not be involved directly in the evaluation process or in rejection of offers.

The Supervisor shall be responsible to take any action necessary to ensure the confidentiality of the offers, their evaluation and of the overall process until completion.

All offers and any documents related thereto, which shall be transferred together with the evaluation report to the authorized organs, shall be safeguarded.

Each evaluator shall make his own individual evaluation without undue influence; thereafter, the supervisor shall determine the average, in the presence of the evaluators from individual results obtained.

The evaluation shall be completed within the validity period so as to leave enough time for contract award.

Any recommendation for award made thereof, under any evaluation undertaken, shall be final; therefore, an evaluation exercise cannot be re-conducted, except where there is an evident situation of non compliance with this Law; after evidence is made on non compliance, another similar evaluation shall be conducted by another ad-hoc evaluation committee; the second committee shall not be provided with the first evaluation report which shall remain secret until the second evaluation exercise and report thereof completed.

Joint venture
Article 53

Investors established in the Republic of Montenegro shall be encouraged to participate to any solicitation whereon the Republic of Montenegro encourages the development of the economy; they may offer independently or in joint venture with other investors established in the Republic of Montenegro or abroad, but such joint venture shall not be, under any solicitation exercise, mandatory or be a condition for eligibility.

Article 54
Eligibility

Natural persons, companies or firms shall not be eligible for the award of contracts for concessions or BOT where: they are under bankruptcy; payments to them have been suspended in accordance with the judgment of a court other than a judgment declaring bankruptcy and resulting, in accordance with their national laws, in the total or partial loss of the right to administer and dispose of their property; legal proceedings have been instituted against them involving an order suspending payments and which may result, in accordance with their national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of their property; save after the completion of any punishment upon them, they have been convicted, by a final judgment, of any crime or offence concerning their professional conduct, except after the enforcement of the punishment against them; they are guilty of serious misrepresentation with regard to information required for participation in an invitation to offer; they are in breach of contract on another contract with the contracting public entity, only where a final judgment by a court is made that the breach of contract is the responsibility of the investors; they are found guilty of bribery or kickbacks under international treaties or conventions or, they are ineligible on the same grounds and evidence by any bank, institution or organization providing funds for general development, public investment or reconstruction; and they have engaged in corrupt or fraudulent practices in competing for the contract in question.

To be eligible for participation in invitations to pre-qualify or to offer and thereinafter to be a contracting party, participating investors shall provide evidence satisfactory to the authorized organ of their eligibility under this Article, proof of compliance with the necessary legal, technical and financial requirements and of their capability and adequacy of resources to carry out the contract effectively.

To this end, any offer submitted shall include the following information:

a document, dated less than 90 days previously, drawn up in accordance with the investors' national law or practice certifying that the investor meets the conditions laid down in this Article, and none of the situations referred to in this Article applies to him;

copies of original documents defining the legal status, and establishing the place of registration and/or statutory seat and, if it is different, the place of central administration of the company, firm or partnership or, if a joint venture, of each party thereto constituting the participating investor;

details of the experience and past performance of the investor (or of each party to a joint venture) on contracts of a similar nature within the past five years, and details of other contracts in hand including details of the actual and effective participation in each such contract;

where applicable, the major items of equipment proposed for use in carrying out the contract;

the qualifications and experience of key personnel proposed for administration and performance of the contract, at and away from the place of performance of the contract;

information relating to the nature, conditions and modalities of subcontracting wherever the subcontracting of any elements of the contract amounting to more than 10 % of the offer price is envisaged;

reports on the accounting and financial standing of the investor (or of each party to a joint venture) such as profit and loss statements, balance sheets and auditor's reports for the past five years, an estimated financial projection for the next two years, and an authority from the participating investor (or authorized representative of a joint venture) to seek references from the bank of the investor;

information regarding any current legal or arbitration proceedings or dispute in which the investor is involved; the information referred to shall be confined to matters of direct interest to the award or performance of the contract; and,

for companies or firms established in the Republic of Montenegro, evidence that previous payments were made or in process to be made for any taxes, customs duties and any other payment due to the Government or to a Self-Local Government.

CHAPTER FIVE
LEASING

Leasing of public facilities
Article 55

Subject to the Articles 6, 11 and to Chapter Three of this Law, leasing shall be permitted for existing public facilities, to be rehabilitated or not, or for new public facilities, or for the use of an existing private facility to be utilized for public uses.

Existing public facilities
Article 56

Pursuant to Article 55 of this Law, where a public entity prefers leasing to the owning a public facility, the public entity shall -

1) determine the market value of the facility by using the service of an independent valuator who shall be selected in compliance with the law;
2) clarify property titles;

3) seek the authorization, in compliance with the law, to dispose the existing public facilities, by public offer, whereby the disposal is accompanied by an offer from the seller to lease for a given period the public facilities that are offered;
4) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder; and,
5) where a rehabilitation is needed resulting in an investment needed prior to the leasing, detailed drawings and budget estimates shall be prepared and be part of the solicitation documents.

New public facilities
Article 57

Pursuant to Article 55 of this Law, where a public entity prefers leasing to building a public facility, the public entity shall, prior to any solicitation, in compliance with the law:

1) obtain prior approval of the design by the Pre-Investment Committee of the Department for public works; where applicable, clarify land titles where the new facility is needed;
2) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder.

Use of existing private facility for public use
Article 58

Pursuant to Article 55 of this Law, where a public entity prefers leasing a private facility for public use, the public entity shall, prior to any solicitation, in compliance with the law:

1) stipulate in the solicitation documents the standards for public facilities as approved by the Pre-Investment Committee of the Department for public works;
2) seek the authorization, in compliance with the law, to enter into such agreement and therefore obtain yearly appropriations to meet the obligations created thereunder.

Insurance costs
Article 59

Under any leasing agreement, all insurance costs shall be on the private investor or the private operator; copy of the insurance contract shall be part of the leasing contract, and evidence of payment for renewal shall be conditional to the maintaining in force of the contract.

Maintenance costs
Article 60

Under any leasing agreement, the maintenance costs of the facilities, other than daily cleaning of interior shall be a responsibility on the private investor or of the operator.

Maximum leasing fees payable
Article 61

Under any leasing agreement, the increase of the fee payable, for renewal, shall not be higher than the yearly inflation as per indices on inflation published by an official statistic office; the name thereof shall be stipulated in the solicitation documents and thereinafter be part of the leasing contract.

Subsidy and contingent liability
Article 62

Under the provisions of this Chapter, the private sector investor or operator shall not be allowed to obtain any kind of benefits, directly or indirectly, from any kind of subsidy, or otherwise obtained by the use of any public funds for reconstruction or rehabilitation, or otherwise requires guarantees other than usual guarantees under a normal leasing agreement in the private sector; except in the case of gross negligence, or under a court decision, any provisions of a leasing agreement entered into, whereby any contingent liability is created on any public entity, shall be deemed to be null and void.

Procurement by the private sector
Article 63

For avoidance of doubt, for investment made by a private sector investor or operator under this chapter, the procurement activities by him shall be undertaken as per the best recognized procurement practices in the private sector.

CHAPTER SIX
MANAGEMENT CONTRACT

Consultants or consulting firms
Article 64

Subject to the Articles 7, 12, 13 and to the Chapter Three of this Law, management contract may be entered into, whereby the management, legal, financial, technical or supervisory services are delivered by private consultants or private consulting firms.

Terms of reference
Article 65

Pursuant to Article 64 of this Law, management contracts being utilized under this Law for preparatory actions or control of activities for the privatization of the economy, any public entity, in addition to all requirements of the Public Procurement Law, shall utilize the standard format for terms of reference as approved by the privatization Council for:

1) Economic consultants;
2) Experts for formulating policy in the adequate field of expertise;
3) Legal counsel;
4) Technical (Civil Engineering) Consultants;
5) Financial Advisors;
6) Procurement expert;
7) Management, supervision expert;
8) Experts for corporate governance;
9) Expert for environmental protection; and,
10) Any adviser for privatization, as may be determined by the Privatization Council.

Monitoring of consultants under management contract
Article 66

Any public entity entering into management contract under this Law whereby the services are linked to a privatization exercise, shall appoint a monitoring committee of three members, subject to Articles 67 and 68 of this Law.

Endorsement
Article 67

Selection of the members of the monitoring committee shall be endorsed by:

1) the Government, in the case of Ministries, Departments or Secretariats;
2) their respective municipal assembly, in the case of a Self-Local Government or group of Self-Local Governments;
3) the parent ministry, for the publicly-owned companies or firms.

Membership and powers
Article 68

The members of a Monitoring Committee shall not be elected persons and shall be public servants having the relevant expertise to make decision, made on majority, on behalf of the public entity to determine if services are delivered timely and satisfactorily or otherwise in compliance with the terms of reference and the contract entered into.

Reports by consultants
Article 69

Under the provisions of this Chapter, any report made by consultants under management contracts shall be in the format approved by the Monitoring Committee, and copies thereof shall be made available to the Privatization Council.

CHAPTER SEVEN
CONCESSIONS

Usage compensation
Article 70

Besides the particular set under this Law for taking part in the preparation of offers, the application for taking part in the solicitation exercise shall:

1) be filed together with particulars relating to the duration of usage conditions and modality of usage compensation for the use of the natural resources of goods in general use;
2) conditions for the hand-over at the termination of usage;
3) credit rating of the investor or operator;
4) particulars about other conditions concerning the rights and as particulars about other conditions concerning the rights and duties of the contracting parties.

Special conditions
Article 71

Subject to issuance of a license, a concession may be granted on the condition that the utilization of the natural resources or goods in general use or performance of activity provides for:

1) the maintenance of the technical and technological unity for the system;
2) its efficient operation and rational management; and,
3) protection of the environment.

Contract offered
Article 72

A Concession Contract shall especially include:
1) contracting parties;
2) subject matter on concession;
3) duration of preparatory operations;
4) duration of concession;
5) modality of and time-limits for securing funds for financing;
6) conditions of usage;
7) compensation for usage;
8) rights and duties concerning the application of measures for general safety and protection of the environment;
9) conditions for terminating the contract;
10) settlement of disputes; and,
11) other matters the contracting parties may agree upon.

Transfer
Article 73

Subject to Article 74 of this Law, alternatively to re-seeking offers, a concession may be transferred to another person, foreign or not, partly or wholly, with the approval of the authorized organ.

Validity of contract
Article 74

Any contract of concession transfer as referred to in Article 73 of this Law which is concluded without approval of the grantee of concession, without publication in the Official Gazette of the Republic of Montenegro, without public hearings and without any requirements for award under this Law, shall be null and void.

Conditions for the granting of the concession
Article 75

A concession may be granted in order to provide for:
1) rational exploitation of natural resources or goods in general use;
2) technical and technological advancement of the business constituting the subject matter of a concession;
3) technical and technological uniformity of systems in the field of infrastructure;
4) efficient operation and rational control of such systems; and,
5) protection and improvement of the environment in conformity with the environmental protection regulation;

Natural resources and goods in general use as well as building devices and installation exploited by public enterprise founded by the state or a self-local government unit may be conceded to another person provided that such public enterprise are unable to provide for the rational exploitation or trouble-fee operation in conformity with the regulation governing the conduct of the business of such enterprise.

Subject Matter
Article 76

The Subject matter of a concession may be:

1) prospecting or exploitation of natural resources or raw materials with the aim to create employment opportunities and to generate revenues to an investor / operator and to the Government, or otherwise, as the case may be, to the self-local governments;
2) construction, maintenance and exploitation of facilities for prospecting or extracting, natural resources or raw materials;
3) construction of facilities, remodeling, modernization or rehabilitation of existing facilities, for exploitation of water having natural curative properties and other similar item for the purpose of their exploitation;
4) construction, maintenance, exploitation of facilities, or rehabilitation of existing facilities, on natural sites, wildlife, or national parks in the view to attract more tourists;
5) any other raw material or natural resource of the Republic of Montenegro, where improved exploitation by a private sector investor or operator results in a possibility to generate revenues therefrom for the Government or to the Self-Local Governments, whereon there is an evident situation resulting in financial, social, environmental or economical improvement, or any combination thereof.

Recommendation for awarding a concession contract
Article 77

The recommendation for granting a concession shall be submitted to the Government through the relevant Regulatory Body (hereinafter regulatory organ) established under this law and shall include the following:

1) the subject matter of the concession;
2) the size of investment;
3) the duration of the recommended concession;
4) the basic conditions for the utilization of the concession;
5) compensation purpose of exploiting the subject matter of concession;
6) the information on the interested contracting parties; and,
7) any other information as may be requested by the Government.

Prior to submitting a recommendation to the Government, a Regulatory Body shall ensure that inputs were already obtained from any other public entity, wherefrom improvement of a concession may result.

A Regulatory body shall notify the investor or the operator of the position taken by the Government on the presented recommendation.

Decision to grant of the concession
Article 78

Pursuant to the recommendation to grant a concession the Government adopts a decision on the granting of a concession.

Decision to grant a concession especially includes the following:

1) reasons wherewith the concession should be granted thereunder;
2) where applicable, in addition to any private sector investment or involvement, the necessary funds, resources and time limits for raising them, that are necessary thereto;
3) anticipated income and expenditure associated with the concession for the whole duration, resulting therefrom;
4) the technological capacity of parties for the utilization of concession, and the risks thereafter;
5) particulars on the effects on the overall infrastructure and other economic areas, as well as on the uniformity of technical and technological systems, their efficient operation and control to be rational thereinafter;
6) duration of concession thereat;
7) modality of payment and issuance of guarantees or other sureties for the performance of duties and the amount therefore;
8) environmental impact studies undertaken and responsibilities resulting therefrom;
9) employment estimates, number of employees and qualifications needed thereto; and,
10) any relationships for property, movable or immovable, thereunder;
11) permits, licenses, registration or any other requirements by law, whereby operation is to be permitted theretofore.

Enactment of a concession decree
Article 79

The Government shall adopt a decree regulating the details and conditions for granting a concession.

Concession contract
Article 80

Any concession contract shall be:

1) made in writing;
2) concluded in conformity with the terms and conditions set out in the concession decree; and,
3) in compliance with this Law.

Contents of the contract
Article 81

Where authorized by a concession decree, any concession contract shall be concluded by the public entity responsible of the concession, shall be subject to endorsement by a regulatory body and, shall include provisions relating to, but not limited to, the following:

1) the name of the contracting parties;
2) the subject matter of concession;
3) the duration of preparatory operations and the duration of the concession;
4) the conditions under which the duration of concession may be extended or modified;
5) modality of a time-limit for raising funds;
6) the schedule of investment;
7) the amount and modality for guarantees on the performance of the activities;
8) where applicable, standards of the products or services as well as the criteria for setting the prices, rates or tariffs payable by the end-users;
9) compensation paid for the concession license, terms and conditions for payment;
10) rights and duties concerning the application and consequences thereof;
11) modality for disputes settlement;
12) the application law;
13) time and modality of handling over the building installation or plant and state in which it has to be application of ruling law;
14) modalities of mutual reporting;
15) modalities for monitoring by the regulatory body;
16) rights and duties of contracting parties;
17) determination of risks and responsibilities resulting from the contract;
18) any other matters mutually agreed upon by the contracting parties or otherwise stipulated in the concession decree.

Registration
Article 82

Any concession contract concluded with a foreign party shall be reported and registered in the manner provided by the law governing foreign investment.

Payment obligation
Article 83

The compensation for any concession granted, hereinafter the concession compensation, shall be payable in conformity, in order of precedence, with the concession decree, the concession contract, the license issued by the regulatory body and any decision made by the regulatory body after public hearings, in compliance with this Law.

Criteria for setting the concession compensation
Article 84

The concession compensation shall be determined by taking into account, but not limited to:

1) the kind, category or quality of the natural resource of the raw material;
2) the market price of the natural resource or raw material;
3) the general market conditions and trends;
4) the duration of concession;
5) the contracted risks;
6) the coverage of investment costs;
7) the anticipated profit;
8) any other item governing the contract entered into.

Allocation of the concession compensation
Article 85

Concession compensation shall be regarded as revenues for the Republic of Montenegro except where revenues shall be on a public entity, as defined under this Law.

Conditions for and modality of pursuing a concession activity
Article 86

Any concessionaire shall build, maintain and exploit facilities and pursue the concession activities and exploit natural resources or raw materials in compliance with:

1) the regulations governing the regional and town planning;
2) the terms and conditions stipulated under the concession contract;
3) the standing environmental protection regulations;
4) the concession decree;
5) the law in force *infra civitatem*.

Concession assignment
Article 87

Any concessionaire shall not assign to some other party the concession; therefore any such assignment shall be null and void.

Increase in the value of the subject matter of concession
Article 88

Except as otherwise stipulated in the concession decree, any increase in the value of a publicly owned installation of any type, exploited as the subject matter of a concession or which is contributing to the exploitation which has arisen in the performance of the concession activity shall be the property of the Republic of Montenegro or the public entity, as the case may be.

Discoveries
Article 89

Anything of historical, cultural, natural value, or other interest or of significant value unexpectedly discovered on a site shall be public property; therefore, the concessionaire shall notify, upon discovery, the regulatory body and carry out instructions for dealing with them.

Protection of the concessionaire rights
Article 90

In addition to rights, absolute and accessory, any concessionaire shall be guaranteed the rights stipulated under:
1) the concession contract;
2) the concession decree;
3) where applicable, the co- financing agreement.

Where no specific provisions are made under the law of the Republic of Montenegro for specific rights of the concessionaires, provisions made under international treaties or otherwise the best international practices shall be applied.

In the event of a change in the Republic of Montenegro law or regulations on the basis of which a concession contract has been concluded, the law and regulations which were in force on the contract conclusion date shall apply to the relations, or otherwise the most favorable to the concessionaire shall apply.

Where in any concession contract under this Law, investment is required for prospecting before exploiting, the same concession agreement shall include the exploitation of the result of the prospecting.

The contractual rights of any concession enterprise shall include the following:
1) Performance of all operations associated with opening, development and exploitation for the construction of facilities necessary for the exploitation of raw materials or natural resource;
2) Exploitation of all of the mineral raw materials or natural resources specified in the concession contract;
3) Utilization of other natural resources and conditions in conformity with the concession contract and the applicable law; and,
4) Sale of the mineral raw materials or natural resources, produced from the exploitation of a concession, in local and international markets in conformity with law.

Other rights and duties
Article 91

Should it be necessary to expropriate and/or develop building or land in connection with the granting of a concession, the costs for any expropriation and/or development of building or land shall be charged to the concessionaire and the concession contract shall provide the costs thereof and the terms and conditions for the payment of such costs.

In a case as that referred to in sub-article 1 of this article, the determination of public interest and the expropriation shall be carried out in compliance with the law.

If a public entity or the regulatory body issues, pursuant to the expropriation regulations, any legal instrument forfeiting or limiting any right of use in relation to built any facility constituting, directly or indirectly, the subject matter of a concession, the concessionaire concerned shall be entitled to a compensation which may not be lower than the market value, as determined by an independent financial adviser to be paid by the public entity.

Formation, organization and operation
Article 92

For the purpose of pursuing a concession activity, the concessionaire concerned shall establish an enterprise within 60 days from the date of the concession contract and the head office of such enterprise shall be in the Republic of Montenegro, unless the concessionaire concerned has already an enterprise established and registered for activities of a similar nature; therefore, the enterprise shall be operated and be otherwise organized and operated in conformity with the law of the Republic of Montenegro.

Changes
Article 93

The head office or status of a concession enterprise may be changed only after a prior approval by the regulatory body issuing the license for concession.

Dissolution of a concession activity
Article 94

In the event of dissolution of a concession enterprise, any private assets, property, movable or immovable, for the concession shall be offered to the public entity at the fair market value determined by a financial adviser; where, after sixty days of such offer, the public entity did not proceed with the buying, the private assets may be liquidated, or otherwise disposed by the concession enterprise in compliance with the law.

Expiration of a concession
Article 95

Any concession partnership may be terminated, as per the terms and conditions of the concession contract and by issuance of a decree, in the following cases:
1) Expiration of the concession contract;
2) Redemption of the concession;
3) Forfeiture of the concession;
4) For any other reason stipulated in the concession contract;
5) By mutual agreement.

Decision on the conditions for and modality of letting mineral raw material deposit
Article 96

For the purposes of this Law, the deposits shall be classified as follows:
1) Deposits whose exploitation was under way on the effective date of the concession agreement;
2) Deposit existing in the exploitation was under way on the effective date of this decision but not subjected to exploitation;
3) Investigated deposits in the exploitation fields which are not being exploited;
4) Deposits which have not been subjected to geological prospecting and which in the opinion of the ministry responsible for mining are suitable for being prospected and exploited on the basis of a concession contract.

The subject matter of any concession contract may be granting of the right of exploitation of the mines in which the exploitation of mine waste dumps has ceased.

The ministry responsible for mining shall present to interested legal entities and to the regulatory body the particulars about the deposits.

Where of public interest and where initiated by the regulatory organ, decision on sites may be subject to public hearings in compliance with this Law.

Crude oils or gas, under land or sea
Article 97

In the case of prospecting for, exploitation of crude oil and gas in the land and seabed exploratory location within the territory of the Republic of Montenegro, the special character of these types of operations, the operating continuity and the specific conditions necessary to result in investment, local or foreign, shall be taken into consideration.

Deposit under way
Article 98

In case of deposits whose exploitation was under way or deposits existing in the exploitation fields of mining enterprises, but not exploited on the effective date of this Law, the ministry responsible for mining shall have the right of offering mineral raw material to obtain offers for concession in compliance with this Law.

Geological prospective
Article 99

The ministry in charge of mining shall open competition for award of concessions in compliance with this Law, for the investigated deposits located outside the existing exploitation fields and for the deposits which have not been subjected to derailed geological prospective, which in the opinion of the ministry responsible for mining, may be suitable for prospecting, exploitation on the basis of concession contract.

Approval for deposit site
Article 100

In addition to the requirements under this Law, approval for deposit site shall be obtained from the ministry responsible for mining, prior to any seeking of offers, and the request for approval shall include the technical and financial information on the deposit constituting the subject matter of the concession to be offered.

Technical requirements for deposits
Article 101

In any technical report on any deposit that may constitute the subject matter of a concession, shall be included the following:

1) indication of the mineral raw materials involved;
2) name of the locality;
3) indication of the deposit together with a layout of the exploitation field involved at the scale of 1;10,000 delineated by control points;
4) coordinates and area particulars, proprietary situation particulars, on the infrastructure surrounding and any building located in the exploitation field;
5) deposit evidence of basic and detailed geological field;
6) deposit evidence of basic and detailed geological prospecting;
7) particulars on the quality and quantity of the mineral raw materials appraisal;
8) the cost effectiveness of exploitation;
9) duration of planned prospecting, exploitation;
10) expected compensation to be paid by the private investor or operator;
11) any requirements for any public entity to participate in the construction of infrastructure and acquisition of equipment;

The report on the deposit constituting the subject matter of concession shall be prepared by the ministry responsible for mining; where a concession is offered for prospecting and exploitation, the same report requirements shall apply, but shall be based on preliminary findings that are available before prospecting.

Technical commission
Article 102

The ministry responsible for mining shall establish a special technical commission responsible of examining the technical information submitted by participating investors and prepare a technical assessment report to be made available to all evaluators, prior to their undertakings of the examination, evaluation and comparison of offers in compliance with this Law.

Technical and financial reports
Article 103

In addition to the requirements under this Law and under the concession contract, any concession enterprise shall report by 15th March of each year a status report on technical and financial results of the concession.

CHAPTER EIGHT
BUILT-OPERATE-TRANSFER (BOT) ARRANGEMENT

Build-Operate-Transfer, BOT
Article 104

Any natural or corporate person, national or foreign, may be permitted to build-operate and transfer (BOT) a specified facility, installation or plant or infrastructure set out under a franchise regulated by the regulatory body established under this Law.

Type of permitted arrangements for BOT
Article 105

Are hereby permitted under this Law, Build, Operate and Transfer, BOT contract arrangement, under a franchise authorized by a regulatory body, whereby a private investor and /or operator is building and operating a public utility and, after a determined period, is transferring the ownership thereof to a public entity; BOT arrangements shall include Build-Lease and Transfer (BLT), Build-Transfer-and-Operate (BTO), Develop-Operate-and-Transfer (DOT), Rehabilitate-Operate and Transfer (ROT); tariffs payable by the clients shall be regulated by the contract entered into and shall be subject to the decision, after public hearings, of the regulatory body for the tariffs payable and the quality of the services to be delivered.

BOT System
Article 106

For the purpose of this Law BOT arrangements shall be understood to mean the letting of the construction of building, installation or plant on the basis of the BOT system (build-operate- transfer) under an agreement concerning the construction and financing of a complete building installation or plant, its operation and transfer to a public entity of the Republic of Montenegro within the contracted term.

Eligible types of project
Article 107

The construction, rehabilitation, improvement, betterment, expansion, modernization, operation, financing and maintenance, of the following type of projects which are normally financed and operated by the public sector which may be, under this Law, wholly or partly financed, constructed and operated by the private sector, including other infrastructure and development projects as may be authorized in compliance with this Law.

The following infrastructure or projects and related facilities shall be permitted:

1) highways including expressways, roads, bridges, interchanges, tunnels;
2) railways or rail-based projects packaged with commercial development opportunities;
3) non-rail mass transit;
4) port infrastructures like piers, wharves, quays, storage, handling, ferry services;
5) power generation and transmission;
6) telecommunications;
7) information technology;
8) water supply, sewerage and drainage;
9) education and health infrastructure;
10) tourism facilities and sites;
11) government or self-local government buildings;
12) housing projects for social security;
13) public markets;
14) warehouses and post-harvest;
15) environmental and solid waste management including collection equipment, composting plants, recycling and, incinerators.

Transfer
Article 108

After the expiration of the franchise period and upon recovery of the investment, the project company shall transfer, in compliance with the terms and conditions of the BOT contract, the entire facilities of such BOT project to the public entity in good condition and without any claim.

Payments from beneficiaries
Article 109

Within the BOT contract period or otherwise extended sufficiently for the recovery of investment, the project company shall operate lawfully and independently, and recover and obtain returns on its investment through payments received from the beneficiaries.

Minimum capital of an investor
Article 110

The registered capital of an investor shall not be less than 25% of its total investment.

The project company shall be entitled to the ownership and management rights of such facilities during the franchise period as determined under the BOT contract.

Examination and prior approval of projects
Article 111

Subject to Article 4 of this Law, prior to initiating any seeking of offers, a feasibility study report of a BOT project shall be proposed by the public entity for the examination and approval by the Privatization Council.

Preparation of documents
Article 112

Pursuant to Article 111 of this Law, upon obtaining approval for a BOT project, the public entity authorized to issue such BOT project shall start to prepare the pre-qualification documents and the bidding documents and submit such documents, for examination and approval, by the Privatization Council.

Pre-qualification of investors
Article 113

Before the seeking of offers, a pre-qualification of investors, local or foreign, or in joint venture, shall be conducted to invite investors intending to submit offers. For pre-qualification, an investor intending to submit an offer shall provide, in addition to the requirements under this Law, at least the following documents:

1) A legal background on their on-going operations;
2) Certification of experience and performance of similar contracts in nature and complexity;
3) Ability to organize and manage the BOT project; and,

4) Financial and credit status and evidence of available assets for the project.

Bidding for BOT
Article 114

In addition to the requirements under this Law for solicitation documents, shall be include herewith at least:

1) Feasibility study report of the BOT project;
2) Proposed schedule of the construction of the project;
3) Proposed billing standards and adjustment formula.

Feasibility study report
Article 115

Subject to Article 111 of this Law, the feasibility study report of the project shall include:

1) Survey of the project and target;
2) Assessment of the effects of the project on the environment;
3) Market demand for the project, as well as its costs and charges;
4) Description of project engineering and technical index, including the technology to be adopted;
5) Description of the project company, including engineering, construction and operation plans;
6) Financial analysis, including total investment, cost of labor and materials, financing scheme and cost, cash flow, internal rate of return, inflation rate, supposed foreign exchange rate and interest rate, analysis of risks and sensitivity; and,
7) Other items included in the feasibility study report.

Examination before award
Article 116

The BOT agreement shall be concluded in accordance with this Law; therefore, the public entity shall submit the outcome of the evaluation of offers and the BOT agreement, with the feasibility study report of the investor's project attached thereto, to the Privatization Council for examination and approval; after approval of the privatization Committee, the same documents along with the recommendation of the Privatization Council shall be made available to Government for final approval before award of the contract.

The BOT contract agreement
Article 117

BOT agreement shall be in compliance with the laws and other regulations in force and should at least include the following:

1) the names, places of residence and representatives of the legal persons of the relevant parties of the BOT agreement;
2) The content, conditions and terms of the BOT;
3) The duration of the BOT and the terms for the recovery of investment by the investor;
4) Project design, construction, operation and maintenance standards;
5) The schedule and extension of the project, and the outcome of termination;
6) The construction price of the project and the billing plan;
7) The criteria and procedure for handing the project over to the Government after the expiration of the term of the BOT;
8) The rights and responsibilities of the governmental organs;
9) The rights and responsibilities of the BOT project company;
10) The risk-sharing by category of risks;
11) The transfer of the rights and responsibilities of the project company.

Establishment of the BOT project company
Article 118

The investor approved to win the contract shall establish the BOT project company in accordance with the relevant laws and regulations of the Republic of Montenegro.

Franchise registration
Article 119

The Public Entity shall carry out franchise registration with the regulatory body for all BOT project agreements concluded pursuant to the provisions herein. To be a registered BOT agreement, a franchise shall be issued by the regulatory body; therefore an investor issued with the franchise shall be protected by the laws and regulations of the Republic of Montenegro.

Market demands
Article 120

Except in cases where the existing BOT project is unable to satisfy market demands, the governmental organs shall not approve any new competitive projects.

Supervision, examination and auditing
Article 121

The regulatory body shall be entitled to conduct supervision, examination and auditing of the BOT project company's operational activities.

Guarantees
Article 122

Except in the case of public private co-financing scheme, any governmental organ or any public entity shall provide any form of guarantee regarding the rate of return of the project investment. BOT contract arrangements shall be based on identified returns sufficient to reimburse investment, and where such returns are insufficient at expiration, extension shall be allowed for full recovery of the investment made by the private investor.

Customs and taxes
Article 123

The BOT project company shall pay customs and taxes in accordance with the provisions of laws.

Training, technology and data
Article 124

The project company shall be responsible for the training of the personnel required to assume independent responsibility for the operation and maintenance of the project after the transfer of the project. After the expiration of the term of BOT agreement, the project company shall, without reservation, hand over the technology and data of the operation and maintenance of the project to the government organs without any compensation.

Changes in policy
Article 125

The BOT project company shall be responsible of commercial risks such as project financing, construction, operation and maintenance through methods such as adjustment of the billing standards and the extension of the BOT term, authorized by the regulatory body; the public entity shall be responsible of the risks of the BOT project that are directly due to material effects resulting from changes in policy.

Applicable law and the settlement of disputes for BOT
Article 126

The BOT agreement's execution, performance, and interpretation, as well as the settlement of disputes, shall be in accordance with the laws of the Republic of Montenegro; in issues not yet regulated by the laws of the Republic of Montenegro, the best international practices such as the ones made under international convention or the latest "Acquis Communautaire" of the European Union shall prevail.

Court proceedings for BOT
Article 127

Any disputes arising during the performance of the BOT agreement or having connection with the this agreement shall be settled through consultation between the parties to the agreement in the presence of the regulatory body. If a settlement cannot be reached through consultation after 30 days, such disputes shall be submitted to a Court of the Republic of Montenegro and the latest UNCITRAL Arbitration Rules shall be applied, supplemented by the Supplemental Rules of the International Center for the Settlement of Investment Disputes (ICSID).

CHAPTER NINE
REGULATORY BODY

Powers
Article 128

Pursuant to this law the Government shall establish a regulatory body as an organ having powers to:

1) issue license for concession;
2) authorize franchise for BOT arrangements;
3) determine allowable increases, decreases or no change in tariffs payables;
4) determine and control quality standards of public services delivered;
5) promote operating efficiency of investment made by private investors;
6) monitor the private company performance and contractual compliance;
7) ensure public satisfaction of clients, receive complaints;
8) arbitrate disputes with consumers and ensure responsiveness to final customer needs;
9) impose sanctions on private investors for failure to meet regulated quality standards;
10) ensure assets serviceability;
11) organize and monitor public hearings.

For BOT or Concessions contract arrangements entered into under this Law, all functions and powers of the regulatory body herein established shall be, *mutatis mutandis*, on the regulatory body established by law to regulate for a specific sector.

Where no such regulatory body for a specific sector is established by law, the regulatory body herein established shall exercise all the powers and duties as imposed under this Law.

Members
Article 129

The members of the regulatory body shall ensure that the licenses and franchises permit the conduct of activities for development with the up-most transparency and integrity in full compliance with this Law.

The regulatory body shall comprise four permanent members and one ad-hoc member:

1) a Chairperson who shall represent the Government and who shall be a judge or an ex-judge;
2) a member who shall represent the Ministry of Finance;
3) two members who shall represent the Self-Local Governments; and,
4) an ad-hoc member from the public entity initiating a BOT or concession project

Decision shall be made on majority of votes, each member having one vote; quorum for decision and public hearings shall be 3 members; in case of equality of vote, the Chairperson shall have a casting vote.

Except for the ad-hoc member from the public entity initiating a project who shall be appointed by the head of the public entity, the members of the Regulatory Body, who shall not be elected persons, shall be appointed by the Government, in consultation with the President of the Republic and with the leader of the opposition parties, and on such terms and conditions as may be determined by the Prime Minister. Every member shall hold office for a period not exceeding 3 years and shall be eligible for one re-appointment.

The Government may, in consultation with the President of the Republic and with the leader of the opposition parties, at any time terminate the appointment of a permanent member who has been guilty of: any misconduct, default or breach of trust in the discharge of his duties; and an offence of such nature as renders it desirable that his appointment should be terminated.

The Regulatory Body may engage in compliance with the law, such number of persons as may be necessary, capable of assisting it with expert advice; such expert shall not have, in any matter, right to vote.

The Regulatory Body shall meet at such time and place, as the Chairperson deems fit and undertake public hearings in compliance with this Law and the rules made under.

Subject to Article 132 of this Law, the Government of the Republic of Montenegro shall determine the remuneration of the members of the Regulatory Body, for carrying out their duties under this Law.

Harmonization
Article 130

To maintain national harmonization, fair competition and for proper governance on decisions made, the regulatory body shall:

1) train regulatory staff;
2) publish local and regional performance indicators;
3) publish locally monitored activities and regulatory decisions;
4) report and monitor guidelines for comparable reports.

Criteria for selection
Article 131

Members and staff of the regulatory body shall be impartial and criteria for their selection shall be determined by the Government; the selection shall be made so as to ensure:

1) the protection of the legitimate interests of investors and freedom from political influence;
2) the protection of consumers' rights to receive public services from the operation at the level of quality expected and to complain when services are not delivered as expected;
3) that regulators be devoted to the responsible discharge of their regulatory functions;
4) that the regulatory body remains true to its mandate and fully accountable; tenure may be given for a fixed period and provide protection from arbitrary removal from office.

Funds and personal financial interests
Article 132

Except as otherwise authorized by the Government, the regulatory body shall be funded through direct levies on concession and BOT operations and not from public budgets; regulators shall have no personal, directly or indirectly, financial interest in any of the operations to be regulated; in addition, members shall have no personal interests for a period of three years on any BOT or concession contracts, after termination of contract and for a period of two years after termination of office.

Minimum tariffs payable by clients
Article 133

Notwithstanding any mutual agreement resulting to the contrary, for BOT arrangements, the tariffs payable by the clients or the consumers shall not be less than the tariffs determined under the BOT contract.

Notwithstanding any mutual agreement resulting to the contrary, for concession contract, the compensation payable by the investor or operator shall not be less than the compensation determined under the concession contract.

Accountability
Article 134

Any person may participate in the public hearings organized by the regulatory body; the public hearings shall be organized to permit the investors, the operators and the consumers to express their views before determining tariffs charged by the investors and operators for the public services provided to the consumers.

The regulatory body shall report annually to the Government on all their activities, including outcomes of public hearings.

Public hearings
Article 135

After a license or a franchise is authorized under this Law, public hearings shall be conducted in compliance with the rules made under this Law for tariffs or fees under BOT and Concession arrangements and for the compliance with standards on the quality of the services delivered, as determined by the contracting arrangements.

Appeal on decision
Article 136

Any investor, operator, consumer, client, group of clients or group of consumers may appeal a decision made by the regulatory body by a written request to the regulatory body for a final public hearing; where such request for appeal is made, the proceedings of the final public hearing shall be held not later than one month after receipt of such appeal request; decision made under such appeal shall not limit in any manner any decision made by a court.

Co-financing schemes for investment
Article 137

This article shall refer to major infrastructure projects BOT or Concession by a private sector investor and / or operator co-financed by a public entity, on prior approval of the Minister responsible for finance and the Regulatory body.

For co-financing schemes, the public entity shall collaborate with the Regulatory Body and the Ministry responsible for finance who shall be the organs for the preparation and approval of any co-financing scheme.

Where appropriate, the Ministry responsible for finance and the regulatory body may seek the participation of development banks or any other financial institutions for loans, credits or grants to be offered to a private investor without governmental or public entity guarantee.

Where risk capital is to be made available by a public entity or by the Government in the form of shares for a corporate body to be established for such a project, the Ministry of Finance and the Regulatory Body shall also seek the approval of the Government and ensure appropriation is made by the public entity or by the government to meet obligations.

Notwithstanding any conditions under loan, credit or grant of a banking institution or any condition under any co-financing agreement, the investor or the operator shall be authorized by a regulatory body to procure the goods, works and services required for the facility, using its own procurement procedures applicable by the private sector.

Where the goods, works or services required for the facility and to be financed partly by public or wholly by local, regional or international public funds, such goods, works or services shall be procured in accordance with the provisions of the public procurement law or of any treaty or agreement entered into with a co-financing development institution.

Where, exceptionally and after approval of the Government, a public entity contributes directly by risk capitals to own shares of an enterprise created for BOT or concession, a divestiture plan not exceeding fifteen years shall be proposed by the investor, as part of his offer, in the view that only the investor or the operator will own shares at time of the transfer of the facilities for BOT and at termination of the concession.

Competition for small projects
Article 138

Where projects of low complexity are prepared by a public entity and approved in compliance with this Law, with the aim to promote the participation of the private sector for the delivery of public services of such low complexity, competitive licenses, concession or competitive franchises for BOT may be offered by the regulatory body under open and fair competition, and after advertising for pre-qualification and offering in compliance with this Law, among investors and / or operators, only where the value of the total investment for such low complexity projects does not exceed 1 million DEM and the duration does not exceed ten years.

Competitive tariffs and fees for services
Article 139

Tariffs or fees for public services delivered shall be competitive with tariffs in force in the territory of the Republic of Montenegro.

Costs of licenses offered shall not be higher than licenses issued for similar services obtained in the territory.

Except in co-financing scheme, the project shall not create or result in public debt or any contingent liability on the part of the public entity and / or the Government.

Priority for project approval
Article 140

Special priority shall be given by the public entities and the regulatory body to not serviced localities and to indispensable public services contributing to economic stability or growth; for local development projects, the regulatory body and the self-local governments shall promote the use and the development of small scale BOT or Concession enterprise; under this section; in addition, any offer for any concession or BOT contract shall include subcontracting arrangements using such small scale enterprises for at least ten per cent (10 %) of the estimated total value of the contract.

CHAPTER TEN
FINAL PROVISIONS

Rules, regulations and forms
Article 141

The Privatization Council and the Regulatory Body pursuant to provisions of this law shall make such public solicitation rules, regulations under the guiding principles of accountability and transparency for purposes of this Law.

Article 142
Transparency

Any person who directly or indirectly, in any manner influences, or attempts to influence any officer or member taking part in any seeking of offers, whether or not his role is critical to the decision-making, with the object of obtaining an unfair advantage under this Law, shall commit an offence; any evaluator, supervisor of an ad-hoc evaluation committee, members of the regulatory body who directly or indirectly, in any manner influences, or attempts to unduly influence a supervisor, an evaluator, shall commit an offense.

The permanent members of the Regulatory Body, on assumption of duty shall take their respective solemn statement of office specified in the form set out in the regulations made under this Law; all experts or consultants engaged to deliver services that include access to confidential information shall comply with confidentiality obligations as set out in the contract documents and under this Law; all persons involved in seeking of offers shall be guided by the rules and by the code of ethics as laid down under this Law; the solemn statement taken under this article shall include an undertaking to be bound by the Code of Ethics under this Law.

The permanent members of the Regulatory Body shall file with the State Prosecutor a written statement of assets and liabilities not later than 30 days after appointment and upon termination of appointment; where, subsequent to a declaration made therefore, the state of assets and liabilities is so altered as to be reduced or increased in value by a prescribed amount, as set out by the State Prosecutor, a up-dated declaration shall be made; no declaration of assets and liabilities filed shall be disclosed to any person except with the express consent of the person concerned or by order of a Judge on reasonable cause shown.

Subject to a reasonable administrative fee, the public shall be given prompt access by the Regulatory Body to this Law, to up-dated provisions of this Law, to any legal instruments made under, to standard documents and forms, and to the annual reports; accessibility shall also be made possible by electronic mode of communication.

The Regulatory Body shall publish in the Official Gazette, not later than 45 days after such authorization or any changes made thereof:

1) information on Concession license and on BOT franchise being authorized,
2) any change made on tariffs or fees,.

Any public entity and the regulatory body involved in any seeking of offers or in any activity under this Law shall record and safeguard all relevant documents issued and received where they directly or indirectly relate to any activity undertaken under this Law; any person who, willfully or negligently, by any action or omission resulting in the non availability of any document or evidence shall commit an offense; all documents, of any type, shall be kept in safe condition for a minimum period of ten years after completion and payment of contracts and, be available instantaneously for review or audit or by any expert hired therefore in compliance with this Law; except for records, directly or indirectly, related to the national security, contractual documents for which the obligations are fully fulfilled, shall be made accessible to any person interested within two weeks from receipt of a written request; where the request concerns viewing only the documents, it shall be in the presence of an officer; where the request is to obtain copies thereof, it shall be subject to payment of reasonable fee.

Consultants, or any of their affiliates, shall not be hired for any assignment that would be in conflict with their previous and current assignment, and prior obligations to other clients, or that may place them in a position of not being able to carry out the assignment in the best interest of the public entity.

All private investors and operators, shall, under this Law, include in their offers a declaration that the content of their offers have been independently raised and prepared by certifying that no consultation has been made by other investors or operators and consequently that no unfair advantage is taken from unfair and non equitable competition.

For information, the regulatory body shall make available, at least once a year, a technical and financial report to the Government of the Republic of Montenegro on the implementation of each of any concession or BOT agreement, on any investment related thereto, and the any activities initiated by the Regulatory Body, including its own activities, and financial results therefrom.

Code of ethics
Article 143

The prime concern of all persons involved in solicitation activities shall be governed by principles of transparency and accountability.

All persons shall handle public solicitation by: ensuring adequate time for preparing offers; complying with this Law; maintaining strict confidentiality as requested under this Law; and maintaining ethical practices by developing and maintaining honest and professional relations with investors and third parties, by having an attitude that shall reflect this Law.

No person involved, directly or indirectly, in public solicitation shall accept any type or form of advantage from an individual or any type of organizations; any person, organization, entity, association or any other group of persons who is offered or received such gratuities shall refuse it and return it to the giver in a dignified manner, advising him in writing that this Law prohibits such reward or gift.

All persons involved, directly or indirectly, in matters of public solicitation shall be expected to be free from interests or relationships which are actually or potentially inimical or detrimental to the best interests of the Republic of Montenegro and shall not engage or participate in any commercial transaction involving the Government or a public entity in which they have any kind of financial interest.

A conflict of interest exists where a person:

1) possesses an interest outside his official duties that materially encroaches on the time or attention which should otherwise be devoted to affairs of Government;
2) possesses a direct or indirect interest in or relationship with an outsider which is inherently unethical or that may be implied or inferred to be, or make possible gain or advantage due to the person’s ability to influence dealings;
3) entertains relations which are unethical, rendering his attitude partial toward the outsider for personal reasons or otherwise inhibit the impartiality of the person’s business judgments;
4) presents, by acts or omissions, the public entity he represents or the Government in an equivocal, embarrassing or ethically questionable position;
5) entertains relations compromising the reputation on the integrity of the public entity he represents or the Government;
6) receives benefits by taking advantage of an opportunity that properly belongs to the public entity he represents or the Government;
7) creates a source of revenue or advantage by using public property which comes into his hands either in course of his work or otherwise; and,

8) discloses confidential information of his public entity to a supplier or to unauthorized persons.

Repeal
Article 144

The law on concession (Official gazette of the SRoM 13/91) shall be repealed as of the application date of this law.

Transitory provisions
Article 145

Any right or obligation subsisting at the commencement of this Law in favor of, or against any of the public entities shall, on commencement of this Law, be a right or obligation in favor of the same public entities.

Any situation which came into being but were not exercised before the entry into effect of this Law, shall remain in full force in conformity with the old legislation; but their exercise, duration and procedure to enforce them shall be regulated by this Law and by the Rules of Court; if the exercise of the right or of the action was commenced under the old laws, but is pending on the date this Law takes effect, and the rules and regulations were different from that established in this Law, the rules and regulations made under this Law shall apply.

Rules and regulations laid down or made under this Law which may prejudice or impair vested or acquired rights in accordance with the repealed legislation shall have no retroactive effect.

Commencement
Article 146

This Law shall take effect after eight days following its publication in the Official Gazette of the Republic of Montenegro, and shall be applied as of 1st July 2002.