The Client: Government of Montenegro
Directorate for Public Works, Podgorica

Prepared by: Energoprojekt – Hidroinženjering a.d. Beograd

ENVIRONMENTAL IMPACT ASSESSMENT

For the Regional Sanitary Landfill at the Možura Site, for the Municipalities of Bar and Ulcinj

Coastal Region of Montenegro

Energoprojekt – Hidroinženjering a.d.

Belgrade, April 2010

Contents

GENERAL

• Court Registry for Energoprojekt - Hidroinženjering a.d. Company

• License of Energoprojekt - Hidroinženjering a.d. Company

• License of the Review Processing Administrator

PART I

PART II

CHAPTER ONE

CHAPTER TWO

EXECUTIVE SUMMARY

The objective of a sound sanitary landfill design and operating practice is to minimize the impact of potentially polluting waste on the surrounding environment and to people living in the landfill's vicinity. The development of the new Možura landfill, including its construction, operation and management, is associated with a range of potential environmental impacts. The key environmental impacts (negative and positive) identified during this EIA were assessed as minimal, moderate or significant and are summarized in Table 1.1 below.

The key 'negative and positive' environmental issues highlighted in the table below represent the key areas where it is necessary to ensure the implementation of mitigating, management and monitoring measures in order to control these impacts, which are included in the conceptual design and environmental management plan, for the site of Možura.

Table 1.1

Impact	Potential Significance of Impact	Comments, Finding and Recommended Actions
Loss of land in productive use	**Minimal**	To the East end Northeast of the site shrub and pastures are located. The land on this particular site is not used for any commercial or agricultural activity. Since there is no agricultural land at this location, there is no impact on the quantity and quality or loss of agricultural land. There are no significant land use changes, because this land has not been cultivated for more than 30 years.
Creation of Opportunities for Local Employment (skilled/semi-skilled)	**Moderate**	There may be some employment opportunities for the local inhabitants during both the construction and operation of the site, depending on the required skill profile.

Reduction in Local Property Values	**Minimal**	The land has not been used for more than 30 years. The market price of land, per m^2, at this location is five times lower than in the surrounding area. Nearby, some research works are also carried out for limestone exploitation. It is thus unlikely that the price of land per m^2 in the wider vicinity (area beyond immediate impact zone) may decrease (e.g. plots in the coastal area) due to this activity.
Impacts on Human Health	**Minimal**	It is recommended to maintain a health-monitoring program in order to ensure that an early warning is given in the case of presence of any noxious or infectious substances that may have an adverse effect on the operating staff, and that the operational practices are maintained at a high standard in order to minimize possible health impacts. The operational practices, as proposed by the conceptual design, to minimize the potential risks for human health as a result of the sanitary landfill operation, include the following: ▪ A strict control of all entries to and exits from the site; ▪ The control of vermin, insects and birds by compacting the deposited waste, daily waste covering and a gradual filling of each cell; ▪ The provision of first aid facilities, and organization of regular medical examinations for the landfill personnel
Risk of Explosion at the Landfill	**Moderate**	In order to minimize the risks to human health from landfill gas, an active gas collection system was proposed by the conceptual technical solution. However, professional installation and maintenance of the gas collection system is essential to proper control of landfill gas, so that the qualified staff will need to be trained to carry out these duties.

Water Resources Contamination by Leachate Emissions	**Minimal**	When developing the site, it is proposed to install a low-permeability liner across the landfill bottom to prevent any leakages of leachate. The leachate will drain towards the lowest point at the site floor, where it will be treated so that the strict emission standards are met.
Odor Impacts	**Moderate**	At a landfill site, odors are generated as a result of movement, placement and decomposition of waste. The main method of reducing the generation of odors from the site is to fill the landfill site in small well-confined cells, and use daily covers to prevent any prolonged exposure of vulnerable wastes to the atmospheric impacts. Daily covers will consist of a mixture of clay and soil. The excavation material from the quarry bordering on the landfill could be used for landfill covering. The planning of the site in accordance with the highest standards for landfill gas collection will substantially reduce this risk, following the proposed conceptual technical design
Dust generation from the vehicle movements, placement of the waste, transportation of cover material, and the construction works at the site	**Moderate**	The dust generated during the construction phase and landfill operational may have a potential impacts on the Environment. The following measures will be applied in order to reduce the impacts on the environment: landfill covering and/or spraying water on the top of the landfill in dry weather conditions in order to reduce the potential for windblown dust, and spraying water over the site roads in dry weather conditions; landscape organization and planting of vegetation in order to hide the works from view from the nearby settlements (the distance to the nearest house is approximately 900m) at an early stage, which will also serve the purpose of protection against dust spreading.

Emission of the exhaust gases from vehicles	**Minimal**	As there are very few existing traffic movements and a few other air pollution sources in the vicinity of this area, the landfill-related vehicles are likely to generate most of the total emissions. Baseline levels of pollutants are low; the additional emissions from these landfill-related vehicles are highly unlikely to raise the level of air pollutants to an acute level.
Construction noise, vibrations from landfill development	**Moderate**	On the Southeastern side of the sanitary landfill 'of Možura there are two hills named Orlovo and Belvedere (449 m and 337 m above the sea level respectively), representing a natural barrier to noise spreading. The technical solution may consider some protective measures for the remaining borderline area of the location. The impact of noise will be especially felt by the people working on the site, but those effects are temporary. The noise impact on the population will not be significant since this location is distanced from the closest settlements.
The noise relating to the Možura landfill operation	**Minimal**	The expected highest noise levels from the land filling operations will be approximately equal to the worst-case scenario for the construction phase-related noises, although it is necessary to apply the same measures to protect the environment from the spreading of noise. In foregoing paragraph includes a description of the location for the ''Možura'' sanitary landfill (naturally protected by two hills), in this particular case the spreading of noise from the operational activity will be reduced down to a minimum.

Loss of flora and fauna habitats	**Minimal**	The impact on flora, fauna and geological conditions is assessed through loss or damage caused to the local plant and animal species and geological and paleontologic resources. This locality is not known for any protected or endangered resident plants or animal species. A relatively small area size of the landfill, including the adjacent facilities and an access road, has no impact on the vegetative cover and natural habitats. The trees will be planted as a natural fence around the landfill.
Increased traffic congestion along the main coastal highway	**Minimal**	The movement of waste collection vehicles will only have a small share in the total traffic volume along the main coastal highway, especially during the winter season, i.e. from September until May of the following year. Also in the summer season, from May to September, no traffic congestion can be caused by the waste collection vehicles.
Increased traffic congestion along the access road to the site	**Minimal**	Regarding the number of vehicles which will circulate at the landfill as well as the number of trucks which will transport the waste from different locations, it can be concluded that those can practically have no influence on any of the environmental aspects. Along the access road to the landfill, increased traffic impacts will manifest more during the summer season (for 3 months), whereas the situation will remain almost unchanged in the winter season (for 9 months), compared to the current one. Moreover, the access road to the landfill is for operational use only and would be used only rarely by other vehicles.

Loss of visual amenity during the site construction and operation	**Minimal**	The Možura site will visually change due to the disposal of around 1,100,638.6 m^3 of waste over the period of 28 years. The changes to the eco-system in a wider area will include: an insignificant change of the natural landscape into an anthropogenic one, as well as some insignificant changes to the topography, earth cover, microclimate characteristics, biocenotic conditions etc.; no temporary changes in the visual layout from the road and those in the landscape would be noticeable.
Wind-blown litter	**Minimal**	The potential for wind-blown litter will be significantly reduced by waste compacting following its deposition, application of daily covers, and the natural surroundings of the landfill. Also, the landfill is bordering on a quarry.[1]

[1] The Government of Montenegro, at its session held on 27 April 2006, before the landfill site for the Municipality of Bar and Ulcinj was identified, had adopted the Decision granting the concession for a detailed geological research and exploitation of non-metalic mineral raw materials, i.e. stone for technical and building purposes at "Možura- Orlovo" (Official Gazette of Montenegro 30/2006 of 8 May 2006).

Item 1.19. of this Decision stipulates that at the request of competent ministry "the activities of possible waste disposal at a regional or municipal sanitary landfill shall have precedence over the exploitation of stone, i.e. that the quarry site, necessary infrastructure and other requirements for the operation of this facility intended for the exploitation of technical and building stone shall represent no obstacle for a free operation of the future landfill ".

This condition is also stipulated under the Contract number 01-1705/7 of 30 June 2006 (Article 33) which was signed by the Ministry of Economy, on behalf of the Government of Montenegro, and the LLC " Montim d.o.o".- Belgrada, that was awarded the concession.
According to the Contract, the landfill project has the precedence over the quarry so that the quarry boundaries can be modified as required to make it possible both for the landfill and the quarry to be operated in this area, free of any potential cumulative impacts.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Based on this assessment, the following can be concluded:

1. The Možura regional landfill for the Municipalities of Bar and Ulcinj is expected to be used for a period of 20 years. A minimum operating life of the sanitary landfill (without a recycling centre) is expected to last for 23 years, whereas with a recycling centre it would be operational for 28 years.

2. There are many uncontrolled wild dumpsites that have existed for many years in this region. Per Government decision all illegal dumpsites and other uncontrolled and unprotected areas for garbage disposal in this region of Montenegro will be closed and rehabilitated. The Možura site is located within an area that was formerly used for agricultural purposes. Such activities were, however, abandoned about 30 years ago. The site is covered with typical Mediterranean flora with no identified endangered species.

3. The selected location of Možura has adequate characteristics for the construction of a sanitary landfill and its facilities. To achieve this conclusion, the main geographical, physical and biological factors were investigated: geological composition, geographic and geomorphologic and climate characteristics, the existing infrastructure, the current state of the environment, the safety of the surroundings and the landscape. There are no cultural and historical monuments or any protected natural resources in a wider area around the Možura site.

4. The proposed technical solution is usual for the selected disposal method and is based on the following: the landfill will consist of six separate cells, each with a stable foundation with sufficient bearing capacity, , an impermeable base layer, stable containment walls (stability proven also under seismic conditions) and a cover system consisting of intermediate / temporary covers during operation, and an impermeable, stable final cover once a cell is filled to capacity and finally closed.

5. In 2007, an annual quantity of municipal solid waste produced by the two municipalities was estimated to about 25,943 tons. The planned lifetime of this landfill is 20 years. According to the data on the produced and recycled quantities of solid municipal waste (Tables 3.1/3 and 3.1/4) for the period of 28 years, with a recycling centre, 804.560,4 tons of solid municipal waste will be disposed. This quantity of waste equals the volume of 804,560.4 x 1.2 = 965,472.5 m^3, which corresponds to the density of compacted material of 0.83 tons/m^3. Around 14% of inert material for the covering of waste should be added to the calculated quantity

of disposed municipal waste (in m^3), which, including the inert material, amounts to approximately 1,100,638.6 m^3.

6. The solid waste that is disposed on the landfill is covered on daily basis with a 0.1 m deep layer of inert material or soil. When a layer of disposed waste is finalized, it is topped with a 0.2 m deep final layer. After its closing, the landfill will be permanently rehabilitated. A stratum of clay or some other material whose main purpose would be to prevent the storm water from entering the waste will be extended on the top of the compacted final layer. The insulation layer will be topped with a stratum of humus.

7. In order to provide for a complete protection of the human environment, an environmental monitoring program (including the environmental compartments such as: water, air, soil and noise) was prepared. The program is designed to obtain the data, based on the selected quality indicators, on potential leachate infiltration outside of the landfill, water quality, critical gas concentration, climate conditions, air and soil quality. Furthermore, some sanitary protection measures will be applied, including the technical and aesthetical ones, such as afforestation of the peripheral parts of the landfill and the landfill itself, upon its closing.

8. The procedure to assess an impact of the Možura Regional Sanitary Landfill Project for the Municipalities of Bar and Ulcinj on the environment was conducted in accordance with the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), which is harmonized with the EU Directives (97/11/EC; 2003/35/EC; 2003/4/EC; EESPO/1991).

9. The Environmental Impact Assessment was made available for review by the concerned public in the premises of the Environmental Protection Agency, the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment, the Municipality of Bar, and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj. 11 January 2009 was set as the time limit for the public review and the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection. During the public consultations, the object Environmental Impact Assessment was reviewed by no representative of the concerned bodies and organizations or the public.

10. The documentation relating to the conducted public consultation procedure is enclosed with this document.

11. In conclusion:

- The selected location is adequate for the construction and exploitation of a sanitary landfill. It was determined to be the most suitable among a number of alternatives investigated in the municipalities' territory. A detailed account of the selection criteria and the ranking performed is described in Table 1-1 below.

- The technical solution provides for a full protection of the environment. However, both civil works for construction as well as all procedures for operation need to be carried out diligently and according to good practice, fully controlled and supervised in accordance with the prepared final design.
- One key factor to achieving diligent operation will be an obligatory training of the landfill operating staff.
- The construction of a sanitary landfill and rehabilitation of the existing uncontrolled dumpsites in the area of Bar and Ulcinj will have a significant net-positive environmental impact.

PART I

1. INTRODUCTION

1.1 SCOPE OF EIA

This Environmental Impact Assessment (EIA) was prepared by Energoprojekt – Hidroinženjering a.d.Beograd, for the regional sanitary landfill for the Municipalities of Bar and Ulcinj in the coastal region of Montenegro.

Preparation of an Environmental Impact Assessment for the construction of a regional sanitary landfill at the Možura site in the Municipality of Bar was requested by the Directorate for Public Procurement of the Government of Montenegro. This EIA also fulfills the World Bank's requirements for safeguards documentation under its operational policy on environmental assessments, OP4.01.

The Možura site in the Municipality of Bar was chosen for the construction of a sanitary landfill following an analysis of other potential landfill sites in the Municipalities of Ulcinj and Bar (the alternative locations were ''Goran'' and ''Kruče''), which was carried out in order to identify possible locations that would best suit this purpose.

1.2 PUBLIC CONSULTATIONS

There is a general lack of experience in public debate and consultations among the Montenegrin public regarding sanitary landfill projects. Until 2004, no sanitary landfill licensed and diligently operated according to good international practice existed in Montenegro. There were only municipal and illegal waste dumps which were neither managed nor subject to disposal control. This was only the second time for public consultations regarding a sanitary landfill project to be undertaken in Montenegro, and the public was not experienced in responding to such a situation. In general, the main issue concerns a general misunderstanding regarding the distinction between a dumpsite and a sanitary landfill.
Since 2002 the following public consultations relating to similar subject matters have been organized in Montenegro:

- Public consultation meetings for the citizens of the Municipality of Kotor, i.e. the village of Kavac which is situated in the vicinity of the Lovanja site.
- Public consultation meetings for the citizens of the Municipality of Bar.
- Public consultation meetings for the citizens of the Municipality of Ulcinj.

The public consultations relating to the EIA for the regional sanitary landfill for the Municipalities of Bar and Ulcinj were organized by the authorities of Montenegro, i.e. the

Ministry of Tourism and Environmental Protection. The landfill was planned to be constructed on the cadastral lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

The Ministry of Tourism and Environmental Protection of Montenegro, in accordance with the Law on Environmental Protection of Montenegro and the World Bank's OP 4.01, notified the concerned public, public organizations, local authorities and NGOs about the time and venue of the public consultation meeting concerning this EIA. The draft EIA was made available for review at the premises of the Environmental Protection Agency, and the Secretariat for Spatial Planning of the Municipality of Bar and Ulcinj, respectively. An invitation for public review and consultation was announced in the most read daily newspapers in Montenegro, as follows:

- Daily Newspaper ''Pobjeda'', on 24–25 December 2008
- Daily Newspaper '' Vijesti'', on 27 – 28 December 2008
- Daily Newspaper ''Dan'', on 26 December 2008

as well as in other public media such as the local radio stations of Bar and Ulcinj.

The public review lasted until 11 January 2009 but was attended by no representative of the concerned public, hence the EIA was reviewed by no member of the public during the public consultation process.

In agreement with the Project Bearer, a public consultation meeting was held on 16 January 2009 in the conference room of the Municipality of Bar at 1 p.m.

The Minutes of the public consultation meeting are enclosed to this EIA as Annex II

1.3 DATA COLLECTION

Within the scope of this project, a survey was carried out in order to identify the characteristics of the baseline environment at the "Možura" site. The data were collected from the available maps and surveys, through on-site visits, field surveys, and discussions with the national, regional and local officials. A complete list of references is provided in Annex I.

The data collection process was carried out through an active support by and coordination with the following institutions:

- The Ministry of Tourism and Environmental Protection of Montenegro;
- The Ministry of Agriculture, Forestry and Water Management;
- The Institute for Public Health (Center for Health Ecology);
- The Institute for Technical Research of Montenegro;
- The Institute for Nature Protection;
- The Hydro Meteorological Service of Montenegro;
- The Centre for Eco-Toxicological Research

- The Institute of Biology of Montenegro

2. INSTITUTIONAL AND LEGISLATIVE FRAMEWORK

2.1 NATIONAL ENVIRONMENTAL INSTITUTIONS AND LEGISLATION

The Environmental Law of Montenegro, Official Gazette of Montenegro 12/96 and 55/00, and Article 88 item 2 of the Constitution of Montenegro.

Relevant sections of this Law are listed here below:

Part I, General Provisions
Article 2 clearly states that 'Montenegro is envisaged as an Ecological State'.

Article 3
'The national authorities works to upgrade the quality of human environment, reduce all factors that have a negative impact on human life and health, eliminate and prevent any harmful effects on the human environment in order to facilitate and upgrade the quality of living.
The human environment in the sense of this law represents the natural surroundings, air, soil, water and the sea, vegetation and live stock, natural phenomena, climate, ionic and non-ionic emissions, noise, vibration, including those created by human communities such as towns and other settlements, cultural and historical heritage, infrastructure, industrial and other facilities.'

The objectives of this Law are identified under Article 5 and 6.

Article 7
'The basic principles of protection of the human environment are the following:
1. Preservation of natural heritage;
2. Biodiversity;
3. Reduction of risks;
4. Assessment of negative impacts.
While planning and executing the activities that may have a negative impact on the human environment, a preliminary assessment procedure needs to be undertaken.
5. Alternative solutions – where the technologies and activities having a negative impact on the human environment can be replaced by other solutions involving considerably lower risk factors, those have to be applied even if more costly .
6. Substitution of the chemicals
7. Reuse and recycling: substances that can be reused, recycled or bio-processed shall take precedence over other methods provided that the related costs are proportional to the value of the protected object.
8. The polluter pays principle: the polluter pays a fine for polluting the environment and possibly causing damage to the human environment.

9. Consumer-paid fines;
10. Security;
11. Data transparency.
The data referring to the human environment have to be publicly disclosed. Every person has the right to be informed about the state of the human environment and included into the decision-making process where an activity may have a negative impact on the human environment.'

Article 8 paragraph 8
The term "waste" relates to the substances and items resulting from the process of production and consumption of goods. According to its characteristics, waste can be classified as:
- Solid waste
- Liquid waste
- Gas waste
Waste can be also classified as hazardous, special and radioactive waste.'
Part II, Specified protection measures, prohibitions and restrictions
Article 9 relates to the prohibited actions. Paragraph 6 stipulates that the 'disposal of all types of waste is prohibited at any location other than the one previously designated for such a purpose'.
Whereas general restrictions are stipulated under Article 10, 'Local government units and organizations whose basic activity is to protect some specific parts of the natural heritage adopt specific protection programs according to the ecological program defined under Article 11 of this Law and according to their specific interests'.
Two or more regional local self- government units may pass a common protection program provided that it is in their mutual interest.
Protected Natural Goods
Article 15
Natural goods that are regarded as an object of interest of the State, and that are under special protection are the following:
- Nature reserves
- National parks
- Protected plant and animal species
- Natural monuments
- Parks
- Regions with special natural characteristics

Quality standards are stipulated under Articles 16, 17, 18 and 20.
- Quality standards
- Emission standards
- Production process standards
- Standards relating to an assessment of negative impacts

Articles 25 and 26, Part III, Notification System.
Part IV, Providing Information and Data Transparency
Part V, Responsibility for the pollution of human environment

Part VI, Financing
Part VII, Non- governmental ecological organizations
Part VII, Supervision
Part IX, Fines
Part X, Transitional and final provisions

The Regulation on Environmental Impact Assessment of Montenegro was published on 16 May 1997 and updated in 2005 (Official Gazette of the Republic of Montenegro 14/97 and 80/05). The EIA regulations provide a list of projects for which EIA reports are required, outline the contents of an EIA report and the related studies, and describe the authority and procedure for their approval.

During the construction phase, the facilities such as a landfill for the disposal of municipal solid waste need to meet a great number of criteria and restrictions so that such a facility may satisfy the requirements of environmental protection following its construction, i.e. during the exploitation and post-exploitation phase.

At the very beginning, it is necessary to comply with the Environmental Law prohibiting the disposal of all types of waste within the framework of environmental protection, other than at the pre-selected locations (Article 9 paragraph 1 point 5 of the Law). This assumes that the investor has to select a location in accordance with the urban planning documentation (Article 58 and Article 59 of the Law on Spatial Planning) and obtain an approval of the environmental impact assessment for the sanitary landfill construction and exploitation (Article 19 of the Environmental Law). One of the fundamental principles for the selection of a particular location where some activity is to be performed, such as the selection of a landfill site, relates to the requirement to consider some alternatives. According to the local legislation and particularly the EU legislation, consideration of various alternatives represents one of the most important instruments to indicate the quality of the chosen location in relation to the other locations that were analyzed, which needs to be done through a public process. In this way, possible conflicts between the investors and the public that is interested in an issue are avoided. This criterion for the related specifications is of a vital importance for the construction of a structure. On the basis of the above stated, it is clear that this process must be transparent.

The landfill siting is subject to some limitations, so that no landfill can be located within a water source protection zone, in the protected area, in water-flooded areas, near the rivers and natural wells, on the slopes descending towards a river with a gradient of more than 10 %, etc.

A very important criterion for the landfill construction is the protective zone surrounding the landfill, which has to be formed. The basic criteria defining a protective zone are the following: a landfill must be at least 500 m away from an urban or industrial structure; 1000 m from an inhabited settlement; 100 m from a public road; 3000 m from a drinking water source; and 1000 m from the coast.

The limiting factor for a landfill construction relates to the fact that the building material has to be selected so that only municipal waste can be disposed of on the landfill, which is in accordance with the EU directives, so that no hazardous waste is allowed to be disposed of at the landfill under any circumstances.

The leachate must be collected and treated so that it meets the criteria stipulated by the Regulation on Wastewater Quality, so that it can be discharged into the natural environment or the public sewerage system.

Besides the legal limitations, limiting factors may also include the following: the required infrastructure for landfill operation at the proposed location in not in place. This will increase the building costs for this landfill, which may be considered as a limiting factor.

The Environmental Impact Assessment for a sanitary landfill at the Možura site – Bar was developed in accordance with the following

The Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05)

Although this Law was adopted in 2005, its implementation started on 1 January 2008. This Law is fully harmonized with the EU directives regulating this area.

The Law stipulates the procedure for an impact assessment for the projects that may have a significant impact on the environment, the contents of the environmental impact assessment, involvement of the concerned stakeholders and organizations and the public, the procedure for making an assessment and the issuing of approvals, and for notification about the projects that may have a significant impact on the environment of another country, including supervision, as well as other issues of significance for environmental impact assessment.

When assessing an impact on the environment in every particular case, this Law specifies both direct and indirect impacts that a project may have on the human life and health, the soil, the water, the air, the climate and the landscape, as well as an impact on the material resources and cultural heritage.

2.2 WORLD BANK GUIDELINES FOR ENVIRONMENTAL ASSESSMENT

According to the Terms of Reference for this project, the EIA should be prepared in compliance with the World Bank Guidelines for EIA set out in the World Bank Operational Policies (OP) 4.01 of October 1991, and revised in 2004.

The Guidelines point out that the purpose of an EIA is to improve the decision-making process and to ensure that the project options under consideration are environmentally sound and sustainable. An EIA should identify the ways to improve the environmental aspects of a project, by introducing some measure to minimize, mitigate or compensate for any adverse impacts.

According to the World Bank Operational Policies 4.01, a project-specific EIA should normally include the following:

a) Executive summary, discussing the finding and recommended actions.

b) Policy, legal and administrative framework;

c) Project description;

d) Baseline data;

e) Environmental impact

f) Analyses of alternatives

g) Environmental management plan

h) Appendixes

List of EIA reports
- References, written materials published and unpublished
- Records of interagency and consultation meetings
- Tables presenting relevant data referred to or summarized in the main text
- List of associated reports.

According to the Guidelines, the level of actual EIA should be based on the expected environmental impacts. The classification of each proposed project depends on the type, location, sensitivity, and scale of the proposed project, as well as the nature and magnitude of its potential impacts.

Sanitary landfill projects are typically defined as Category "A" projects under the Guidelines. Such projects should be subject to a full environmental analysis through the planning and implementation phases.

2.3 NATIONAL SOLID WASTE REGULATIONS

The Rulebook was published in the Official Gazette of the Republic of Montenegro 80/05 of 12 December 2005 - The Rulebook on sanitary and technical specifications that need to be fulfilled in order to facilitate a proper landfill and/or dumpsite operation, on operational and maintenance standards and methods for solid waste testing.

The Waste Management Law (Official Gazette of the Republic of Montenegro 80/05)

This Law was adopted on 28 December 2005, whereas its application started on 1 January 2008, due to an absence of the conditions for its implementation.
This Law regulates the following: types of waste; methods for waste classification; preparation of a waste management plan; provision of the conditions for waste handling; the rights, obligations and responsibilities of legal entities and natural persons relating to waste management; the requirements for and the method of issuing permits; the principles for management of special types of waste; waste incineration; waste depositing and storage; cross-border movement of waste; sources of finance; and the competent authorities that will supervise the implementation of the Law.
Therefore, this Law stipulates the procedures for waste management and establishment of the conditions for waste management, as well as other significant issues. For example, Article 59 paragraph 1 specifies the following requirements: "the competent public administration authority, in collaboration with other authorities of public administration, shall specify in greater detail and on the basis of a special regulation the site characteristics (geological, hydrological, morphological, meteorological, seismic, and other characteristics), building requirements, sanitary and technical requirements, the method of landfill operation and closing, training and professional qualifications of landfill managers, and similar.

This Law is based on the UN development laws. The provisions of this Law are mostly of a general nature, including no particular technical specifications relating to the protection of human health and the environmental. The national Law on Solid Waste that was published in the Official Gazette of the Republic of Montenegro 80/05 is harmonized with the relevant EU directives –specified in Annex I.

2.4 THE EU-DIRECTIVES 1999/31/EC, 2006/12/EC and 2008/98/EC

According to requirements of the foregoing EU Directives, and in order select the most suitable site for a landfill, all technical aspects, such as the base sealing, leachate drainage, surface water drainage, gas evacuation, final cover, observation wells (environmental arrangements), access roads to the site and, if necessary, groundwater drainage, need to be thoroughly engineered. The requirements stipulated by the Regulation of the EU-Directive 1999/31/EC, relating to those items, are explained below. These requirements are fully in accordance with the 2006/12/EC and 2008/98/EC.
The Government of Montenegro, represented by the Ministry of Tourism and Environmental Protection, will keep track of every change and amendment to the EU

Directives, promptly act accordingly and follow the related recommendations for possible amendments.
The major components of the adopted EU Waste Framework Directive of 2008 are the following:

- reinforcement of the existing 5-step waste hierarchy
- compulsory establishment of waste prevention objectives for Member States in their waste prevention programs and for the EU by 2014
- clarification of the definition of recycling to exclude energy recovery and reprocessing into fuels or backfilling materials
- establishment of new recycling targets for household waste as well as construction and demolition waste
- requirements for separate collection
- possibility for EU to adopt "end-of-waste" criteria with harmonized standards for recycled materials to be considered products rather than waste.
- inclusion of some municipal solid waste incineration facilities in the list of recovery operations as opposed to disposal operations
- inclusion of the concept of "by-products"

General Requirements For All Classes of Landfills

1. Location

The location of a landfill must take into consideration the requirements relating to:

- The distance from the site boundaries to any residential and/or recreational areas, waterways, water bodies and other agricultural or urban sites;
- The existence of groundwater, coastal water or nature protection zones in the area;
- The geological and hydro geological conditions in the area;
- The risk of flooding, subsidence, landslides or avalanches on the site;
- Protection of the nature and/or cultural heritage in the area.

The landfill can be authorized only if the characteristics of the site with respect to the abovementioned requirements, or the corrective measures to be taken, indicate that the landfill does not pose a serious environmental risk.

2. Water Control and Leachate Management

Appropriate measures shall be taken, with respect to the characteristics of the landfill and the meteorological conditions, in order to:

- Control water flows originating from the rainfall entering the landfill body;
- Prevent surface water and/or groundwater from entering into the landfill waste;
- Collect contaminated water and leachate. If an assessment based on consideration of the location of the landfill and the waste to be accepted shows that the landfill poses no potential hazard to the environment, the competent authority may decide that this provision does not apply,
- Treat the wastewater and leachate collected from the landfill so that the appropriate wastewater discharge standards are met.

The above provisions may not apply to landfills for inert waste.

3. Protection of Soil and Water

A landfill must be situated and designed so as to meet the necessary conditions to prevent the pollution of soil, groundwater or surface water and ensure an efficient collection of leachate as and when required according to Section 2. The protection of the soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a top liner during the passive phase/post closure.

3.1 The geological barrier is determined by geological and hydro-geological conditions below and in the vicinity of a landfill site providing sufficient attenuation capacity to prevent a potential risk to soil and groundwater.
The landfill base and sides shall consist of a mineral layer which satisfies the requirements of permeability and thickness, with a combined effect in terms of protection of the soil, groundwater and surface water at least equivalent to the one resulting from the following requirements:

- Landfill for hazardous waste: K <= 1.0 X 10^{-9} m/s; thickness a 5 m,
- Landfill for non-hazardous waste: K <= 1.0 X 10^{-9} m/s; thickness >= 1 m,
- Landfill for inert waste: K <= 1.0 X 10^{-7} m/s thickness >= 1 m, m/s - meter/second.

Where the geological barrier does not naturally meet the above conditions it can be completed artificially and reinforced by other means giving equivalent protection. An artificially established geological barrier should be no less than 0.5 meters deep.

3.2 In addition to the geological barrier described above, a leachate collection and sealing system must be added in accordance with the following principles so as to ensure that leachate accumulation at the base of the landfill is kept to a minimum:

Leachate Collection and Bottom Sealing

LANDFILL CATEGORY	NON HAZARDOUS	HAZARDOUS
Artificial sealing liner	Required	Required
Drainage layer >= 0,5 m	Required	Required

Member States may set out some general or specific requirements for inert waste landfills and for the characteristics of the abovementioned technical means. If the competent authority, having considered the potential hazards to the environment, finds that the prevention of leachate formation is necessary, a surface sealing may be ordered. The following recommendations apply to surface sealing:

LANDFILL CATEGORY	NON HAZARDOUS	HAZARDOUS
Gas drainage layer	Required	Not required
Artificial sealing liner	Not required	Required
Impermeable mineral layer	Required	Required
Drainage layer >= 0,5 m	Required	Required
Top soil cover > 1 m	Required	Required

3.3 If, on the basis of an assessment of environmental risks and in particular taking into account the Directive 80/68/EEC (l), the competent authority decides in accordance with Section 2 ('Water Control and Leachate Management'), that no collection and treatment of leachate is necessary, or where established that the landfill poses no potential hazard to soil, groundwater or surface water, the requirements from paragraphs 3.2 and 3.3 may be reduced accordingly. In the case of landfills for inert waste these requirements may be adapted by national legislation.

3.4 A method to be used to determine a landfill permeability coefficient, in the field and for the whole extension of the site, is to be developed and approved by the Committee set up under Article 17 of this Directive.

4. Gas Control

Appropriate measures shall be taken in order to control the accumulation and migration of landfill gases.
Landfill gases shall be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and used. If the gas collected cannot be used to produce energy, it must be flared. The collection, treatment and use of landfill gas under paragraph 4.2 shall be carried on in a manner which minimizes the damage to and/or deterioration of the environment and a risk to human health. (OJ L 20, 26.1.1980, p. 43. , Directive as last amended by Directive 91/692/EEC (OJ L 377, 31.12.1991, p. 48)).

5. Difficulties and Hazards

Measures shall be taken to minimize the difficulties and hazards arising from the landfill through:

- Emissions of odors and dust;
- Wind-blown materials;
- Noise and traffic;

- Birds, vermin and insects;
- Formation and aerosols;
- Fires.

The landfill shall be equipped so that no dirt originating from the site is dispersed onto the public roads and the surrounding land.

6. Stability

The emplacement of waste on the site shall take place in such a way as to ensure the stability of the mass of waste and associated structures, particularly with respect to the avoidance of land sliding. Where an artificial barrier is established it must be ascertained that its geological substratum, considering the morphology of the landfill, is sufficiently stable to prevent any settlement that may cause damage to the barrier.

7. Barriers

The landfill shall be secured to prevent a free access to the site. The gates shall be locked outside operating hours. The system of control and access to each facility should contain a program of measures to detect and discourage illegal dumping within the facility.

PART II

LAYOUT OF THE PART II

Part II of the EIA is divided into three Chapters. The structure of Part II, following this introductory discussion, is as follows:

▪ Chapter 1

This section discusses some alternatives to the project, in accordance with the World Bank Operational Policies 4.01 (OP 4.01.). This section presents the rationale for the development of the selected sanitary landfill location.

▪ Chapter 2

This section presents the Environmental Impact Assessment for the proposed landfill at the Možura site. The environmental assessment comprises a description of the baseline environmental conditions proposed by the conceptual design and operational management procedures, potential impacts and their significance. The section also comprises a discussion on the requirements for environmental management, mitigation and monitoring, and concludes by identifying the key issues requiring further attention at the detailed planning stage.

▪ Chapter 3

This section presents an Environmental Management Plan for the construction, operation and management of the new regional sanitary landfill at Možura, based on the recommendations, findings and conclusions from the proposed conceptual design.

CHAPTER 1

1. PROJECT ALTERNATIVES

The framework for waste management policy in Montenegro includes the Law on Waste Management (Official Gazette of the Republic of Montenegro 80/05), the National Strategic Master Plan for Waste Management (December 2004), the Waste Management Study prepared for Montenegro for the purpose of drafting of a Physical Plan by the University of Montenegro (July 2005) and the Waste Catalogue of Montenegro.

Before 2004 no sanitary landfill existed in Montenegro. There were only municipal and illegal waste dumpsites which were neither managed nor subject to any disposal control. There is no accurate record of the number of illegal disposal sites, but it is well known that every urban settlement in Montenegro has at least one main dumpsite and a number of illegal waste dumpsites.

In 2004, the first inter-municipal temporary sanitary landfill for municipal waste was planned at the site of ''Lovanja'', for the municipalities of Kotor, Budva and Tivat, and the conditions were created for the rehabilitation and construction of an inter-municipal sanitary landfill for municipal waste in Podgorica.

The Waste Management Concept contained in the Physical Plan of Montenegro until 2020 (Official Gazette of Montenegro 24/08) presented 8 inter-municipal landfills for municipal waste for the following municipalities:

1. Bar and Ulcinj
2. Kotor, Budva and Tivat (possibly not including Herceg Novi)
3. Herceg Novi
4. Podgorica, Danilovgrad, Cetinje
5. Nikšić, Plužine and Šavnik
6. Pljevlja and Žabljak
7. Kolašin, Mojkovac and Bijelo Polje
8. Berane, Rožaje, Andrijevica and Plav

Since the problem of solid waste management in Montenegro is highly existent and requires an urgent implementation of the appropriate measures, having recognized the problem, the World Bank allocated some funding to the Government of Montenegro to implement the following two projects: Montenegro Environmental Infrastructure Project (MEIP) and Montenegro Environmental Sensitive Tourist Areas Project (MESTAP),

aimed at improvement of municipal solid waste management services in the Coastal Region of Montenegro.

The Southern part of the Montenegrin Coast, including the municipalities of Bar and Ulcinj, represents an attractive tourist area and, for the purpose of further development of this area, it is necessary to develop all infrastructural elements such as water supply, waste water treatment, solid waste disposal, communications, roads … etc.

1.1 CURRENT SITUATION

This chapter presents a short description of the current waste disposal sites in the municipalities of Bar and Ulcinj (photo archives).

The current situation in these municipalities, as well as in the entire country, is characterized by poor solid waste managing practices, which jeopardizes the human health and the environment. The solid waste is collected in an organized manner only in urban areas. There is no organized method of waste collection in the rural areas. There is no separate system for the collection of dangerous waste. The frequency of waste collection is not determined by needs, since it depends on the capacities of the municipal services. There are no sanitary landfills, only some dumpsites for the disposal of municipal waste.

The municipal waste that is collected from the Municipalities of Bar and Ulcinj is disposed at the municipal waste disposal sites whereby the water, air and land are significantly polluted.

The current dumpsite in the Municipality Bar (the site of Goran) can be described as an open dump, continuously burning, with no soil cover, and with the trucks dumping solid waste down a steep cliff in the vicinity of the coast. It has been used for 1 year and is located near a dumpsite that had been used for more than 15 years. It does not affect the water supply system while its impact on the quality of the seawater is still unknown, as no research has been done so far.
The current dumpsite in the municipality Ulcinj (the Kruče valley) can be described as an open dumpsite, continuously burning. The road at the dumpsite is only partly covered by the soil and used by the trucks and bulldozers which operate on the dumpsite. The waste is disposed of from the road and unloaded into the valley. It is located on a terrain made of clay, in the vicinity of some villages. It affects no surrounding water sources. The EU Directive1999/31/EC of 26 April 1999 provides the recommendations for solid waste disposal, including (as amended in 2006 and in 2008) the following:

- Geological features of the terrain;
- Basic layers of the landfill and the terrain;
- Drainage of the terrain;
- Landfill gases;
- Landfill-associated risks;
- Landfill monitoring program, etc.

According to these recommendations, it can be concluded that the foregoing conditions are met by no aforementioned dumpsite. All recommendations of the EU will be met by the regional sanitary landfill of Možura for the Municipalities of Bar and Ulcinj, according to the solution provided by the conceptual design and the considered alternatives.

1.2 AN ANALYSIS OF ALTERNATIVE LOCATIONS FOR THE SANITARY LANDFILL

In the process of consideration of potential locations for the sanitary landfill siting, the sites of ‘‘Kruče’’ and ‘‘Goran’’ were also considered, as described in the following chapter:

- An analysis of the situation in the area of the Municipalities Bar and Ulcinj, “without a design”
- A brief description/analysis of the site of ‘‘Goran’’ in the Municipality of Bar, as a potential sanitary landfill site;
- A brief description/analysis of the site of ‘‘Kruče’’ in the Municipality of Ulcinj, as a potential sanitary landfill site;
- Description of the selected site

The alternative locations for the sanitary landfill are shown on Figure 2.2.1/1.

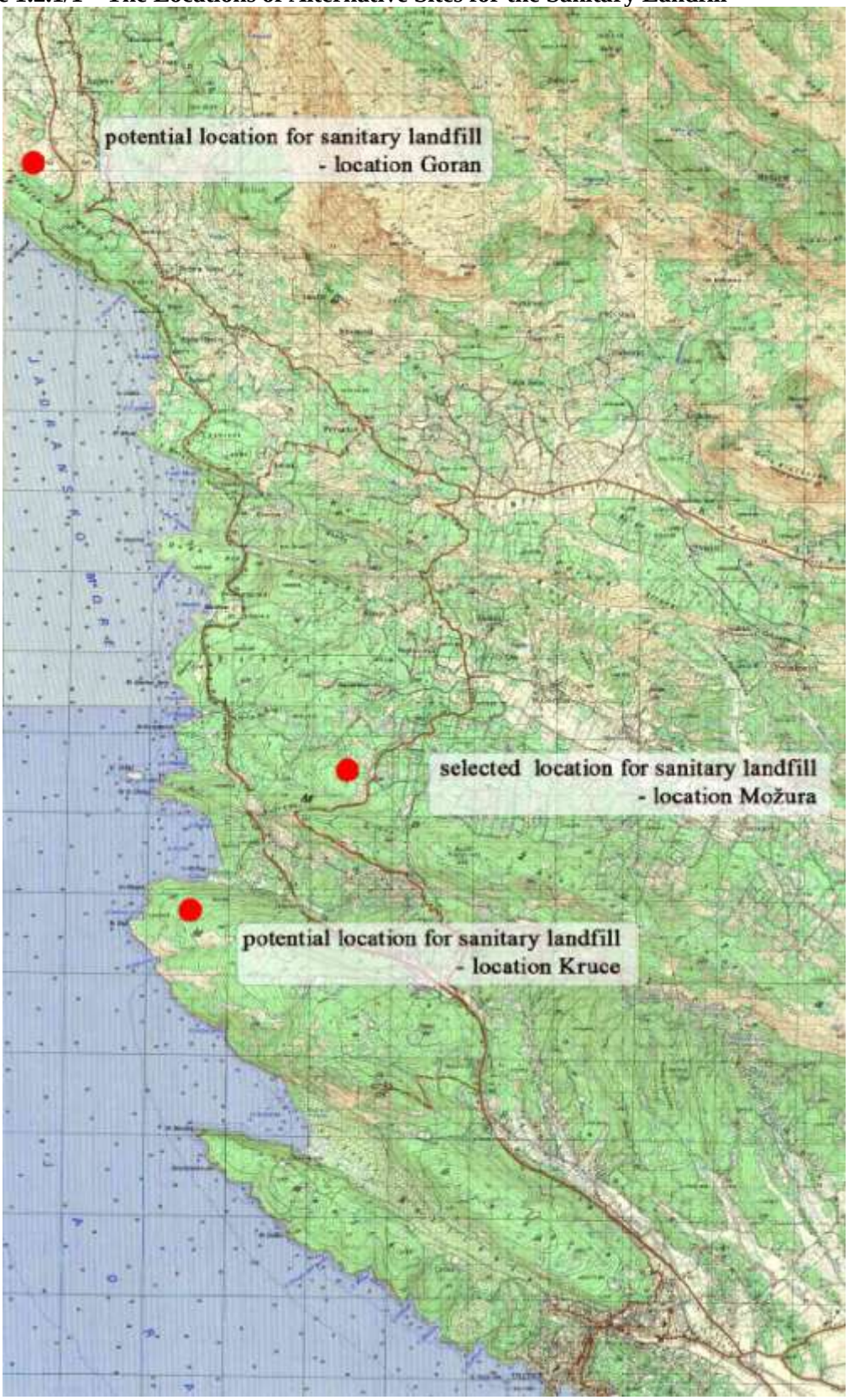
1.2.1 An analysis of the situation regarding the sanitary landfill of “Možura”, “without a design” (no alternative option)

The current situation on the dumpsites of ‘‘Goran’’ and ‘‘Kruče’’ is described in paragraph 2.1, including all negative impacts that may be anticipated, on the environment, human health, and visual impression, which may be caused by the ‘operation’ of these dumpsites. (Photo Archive)

The manner of operation of these dumpsites and an increasing public resistance in the Municipalities Bar and Ulcinj, made the existence of these sites unacceptable any longer. If such a situation continues, the dumpsite in the municipality of Bar will be operated under the following conditions: the trucks will keep dumping all solid waste down a steep cliff in the vicinity of the coast, with a high possibility that the sea may be polluted, which could in turn represent a serious threat to the health of the tourists and local population during the summer season, including an ecological catastrophe in the mentioned area. As for the municipality of Ulcinj, there is a high possibility that the existing dumpsite may affect the quality of water sources and intermittent water streams in the area around the dumpsite, and thus of the sea as well.

The dumpsites of Bar and Ulcinj are subject to no protection or control relating to the disposal of solid waste. Accordingly, should the disposal of waste continue in this manner, the existing dumpsites may obviously represent a serious threat to the human health and the environment.

Figure 1.2.1/1 The Locations of Alternative Sites for the Sanitary Landfill



1.2.2. Brief description/analysis of the site of Goran, as an alternative location for the sanitary landfill in the Municipality of Bar

The selected site of ‘‘Goran’’, following the rehabilitation of the existing dumpsite, would represents a good location for the construction of a sanitary landfill. However, the presented environmental segments should be taken into consideration: geological composition, geographic and geomorphologic and climate characteristics, the existing infrastructure, the current state of the environment, the distance from the highway and the settlement of "Zaljevo", the safety of the surroundings and the landscape. In a wider area of ‘‘Goran’’, there are no cultural or historical monuments, and no protected natural resources as well.

The considered site for a regional sanitary solid waste landfill for the municipalities of Bar and Ulcinj is located at the site of ‘‘Goran’’, 3.4 [km] South of Bar and 25.8 [km] Northwest of Ulcinj. A 500 m long access road through a valley leads to this potential location for a sanitary landfill, covering an area of 25.00 [ha] (under the General Urban Plan of the Municipality). This site is partly bordering on a quarry, owned by the Municipality of Bar, which may be used for the sanitary landfill purposes. The Eastern border of the mentioned location is made up of a 120 [m] high hill separating the proposed site from the settlement of Donje Zaljevo. From its Northern, Western and Southern side, the site it is surrounded by Volujica Hill. Due to its position, it can be seen neither from the sea nor from the main road. It is connected to the Ulcinj – Bar main road M-24 by a 500 [m] long access road.

The surface of the area designated for a future sanitary landfill is in the shape of an irregular trapezoid covering an area of 8[ha]. Following an excavation and extension of the central and lower part of the quarry, being in the shape of a cascade of siphons and having a relatively steep bottom, the existing surface area size of 3 [ha] of the quarry bottom will be extend for 3 [ha] more. Following its excavation and extension, the bottom of the quarry will encompass a total area size of 6 [ha]. The required material for the construction of the banks, a clay layer on the bottom, and for the solid waste covering will be obtained from the excavated material.

“The Environmental Impact Assessment for the regional sanitary landfill at the locations of Lovanja and Goran in the Coastal Region of Montenegro’’, prepared by the Hydrometeorology Service of Montenegro (for five Municipalities in the coastal region: Kotor, Tivat, Budva, Bar and Ulcinj), accurately presented the findings for the potential solid waste disposal site of Goran.

This location was abandoned as a potential site for the landfill due to strong political and public pressures.

A meeting relating to the reasons why the location of Goran had been abandoned was attended by the World Bank representative. The Minutes of this meeting were drafted on the WB memorandum and filed in the World Bank archives.

Generally, it may be concluded that the rehabilitation of the existing open dumpsite at the site of ''Goran'' would have a positive impact the environment.

1.2.3 Brief description/analysis for the construction of a sanitary landfill at the Kruče site in the Municipality of Ulcinj

The Public Enterprise for Water Supply, Wastewater Treatment and Drainage, and Solid Waste Disposal for the Coastal Region of Montenegro and the Municipality of Cetinje, PE "Montenegrin Coast" (PEW), Budva, initiated some activities to resolve the issue of municipal solid waste disposal (MSW) in the municipalities of Ulcinj and Bar. The Company "Medix", Podgorica, was contracted by the PEW to prepare an environmental impact assessment for the sanitary landfill at the location of Kruče in the Municipality of Ulcinj. The rehabilitation of an open dumpsite and the construction of a new sanitary landfill for the disposal of municipal solid waste (MSW) at the site of Kruče, the Municipality of Ulcinj, was anticipated on the cadastre lot1018/1, the Cadastral Area of Kruče.

The location of Kruče can be accessed from the Bar - Ulcinj highway, by a local access road (1,550 m long) which is only used by the vehicles that transport the waste to this location. The furthest point of the sanitary landfill area is approximately 1200m away from the sea. The surface area size of this potentially new sanitary landfill encompasses 13 hectares.

An estimated landfill capacity amounts to 650.697 m3 of waste during the exploitation phase, from 2009 – 2022, for the municipalities of Ulcinj and Bar. According to the Preliminary Design for the construction of a sanitary landfill, total investment costs both for the rehabilitation of the existing open dumpsite and the construction of a new sanitary landfill amount to EUR 3,082,509.87

Final selection of this project location would entail the rehabilitation of the existing open dumpsite, the reduction of the MSW sanitary landfill area, the control of leachate collection and treatment, as well as of the landfill gas (biogas) treatment systems.
According to the study that was prepared by ''Medix', there are approximately 100,000 cubic meters of unselected waste at the existing dumpsite. As proposed by the Preliminary Design, 15,000 m3 of the previously unselected MSW material should be selected and disposed at the sanitary landfill.

This is not an optimal solution. Therefore, the Final Design is expected to specify in more detail what should be done with the rest of the waste amounting to 85,000 m^3, as well as describe the collection technology, the surface to be covered with the protective layer (soil, gravel, clay, geo-textile), and the manner of landfill gases and leachate monitoring over a period of 30 years after the landfill closure should be foreseen too.

"The Environmental Impact Assessment for the sanitary landfill at the location of Kruče" was prepared by Company "Medix", Podgorica. It includes some significant findings and

recommended actions in order to improve the conditions and development of the Kruče solid waste disposal site.

There is no flora of a particular quality, whereas the entire area (except for the area where the waste has been disposed) is covered by the undergrowth (macchia) that is typical for the coastal region.

The land at the Kruče site is owned by the state. This land parcel borders on a land parcel that is privately owned. The future landfill will not cover the private parcel, but having in mind that this open disposal site has existed for several years, this parcel has already been devastated by the disposal site. There are no power lines close to or at the location, and no water or electricity supply is available at the very site. There are no permanently inhabited places in the vicinity of the disposal site.

This location has also been abandoned due to the vicinity of the seashore, the proximity of an already developed tourist village and generally, its quality for a future tourist development. The terrain, due to its configuration, descends to the sea. In order to flatten the terrain, significant construction works would have to be undertaken during the construction phase of the landfill.

In general, it may be concluded, as in the case of the Goran site, that a rehabilitation of the existing open dumpsite at the Kruče site would have a positive impact the environment.

1.2.4 Description of the selected site

The selected site for the regional sanitary solid waste landfill for the municipalities of Bar and Ulcinj is located at Možura, 17 km Southeast of Bar and 11 km Northwest of Ulcinj. The planned location of the landfill is opposite of the Hladna Bay, in territory of the Municipality of Bar, in front of the entrance to the Belveder tunnel, i.e. the border between the municipalities of Bar and Ulcinj. The area intended for the construction of a sanitary landfill and recycling centre extends across 24.4 ha.

The explored area for the purpose of this EIA extends from the Paljuška cove in the North to the Kruče cove in the South, and from the sea shore in the West to the Kurtovog Peak (546 m above the sea level) in the East (Annex I).

The landfill should be located on the hill slope near the Bar – Ulcinj road, overlooking the sea, and encircled by the bay. The site has an uneven limestone texture. A 2,000 m long dirt access road runs from the main road to the landfill site. Neither site nor surroundings have a natural or cultural protection status. The configuration of the terrain in this zone and around the intended landfill site, at a distance of 850 m, is such that no residential or business structures could be constructed. The site is about 1,500 m far from the sea.
A detailed description of the ‘‘Možura’’ site and the justification for its selection follow below.

Table 1-1 –Comparison of Potential Landfill Sites

Site 1 (Kruče – The Municipality of Ulcinj),
Site 2 (Možura – The Municipality of Bar),
Site 3 (Goran – The Municipality of Bar).

Criteria	Ranking	Site 1	Site 2	Site 3
Adequate land area and volume to provide sanitary landfill capacity to meet projected needs for at least 10 years, so that costly investments in access roads, drainage, fencing, and weighing stations are justifiable. For siting purposes, land area requirements shall be estimated based on the landfill cell area required (typically for a depth of 10-25 meters; a final solid waste density of 800-1,000 kg/cubic, and a minimum soil to refuse ratio of 1: 6), as well as about 2-4 hectares for the receiving area, 2-4 hectares for the leachate treatment and/or evaporation ponds, and 10% land for a landscaped buffer zone.	area adequately large with reserve = 3 points area just large enough = 2 points area too small, future expansion required = 1 point	3	3	1
Preferably, a site accessible within 30 minutes travel time (a function of road and traffic conditions) is to be sought, even if it means buying land, because of the need to avoid adversely affecting the productivity of collection vehicles. At distances greater than 30 minutes travel, for collection operations to be economic, investment in either large capacity collection vehicles (5 tonnes per load or greater) or transfer stations with large capacity vehicles (20 tonnes or greater) would be necessary.	15-30 min = 3 30-40 min = 2 40-60 min = 1	3	3	3
If transfer stations are required, the landfill should be accessible within 2 hours of travel time (one-way) by transfer trucks from the transfer station. Otherwise, for longer distances, transfer by rail or barge directly to the landfill site needs to be considered. Siting of rail or barge transfer sites within the refuse collection area may be difficult. Double handling by truck transfer and by rail or barge transfer units should be avoided because of costs.	transfer conditions not required or fulfilled = 1 transfer conditions not fulfilled = 0	1	1	1
Accessible from a competent paved public road which has an adequate width, slope, visibility and construction to accommodate the projected truck traffic. To minimize landfill development costs, the requirement for new access road construction generally should be less than 10 km for large landfills serving metropolitan areas and less than 3 km for small landfills serving secondary cities.	access conditions fulfilled = 1 not fulfilled = 0	1	1	1
A gently sloped topography amenable to development of sanitary landfill by the Cell (Bund), with slopes which minimize the need for earthmoving to obtain the correct leachate drainage slope of about 2%.	topography suitable = 2; requires significant earthworks = 1, not suitable = 0	1	1	2

Groundwater's seasonally high table level (i.e., 10 year high) is at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development. A minimum depth of 1 meter of relatively impermeable soils above the groundwater's seasonable high level exists (preferably, less than 10^{-9} meters/second permeability when undisturbed). If these criteria are not met, use of impermeable clay and/or plastic liners may be required to protect groundwater quality.	natural groundwater barrier is present = 3 not present = 1	1	1	1
Availability on-site of suitable soil cover material to meet the needs for intermediate (minimum of 30 cm depth) and final cover (minimum of 60 cm depth), as well as bund construction (for the Cell method of landfill). Preferably, the site would have adequate soil to also meet daily cover needs (usually a minimum of 15 cm depth of soil). However, daily cover needs can be alternatively met by using removable tarps, other relatively inert materials (i.e., compost residuals), or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day. For purposes of siting, assume that at least 1 cubic meter of daily, intermediate, and final compacted soil cover is needed for every 6 cubic meters of compacted refuse. In most developing countries with highly organic wastes and warm climates, compacted refuse (after one year of natural consolidation and decomposition within warm and wet climates) achieves a density of 800-1000 kg/c.m.	cover material available within 5 km distance = 3 points within 10 km = 2 points within 20 km = 1 points beyond 20 km = 0 points	2	3	3
None of the areas within the landfill boundaries are part of the 10-year groundwater recharge area for existing or pending water supply development.	must not be in GW protection zone, present or future (KO)	Not within a protection zone	Not within a protection zone	Not within a protection zone
No private or public drinking, irrigation, or livestock water supply wells within 500 meters downgradient of the landfill boundaries, unless alternative water supply sources are readily and economically available and the owner(s) gives written consent to the potential risk of well abandonment.	distance to any forms of ground and / or surface water use is more than 1000m = 2 more than 500m = 1 less than 500 m = 0	1	2	0
No environmentally significant wetlands of important biodiversity or reproductive value are present within the potential area of the landfill cell development.	no significant habitats or wetlands must be converted (KO)	No wetland areas	No wetland areas	No wetland areas
No known environmentally rare or endangered species breeding areas or protected living areas are present within the site boundaries. If this criterion is not met, alternative habitats of comparable quality for relocation of the species would need to be available.	no endangered species present = 3 present but compensation possible = 1 present, no compensation possible = 0	3	3	3
No significant protected forests are within 500 meters of the landfill cell development area.	no protected forests must be closer than 500 m (KO)	No protected forests	No protected forests	No protected forests
No open areas of high winds, otherwise windblown litter will not be readily manageable.	wind impact must be manageable (KO)	The site is open; strong winds may have an	The site is sheltered, which prevents the	The site is sheltered, which prevents the

		impact on the site. Wind impact is not manageable.	litter from being windblown.	litter from being windblown.
No major lines of electrical transmission or other infrastructure (i.e., gas, sewer, water lines) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.	no lines = 3 lines which can be relocated = 1 lines that cannot be relocated = 0	3	3	3
No underlying limestone, carbonate, fissured or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit above sensitive groundwaters.	located on low permeability rock = 3 located on moderately karstic limestone = 1 located on mature karst = 0	1	1	1
No underlying underground mines which could be adversely affected by surface activities of landfilling, or minable resources which could be rendered less accessible by landfilling, unless the owner(s) gives explicit consent.	mines not present = 3 mines present = 1	3	3	1
No residential development within 250 meters from the perimeter of the proposed landfill cell development, for reasons of particulates and bioaerosols, in cases where there is landfill gas collection and flaring. If there is no gas collection and flaring, at least 500 meters are recommended, due to volatilized organics, heavy metals and other potential toxic constitutents in landfill gas.	distance to next residential areas more than 100m = 3 distance 500-1000m = 2 distance 250-500m = 1 distance less than 250m = 0	2	2	2
Avoid visibility of the proposed landfill cell development area from residential neighborhoods within 1 km. If residents live within 1 km of the site, landscaping and protective berms would need to be incorporated into the design to minimize visibility of operations. Curving of the access road is recommended to avoid visibility of the active portions of the landfill from the main road.	no visibility from any side = 3 visible from distance = 2 visible from close vicinity = 1	2	3	3
No perennial stream within 300 meters down-gradient of the proposed landfill cell development, unless diversion, culverting or channeling is economically and environmentally feasible to protect the stream from potential contamination.	streams more than 500m away = 3 streams 300-500m = 1 streams less than 300m = 0	3	3	1
Avoid siting within areas of significant seismic risk which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures, otherwise side slopes may need to be adjusted to be gentler than the maximum of 2.5:1.	seismic risk low (zones 1-5) = 3 moderate (5-8) =2 high (9+) = 1	1	1	1
No fault lines or significantly fractured geologic structure within 500 meters of the perimeter of the proposed landfill cell development which would allow unpredictable movement of gas or leachate.	faults more than 500m away = 3 faults less than 300m = 1 significant fault crossing site = 0	3	3	3
No siting within 3 km of a turbojet airport and 1.6 km of a piston-type airport. For sites located more than 3 km and less than 8 km from the nearest turbojet airport (or more than 1.6 km and less than 8 km from the nearest piston-type airport), no consideration is	criteria fulfilled = 3 not fulfilled = 1	3	3	3

to be given unless the aviation authority has provided written permission stating that it considers the location as not threatening to air safety.				
No siting within a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, must be amenable to an economic design which would eliminate the potential for washout.	not located on a floodplain = 3 on floodplain but mitigeable = 1 on floodplain, not mitigeable = 0	3	3	3
Avoid siting within 1 km of socio-politically sensitive sites where public acceptance might be unlikely (i.e., memorial sites, churches, schools) and avoid access roads which would pass by such culturally sensitive sites.	distance of culturally significant site more than 1500m = 3 distance 1000-1500m = 2 distance 500-1000 m = 1 distance less than 500 m = 0	3	3	3
TOTAL		43	46	39

CHAPTER 2

2.DESCRIPTION OF LANDFILL DESIGN AND OPERATION, MITIGATION MEASURES AND MONITORING

2.0 DESCRIPTION OF LANDFILL DESIGN AND OPERATION

Seen as a long-term perspective to resolve the issue of municipal waste disposal from the municipalities of Bar and Ulcinj, the Možura site was identified as the best solution for the construction of a regional sanitary landfill.

The future regional sanitary landfill of Možura has to be constructed fully in accordance with the Law on Waste Management and the EU Directive 99/31/EC, 06/12EC, 08/98EC.

A modern regional sanitary landfill has to be designed at the Možura site in accordance with the spatial planning documentation.

The site has to be designed to comply with the highest standards relating to the acceptance of household and commercial waste collected from the studied area.

Preparatory works

According to the feasibility study, the capacity is important for the construction of a sanitary landfill at the Možura site in Bar. This Study envisages the construction of sanitary cells, the size of each being 250 m x 150 m.

The following preparatory works are required for the construction of a sanitary cell:

1. Preparation of the terrain, so that the following is provided:
    - The required area for a sanitary cell
    - A plateau for the material from cell excavation
    - A plateau for the infrastructure
2. The conditions for an undisturbed operation need to be provided.
3. Facility construction:
    - sanitary cells
    - manholes for leachate collection
    - water-well for leachate with pumps
    - cells for truck wheels washing

- doorman's booth, computer room, toilettes and the scales to measure the trucks

4. Infrastructure includes:
   - sewerage system for leachate from sanitary cells
   - water supply system, under pressure, for leachate
   - transport roads
   - electricity
   - security channels
   - water-well for landfill area watering
   - future sanitary landfill area fencing

Following the construction of a sanitary cell, including the associated infrastructure, the following needs to be prepared:

1. Wind – protection belt
2. Protective passive vegetation
3. Horticultural vegetation

Sanitary Landfill Facilities

The Feasibility Study anticipated the following components of the landfill:

1. Entrance into the landfill complex with a recycling centre (gate)
2. Completely fenced landfill area
3. Area for the construction of associated facilities:
   - Administrative block
   - Technological block
4. Reception check point with surveillance
5. Electronic scales for determining waste net weight
6. Transformer-station for complete complex
7. Municipal-service block
8. Recycling centre, including a storage for removed materials
9. Disposal of municipal waste to sanitary cell
10. Acceptance and treatment of the collected landfill leachate
11. Bio-gas collection and treatment
12. Construction of a cell for the washing of vehicle wheels
13. Cultivation of greenery as a protection belt
14. The construction of traffic and infrastructure networks and the facilities

The foregoing areas are envisaged by the Study. Those need to provide for a fully harmonized technological process so that of the municipal waste is accepted and disposed of with a view of protecting the environment.

Landfill Area Fencing

The Možura site should be surrounded with a 2.2 m tall fence. The fence needs to have such characteristics that will completely disable any uncontrolled entrance into the landfill. The fence can be made of concrete blocks or a concrete base and the pillars with a net stretched in between. There can be only one entrance to and exit from the landfill (an electronically controlled gate).

Space for the construction of supporting facilities

The supporting facilities at the landfill site are planned so that they create a unique area with no overlapping of functions. The areas which are not under the facilities and operating areas are envisaged to be covered with vegetation. Since the landfill is planned to operate for a minimum 20 years (according to Feasibility Study: 23 years without and 28 with recycling) the supporting facilities will be made of firm materials.

The scales used to weight municipal waste

An electronic scale used to weight the municipal waste is located at the landfill entrance, next to admittance facility, next to the computer room for the registration and recording of municipal solid waste data. Following the entrance into landfill, vehicles are directed to the electronic scale together with the required documentation relating to the waste. An employee at the measuring point needs to confirm that the waste transportation documentation is in order and measure the gross weight of a vehicle (vehicle + waste). Following the measurement, the vehicles proceed to the sanitary cell to unload the cargo. When unloaded, each vehicle must pass through the cell for wheels washing, and then proceed to be measured for the second time so that a net weight of the waste is confirmed. No vehicle is allowed to leave the landfill area and return to the public roads without prior wheels washing.

Unloading and spreading of waste

The unloaded waste is spread across the sanitary cell using machines and pressed with a compactor. The pressing is used to reduce the volumes of waste and water infiltration. Following its unloading, the waste is covered with soil, pebbles or layers of active coal, on daily basis.

Sanitary cell

The Feasibility Study envisages an area for two sanitary cells, the size of each being 250 x 150 m each. The filling height should be up to 32 meters. The total capacity of both sanitary cells amounts to approximately 1,100,000 m^3 of compacted material.

According to this Study, the foundation of a sanitary cell will consist of the following layers (two options).

Option1:

- A 1 m deep layer of waterproof clay, permeability of $K \leq 10^{-9}$ m/s,

- A 2.5 mm thick HDPE foil cover;
- A layer of geo textile,
- A layer of gravel, granulation 16-32 mm.

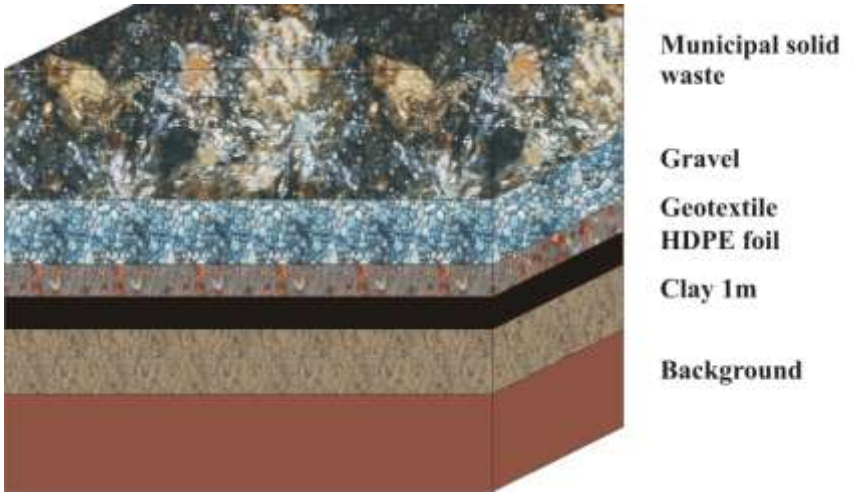


Figure 2.0/1 Cross section of sanitary cell layers (option 1)

Option 2:

- A 0.5 m deep layer of waterproof clay, permeability of $K \leq 10^{-9}$ m/s,
- A layer of synthetic bentonite, permeability 10^{-11} m/s,
- A 2.5 mm thick HDPE foil cover;
- A layer of geo textile,
- A layer of gravel, granulation 16-32 mm.

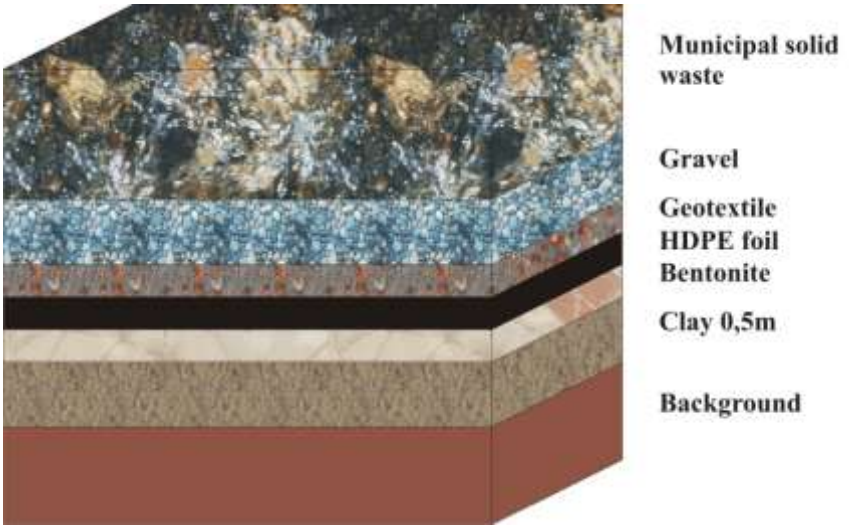


Figure 2.0/1 Cross section of sanitary cell layers (option 2)

Sanitary cell construction is planned according to the Law on Waste Management of the Republic of Montenegro 80/05 and the EU Directive 99/31/EC, 06/12EC, 08/98EC with a view to protecting the underground waters, air and land.

The main goal of having a controlled sanitary cell for municipal waste is to protect the environment, underground and surface waters, air and land from pollution with landfill products.

The designed sanitary cell must collect all leachate to be discharged through a drainage system and further transported to a water-well. The leachate is collected from a sanitary cell using perforated pipes. The top part of a pipe is perforated (ϕ 300 mm), 2/3 above the pipe bottom.

A perforated pipe is placed along the entire sanitary cell. 5 pipes should be installed in each sanitary cell. In total, 5 manholes and a basin for the collection of leachate from the sanitary cell need to be installed as well.

Leachate circulation

During the filling of a landfill cell with municipal solid waste, it is very important to sprinkle the municipal waste using the leachate from a special water-will for leachate. This increases the humidity of waste which enables a more successful compression and higher degradation of organic biodegradable waste (subject to rotting) due to the influence of micro organisms. The sprinkling of municipal solid waste results in the compression of materials in the main part of the landfill and biogas generation.

Landfill leachate treatment plant

A landfill leachate treatment plant is designed to be built after the basin for leachate collection and before its discharge into the recipient (a natural recipient or the public sewerage network). An optimal solution would be to treat the leachate on the sport to meet the applicable standards prior to its discharge into a natural recipient or the public sewerage system.
The leachate treatment plant will be designed to meet the required values for COD, BOD, NH_3, chloride and suspended solids.

Biogas Generation, Capture and Collection

Bio gas is generated through an anaerobic process, including the production of methane (CH_4). The volumes of methane depend on the quality and quantity of bio degradable organic substances.
Solid waste degradation at a landfill includes various complex aspects. Those include some physical, chemical and biological processes which take effect at the same time until the waste is degradable.

Physical degradation means the transformation of waste components including a change in their physical characteristics, such as volume reduction. Speaking about the physical phenomenon, sedimentation, absorption and release of substances should be mentioned as well.

Chemical degradation includes a chain of reactions among various substances that the waste is composed of. Chemical degradation influences the leachate quality, decomposition variation, redox – potential and pH value.
The basic mechanism for waste decomposition at a landfill involves biological degradation i.e. substance transformation under the influence of micro organisms, such as bacteria. It controls speed of chemical and physical degradation influencing Ph and redox – potential. Biological degradation is conducted in several stages and the basic stages are the following:

- Aerobic stage
- Optional anaerobic stage
- Methanogen anaerobic stage

The system for bio gas collection is in the form of a net made of vertical bio spines which are installed as the level of landfill is rising during its filling.
40 bio spines for bio gas collection should be envisaged to be installed at a sanitary cell.

Infrastructure

Transport roads
On the occasion of driving municipal solid waste from the municipalities of Bar and Ulcinj, the local road which leads to the location of Možura, which is connected to the highway Bar – Ulcinj, will be used.

The landfill zone will include the following roads:

1. The roads for the solid waste transportation from the entrance to the landfill to the sanitary cell, i.e. paved road.
2. The roads around the sanitary cells, i.e. dirt roads.

Storm water drainage channels
The final design will identify a system of safe channels and ditches by the road. Storm water should not mix with the leachate and wastewater.

Sewage network
Sewage network is composed of:

1. A system of sewage pipes for the leachate
2. Drainage of leachate from the collection water-well to a sanitary cell
3. Drainage of leachate from the water-well to the leachate treatment basin
4. Drainage of leachate from the treatment basin to sanitary cells
5. Drainage of leachate from the treatment basin to the natural recipient or the public sewerage system

6. Drainage of collected water to the recipient or the public sewerage system

The entire sewerage network has to comply with the applicable wastewater regulations Leachate should not be mixed with wastewater.

Electricity
Energy demand will be identified by the final design, as well as the required equipment for regular sanitation and sanitary landfill operation and exploitation.

Water supply system
Water is important for a normal and quality work both in the phase of sanitation and exploitation.
The design must foresee the required volumes of water, both in the sanitation and exploitation stage. A water source has to be ensured at the landfill site:

1. For the watering of municipal waste, which is disposed and compacted in the sanitary cell. It is necessary to build an internal water supply system.
2. Land watering around the landfill, in order to maintain the trees and grass around the sanitary cell.
3. Hydrant network in case of fire.

The Design will anticipate a water supply network for drinking water supply and sanitary purposes.

Revitalization and re-cultivation of area

As an integral part of the Final Design for the construction of a sanitary landfill, revitalization of the entire area where the facilities will not be built but where the environmental protection measures have to be taken will also be anticipated.
Landfill re-cultivation includes the protection of the slopes against erosion and ecological protection at the top of the sanitary landfill and in other areas that will be afforested.
During the process of revitalization, all segments of the environment need to be adjusted in the sense of environmental protection, which has to be taken into account.

2.1 SANITARY LANDFILL DESCRIPTION AND OPERATION, AS PROPOSED BY THE CONCEPTUAL DESIGN, FOR THE LOCATION OF ‘‘MOŽURA’’

CAPACITY

Population figures for the Municipalities of Bar and Ulcinj are given in the table 2.1/1, below, according to the population census from 2003 (Monstat), along with the areas covered by these Municipalities, as well as the size of an overall area from which the waste will be collected.

Table 2.1/1 Number of population and area of the Municipalities of Bar and Ulcinj

Municipality	Total	Urban	Other	Area (km^2)
Bar	40,037	17,747	22,290	598
Ulcinj	20,290	10,828	9,462	255
Total	**60,327**	28,575	31,725	**853**

On the basis of the data obtained from the Public Communal Enterprise of Bar and the Public Utility Company of Ulcinj, the volumes of collected, transported and disposed municipal solid waste amount to: (It should be noted that this data is approximate)

Table 2.1/2 Collected, transported and disposed quantities of municipal solid waste

year	Bar	Ulcinj
2005	58,000 m^3	2,180 m^3
2006	65,000 m^3	2,325 m^3
2007	104,800 m^3	2,475 m^3

According to the data from the Physical Plan of Montenegro (until 2020), a total number of inhabitants in the municipalities of Bar and Ulcinj amounts to 60,327 (Monstat 2003), whereas a total number of inhabitants in 2021 will amount to 65,692. Following the methodology from the Physical Plan, the number of inhabitants will increase by 0.5 % on annual basis, whereas the total number of inhabitants in Bar and Ulcinj in 2007 was 61,542. The corresponding quantity of municipal solid waste production amounts to 22,462 tons/year. According to the official data, in 2007 the municipalities of Bar and Ulcinj recorded 1,547,028 overnight stays with the production of municipal solid waste amounting to 2,320.5 tons. This quantity has to be increased by 50 %, because a significant number of tourists was not included in the official data.

According to these calculations, in 2007 an estimated quantity of municipal solid waste amounted to approximately 25,943 tons. Possible mistake for municipal solid waste production may equal approximately 3 %.

Table 2.1/3 Estimate of waste quantity for the municipalities of Bar and Ulcinj for a period of 10, 20 and 30 years (without recycling)

Time period	Quantity of municipal waste (without Recycling centre)
10 years (2010-2019)	301,456 t
20 years (2010-2029)	668,929 t
30 years (2010-2039)	1,116,877 t

Table 2.1/4. Estimate of waste quantity for the municipalities of Bar and Ulcinj for a period of 10, 15 and 20 years (with recycling)

Time period	Quantity of municipal waste (with Recycling centre)
10 years (2010-2019)	244,055.5 t
20 years (2010-2029)	530,683.6 t
30 years (2010-2039)	880,082.3 t

Assuming that over a period of 23 years 794,126 tons of solid municipal waste will be disposed without recycling, this quantity of waste amounts to 794,126 x 1.2 = 952,951.2 m3, which corresponds to the density of compacted material of 0.83 t/m3. Around 14% of inert material for covering of the waste should be added to the calculated quantity of disposed municipal waste (in m3), which altogether amounts to approximately 1,086,364 m3. **Therefore, a maximum useful life of the sanitary landfill (without recycling centre) is 23 years.**

According to the data on produced and recycled quantities of solid municipal waste (table 9) for the period of 28 years with recycling centre, 804,560.4 t of solid municipal waste will be disposed of. This quantity of waste includes a volume of 804,560.4 x 1.2 = 965,472.5 m3, which corresponds to the density of compacted material of 0.83 t/m3. Around 14% of inert material for the covering of waste needs to be added to the calculated quantity of disposed municipal waste (in m3) which altogether amounts to approximately 1,100,638.6 m3. **Therefore, a useful life of the sanitary landfill (with a recycling centre) is 28 years.**

2.2DESCRIPTION OF THE WORKS

The description of the works relates to the preparation of the area for a landfill, waterproofing, construction of initial fill and closing banks, collection of leachate and gas evacuation, storm water evacuation, the establishment of a control area, and the construction of a leachate pre-treatment plant, auxiliary services and landfill equipment.

2.2.1. LANDFILL AREA PREPARATION

Landfill area preparation basically includes the clearing of the terrain and organization of a plateau where the control building will be built, and an area for maneuvering, a weighing scale and workshop will be installed.

Landfill area preparation will be carried out in stages, each corresponding to the respective stages of filling of various dikes, i.e. a first stage until the filling of the first bank is completed and the second stage until the completion of the second closing bank.

After the preparation of a Final Design and tender announcement for the construction, it will not be possible to build a sanitary cell and make it ready to receive the waste before August or September 2010.

If the total land area size that is available for municipal waste disposal at the locality of "Možura" extends across 24.4 ha, then the following will apply:

Landfill Facility	Area (m^2)
Two sanitary cells, the size of each cell being 250 m x 150 m, with embankments	75,000
Ditches around sanitary cells	1,500
Internal roads with storm water drainage	9,000
Point of receipt, scales, cell for washing wheels	1,500
Leachate collection system	1,200
Leachate treatment plant	1,500
Recycling centre	15,000
Area for biogas collection, treatment, flaring, and the production of electricity from biogas	1,200
Offices, services, maintenance, warehouses	4,000
Area for the construction of infrastructure network, facilities (water supply, sewerage, electricity, TT network)	500
Fence	500
TOTAL	**110,900**

2.2.2. PREPARATION AND WATERPROOFING

The dumping area will be prepared by removing the soil in the process of enlargement of the landfill bottom. The soil will be used to build the banks, until the gradient is obtained right for waterproofing. This surface will be adjusted.

The total area will be waterproofed. Waterproofing of the dumping area will be carried out by means of artificial barriers and will be gradually performed in the course of landfill operation. The area size covering the clay bottom, slopes and embankments for one sanitary cell equals 40,000 m^2, the clay layer being 1 m deep. 40,000 m^3 of clay should be ensured to cover the bottom of one sanitary cell

During the first stage of the works, including the construction of the first basin and a five meters tall embankment, the working surface encircled by this embankment will be waterproofed. The entire landfill bottom and the frontal parts of the banks will be made waterproof. A system for leachate evacuation to the storage pond will also be installed.

The area of Možura is made of mainly sediment rocks dating from the Quaternary, Paleocene, Cretaceous and Triassic period. Because of this content of underlying stratum of the terrain for building the sanitary cell it is necessary to ensure the existence of an impermeable foundation made of a natural or synthetic material. Clay with coefficient of permeability of $K \leq 10^{-9}$ m/s (the clay from the Ćurke deposits, ten kilometers away from

Ulcinj, or bentonite clay deposits on the Paštrovačka mountain, may be used as a potential borrowing pit for the material for a non-permeable base.)

Due to the importance of waterproofing in this zone and the need to achieve the highest safety regarding its waterproofing capacity, a 20 [cm] deep layer of clay and a HDPE (polyethylene of high density) foil, 2.5 mm thick, needs to be installed, which is impermeable for water solutions and gases, and a high-density polyethylene sheet needs to be covered by a protective layer of geo textile.

On the top of the sheet, which always has to be protected by at least one layer of compacted clay, a 20[cm] deep layer of security draining material will be laid in order to protect the sheet from impacts and to allow the drainage of produced leachate towards the inner evacuation networks.

The slopes and banks, constituting the boundaries of the landfill basin, will be fitted with a waterproof layer consisting of a high-density polyethylene sheet.

2.2.3. BUILDING OF THE INITIAL FILL AND CLOSING BANKS

The technology for disposing municipal waste into the sanitary cells require that unselected waste is spread out on the sanitary cell by bulldozer (dozer), and then sprayed by water to provide for quality compacting by the compacting machinery and adding of waste up to the height of 3 m to be subsequently covered by inert material. When the level of a cell reaches 3 m in height, with a well-compacted material, and is covered by a 25-30cm deep layer of gravel and gravel and rock, the area is sprayed by water and bio thorns are installed for biogas evacuation from the landfill. In order to obtain a treatment surface as well as a progressive closure of the landfill, closing banks are built.

The Law on Waste Management 80/05 and EU Directive 99/31/EC, 06/12EC, 08/98EC stipulate that the following must be done before the closing of a sanitary cell:

- Apply a 0.5 m deep layer of gravel, gravel and sand. The layer is applied to the entire area.
- A 0.5 m layer of gravel is applied to the layer of clay. A layer of synthetic bentonite may be an alternative to the clay layer.
- This is topped with a 1 m deep layer of soil.

The banks will be constructed using the excavated material, or from other works. A 1 m deep layer of soil for the final covering of the sanitary cell after its closing, including a surface layer of humus, not les than 10-30 cm deep, can partially be provided from the area that is situated next to the location.

2.2.4. LEACHATE COLLECTION AND GAS EVACUATION

On the top of the clay layer at the bottom of the landfill, a PVC/PE grooved pipe Ø300 [mm] in diameter will be installed for the drainage and collection of leachate. 2/3 of the upper part of the pipe will be perforated (300 mm). The pipe will be protected with a layer of gravel, to provide for the draining, (gravel granulation of 16/32 mm). The secondary drains will be 200 [mm] in diameter, and the tertiary ones will be arranged in a fishbone array with diameter of 100 [mm].

Perforated pipe is placed along the whole sanitary cell. 5 pipes should be installed in one sanitary cell. 5 manholes and basin for the collection of leachate from the sanitary cell should be installed in total.

The leachate that is generated in a sanitary cell is collected in manholes, and then transported by mutual collector to the condensing pond (last well). From the condensing well, the leachate goes back to the landfill.
In order to calculate the quantity of generated leachate in a sanitary cell, the area size of the cell needs to be taken into account, as well as the quantity of precipitation in the landfill zone: 37,500 m^2 (area of one sanitary cell) x 1,350 mm/year (annual precipitation) = 50,625m^3/year. From the total quantity (50,526 m^3) around 20% of leachate is generated: 50,625 m^3/year x 0.2 = 10,125 m^3/year of leachate. Average daily quantity of leachate (for one sanitary cell) is: 10,125 m^3: 365 days = 27.7 m^3. If rainy periods are frequent, and the level of disposed waste is lower than 6 meters, the calculation should be based on a double daily quantity of leachate, which in that case amounts to 55 m^3/day.

For leachate storage prior to its transfer to the landfill leachate pre-treatment plant, a pond of 55 [m^3] of useful capacity will be built. It will consist of a reinforced concrete prefabricated tank.

Setting up of evacuation shafts has been foreseen, for gas treatment purposes, in the central axis of the landfill and linked to the leachate network.

These shafts are made of concrete, as grooved pipes surrounded by gravel, 1 [m] in diameter.

These shafts play an additional role, as they allow leachate evacuation as well as drainage of the dumping surface.

These shafts will be accessible from the operation area, from the start of the landfill until its closure.
Depending on the dimensions of sanitary cell a number of lined up bio thorns will be installed for the collecting of biogas. If the cell with its embankments is 250 m long, 8 bio thorns should be installed in one row. If the sanitary cell is 150 m wide, including the embankments, bio thorns should be installed in 5 rows. Accordingly, the total number of bio thorns in one sanitary cell is 40.

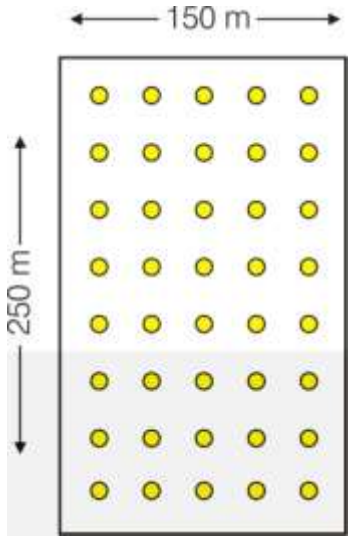


Figure 2.2.4/1. Distribution of bio thorns in sanitary cell

During operation, this network of shafts will be complemented with other, simpler ones, consisting of gravel drains, which will grow with the landfill.

2.2.5. STORM WATER EVACUATION

The storm water evacuation network consists of parametrical ditches corresponding to various levels of filling, the ditches with an access from the outside and from inside for the purpose of their servicing, including the corresponding works.

The ditches will be made of soil and, whereas the slopes exceeding the gradient of 20 % will be covered with a 20 [cm] deep inner layer of H-200 concrete. The lower width of every ditch will be 0.7 [m], the banks will be 1:1 and the maximum depth will be 0.8[m]. Under-road passes will be made of centrifuged concrete pipes.

2.2.6. CONTROL AREA

The control and admission area consists of:
A control building, gable, tiled roof and electronic weighing scale equipped with a computer system and an area for the workshop, maneuvering and unloading.

2.2.7. LEACHATE PRE-TREATMENT PLANT BUILING

The leachate treatment plant will consist of:

- A retention and homogenization pond: where leachate coming from the inner network will be collected. This pond will serve to stop the leachate flow before its transfer to the treatment plant.

- Regulation valve The main leachate discharge pipe will be fitted with a flow regulation valve to avoid surpassing the hydraulic design capacity of the retention pond.

- Physical-chemical treatment plant: it consists of a coagulation chamber, a flocculation chamber and a sedimentation tank. Sediment sludge is disposed of in the landfill itself and the treated water is re-circulated for evaporation.

2.2.8. AUXILIARY SERVICES

The water for landfill servicing: an intake structure or a well will be built. A tank will be placed in the aisle to provide for water supply by means of cistern trucks, as needed.

Power Supply: power supply will be available through linking to a MT line at the nearest possible connection point to the line. Power lines will be available from the switchgear to the control hut, workshop aisle, maneuver zone and scavengers' zone.

2.2.9. LANDFILL EQUIPMENT

Landfill equipment consists, in addition to that mentioned above, of the following:

- Electronic weighing scale, for up to 45 Tons.
- Compacting/crushing machine
- Crawler
- Truck head (1 unit)

2.3 LANDFILL OPERATION

2.3.1. ANIMAL WASTE

For the treatment of animal corpses, a flat area will be provided, within which a cell will be built for their burial. Each burial will be carried out independently on the animal's arrival. The animal shall be deposited and lime be poured over it, proceeding to cover the cell completely with enough earth.

2.3.2. BULKY WASTES

Bulky waste, consisting of household waste (couches, electrical appliances, etc.) and vehicles out of use, shall be assigned to the respective areas for storage. Those will be stored so that a disorder is avoided and. All methods will be considered and the most convenient one will be applied in practice.

2.3.3. FIRE

No fire shall be applied to the waste under any circumstances, in accordance with the basic regulations for landfill management. In this case, special attention shall be paid, as the landfill is waterproofed with plastic geo-membrane.

2.3.4. MEDICAL AND OTHER HAZARDOUS WASTES

No medical or other hazardous wastes should be deposited at the landfill under any circumstance. This will be guaranteed through regular inspections of the deposited waste.

2.4. COLLECTION AND TRANSPORT OF WASTE

According to the available documentation, the municipal waste will be collected and disposed of in the following order: collection, transport and disposal.

Collection and transport of waste

The streets in towns and suburbs are being cleaned manually and with assistance of a special vehicle. Households, shops, hotels, restaurants, etc, deposit their waste into the garbage containers.

The transport of collected waste is organized three times a week in inhabited places, and once a week in the downtown city areas. The garbage and containers with garbage are transported by special vehicles (compactors), their volume being 9-15 m^3. Those vehicles are constructed to lift the containers and empty them from the backside of the vehicle. The containers for garbage the capacity of which equals 5-7 m^3 are driven to the landfill and emptied there. Vehicles with moveable platform are used for this manipulation.

2.4.1 WASTE DISPOSAL

According to the Preliminary solution, the waste will be driven to the landfill by special vehicles. The trucks that carry the waste will go to a scale at the landfill. After the weighing and checking of its contents, the truck will go to the specified place to be unloaded. The waste will than be compacted and cover with soil.

2.4.2 GENERATION OF LEACHATE ON THE LANDFILL

The leachate that is generated on a landfill includes a significant concentration of inorganic and organic compounds, which are dangerous for the environment. Such wastewater results from precipitation, infiltration through the surface layer of the landfill, dissolved organic and inorganic materials, biologic material, as well as semi-products and final products of the organic dissolution process.
The characteristics of this wastewater depend on the sort of waste which is deposited, and those change over time, being different from one location to the other. The characteristics of wastewater can also depend on the sort and thickness of the cover, on the landfill's age, meteorological characteristics of the area (intensity, duration and frequency of precipitation), as well as on the hydrology of the locality where the landfill is situated. The process of organic disintegration doesn't happen instantly. The establishment of an adequate microbiologic regime needs time, which varies from several months to several years. The process of disintegration and decaying has few phases: aerobic, anaerobic sour

phase, the phase of accelerated forming of methane and the phase of decelerated forming of methane.
Methane is the final product of the organic decaying of the solid communal waste. It is, as it is known, a gas with no color and odor. Methane is the simplest carbonate-hydrogen, with empiric formula CH4. It's very flammable and it can be found in the oil deposits, peat moors and bogs, where it is formed through decaying of cellulose material and other organic compounds. It is the often cause of explosions in coalmines. So, as it becomes during the process of decaying of organic materials, which exists in the part of the landfill, that is deposited waste material, methane is, beside waste water (filtrate), always present in landfills and it is potentially very dangerous, because of its flammability and explosiveness.
A final conclusion that can be drawn is that the quality of wastewater largely depends on the phase of biologic disintegration, as well as that the water at the exit from the landfill system represents an average value for the quality of the landfill (composite sample) as a whole.

2.5 CLOSING AND RECOVERY OF THE LANDFILL

Closing and recovery of the regional sanitary landfill and the existing uncontrolled dumpsites in Bar and Ulcinj will be implemented according to the recovery design.

Upon completion of waste disposal, when designed and projected elevation for disposal of CCW is reached, the sanitary cell is closed pursuant to the EU Directive 99/31/EC, 06/12EC, 08/98EC Figure 2.5/1 shows a cross section of sanitary cell layers.

After the sanitary cell closure, it is necessary to provide lateral inclination of 2% from the edges towards the centre, which enables the collection of storm water from the cell surface. Longitudinal inclination should be 1 – 1.5%.

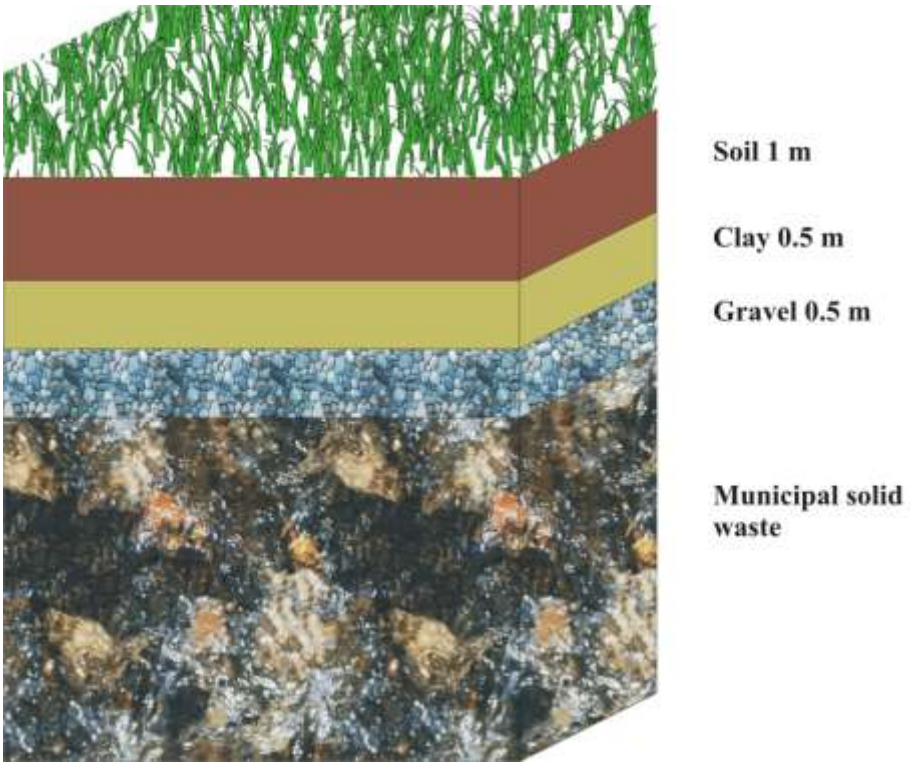


Figure 2.5/1. Cross section of Layers for Sanitary Cell Closure

Cultivated land should be biologically active (taken from excavation sites less than 50 cm) and free of stones, branches, roots and their parts, that could hinder agricultural work after the spreading of a layer of soil. Apart from that, it should neither contain pathogenic agents, nor substances that may intoxicate the plants.

After its closure, during the post-operative phase lasting for 30 years, the landfill must be controlled by its user.

2.6 ASSESSMENT OF ENVIRONMENTAL IMPACTS OF THE PROPOSED MOŽURA SANITARY LANDFILL

2.6.1. INTRODUCTION

This Environmental Impact Assessment (EIA) was prepared by Energoprojekt – Hidroinženjering a.d.Beograd for a regional sanitary landfill in the coastal region of Montenegro, for the Municipalities of Bar and Ulcinj.

The preparation of an Environmental Impact Assessment relating to the construction of a regional sanitary landfill in the Municipality of Bar was ordered by the Directorate for Public Procurement of the Government of Montenegro.

The Environmental Impact Assessment for the regional sanitary landfill at the Možura site, for the Municipalities of Bar and Ulcinj, was prepared on the level of a conceptual design, including the presentation and discussion of significant findings and recommended actions to improve the conditions for the development of a solid waste disposal site for the Municipalities of Bar and Ulcinj.

The future sanitary landfill of Možura is located in the territory of the Municipality of Bar, to be also used by the Municipality of Ulcinj. Those municipalities encompass the area of 853 square kilometers, with a population of approximately 60,327 inhabitants (Monstat 2003.)

This Study assesses the potential impacts of the construction and operation of a sanitary landfill at the Možura site that is located in the Municipality of Bar, the Coastal Region of Montenegro.

This section includes:

- A description of the baseline environmental conditions at the site;
- A description of the design and operational management features of the proposed sanitary landfill;
- An evaluation of the potential impacts of the proposed developments at the site,
- Assuming adherence to standard day-to-day operational practices;
- Recommendation of environmental mitigation, management and monitoring
- Requirements which should be adhered to in developing and operating the site;
- Identification of any key issues requiring further site investigation, field survey and environmental assessment.

This paper is designed to identify the key environmental impacts for the site, and to identify the issues that require further evaluation. This further evaluation should be carried out during the detailed planning stage of the project, and should focus on ensuring that the design and operational environmental management plan are developed in full recognition of the potential environmental impacts.

2.6.2. BASELINE ENVIRONMENTAL CONDITIONS

The section presents the available data on baseline environmental conditions at the Možura site. The key site characteristics, which influence the potential for significant environmental impacts during both the construction and operation of the proposed sanitary landfill, are described with respect to the following:

- Site location and general characteristics;
- Climatic regime;
- Geology and soils;
- Hydrology, Hydrogeology, Water quality
- Ecology (flora and fauna)
- Population and population density;
- Air quality;
- Traffic; and Vibrations.

2.6.2.1 Site Location and General Characteristics

The location "Možura", the site planned for implementation of the project "Regional sanitary landfill for the municipalities of Bar and Ulcinj", is situated on the cadastral lot 2416/1, the Cadastral Area of Kunje, (coordinates- X: 4650527, Y: 6597237) the Municipality of Bar. Total area of this parcel is 135 ha.

The planned landfill site is located opposite of the Bay of Hladna, in territory of the Municipality of Bar, in front of the entrance to the Belveder tunnel, i.e. the border between the municipalities of Bar and Ulcinj. The area size intended for the construction of a sanitary landfill and a recycling centre encompasses 24.4 ha.

The research area that was investigated for the purpose of this Study lies in the Paljuška cove in the North, the Kruče cove in the South, West of the sea shore and East of the Kurtovog Peak (546 m above sea level).

The landfill should be located on a hill slope near the Bar – Ulcinj road, overlooking the sea, and surrounded by a bay. The site is of uneven limestone texture. A 2,000 long dirt access road runs from the main road to the landfill site. The site and its surrounding area are not a part of any protected nature or cultural zone. Due to the land configuration in the zone around the planned landfill location, there are no inhabited or business structures in a circle of around 850 meters. The site is approximately 1,500 m far from the sea.

The data relating to an exact location of the Regional Sanitary Landfill for Bar and Ulcinj Municipalities were made available by the Secretariat of Urban Planning, Civil Engineering and Environmental Protection on a topographic map, scale 1: 10 000. The surface of the area designated for a future sanitary solid waste landfill is in the shape of an irregular trapezoid encompassing an area of 24.4 [ha]. This site belongs to the Municipality of Bar. The coordinates of the landfill area are shown in Table 2.6.2.1/1 below, while the site location is marked on a topographic map shown on Figure 2.6.2.1/2

Table 2.6.2.1/1 Coordinates of the bordering points of the area determined for the sanitary solid waste landfill at the Možura site.

Point	1	2	3	4	5
X	4 650 310	4 650 220	4 650 540	4 650 735	4 650 630
Y	6 597 040	6 597 470	6 597 610	6 597 460	6 597 015

Figure 2.6.2.1/2 Location of the "Možura" Sanitary Landfill Site on topographic map

The zone where the Regional Sanitary Landfill is located is situated on a rough sloping terrain, composed mostly of limestone, where the compounds of permeable rock mass may be seen as well as compounds of watertight rock mass i.e. those are functioning as a hydro-geological barrier.

Due to the land configuration in the zone around the planned landfill location, there are no inhabited or business structures with a circle of around 850 meters. To the West from the landfill location, at a distance of around 2000 m in a straight line, a tourist complex will be constructed as envisaged by the Feasibility Study for the Construction and Operation of a Regional Sanitary Landfill in the region of Bar/Ulcinj Municipality / by Porr Tehnobau und Aktiengesellschaft, Vienna, 2008. That location is around 1500 meters away in a straight line from the sea. By decision of the Government of Montenegro, a concession was awarded for a detailed geological research and exploitation of non-metallic mineral ore, masonry stone "Možura" - "Orlovo", (Official Gazette of Montenegro 30/2006).

The Možura location, where the construction of a sanitary landfill for the Municipalities of Bar and Ulcinj is anticipated, is situated around 295 meters above sea level. There is no existing paved access road to the site; therefore, General Design for an access road was prepared.

The construction of a 2.5 km long access road, running from the existing main road Bar – Ulcinj, represents the first and necessary condition for the development of this landfill.

The Location of the Proposed Sanitary Landfill of Možura is shown on Figures 2.6.2.1/3 and 2.6.2.1/4 below.

In order to assess the potential impacts that this landfill and the works may have on the environment during its regular operation or in the case of an accident, it is necessary to analyze primarily the present condition of the environmental at the monitored site, as well as to provide some basic relevant information, such as population numbers and concentration levels, climate regime; geology and soils; hydrology, hydrogeology, water quality, ecology (flora and fauna), population and population density; air quality; traffic and vibrations and other.

Figure 2.6.2.1/3 Location of the proposed sanitary landfill site at Možura

Figure 2.6.2.1/4 Location of the proposed "Možura" sanitary landfill site (view from the nearest edge to the sea)

2.6.2.2 Climate

Climate factors, which have priority among factors of significant impact on the climate of a region, are: geographic width, distance from the sea, relief, height above sea level, soil, plant coverage and human activities.

In order to consider the climate characteristics in a wider area of the Možura site, some relevant data were analyzed. Meteorological characteristic, based on those data, are given for this area.

The future ‘‘Možura’’ sanitary landfill location is characteristic for its Mediterranean climate, distinguished by a mild, very rainy winter period and a distinctly dry, relatively long and warm summer period.

The climate conditions in this region range from those most favorable to very unfavorable ones. During the year, depending on the season, particular atmospheric processes like cyclones, atmospheric fronts (warm and cold), storms, strong southern winds, strong and very cold northern winds, etc. take place.

Climatic indicators of for the Municipality of Bar during the interval 1950 -2003 are given in the following analysis.

- **Temperature**

An average annual temperature is 15.7 ˚C. Though this area is near the Adriatic Sea, the temperature amplitudes are very strong. The absolute, annual amplitude amounts to 44.9˚C (ranging from –7.2˚C to 37.7˚C). An average annual amplitude amounts to 14.8 ˚C.

Table 2.6.2.2/1 Average monthly temperature in ˚C

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC	ANNUAL
Av.Val.	8.5	8.9	10.6	13.6	18.1	21.6	23.7	23.5	20.4	16.8	13.1	9.9	15.7
MAX	11.3	11.4	14.0	16.3	21.6	26.2	26.1	27.0	22.6	19.2	15.9	12.1	17.1
MIN	5.8	5.0	6.8	10.5	15.0	19.7	22.1	20.1	15.3	13.6	9.5	5.8	14.8

Table 2.6.2.2/2 Absolute maximum of temperature in ˚C

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC	ANNUAL
Av.Val.	17.0	18.2	20.9	23.9	27.9	30.9	33.0	32.6	29.4	26.6	22.5	18.7	33.8
MAX	20.2	24.9	26.0	30.1	32.0	36.6	37.7	37.0	33.6	32.3	27.3	22.6	37.7
MIN	13.8	14.0	16.7	18.2	23.3	26.6	29.1	27.0	25.3	19.8	17.7	14.2	30.9

Table 2.6.2.2/3 Absolute minimum of temperature in ˚C

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC	ANNUAL
Av.Val	-1.6	-0.8	1.2	4.5	8.4	12.4	15.1	15.0	11.7	7.2	2.8	-0.3	-2.9
MAX	2.6	3.7	6.4	7.6	11.0	16.1	19.4	19.8	16.1	10.4	7.1	3.5	0.6
MIN	-7.2	-6.0	-5.5	0.7	4.7	9.1	12.4	9.5	7.4	1.1	-2.4	-6.5	-7.2

Air temperature is of particular significance for air pollutants. Thus, if the temperature is cooler, for instance, the use of heating fuel increases causing an increase in the quantity of flue gases and pollutants, primarily sulphuric and nitrogen oxides and soot they contain. The annual air temperature curve in Bar indicates that extreme values are pronounced in July (absolute maximum) and January (absolute minimum). The average annual temperature for the period from 1950-2003 amounted to 15.7˚C.

The warmest months are July and August with an average temperature exceeding 23.7˚C. Tropical temperatures are very frequent in these zones. During the period of autumn and winter, frosts are pretty common (when the temperature decreases below zero) during 11% of days and nights in January and 8% of days and nights of February. Even 4% of days and nights in March are accompanied by frost.

During the summer very high temperatures (daily temperature exceeding 30˚C) are very often. Tropical temperatures were recorded during 5% of days in June, 18% in July and 21% in August. In September the temperature of 30˚C is reached only during 3% of all days. Regarding the position of location the high temperatures should be treated seriously since in such climate conditions accompanied by the mild wind, strong evaporations are quite common

Air temperature has a special significance from the aspect of the pollutant. For example, if the temperature is lower, consumption of fuel for heating grows, resulting in larger quantities of smoke gasses and pollutants, especially sulfur and nitrogen oxides, and soot. The annual variations of air temperatures in Bar indicate that the extreme values are expressed in July (absolute maximum) and January (absolute minimum).

- **Precipitation**

The annual precipitation in this region amounts 1353.3 [l/m^2]. The precipitation is minimal during the summer time. The precipitation during June, July and August represents 10 % out of the annual quantity of precipitation while it amounts 38 % of the total annual precipitation during October, November and December. The extremely rainy month is September with the precipitation reaching 412 [l/m^2].

Table 2.6.2.2/4 Sum of precipitations in u mm/m^2

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC	ANNUAL
Av.Val.	146.2	135.4	118.4	119.8	84.5	53.1	34.1	49.1	119.9	141.2	187.2	170.0	1353.3
MAX	329.4	358.0	298.3	271.1	310.4	204.7	129.1	203.4	411.7	342.0	433.4	393.5	1903.8
MIN	2.4	5.0	1.0	10.6	1.9	3.3	0.0	0.0	1.8	0.0	20.6	18.2	810.1

According to the data in Table 2.6.2.2/4, it is evident that the differences between precipitation in the periods of minimum and maximum levels are very pronounced in the area of the Municipality of Bar. The table shows that the maximum quantity of precipitation in November amounts to 433.4 mm/m2, while the lowest maximum quantity of precipitation in July amounts to 129.1 mm/m2.

Table 2.6.2.2/5: Monthly quantities of precipitation

Parameters	units	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC
Rains:													
Average RRmly	lit/m^2	141.0	137.9	120.7	119.6	85.8	54.1	33.0	49.1	114.8	114.6	189.2	171.1
Max. RRmly	lit/m^2	317.4	358	298.3	271.1	310.4	204.7	129.1	203.4	411.7	342.	433.4	393.5
St Dev	lit/m^2	83.4	79.0	70.6	62.1	73.9	47.3	33.1	47.9	97.2	76.7	98.3	80.8
P95%	lit/m^2	40	40	37	35	35	34	32	45	64	53	48	43
P99%	lit/m^2	67	59	58	57	70	65	70	83	116	81	76	76
Max RRdly (24h)	lit/m^2	181	157	81	80	114	78	87	122	224	88	135	136

The relative annual fluctuation of precipitation amounts 11.5 %. That is the difference between the rainiest and the driest month in respect to annual precipitation expressed in percentages. This percentage of 11.5 is extremely high and outlines the fact that this area is characterized by the extremely rainy and extremely dry periods.

The days with the defined meteorological parameters are very usual in this area. Therefore, there are 12 rainy series lasting for two days with the daily precipitation exceeding 50 [l/m^2]. The precipitation quantity is therefore enormous especially when taking into consideration the topography of the terrain enabling the incoming of the water.

Considering the fact those 50 million litters of water is obtained from each quadric km in succession of 2 days, the dangerous situation might be probable (the infrastructure suffered many damages in the past). Then, there are the series of frost. Sometimes, there are 11 days and nights in succession characterized by frost, which are followed by three frost series lasting 10 days in the succession. The temperature, then, is usually decreased below zero. There are, as well, series of strong winds. There have been registered three series of 20 days in the succession characterized by strong winds.

All the mentioned parameters describe the existing situation. Its importance or their impact on the landfill is huge. For that reason, the meteorological parameters and their activities should be in the certain way taken into consideration in order to provide the maximal security of landfill operation.

Table 2.6.2.2/6: Relative humidity in %

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AVG	SEP	OCT	NOV	DEC	ANNUAL
AV.Value.	65.7	64.9	66.6	71.1	72.5	70.4	67.8	68.5	70.0	69.3	69.4	68.4	68.7
MAX	78.5	79.9	78.9	79.0	79.0	80.3	78.2	75.6	78.7	77.4	79.3	80.0	78.7
MIN	47.0	46.7	50.8	56.2	65.8	59.0	58.9	58.9	60.2	56.9	57.9	53.3	56.0

The average value of relative air humidity in Bar is 68.7% in the period form 1950 to 2003.

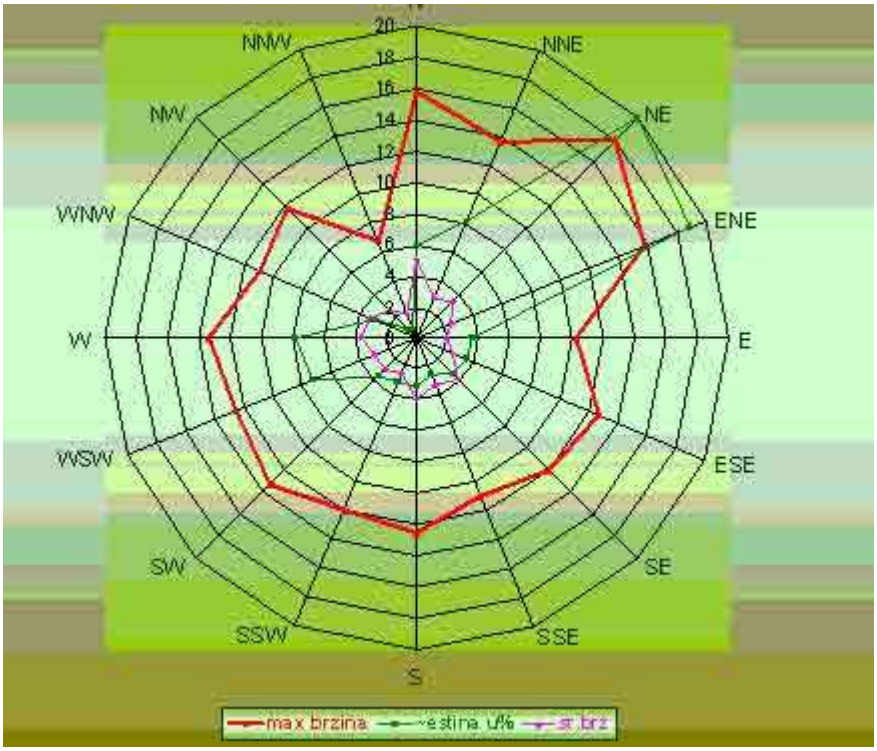
- **Wind**

The frequency of the winds from two directions (NE and ENE) is 38.9%, while amounting to 23.1% from three directions (NNE, WSW, W). The other 11 directions altogether including periods of calm, account for 38% of the weather conditions. This data points to the fact that winds in the Bar blow mainly from the northern and the western quadrants.
These dominant directions, and their speed, of course, may be corrected on the basis of the data obtained by measuring at the planned micro location, in view of the extreme spatial and temporal fluctuation of this meteorological factor.

The wind is one of the most important factors affecting the diffusion of pollutants in the air. Data on wind velocities by their directions for Bar is given in m/s the following table, while the climate wind rose is shown on the picture below.

Table 2.6.2.2/7 Namely, an hourly speed of the in Bar was increased

Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TIHO
Frequency in%	5.9	8.1	20.0	18.9	3.6	3.5	3.3	2.6	3.1	3.1	3.5	7.2	7.8	2.9	0.7	0.6	5.2
Av.speed	5.0	2.7	3.2	2.4	1.9	2.5	3.7	3.3	3.9	2.5	2.8	2.9	3.6	3.3	2.5	1.6	
Max speed	15.8	13.7	18.0	15.8	10.2	12.7	12.0	11.0	12.5	12.0	13.3	12.5	13.3	11.0	11.7	6.7	



Wind Blowing Features
(---maximal wind speed; ---wind force in %; ---average wind speed)

Table 2.6.2.2/8 shows the data collected by the Hydrometeorologic Service of Montenegro. Namely the speed of the wind in Ulcinj increased in the period 1985 - 1999.

Table 2.6.2.2/8 Namely hourly speed wind rose for Ulcinj

direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TIHO
frequency in%	9.8	9.5	12.1	**13.2**	8.8	2.5	2.5	2.0	3.0	2.2	3.5	9.4	7.0	5.7	3.2	3.7	**1.9**
average speed	1.1	1.2	1.6	1.8	2.2	1.9	2.3	2.1	**3.1**	2.2	1.9	2.0	1.7	1.2	1.0	0.7	
MAXav. speed	2.8	2.8	3.5	4.4	5.4	4.5	4.9	4.5	**6.0**	4.4	4.0	4.3	4.3	3.5	3.0	2.3	

At sanitary landfills, it is obligatory to set up a plant for the capturing, burning and utilization of biogas, as well as to cover the layers of waste by inert material, so that the mentioned reasons indicate the sanitary landfill will not have a negative environmental impact, regardless to the given winds that blow in that area.

On the basis of the data available, the climate parameters shown will not have a negative impact on the possibility of constructing the sanitary landfill.

2.6.2.3 Geology and soil quality

Geomorphologic characteristics
As far as geomorphologic characteristics of the terrain are concerned two types of relief can be sorted out:

- Karst
- Deluvial
- In smaller extent proluvial- fluvial and colluvial forms are present

Karst relief is developed in larger part of the research terrain and it is where the location of potential garbage landfill is located. It is defined by anticlinal structural form of Možura (622 m) and Brivska gora (178 m). The coast is mainly rocky, with steep parts.

Deluvial relief is present in the zone of flysch sediments. It is made of degraded flysch sediments, sandstone and marl, as well as of parts of solid rocks represented by limestone, dolomites and chevrons.

In addition to karst and delluvial type of relief, proluvial and colluvial types are developed in smaller extent, which occurred after activities of occasional surface watercourses and by gravity. Proluvial-fluvial type occurs in the area of flysch sediments, and colluvial under steep parts where rock creeps and ravines are formed.

Seismic Characteristics of the Land
Regional seismic characteristics of wider area of potential regional sanitary landfill for municipal waste are studied within the framework of complex research for development of the Map of seismic regionalization of Montenegro, scale 1:100 000. On the basis of catalogue and frequency of earthquakes and developed maps of epicenters in Montenegro and maps of seismic risks, it can be stated that substantial seismic activity of the terrain was shown in this area.

For the Municipality of Ulcinj, an earthquake of maximum intensity I= 8.8 MCS can be estimated in the following 100 years, while for the Municipality of Bar this value is 8.6 MCS (Seismic-geological maps and Seismic micro zoning of the urban area of the town of Ulcinj. Seismological report on the urban area of the town of Ulcinj, 1981.).

Table 2.6.2.3/1. Average seismic parameters (Seismic-geological maps and Seismic micro zoning of the urban area of the town of Ulcinj, 1981)

Town	Basic seismic degree (MCS)	Magnitude M	Max acceleration at bedrock a_{max} (g)	Max acceleration on field surface a_{max} (g)	Seismic coefficient Ks
Recurrence interval T - 50-100 years					
Ulcinj	8.8	6.9	0.13-0.18	0.14-0.28	0.07-0.14

According to the map of Seismic regionalization of Montenegro below (Seismological bureau 1982), of seismic geologic foundations and seismic micro regionalization, an expected maximum intensity of earthquake is I = 9 MCS, which is expected for the whole coastal area.

The seismic risk for the project area is considered significant. On the seismological risk map for Montenegro the coastal area is situated in the highest seismic risk zone of the country zone IX), which corresponds to a 10% probability of a seismic event of a Mercali scale intensity of at least IX occurring within 50 years (which would mean a return period of such an event of 500 years). The ground acceleration foreseen for this type of event ranges from 0.30 g in hard rock (which would apply to the site) to 0.45 g in soft materials.

The Mercali scale is based on the expected impact or destructive power of earthquakes and has 12 levels, from I (not felt by humans) to XII (total destruction of all built environment, significant changes in natural topography).

Regarding the geotechnical stability of the area and built structures under seismic loading, the Feasibility Study anticipated excavation of only a superficial depression fully covering the landfill area, for the purpose of optimizing the gradient for leachate drainage and collection, as well as flattening the area for the installation of the base liner system. Considering that the terrain is stable (both regarding gradient, as well as due to the absence of geological discontinuities which could be potentially reactivated during a seismic event), there are no foreseeable negative impacts on landfill stability under seismic loading and resulting dynamic forces.

Figure 2.6.2.3/2 Map of maximum expected intensity of earthquakes with 63 % probability of occurrence in the territory of Montenegro during the previous 100 years

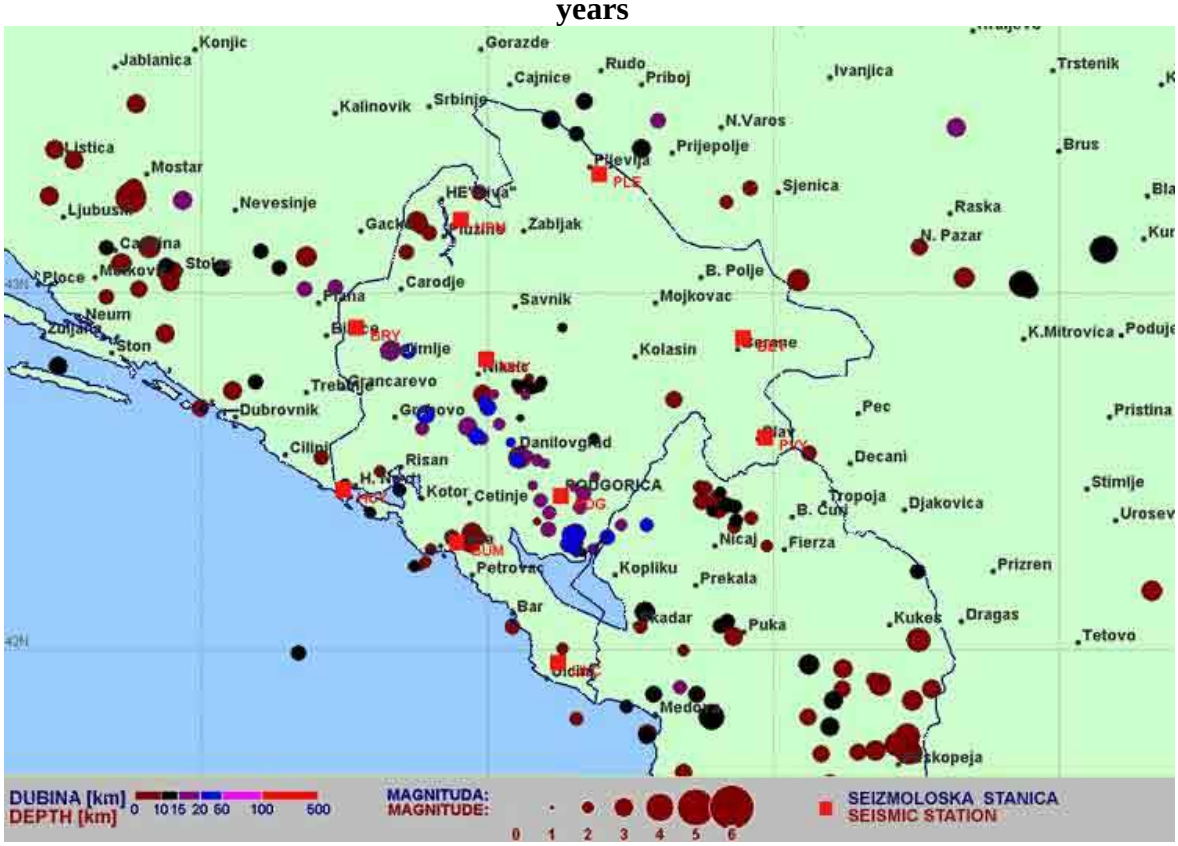


Figure 2.6.2.3/3 Seismic activity in Montenegro during 2007

Building and utilization of a modern regional sanitary landfill for municipal waste must fully comply with valid regulations and principles of anti-seismic designing and building, aiming to bring the seismic risks down to an acceptable level, in accordance with Article 4 of the Law on Construction of Structures (Official Gazette of Montenegro 55/00). Article 16 of the mentioned Law stipulates the necessary technical documentation, while Article 19

point 3 stipulates the requirement for architectural and structural plans with an emphasis on the geophysical stability and the related calculations. So, the project needs to be developed according to the valid seismic standards in order to minimize a potential impact on the sanitary landfill safety.

Geological Composition

Geologic composition the researched area is given according to the OGK 1:100000 list Bar-Ulcinj. It belongs to tectonic structure of the Parathion where the anticline of Možura - Brivska gora is expressed. The Parathion is made of sediments dating from the Mesozoic and the Paleogene period. Tectonic composition of area of research is complex and is mainly represented by rupture areas such as reverse faults- imbrications and smaller faults of local quality.

The Parathion is made of upper cretaceous sediments of K_2^3, foraminifer limestone E_2 and upper Eocene flysch E_3.

In the North of the researched area there are Triassic limestone and dolomites ($T_{2,3}$).

The Ladinian stage and Upper Triassic ($T_{2,3}$)

The Ladinian stage- Upper Triassic series of sediments lie normally across Anisian flysch, Anisian limestone, and sediment-volcanogenic series or is pulled over along reverse dislocation to the Palaeogene creations. The Jurassic sediments normally lie across these series. The lower parts of the series, 30-150m deep, are made of stratified to banked grey limestone, often revolving with dolomites, small grained to big grained breccias. All members of the series are more or less dolomites so that all the transitions from dolomite limestone to dolomites are present.

Upper Cretaceous sediments K_2^3 are represented by banked and stratified limestone with interbed dolomites. They are crystalline and dendrite.

They are exposed in the limestone zones NW-SE, which are separated by Eocene flysch. These zones represent anticline structure, and Eocene flysch is preserved in the syncline structures.

The Senonic sediments in this zone are characterised by sequences of dolomites, dolomite limestone and limestone. They are usually represented by the Clastic series of sediments of limestone siliceous structure. The limestone of this origin contains of numerous fossil remains of rudistic shells on the basis of which the age of these sediments can be defined as Senonic. On the basis of drilling and erosion of some structure, it is estimated that the thickness of Senonic sediments of Parahton is approximately 1000 m.

Flysch of upper Eocene (E_3), Palaeogene Paraautochtonous

In Palaeogene zone of paraautochtonous upper Eocene is represented by flysch only, in whose basalt part a zone of marls can be distinguished and extracted.

The Mid-Eocene foraminifer limestone mainly gradually transverses into the Upper Eocene marls, up to 80 m deep, which are on the top of the Upper Eocene flysch series. Marls are of a homogenous mass. They are very often without sandstone and rough grained intercalations. The marls mainly transverse into typical flysch series of alternating sandstones and marls, about 300 m deep, which ends towards the surface, according to the

sedimentological testing, in 100 m deep conglomerates. Flysch appears from one transitional zone of marl limestone and marl, which is developed from the series of nummulitids limestone, which get their marl character and fully transverse into marlstones.

Foraminifer (nummulitids) limestone (E_2), Palaeogene Para autochthonous
Limestone are usually poorly stratified, contain nummulitids and other foraminifer. Their thickness ranges from 50-100 m. Position of foraminifer limestone to the underlying stratum and roof is clear. They lay in the base of upper Eocene flysch, and transgressively across mastic limestone and dolomites and across smaller appearances of bauxite.

Quaternary
The latest sediments, which are the consistent part of geological composition of this region, are of the Quaternary origin. These are alluvial sediments of the field of Bar and Terra Rossa are of the Quaternary origin. Terra Rossa is the consistent part of karst region. As usual, the bottom of the funnel shape depression is made of terra rossa (red soil). The areas composed of terra rossa, represents the only cultivable areas of the karst region. The alluvial sediments of the field of Bar are gravels of the various granular-metrical composition mingled with the clay sediments, sand, terra rossa and humus.

Alluvial deposit (al)
Mainly sand, gravel and unclear clay, appear in restricted areas, in the lowest flat areas, around rare springs and rivers.

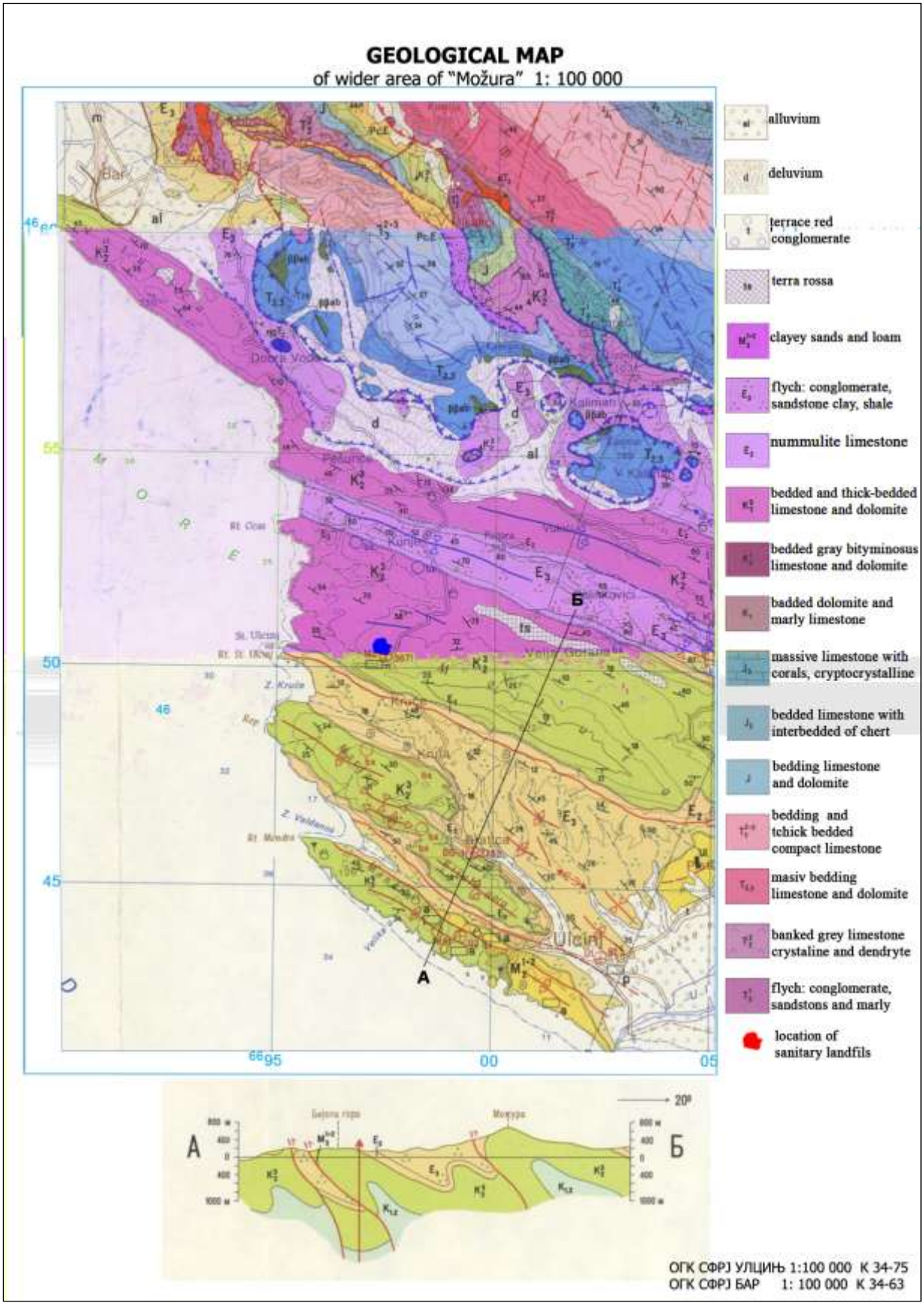
Slope (debris) material (d)
Developed in a significant area of mapped terrain, especially present in steep coastal slopes, along springs and ravines where changes of limestone and flysch series/zones are frequent, which in the presence of surface and running water, with tectonic and different facial composition mechanically and chemically decay in a different manner.

Laterite clay (ts)
Appears in karstified area of paraautochtonous. Laterite clay fills bottoms of sinkholes and karst ravines, whose surface parts are ploughed.

According to data on geological structure of the area of ‘‘Možura’’, shown in the basic geological map, scale 1:100.000 Fig.3.6.2.3/1

Pedological composition and Quality of the soil
The geological base of the hill of Volujica is composed of carbonate sediments like: limestone, dolomite and material originating from the flysh and alluvial sediments which are the consistent part of the Field of Bar.
The soil and its quality mostly depend on the geologic substratum, on the kind of stones that originate from and where they appeared.
Soil is the most valuable natural resource that has a multiple use role among humans, and it may be used as agricultural land, the land for forestation, for building parks and recreational areas as well as for the construction of water supply, infrastructure and housing structures.

Figure 2.6.2.3/4 Basic geological map, in ratio 1:100 000



3.6.2.4 Hydrology and Hydrogeology, Water Quality

Hydrologic characteristics of the area

Ground and surface drainage is being done towards Adriatic Sea. This is indicated in the main Hydro-geological map, scale 1:100.000, for Bar and Ulcinj, where the authors defined the watershed spreading along the ‘‘Možura’’ and dividing this karsts aquifer into two parts. By this watershed the part of the karsts aquifer, wherein the future location for the regional waste landfill is anticipated, is emptied westerly, to the Paljuska embayment and to the ‘‘Kruče’’ bay.

The ground drainage is conditioned by prevalence of karsts. In the vicinity of the micro location for the landfill there is an occasional water flow that drains surface waters during the rainy seasons of a year.

South-easterly from the anticipated location, out of few springs in between the flysch sediments and the aquifer of the anticlinal structure, the rivers of Možura, Bratićka rijeka, Kuče and Mulina are formed. These are also occasional water flows. The landfill location is not situated in their confluence zone and would not have influence on these water flows and springs.

In order to define the exact hydrographical and hydrological characteristics of the area it is necessary to get to know every appearance of surface waters and flows. It is necessary to take the basic hydrologic measuring during one hydrological year (15 months) in all water structures (springs, wells, boreholes, excavations etc) as well as in occasion surface waters. That measuring consists of defining the level of surface waters; defining the flow and specific examinations such as chemical composition examination, water temperature etc. This is especially related to the springs in the ‘‘Kruče’’ village (captured, not-captured and wells) for defining the possible impact of the landfill on the karsts.

Hydrogeology

Research area is made primarily of sediment rocks of the Quaternary, Palaeogene, Cretaceous, Jurassic and Triassic age. Mapped lithology members have complex structure and mutual relations that directly impact on hydro geological circumstances in research area. Hydro geologic characteristics of the researched area are presented in hydro geologic map (Picture 3.6.2.4/1)

According to the extracted rock composition, and according to hydro-geological features in the field, complexes of rock masses that are water permeable, and complexes of rock masses that are water impermeable can be identified, that is, those that have the function of a hydro-geological barrier.

There is no evidence of the existing drinking water and wells in a wider area surrounding the landfill site!

Permeable rock masses

The following complexes of rocks are extracted into the group of permeable rock masses in the research area:

a) Rocks of the Quaternary age, represented by alluvial, and delluvial sediments

b) Rocks of the Cretaceous, Jurassic and Triassic age, that are represented by different rock complexes

c) Sediments appeared by fluvial (alluvion), colluvial (deluvium) process is the youngest mapped unit registered in research area. They are made of gravel, sand, small rocks and unbounded debris material, as well as of clay, which is a compositional part of almost all the layers. Gravel series are very rare.

Layers of different lithology content interchange very often, both vertically and horizontally. Such type of sedimentation is called crossed and is characterized by very complex relations between the members.

d) Permeable rocks that make research area of the potential landfill are characterized by karst-cracked porosity of different degree of fissure, depending on age, lithology compound and other factors that impact creation of primary and secondary porosity. In the location of landfill water-bearing rock is represented by banked and stratified limestone with dolimite interbeds.

Impermeable rock masses

Sediments of upper Eocene and lateral clay represent impermeable rock masses that are represented in research area. Flysch layers are made of breccias, calcarenite, marl limestone, sandstones and marls.

Layout of represented types of aquifers

According to the available fund documentation and hydro geological reconnaissance, and according to the structural type of porosity of rock masses that make the research area, the following parts of aquifer are extracted:

a) confined karts aquifer;
b) karst aquifer(hydro geologic complex of rocks of small to big yield);
c) Conditionally arid parts of terrain.

A confined aquifer is established in rocks with intergranular porosity that is represented by alluvial, delluvial sediments of quaternary age as well as in Miocene sediments. From hydro geological aspect alluvial sediments have more favourable characteristics, because of larger occurrence and better filtration characteristics.

Alluvial sediments found in this area are mainly represented by complex of gravels, sands and clays, with frequent vertical and horizontal interchanging of mentioned members. Because of the restricted thickness of permeable rocks and transmissibility there are no conditions for establishment of more significant accumulation of underground water in them.

Replenishment of confined aquifer is primarily done by infiltration of atmospheric precipitation. Likewise, a part of aquifer that is close to temporary watercourses is replenished because of the hydraulic connection to watercourse, by immediate infiltration.

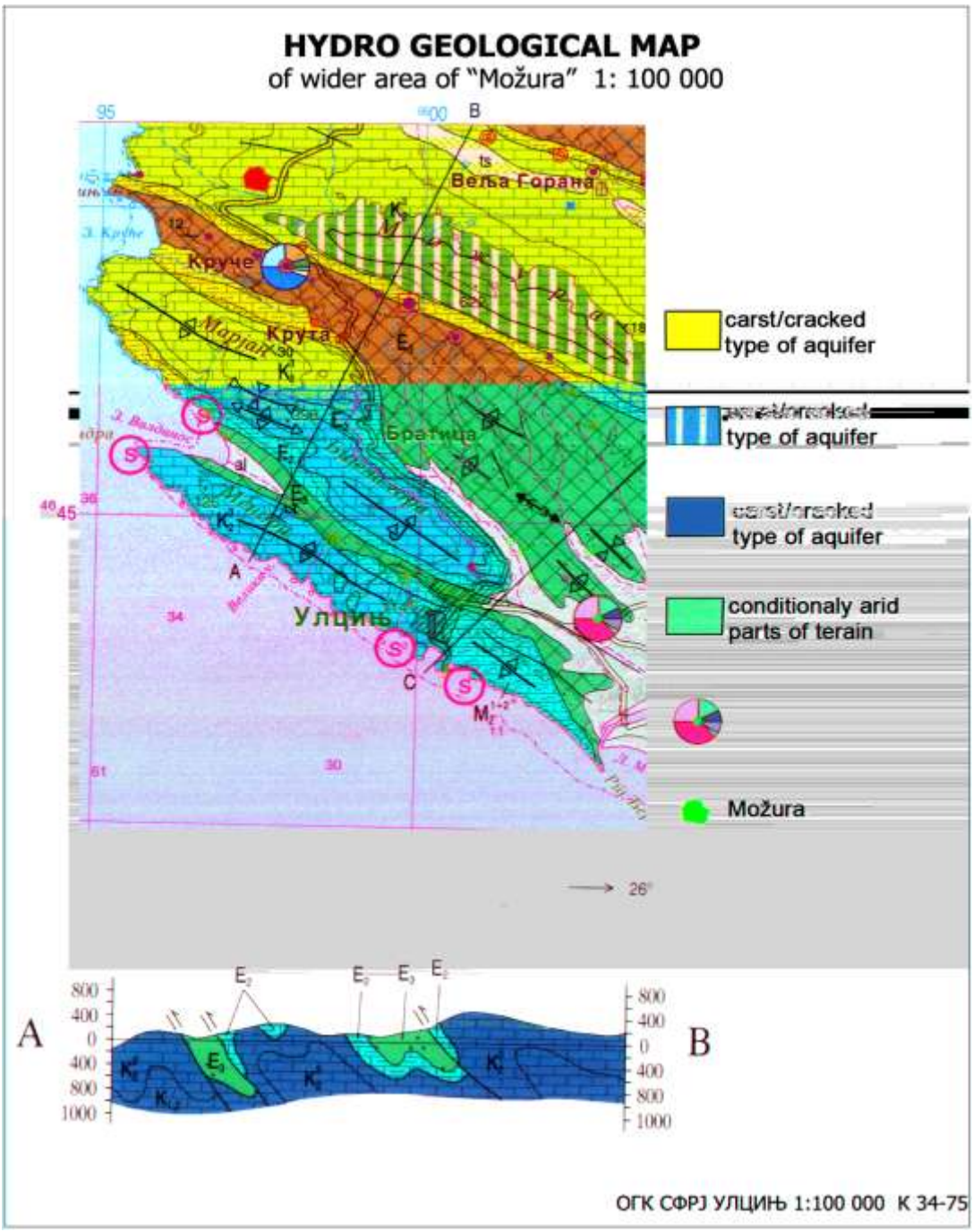


Fig.2.6.2.4/1: Hydro geological characteristic, map scale 1:100 000

Karst aquifer
(Hydro geological complex of rocks of small to big yield)
In the group of carbonate rocks of cavernous-cracked porosity of small of water bearing rock stratified limestone of Mid-Eocene (E2) can be identified, making a narrow belt along the anticline structures of Možura and Brivarska gora. Having in mind the method of occurrence and spatial position in the terrain, those are of poor to mid-karst nature, that is, with small density of karst phenomena and forms
In the group of carbonate rocks of cavernous-cracked porosity of good karstification we have the stratified and banked limestone and dolomite limestone of upper cretaceous age. They make the anticline structures of ‘‘Možura’’ and Brivska gora.
Within these structures is mainly area of occurrence of source area Gac, which mainly drains the mentioned karst area. These are much karstified terrains where permanent surface courses are missing. Precipitations that are excrete in these terrains dive across numerous karst forms, continuing their road to the interior of limestone mass where accumulations of underground water are established.

Partially limestone water bearing rock of ‘‘Možura’’ (k 622 m) is discharged through series of sources of small yield (Q= 0.1-1.1 l/s), that appear from southern side of this anticline structure and in the contact with sediments of Eocene flysch (source Tajmir, Gazivoda etc.). Exception is source Salč, whose yield in hydrological minimum ranges around Q 10 l/s and is tapped as permanent water source of Ulcinj water supply

In its smaller part water-bearing rock of ‘‘Možura’’ is discharged to the west through the submerged springs from ravine Paljuška to the bay of ‘‘Kruče’’.
This aquifer is to the northwest in immediate contact with seawater that salinate it, up to the certain distance from the coast. A part of this aquifer is emptied into the sea and is under impact of seawater can be unambiguously pointed by permanent lateral source Hladni at Old Ulcinj.

To the Southeast this confined aquifer is substantially salinated. That is indicated by analysis of Cl ions in water taken from Darzanski well and surrounding of temporary springs and wells along the southeast edge of Brivska gora. That salinity reaches Sasko Lake.
These conditions of discharge and salination, and good karst of the limestone and dolomitic limestone indicate that the level of the ground water in the zone of a potential landfill is close to the sea water level, which means in the depths about 100 - 200m. This will be established by means of the test hole.

Conditionally waterless parts of the field
Laterite clay belongs to this group (ts) that has a restricted occurrence in the area of Možura and Brivarske gore. They are met mainly at karst forms (sink holes and depressions).
The group of practically impermeable rocks we also include flysch sediments of Eocene age (E_3) that are represented by mainly shale, marls and sandstones. At these sediments clayish-marl components prevail, that causes their impermeability.

Complexes of rocks that are extracted as impermeable spread out in the north and south of the research area and have a function of hydro geologic barrier.

According to our estimations, the level of the underground water sources is either on the level of the field of Bar or below it which means somewhere about 100 m below the level of location ‘‘Možura’’.

In the landfill design phase, before construction beginning, it is recommended to drill investigation well for the reasons of estimation and eventual check of ground water level. It will be very significant owing to necessity of future monitoring (Table 3.4/1 EMP Outline)

2.6.2.5 Ecology

Flora and Fauna
Suitable Mediterranean climate, well developed different types of communications, including the connections with distant countries, development of horticulture, etc, have an impact on a permanent increase in new domestic sorts, especially decorative sorts of flora.

Flora
Geological position, geo-morphological and climate characteristics enabled the development of the various vegetation and animal species in a broader region of Bar.
Eco- system of the periwinkle forest of macchia (underbrush) occupies the region between the coastal area and the zone of thermophile deciduous forest (Macedonian oak forest) from the sea level to 500m above the sea level

Apart from versatile and luxurious flora, geographic position and the soil composition have allowed many different plants species, especially sub-tropic ones, to grow in Bar. There are meadows, fields, vineyards, orchards but the green zone of Bar is also rich in deciduous and conifer trees, pastures, bushes and macchia. In the mountains and forests around Bar there are: beech, fir, spruce, black and white pine, oak, ash, chestnut, hornbeam, European Turkey Oak, etc

Aromatic plants are specific for the flora of this area and in some places near the city of Bar the residents are in collection and processing of the wormwood plant. Apart from using it for making a very good quality tea for medical purposes, this plant is also used for making a good quality honey.

Specific investigations on protected species are not conducted. But field investigation took place on the site proving presence of usual macchia flora. According to the official Montenegrin List of Protected, Endemic and Endangered Species (Official Gazette of Montenegro 36/82) there are no listed species in the area.

Fauna
This zone is especially inhabited by numerous species of insects. Numerous and versatile species here are birds (both migratory and non-migratory birds), reptiles and mammals.

Among mammals the wild dogs-jackals inhabiting deserted areas of Rumija, Volujica and Majelika should be mentioned, including similar species like wolves and foxes.

In Bar and its surroundings many different animal species may be found. These animals mainly live in the mountains that surround Bar. A special value for fauna is the jackal that is most often found in the hills around Bar

This region is inhabited by game like rabbits, partridges, pheasants, etc. However, on the particular project site there are no specific species, which would be under natural protection.

Specific investigations on protected species are not conducted. But field investigation took place on the site proving presence of usual Mediterranean fauna. According to the official Montenegrin List of Protected, Endemic and Endangered Species (Official Gazette of Montenegro 36/82) there are no listed species in the area.

2.6.2.6 Population

According to the data from the Physical Plan of Montenegro:
The data relating to the population, according to the census of 1991 and 2003 for the Municipalities of Bar and Ulcinj, as well as the population projections for 2021, are presented in the table 3 below. The table also comprises the data on the number of population living in urban and other areas.

Table 2.6.2.6/1 Population numbers according to the censuses of 1991 and 2003, along with a projection for 2021

Municipality	1991	2003	2021
Bar	34,463	40,037	43,692
urban	11,215	17,747	34,991
others	23,248	22,290	8,701
Ulcinj	19,861	20,290	22,000
urban	10,025	10,828	17,670
others	9,863	9,462	4,330
Total	54,324	60,327	65,692
urban	21,240	28,575	52,661
others	33,111	31,725	13,031

A household consists of one family or another group of persons who live together and jointly spend their collective income, in order to meet the basic requirements for living (housing, nutrition, etc.), regardless of whether all the members are present in the household, or some of them (due to work, education, etc) have resided in another settlement, or foreign country, for a longer period of time.

The table 2.6.2.6/2 includes the data on the number and size of households according to the census from 2003 (Monstat), for the Municipalities of Bar and Ulcinj.

Table 2.6.2.6/2 The data on the number and size of households (Monstat, 2003)

Municipality	Population	Number of households	Number of persons in households
Bar	40,037	12,447	3.2
Ulcinj	20,290	5,327	3.8

With respect to activity, population is divided into actively working persons who generate personal income and the supported ones. The active population includes the working persons who are older than 15 years of age, unemployed persons looking for a job, and the persons who are not working temporarily, due to military service (active persons who do not work for a particular period of time). Employment includes the performance of particular activities aimed to acquire the means of support.

There are no inhabited or business structures within a circle of 850 m around the site. According to the Regulation (Official Gazette of Montenegro 20/83), this is out of an impact zone.

2.6.2.7 Air Quality

No analysis of the air quality in the area foreseen for the landfill has ever been carried out. In the broader region of the town of Bar, the Hydrometeorological Service of Podgorica set up the group of stations for a continuous 24-hour monitoring of the pollutants that are permanently present in the air (smoke and sulphur-dioxide), including the quality of precipitation. The nearest station of this type to the mentioned location is "Stari Bar" in the circle of the factory "Primorka". The air distance from this station is 15 km - Southeast of the area that is foreseen for a sanitary landfill. The station was operational in the period from 1983-1988. The related analyses showed the characteristic parameters - the presence of smoke and SO^2 in the mentioned period.

The average, maximal and minimal monthly values of the smoke and SO^2 content in the air, expressed in micro grams per a cubic meter, are indicated in the tables below. According the obtained data, this is a high-quality region. All characteristic parameters are fairly low and are appropriate to the air quality needed for the recreational centers.

Table 2.6.2.7/1 Smoke concentrations at the Stari Bar station [µg/m3]

YEARS		MONTHS											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1983.	C_{cr}									5	5	6	
	C_{max}									5	30	18	
	C_{min}									5	1	1	
1984.	C_{cr}	3	6	6	8	0	1	0	1	1	1	9	
	C_{max}	15	15	13	22	3	3	4	3	5	5	21	
	C_{min}	0	4	01	1	0	0	0	0	0	0	2	
1985.	C_{cr}	2	6	4	6	2	1	10	8	7	0	8	
	C_{max}	7	17	8	13	17	8	22	15	19	5	21	
	C_{min}	1	1	0	2	0	0	4	2	1	0	2	
1986.	C_{cr}	6	6	9	4	2	3	6	6	3	14	3	
	C_{max}	12	12	26	21	5	17	12	19	13	102	11	
	C_{min}	1	1	2	1	1	0	0	00	1	1	0	
1987.	C_{cr}	7	4	13	4	6	8	12					
	C_{max}	22	15	5	7	15	16	17					
	C_{min}	1	0	4	2	2	4	8					
1988.	C_{cr}	8											
	C_{max}	21											
	C_{min}	3											

Table 2.6.2.7/2 Concentration of SO2, in [µg/m3] Bar-Old town

YEARS		MONTHS											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1983.	C_{cr}									0	11	20	46
	C_{max}									5	55	45	68
	C_{min}									0	0	17	38
1984.	C_{cr}	20	24	15	9	3	2	2	3	1	3	8	15
	C_{max}	38	62	48	21	17	7	6	20	2	9	21	41
	C_{min}	7	7	3	4	1	0	1	0	0	0	1	2
1985.	C_{cr}	4	11	5	6	5	3	4	4	1	3	7	14
	C_{max}	14	40	22	48	44	8	10	7	3	9	21	41
	C_{min}	2	2	0	0	1	0	0	1	0	0	1	2
1986.	C_{cr}	5	5	4	3	2	0	14	17	4	20	2	6
	C_{max}	12	8	8	8	5	2	26	35	12	79	6	26
	C_{min}	3	3	0	0	0	0	4	2	1	1	0	0
1987.	C_{cr}	3	7	9	8	4	7	4					5
	C_{max}	6	17	19	19	12	15	15					8
	C_{min}	1	1	2	1	1	1	0					3
1988.	C_{cr}	20											
	C_{max}	40											
	C_{min}	9											

The available recorded data show that the objectives of previous observations of air quality referred to:

- The sources of and causes for a change in natural characteristics of the air along the Montenegrin coast.
- The impacts of the air pollution on the environment and the people, and accordingly on an overall development of this region.

Characteristic indicators of air pollution, which come from the combustion of fuel, used for heating of households or for industrial purposes, are mostly sulphur dioxide and smoke. Substances and elements, which are determined as indicators of air pollution, are Lead, Nitrogene oxides, Carbon monoxide and Carbon monoxide. The contents of heavy metals (Cd, Cr, Cu, Pb, Ni, Hg, As, Ba) were observed as characteristic indicators for industrial zones.

Beside the main ingredients, cyanide, polycyclic aromatic carbonate-hydrogen, phenols and similar compounds were determined, too. These compound and other toxicants can enter into air, in certain climatologic situation, as well as substances which are the consequence of the unplanned combustion of waste materials, like used oils, old car tyres etc.

2.6.2.8 Traffic and vibrations

The environmental conditions of the analyzed area depend on the impacts of urban development, agriculture, traffic (road and air traffic), uncontrolled depositing of garbage, usage of herbicides, pesticides, chemical fertilizers, etc.

The landfill should be located on the hill near the Bar – Ulcinj road and a 2,000 m long dirt access road that runs from the main road to the landfill site. There is no regular traffic count data available for mentioning in this EIA.

However, in 2008, the Directorate for Traffic initiated the procurement and installation of modern traffic counters. However, along the M-2.4 highway Bar – Ulcinj no automated traffic counter has been installed. The only source of data collected by the Directorate for Traffic along this section of the road is limited to one-day manual traffic counts carried out by the Company "Crnagoraput" *(Montenegro Roads)* that is responsible for the maintenance of public roads. The following traffic count data along the Bar – Ulcinj road were collected:

- 8,251 vehicles (counted on 18 September 2007, from 6 a.m. to 6 p.m., the site of Kruče);
- 12,623 vehicles (counted on 29 October 2008, from 6 a.m. to 6 p.m., the site of Petlja);
- 12,998 vehicles (counted on 30 September 2009, from 6 a.m. to 6 p.m., at the field office of "Crnagoraput").

Based on an assessment of daily volumes of waste that will be collected from the municipal areas of Bar and Ulcinj, taking into account the level of technical equipment of the public enterprises for the collection and transport of waste, an average number of waste collection vehicles may be anticipated. This number will vary between 15 and 20 waste

collection vehicles, on a daily basis, which will have no significant impact on traffic congestions along the Bar – Ulcinj road, since this road section is traveled by several thousand vehicles on a daily basis.

In this particular case, negative impacts would be caused mostly by the traffic on the existing highway Bar -Ulcinj. Those are reflected through air pollution, noise, vibrations and the pollutant sedimentation on the paved areas that are washed down from the paved surfaces into the surrounding soil or the sea. Such tests are carried out in order to describe the present situation and the impact that the traffic has on the quality of soil, air and waters in the immediate surroundings of the future sanitary landfill. By using this information, future monitoring of the environmental impacts will clearly confine the influence of the traffic and possible impacts of the future sanitary landfill.

2.6.2.9 Vibrations

The vibrations have a smaller significance and impact on the environment than the noise and air-pollution, because those affect a limited space. The source of vibration is the traffic. Vibrations appear in contact surface of pneumatics and pavement, causing occurrence of vertical dynamic reactions, which spread mainly in a form of surface waves, which can cause negative impacts on the people and structures. Generally, the vibrations result from the vibrations of the following three main systems:

- System of vehicles, whose frequencies range from 1 – 10 [Hz]
- System of elastically hanged masses, as wheels, axles, etc, the frequencies of which vary from 10 –20 [Hz]
- System of individual structural compositions, which oscillate in much higher frequencies.

The effect of road vibrations can be observed through their impacts on the built environment and the people. Negative effects on the built environment include the fatigue of material, leading to its shorter duration. An impact of vibrations on the people is manifested on their extremities, through mechanical action of changeable acceleration, and on secondary biological and psychological effects, caused by irritation of nerve receptors.

2.7 POTENTIAL IMPACTS AND MITIGATION MEASURES

2.7.1 INTRODUCTION

This section provides an assessment of the potential positive and negative environmental impacts resulting from the development of ‘‘Možura’’ landfill site, the adequacy of the mitigation measures included in the landfill design, and the potential significance of residual impacts. Additional mitigation measures, which are considered to be necessary, are discussed in Chapter 3, which addresses operational issues pertaining to the proposed landfill site. The range of issues which will be addressed in this section is as follows:

- Impacts on Population
- Hydrology, hydrogeology and water quality impacts;
- Health and safety impacts;
- Air quality impacts;
- Noise impacts;
- Ecological impacts (flora and fauna);
- Off-site traffic impacts; and
- Visual/landscape impacts.

2.7.2 IMPACTS ON POPULATION

Negative impact in this area lasted for years. We have no information that this caused any migration of the population in this area. On the contrary, beside the negative impacts, the number of inhabitants was constantly increasing in these three municipalities, as well as in the whole seaside area. The sanitary landfill of Možura is situated on average 800 – 1000 m away from the nearest village, which is, according to the existing Regulation (Official Gazette of Montenegro20/83), outside of the zone of impact.

It is also expected that the institutional framework for the project as a whole (as stipulated under the agreement between the Municipalities Bar and Ulcinj) will include a transfer agreement to employ the workforce from both public communal companies at the regional sanitary landfill. The potential impact of loss of jobs at the existing dumpsites is likely to be minimal. The creation of local employment opportunities (not skilled/semi-skilled) may happen during both the construction and operation of the site, depending on the locally available skilled workers. Although the construction works will most likely be carried out by external contractors, they should be encouraged to recruit local engineers and workers. However, the skilled workers and engineers mostly work in the public enterprises or at the harbor, so that this impact, as a positive one, may not be so significant. The availability of employment opportunities for local skilled and unskilled persons during the landfill operation should be explored through a survey. Given the tourist industry and harbor-based nature of the local economy, it may be possible that no suitable person that could be

employed during the construction works may be found. In addition, the number of staff required to operate a sanitary landfill is small. Therefore, an overall positive impact of the landfill development on the availability of job opportunities for local people is likely to be minimal. The creation of local employment opportunities (skilled), an impact of the landfill development on the job opportunities for trained local environmental, mechanical and civil engineers may likely be more significant. There is a definite potential for the promotion or redeployment of skilled waste management staff from the waste collection services (as they become more efficient) and the existing dumpsites to the new transfer and disposal services. As for the loss of local recreational and religious facilities, the land to be covered by the Možura site is not used for any recreational or religious facilities at present. An overall level of potential impacts on the recreational and religious facilities as a result of this development is likely to be of a minimum significance.

An overall negative impact of this development on the local property values is likely to be moderate or minimal. Apart from careful planning and professional implementation of the project, taking into account the needs and fears of the local people, no other mitigation measures are available to reduce this impact. Compensation may be considered in certain cases, but it is seen as generally required.

Summary of Impacts

A summary of the potential significant impacts on the population as a result of the Možura landfill construction is shown in Table 2.7.2/1 below

Table 2.7.2/1 The Significance of Potential Impacts on the Population

Potential impact	Positive / Negative	Potential Significance
Impact on local citizens	Positive	No significance
Loss of productive land uses	Negative	Minimal
Creation of local employment opportunities (not skilled/semi-skilled workers)	Positive	Minimal
Creation of local employment opportunities (skilled workers)	Positive	Moderate
Loss of local recreational and religious facilities	Negative	Minimal
Reduction in local property values	Negative	Moderate

2.7.3 HEALTH AND SAFETY

This sub-section discusses the range of potential health and safety impacts associated with the Možura landfill, and their potential significance.

Impacts on the health of local people

The operational practices that are proposed by the conceptual design in order to minimize the potential risks for human health as a result of the sanitary landfill in generally include:

- Strict control over entry and exit to the site;
- Control of vermin, insects and birds by compaction of deposited waste and use of
- daily cover;
- Control of vermin, insects and birds by adoption of cellular filling
- practices;
- Control of birds through use of bird scaring methods;
- Ensuring protective clothing is worn by personnel when working on-site;
- Provision of first aid facilities; and
- Regular health checks for personnel.

It is recommended that a health-monitoring program needs to be maintained to ensure that an early warning is given to the presence of any infectious diseases that may harm the staff, and that the operating practices are maintained at a high standard in order to minimize the health impacts. Provided that these standard operational procedures are complied with, the risk of disease transmission to the local communities will be extremely low. This impact can therefore be defined as an impact of minimal significance.

As for the potential for exposure to/explosion of landfill gas, landfill gas is a product of waste degradation under anaerobic conditions. Having a high content of methane, toxic and inflammable gases, the generation of landfill gas poses significant risks to the human health and life (due to a risk of exposure to and explosion of the gas). The risk is the greatest where the gas is allowed to build-up in a confined space, such as within a building or in collapsed void spaces within the deposited waste. In order to minimize the risks to human health from landfill gas, an active gas collection system is proposed at the site. The designed features will allow a sophisticated degree of control to be achieved. However, professional installation and maintenance of the gas collection system is essential to proper control of landfill gas, and the related staff will need to be trained to carry out these duties. Monitoring of the occurrence of landfill gas at the margins of the site will determine the effectiveness of the proposed control measures. If necessary, the site operator should construct the barriers to cut the landfill gas off near some specific properties, in order to reduce the risk. Given that the site will be manned only by the staff involved in the site closure activities, no existence of a safety risk at the site was anticipated.

Summary of Impacts

A summary of significant potential impacts on the human health and safety from the development of the Možura landfill is presented in Table 2.7.3/1 below.

Table 2.7.3/1 Summary of Potential Health and Safety Impacts

Potential impact	Positive / Negative	Potential Significance
Impacts on the health of local community	Negative	Minimal
Exposure to landfill gas/ explosion of landfill gas	Negative	Moderate
Improvement of the human health and safety	Positive	No significance

2.7.4 IMPACT ON WATER

The offered technical solution requests a complete protection of both surface and ground waters in the Možura area. The construction of bordering ditches provides for a full protection of the landfill against storm waters. Technical solutions with insulators (layers of clay, plastic folio etc.) enable the impermeability of the lower layer and the bank, that prevents the leakage and infiltration of leachate from the landfill into the natural recipient, resulting in its pollution. Through a drainage system, leachate runs in a controlled manner from the landfill to the system for treatment: storage pond, simple treatment plant and pumps for re-circulation. This sub-section discusses the range of potential hydro-geological, hydrological and water quality impacts associated with the Možura landfill, and their potential significance.

The offered technical solution requests a complete protection of both the surface and ground waters in the Možura area. The construction of the bordering ditches ensures a complete protection of the landfill against the storm waters; technical solutions with insulators (layers of clay, plastic folio etc.) enable the impermeability of the lower layer and the bank, that prevents the leakage and infiltration of leachate from the landfill into the natural recipient, resulting in its pollution. Through a drainage system, leachate runs in a controlled manner from the landfill to the system for treatment: storage pond, simple treatment plant and pumps for re-circulation. The conceptual design includes the requirements relating to the washing of equipment, containers and vehicles for the transport of waste. It is recommended to incorporate this maintenance procedure in the General Design. The wastewater after the vehicle washing should be treated in the same manner as the leachate from the landfill, and accordingly discharged into the treatment system. These questions should be answered through the next phases of the design (General design). The quantities of precipitation on the landfill should also be assessed, as well as the infiltration of storm water into the body of the landfill, the quantities of liquid which will evaporate and the volume of expected leachate.

As a part of the landfill development proposal, surface water drains will be constructed around the site to minimize the inflow of water into the site. Although this measure is

included as a matter of standard landfill design practice, it will lead to a positive effect of minimizing the percolation of water into the landfill body. In developing the site it is proposed that a low-permeability liner complex be constructed to contain the leachate generation. The leachate will flow along the base drains to a low point in the site floor, where it will be treated to meet the strict emission standards. The leachate may also be re-circulated in order to minimize the quantity that needs to be treated. The liner has been designed to achieve a permeability, which will provide a high degree of containment. Regardless of the degree of specified containment, however, there will always be some risk of leachate emission from the landfill site. Good operational management will greatly minimize these risks, and a rigorous program of water quality monitoring will need to be carried out to ensure that any impacts are identified and immediately addressed.

Groundwater monitoring wells should be constructed during the initial site investigation phase, and be used during the lifetime of the site for water quality monitoring.

Table 2.7.4/1 Summary of Potential Impacts on Water

Potential impact	Positive / Negative	Potential Significance
Contamination of Water resource from leachate emission	Negative	Minimal
Availability of irrigation water	Negative	None
Reduction in flood storage capacity	Negative	None
Contamination of Water resource by suspended solids	Negative	None
Contamination of Water resource by fuel spillage	Negative	None
Contamination of water from vehicle washing	Negative	None

2.7.5 POTENTIAL AIR QUALITY IMPACTS

Disposal of solid communal waste, regardless of a technical solution, carries some risk of air pollution. In this particular case, there is a risk of unpleasant odor and the explosion of the landfill gases. The landfill gas, as already mentioned, can make an explosive and flammable mixture with the air, in particular concentrations. The technical solution suggests the construction of shifts that will lead the gas from the landfill body into the recipient.

Offered technical solution does not quantify possible quantities of gas, as to assess the possibility of its usage as the source of energy and its combustion. This section discusses the range of potential air quality impacts associated with the ‘‘Možura’’ landfill, and their potential significance. Regarding odor impacts from on-site activities, odorous at landfill sites are generated from the movement, placement and decomposition of waste. The waste

transported to the landfill is likely to have already undergone some decomposition, and as a result, it will be odorous on arrival at the site.
The main method of reducing the generation of odors from the site is to fill the landfill site in small well-defined cells and to use daily cover to prevent prolonged exposure of vulnerable wastes to the atmosphere. Daily cover will be derived from composting of source segregated organic wastes. Only compost, which is stable and non-odorous, should be used as daily cover. Overall, with strict adherence to proper operational management procedures, it is anticipated that the odor impact from the development of the ‘‘Možura’’ landfill can be kept to moderate levels of significance.

Some impact is, however, likely, and during the conduct of the proposed social impact assessment during the detailed planning stage, some form of compensation of inhabitants (possibly including purchase of the properties) should be considered and discussed with the residents. Control of dust generated from on-site vehicle movements, and placement of waste and cover material. Dust impacts can be minimized through good site practices. Again, with judicious application of these mitigation measures, impacts are likely to be kept to moderate levels. The options of compensation and/or purchase of these isolated settlements should be considered during the social impact assessment as a means of minimizing dust impacts. Vehicle exhaust emissions from landfill plant have a potential to cause deterioration in local air quality.

Although there are no data available on the baseline air quality in the area, the area is rural and mountainous and without doubt currently has a very good standard of air quality. As there are very few existing traffic movements and few other air pollution sources nearby, landfill-related vehicles are likely to comprise a high proportion of total emissions. However, given that the baseline levels of pollutants are low, the additional emissions from these landfill-related vehicles are highly unlikely to raise the level of air pollutants to acute levels. An overall potential impact of vehicle emissions resulting from the landfill-related traffic is likely to be a very minimal quantity of dust from the construction activities.

In line with modern sanitary landfill practices, it is proposed that the site be constructed in two separate phases, and be filled in an operational cells within these phases. The purpose of adopting such practices is to minimize the environmental impact of the construction and operation of the landfill. Amongst other reasons, confining the working area to a small part of the site makes it easier to manage the construction activities on site to high environmental standards.

Subsequent site works, particularly landfill earthworks for preparation of cells, will be developed sequentially in a phased manner and will occur in different parts of the site for different periods of time, but will be of minimal significance.

Table 2.7.5/1 Summary of Potential Air Quality Impacts

Potential impact	Positive / Negative	Potential Significance
Odor impact from site activities	Negative	Moderate
Impact of dust from vehicles, MSW unloading and covering materials	Negative	Moderate
Impact of gases emitted from the vehicles on location	Negative	Minimal
Impact of dust from construction activities	Negative	Moderate

2.7.6 NOISE

Analyses of the traffic noise was carried out for the existing road M 2.4 in order to determine an impact on a wider area of the proposed location for the sanitary landfill, by dividing the noise into the one which is produced during the landfill operation, and the one which is produced by the traffic on the road M 2.4.

An estimation of the level of the noise under the conditions of free noise spreading (PGDS: 6182/vehicles/24h; inclination: 0 %), and the traffic structure show that the level of the noise is acceptable even 200 [m] away from location, in accordance with the Montenegrin legislation. The equipment planed for the sanitary landfill operation is designed to control the level of protection against noise, so that it can be concluded that the operating equipment at the sanitary landfill will have no negative impact on the population and the environment during the landfill operation. This sub-section discusses the range of potential noise impacts associated with the Možura landfill and their potential significance. The construction activities associated with the development of the landfill are listed in the previous sub-section. It is assumed that the landfill construction and operational will be limited to daytime (7am to 6pm) periods.

The most significant period of construction noise generation will be noted during the initial site infrastructure works, which are anticipated to be carried out over a period of 5 to 7 months. Following this initial phase, the construction activities will extend throughout the lifetime of the development, as new cells and phases of the site will be required progressively as the site develops. The construction site is close to a borrowing pit for the sand and construction materials. The noise relating to the construction of a sanitary landfill primarily depends on the deployment of the facilities and the proximity of the construction activities to noise-sensitive receivers. (It is likely that the construction activities will depend on the use of skilled and unskilled labor, as well as mechanical equipment. The noisiest construction works that are most likely to have an impact on the nearby environment are expected to be related to the construction of the basic containment layer of the site. The mechanical equipment used for this activity will be similar to the one for the land filling operations.

Operational Noise

Source of operational noise vibrations from the landfill site will include:

- Movement of vehicles on site roads;
- Deposition, leveling and compaction of waste;
- Placement of waste and daily cover material;

The planned development will increase the number of vehicles and operating facilities. The highest noise levels expected from the land-filling operations will be approximately equal to the worst-case construction noise. For much of the operating life of the landfill, noise levels would be lower because the filling area.

Summary of Impacts

A summary of the significance of the potential noise impacts from the development of the ‘‘Možura’’ landfill is presented in Table 2.7.6/1 below.

Table 2.7.6/1 Summary of Potential Noise Impacts

Potential impact	Positive / Negative	Potential Significance
Construction	Negative	Potential Significant
From the on-site vehicle movement - operational	Negative	Potential Significant
Landfill exploitation noise - operational	Negative	Minimal

2.7.7 ECOLOGY

The scope of this EIA includes the conduct of a detailed ecological survey. However, this section includes interpretations of likely ecological sensitivity based on field visits to the site.

The impact on flora, fauna and geologic conditions is assessed through the loss or damaging of the residences of the plant and animal species and geologic and paleontology values. Regarding the loss or damaging of resident plant and animal species, there are no resident protected or endangered species, plants or animals at this site. Relatively small surface of the landfill with adjacent objects and access road does not influence the vegetative cover and natural habitats.

Severance of wildlife corridors

As there are no nature reserves or important ecosystems in the vicinity of the site, no severance of wildlife corridors is likely to occur. In addition, no additional severance above and beyond the one that already exists in the area will be caused from the development.

Creation of new habitats (post-restoration)

One of the major arguments in favor of sanitary land filling is that following completion of infilling activities; the site can be restored and used for recreation and/or very low intensity developments. Although such restoration represents a sizeable proportion of the overall

costs of developing sanitary landfill facilities, it allows the land to be used for some alternative purpose. As the landfill is developed and progressively restored, a research program should be conducted to monitor the introduction of different species, and assess their relative success. The results from this program can be used to ensure that the restored landfill has as wide a diversity of flora (and fauna) as possible. Site restoration presents an opportunity to restore the site to its former rural ecological character. As such, the progressive restoration of the site, and creation of new habitats for flora and fauna is likely to be of ecological benefit to the area.

Summary of Impacts

A summary of the significance of the potential ecology impacts from the development of the ‘‘Možura’’ landfill is presented in Table 2.7.7/1 below.

Table 2.7.7/1 Summary of Potential Ecology Impacts

Potential impact	Positive / Negative	Potential Significance
Loss of flora and fauna habitats	Negative	Minimal
Severance of wildlife corridors	Negative	None
Impact on flora and fauna during construction	Negative	No Significant
Impact on flora and fauna during exploitation	Negative	No Significant
Impact on wild animals movement	Negative	No significance
Creation of new habitats Forming new herb species (post restoration)	Positive	Moderate

2.7.8 OFF-SITE TRAFFIC

The selected site for the regional sanitary solid waste landfill for the municipalities of Bar and Ulcinj is located at the site of Možura, 17 [km] South of Bar and 11 [km] Northwest of Ulcinj. The future sanitary landfill is situated 2000m to the East from the Southern part of the road M.2.4 Bar – Ulcinj. The influence of the traffic on the status of the environment is already described above, whereas the future monitoring team is recommended to take the previous negative impacts of the traffic into consideration. Regarding the number of vehicles which will work on the landfill as well as the number of trucks which will transport the waste from different locations, it can be concluded that there is practically no influence on any of the environmental aspects.

Summary of Impacts

A summary of the significance of the potential off-site traffic impacts from the development of the ‘‘Možura’’ landfill is presented in Table 2.7.8/2 below.

Table 2.7.8/2 Summary of Potential Off-site Traffic Imp*acts*

Potential impact	Positive / Negative	Potential Significance
Increased traffic congestion along the site access road	Negative	Minimal

2.7.9 VISUAL-LANDSCAPE IMPACTS

The visual change of the area of the site ‘‘Možura’’ will happen, due to the disposal of around 1,100,638.6 m^3 of waste over a period of twenty years. Natural landscape in this part was already changed into an anthropogenic landscape. The changes in the eco-system of a wider area will include insignificant changes in the natural landscape that will be transformed into an anthropogenic one, as well as insignificant changes in the topography, earth cover, microclimate characteristics, biocenotic contents, etc., and a temporary change of visual layout from the high mountains. The usual practice of the communal waste disposal in Montenegro, until now, has created an unpleasant picture of those 'dirty' places that nobody wishes to be close to. Negative visual effects of such locations are observed more by the general public than data on the pollution caused, which is not readily available. Mitigation measures, which are included as a standard operational practice: progressive restoration throughout the lifetime of the site to minimize the visual impact of the site; filling of the landfill in small well-defined cells in order to minimize a visual exposure of the areas for waste disposal; and use of daily cover to avoid a prolonged exposure of the deposited waste to sensitive receivers.

All in all, it is considered that the landfill operation will not give rise to any visual impacts on nearby sensitive receivers. In the later phases of the site, when the filling operations will be carried-out at the level of the existing top-ridge of the landfill, the potential for windblown litter will increase. During this short phase of the site development, the tipping area to ensure that litter is confined within a small area should use litter screens. The potential for windblown litter in general will also be significantly reduced by compaction of the waste following its deposition, and through the application of daily covers.
Planting trees is considered as an option in the design phase, especially to the West (potential settlement in the future) as well as to the Southwest (owing to the wind and odor related potential problems)

Summary of impacts

A summary of the significance of the potential visual/landscape impacts from the development of the ‘‘Možura’’ landfill is presented in Table 2.7.9/1 below.

Table 2.7.9/1 Summary of Potential Visual/Landscape Impacts

Potential impact	Positive / Negative	Potential Significance
Visual degradation during construction and exploitation	Negative	Minimal
Visual impact of site restoration –landscape re-cultivation	Positive	Minimal

2.8. MITIGATION MEASURES

An overview of the mitigation measures for the rehabilitation of the sanitary regional landfill of Možura will be recognized through two key elements for a successful mitigation of impacts on the environment - Protective measures and Program for the Monitoring of the Environment

2.8.1 PROPOSAL OF THE PROTECTIVE MEASURES

2.8.1.1 General protective measures

General protective measures include a number of preventing and organizational procedures, which aim to eliminate any situation that could cause the pollution of the environment, both during the landfill construction and exploitation. In order to achieve that aim, it will be necessary:

- To prepare the technical and site planning documentation according to the regulations. It is necessary to obtain the specifications for the site organization from all relevant institutions, within the framework of city planning documentation. It is also necessary to obtain a planning approval from the authorized institutions for the technical documentation relating to the General design.
- To ensure the compliance of technical and technological processes and of the landfill features with the parameters for limit values, which were used for all analysis within the framework of this study, including its examination and assessment.

2.8.1.2 Technical and Sanitary Protection Measures

The technical and sanitary protection measures refer to the protection of the landfill area from uncontrolled access by the people and animals, collection of storm water, wastewater, filtrates from the landfill, wastewater resulting from the washing of vehicles and garbage containers, etc.

A drainage ditch for the collection of storm water and their transport to the recipient will be constructed around the landfill. The landfill leachate is drained through a drainage system,

inside of the landfill body, to a pool which also has to be adequately fenced. The pool for leachate collection must be completely impermeable. The leachate will be treated physically and chemically in the coagulation and flocculation chamber. Dredging of the suspended substances will be carried out in the sedimentation tanks, whereas the water will be pumped back to the landfill. The landfill sludge from the dredged deposition will be deposited onto the landfill.

The General Design should recommend the manner of, frequency and means for disinfection, extermination of insects and vermin at the landfill and in the surrounding area.

2.8.1.3 Protective Measures relating to the Construction and Technical Works

The construction of a stable paved access road to the site is planned, as well as all manipulative surfaces inside the landfill. The access road will be fenced. In parallel with the fence, continuous green belt must be planned.

2.8.1.4 Protection from air pollution

The sanitary landfill of Možura is planned to be used for waste disposal in an organized manner, into the prepared cells which can take the quantity of waste produced over a period of three months in these two municipalities. According to the valid regulations, a cell into which the waste is deposited, when it is full, must be covered in the manner specified by the conceptual design, within the period of six weeks. Movable nets may be used until the moment of permanent coverage, as a safety measure, to prevent further storm water penetration, as well as possible spreading of light particles. These nets should also prevent the access of birds, especially sea gulls, which can be an issue for the airport too.

No other kind of air pollution is expected, taking into account the offered preliminary technical solution which excludes the combustion of garbage. When the garbage that has already been incinerated arrives to the landfill, it needs to be deposited at the place that is planned for such a purpose, where it would be extinguished and further treated as any other deposited waste. Such a situation can be considered as accidental, rather than usual. That means that no air pollution by smoke and other products of combustion is expected.

Regular washing and maintenance of the transport roads in the landfill area will minimize the occurrence of dust, and grouping of the insects, birds, rodents and other animals, thus minimizing the risk of various kinds of animal-transmitted diseases and such impacts on the human health.

2.8.1.5 The protection of waters and soil from pollution

The storm waters from the surfaces which do not belong to the part of the landfill where the garbage is deposited will be carried out to the recipient by a system of drainage ditches. The water infiltrated through the landfill will be also discharged through a system of drainage ditches. The technical solution for the landfill insulation will completely protect the surface and underground waters, as well as the soil, as already emphasized in the previous chapters.

2.8.1.6 The protection against the noise

In order to decrease the level of noise at the landfill site, it is necessary:

- To specify in detail the procedures relating to the movement of vehicles through the landfill and identify the internal transport roads in a way that provides for a minimal impact on the environment.
- All facilities must be designed in accordance with the applicable noise levels that are regulated by law, regarding the performance of various jobs and the level of the complexity of operations.

2.8.1.7 Visual protection

The issue of visual protection relates to numerous facts with quite specific characteristics, so that it needs to be included into the protective measures too. The problem of visual impact is specific because it is related to the cognition of visual impression as an opinion. The opinion that something is dirty, ugly, polluted or the source of disease is being formed on the basis of visual impression, causing negative attitude toward the constructed structure. The conclusion is clear: the structure must be "kept out of sight". A good solution would include a forest stretch although the terrain and the climate not adequate for tree growing. Nevertheless, it is advisable to have a green protective belt.

2.8.2 PROPOSED ENVIRONMENTAL MONITORING PROGRAMME

The impact on the environment in the zone planned for the landfill should be monitored during the operation of the landfill and upon its closing.

In the mentioned area, it is necessary, before the construction and the inception of the landfill exploitation, to review the existing condition of the human environment and its segments separately: water, air, soil. In order to obtain the appropriate and relevant indicators defining the condition of the environment, it is necessary to prepare the Proposal of the Program for monitoring of the environment.

Such a program for monitoring of the environment in a broader and narrower zone of the sanitary landfill of Možura shall be based on the domestic and European legislation. The program foresees a research that will provide the necessary information on:

- The existing condition of the environment (zero condition), the air, water and soil quality
- Monitoring the condition of the environment during the landfill operation
- Monitoring the condition of the environment upon the landfill closure.

2.8.2.1 The existing condition of the environment

In order to review the existing condition of the environment at the Možura site (zero condition), it is necessary to design an appropriate Program/Project, so that the following data may be collected:

- The quality of the surface water- intermittent water currents towards the valley
- The level and the quality of downstream ground water sources
- The air quality
- The soil quality

The quality parameters for the quality of surface and ground water that will be analyzed before the beginning of the sanitary landfill operation are given below:

- Bacteriological analyses (especially pathogenic bacteria that, depending on species, can survive within the waste produced by the households from 5- 100 days for example Salmonella, bacillus dysenteries and the others, then the viruses of poliomyelitis and hepatitis).
- Chemical analyses: electro-conductivity, pH, BPK5, HP, Hg, Se, Pb, As, Cr, Cd, Ca, Mg, Na, K, Fe, N, NH4, phenols, cyanides, chlorides, sulphates and phosphates.

The Soil: the quality of the soil will be assessed at four points in the vicinity of the places where the samples of water were taken. These samples will undergo the following chemical analysis: Hg, Se,Pb, As, Cr, Cd, Mg, Zn, Ca, K, Na and Fe.

2.8.2.2 Monitoring the condition of the environment during the landfill operation and after its closing

After the beginning of landfill operational, some specific quality parameters of the air, surface and ground water, the soil, filtrates and gas must be monitored.

Characteristics of the Air and the Climate

The required meteorological data for the landfill condition monitoring will be provided by the meteorological stations in Bar, while an alternative solution would be a meteorological station near the landfill site. The meteorological data that are necessary for the monitoring of the landfill condition shall follow the foregoing recommendations, as those relate to the procedure for control and monitoring of the environment in the process of landfill operation and upon its closing. The required meteorological data are shown in the following table.

Table 2.8.2.2/1

Base climatic factors	During the landfill operation	After the landfill closure
Storm water volumes	Daily	Daily and monthly average
Wind direction and intensity	Daily	Monthly average
Temperature: min, max Measured at 14 hours , CET	Daily	Monthly average
Evaporation	Daily	Daily and monthly average
Air humidity, measured at 14 hours , CET	Daily	Monthly average

The surface and ground water and leachate will be controlled and checked upon the landfill closure. The spots where the samples will be taken have been already identified, while the quality parameters are given in the table 2.8.2.2/2.

Table 2.8.2.2/2 Quality parameters for the surface and ground water, including leachate

Parameter	Frequency
Leachate level	Weekly
pH	Weekly
Chlorides	Weekly
Electrolytic conductibility	Weekly
BOD_5	Every 6 months
COD	Every 6 months
Total organic carbon	Every 6 months
Other parameters	Every 12 months

Gas Control

Gases will be continuously controlled in order to prevent the formation of an inflammable mixture in the air. Combined with the air, the inflammable gases of methane and hydrogen make inflammable mixtures, provided that the appropriate concentration is reached. The critical concentration limits for methane and hydrogen are within the following limits:
For methane:

- Lower explosion limit amounts 5%
- Upper explosion limit amount 15%

In between the limits, the methane combined with the air reaches a combustion point. The explosion is weaker as the methane concentration is closer either to its lower or upper limit, whereas it would be stronger where the concentration of methane comes closer to 9.5 %.
For hydrogen:

- Lower explosion limit is 4%
- Upper explosion limit is 74%

In order to prevent any undesirable consequences, two levels of gas concentration have been identified:

- The threshold level amounting to 5% from lower explosion limit
- Action level amounting to 20% from the lower explosion limit

The threshold level represents an alarming signal and demands frequent measurements of gas concentrations. The action level of gas concentration indicates that the level of landfill gas circulation needs to be controlled.
However, it needs to be outlined that no high level of gas concentration is expected in the open area on the fringes of the landfill due to the effects of dilution and dispersion.

The quality of the soil will be tested during the landfill operation if potential pollution is detected during the testing of surface and ground water sources.

Noise shall be measured during the construction works at the landfill and during the landfill operation. The noise shall be controlled on the fringes of the landfill especially in the direction of the mines.

The procedure for sanitary landfill monitoring (in accordance with Directive 1999/31/EC) is presented in the table below:

	Operating Phase	***After the Closing***
Leachate volume	*Monthly*	*Biannually*
Leachate composition	*Quarterly*	*Biannually*
Surface water volume and composition	*Quarterly*	*Biannually*
Potential gas emissions	*Monthly*	*Biannually*

Ground water monitoring (in accordance with Directive 1999/31/EC) is presented in the table below:

	Operating Phase	***After the Closing***
Groundwater level	*Biannually*	*Biannually*
Groundwater composition	*As needed*	*As needed*

Conclusion

The Sanitary landfill would be constructed for the needs of the Municipalities of Bar and Ulcinj and is planned to be in use for 20 years.

The assessment of the environmental impact has been in accordance to the valid legislation (Official Gazette of the Republic of Montenegro12/96, 14/97, 21/97 and 50/01; the EU Directive 75/442/EEC on waste –OJL194 of 25 July 1975; Directive 91/156/EEC amending the previous directive one - OJL78 of 18March 1991; Regulation on solid waste transport 258/1993- OJL25 of 22 February 1993;120/1997- OJL22 of 24 January 1997; 2408/1998-OJL298 of 7 November1998; the Directive on solid waste disposal sites 99/31/EC - OJL182 of 16 July 1999).

The Assessment elaborates the available data on the location, technical solutions, and planned activities. An analysis of the current state of the environment was prepared. Based on the current state and the offered technical solution, an assessment of the impact of the sanitary landfill on the environment (population, air, water, soil, flora, fauna, geological composition, traffic, etc.) and the Proposed Monitoring Program, to monitor the state of human environment during the landfill operation and after its closing, were prepared.

CONCLUSIONS AND RECOMMENDATIONS

1. Based on the assessment, the following can be stated:
   The regional landfill for the Municipalities of Bar and Ulcinj in the area of Možura is **planned to be used for a period of 20 years.** Maximum operating life of the sanitary landfill, without a recycling centre, is 23 years and the one with a recycling centre amounts to 28 years.

2. There are many uncontrolled wild dumpsites that have existed for many years in this region. It was decided that the wild dumps and others uncontrolled and unprotected dumps in this region of Montenegro would be closed and rehabilitated. The Možura site is located on the land that was previously intended for agricultural purposes, although this plan was abandoned 30 years ago and all fields abandoned. The site is abundant in the Mediterranean flora.

3. The selected location of Možura has adequate characteristics for the construction of a sanitary landfill and its facilities. However, the environmental characteristics of the site must be taken into consideration and their suitability for the positioning of a landfill carefully assessed: geological composition, geographic and geomorphologic and climate characteristics, the existing infrastructure, the current state of the environment, the safety of the environment and the landscape. In a wider of region the Možura site, there are no cultural and historical monuments or protected natural resources.

4. The proposed technical solution is usual for the selected disposal method and is based on the following: a well-prepared substructure, covered by a 1.0 m deep layer of clay, the permeability of which is calculated as: $k \leq 10^{-9}$ m/s, and a high-density polyethylene folio, 2.5 [mm] thick, extended on the top of the clay layer. The folio is first covered with a protective geo-textile, and then topped with a 0.20 [m] deep layer of gravel, accompanied with a double purpose drainage system aimed to protect the layers below and enable the drainage of leachate from the disposed material towards an internal disposal network. Such an impermeable layer protects the surrounding area from the leachate generated at the landfill, as well as the surface and underground water sources and the soil. In order to obtain a treatment surface and ensure a progressive closure of the landfill, the closing banks must be built. The excavated materials will be used to build the banks. The material used to build the banks has to satisfy the compacting requirements, so that it is recommended to select the appropriate materials following the excavation works. As the inner slopes of the banks will be covered with a protective polyethylene folio in order to avoid any leakages, the use of excavated materials will be feasible, provided that those are free from any vegetation debris as much as possible. The cross-section of the banks is anticipated to look as follows: the top surface: 5m; the slopes of the banks: 2:1 (H:V) seen from the inside area, 2:1 (H:V) seen from the outside area. The initial fill will include a pipe of d=300[mm] in diameter, which will connect the leachate network, and fishbone like connection pipes of d=200[mm] and d=100[mm] in diameter discharging the leachate into the storage

pond. The peripheral drainage system directs the storm water out of the landfill. The leachate is directed through an internal drainage system towards the pool for further treatment- the plant for physical and chemical treatment. The plant consists of a coagulation and flocculation chamber and a device used for the measuring of sediments. After the treatment, the sludge is redirected towards the landfill in order to be disposed.

5. In 2007, an annual quantity of municipal solid waste was estimated to about 25,943 tons. The planned lifetime of this landfill is 20 years. According to the data on the produced and recycled quantities of solid municipal waste (Tables 2.1/3 and 2.1/4) for the period of 28 years, with a recycling centre, 804.560,4 tons of solid municipal waste will be disposed. This quantity of waste equals the volume of 804,560.4 x 1.2 = 965,472.5 m^3, which corresponds to the density of compacted material of 0.83 tons/m^3. Around 14% of inert material for the covering of waste should be added to the calculated quantity of disposed municipal waste (in m^3), which, including the inert material, amounts to approximately 1,100,638.6 m^3.

6. The solid waste that is disposed on the landfill is covered on daily basis with a 0.1 m deep layer of inert material or soil. When a layer of disposed waste is finalized, it is topped with a 0.2 m deep final layer. After its closing, the landfill will be permanently rehabilitated. A stratum of clay or some other material whose main purpose would be to prevent the storm water from entering the waste will be extended on the top of the compacted final layer. The insulation layer will be topped with a stratum of humus.

7. In order to provide for a complete protection of the human environment, an environmental monitoring program (including the environmental segments such as: water, air, soil and noise) was prepared. The program is designed to obtain the data, based on the selected quality indicators, on potential leachate infiltration outside of the landfill, water quality, critical gas concentration, climate conditions, air and soil quality. Furthermore, some sanitary protection measures will be applied, including the technical and aesthetical ones, such as afforestation of the peripheral parts of the landfill and the landfill itself, upon its closing.

8. Finally:

- The selected location is adequate for the construction and exploitation of a sanitary landfill.
- The technical solution provides for a full protection of the environment. However, the civil works should be carried out properly, fully controlled and supervised in accordance with the prepared final design.
- Obligatory training of the landfill operating staff.
- Following the construction of a sanitary landfill and rehabilitation of the existing uncontrolled dumpsites in the area of Bar and Ulcinj, the state of the environmental will be significantly improved.

CHAPTER 3

3. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

3.1. Introduction

A sanitary landfill project is usually large and complex. Every aspect of such a project is delicate and prone to possibly leading to significant impacts on the existing social and environmental structure. Possible errors and negligence would result in long term impacts and unpleasant heritage for the future generations. This chapter points out the standards for site operation and good management practice in compliance with the World Bank standards and international know-how. It also recommends an EMP which should be implemented, including the mitigation measures and monitoring regime all in a timely manner.

3.2. Operational management

The procedures for dealing with solid waste are recommended through operational environmental management. The procedures include the reception, transfer, deposition and processing of waste within the following three phases.

3.2.1. Site Management

The person who will manage the landfill must be trained and/or be very experienced in the sanitary landfill operational procedures. The site manager must be fully familiar with all potential risks and related hazards prior to relying on operational manuals and documentation that must be available. The documents should encompass the following:

- Relevant training of all employees on the site;
- Working procedures and principles;
- Fund allocation for equipment and maintenance;
- Monitoring and controlling of all working procedures in accordance with Environmental legislation and the Law;
- Above all, safety and health regulations and procedures.

3.2.2. Health and Safety

A health and safety policy must be specified in writing and implemented according to the applicable health and safety standards and Montenegrin laws. All operators on the site, sub-contractors, business-related visitors, etc., must be fully acquainted with this policy.
The landfill management will be responsible to introduce and carry out the Emergency Procedures and Medical Screening for all personnel. The trainings to be attended by all landfill operators must provide necessary knowledge about the precautions and measures for early detection of and first aid in the case of possible symptoms of key illnesses.

Frequent risks that may occur are:

- Hazardous material and hazardous landfill gas
- Ponds of standing water
- Pests (biohazard carriers)

3.2.3 Solid waste reception

The first phase of landfill operation includes the reception of waste. Only the waste which was cleared from the reception area is suitable for the disposal and/or processing, and should be permitted further into the site.
All waste loads which require special handling and disposal arrangements should be subject to a pre-booking system to facilitate the use of efficient and safe check-in and disposal procedures.

The arrangement of waste reception facilities proposed for the site has to be designed to facilitate measurement of wastes arriving at the site. All waste delivery vehicles entering the site will be required to weigh over a weighbridge.

The site management is responsible to ensure that the waste delivered to the site is acceptable and safe for disposal and/or processing. The licensing authority normally stipulates the types of waste, which may be accepted on a site. No waste should be permitted access to the tipping face or the topsoil plant unless it is deemed to comply with the conditions of the site license. All site operatives should be fully conversant with the site license and specified waste control procedures. Site reception staff should inspect waste loads visually as a matter of routine and should undertake sampling and testing of waste loads, on both a random and regular basis. Waste requiring detailed inspection should be refused entry to the tipping area and should, instead, be directed to the designated waste inspection area.

Any waste considered by site management unacceptable for disposal should be isolated and segregated from all other waste and stored in a designated, secure quarantine area where the waste can be held safely. Waste delivered to the site on fire should be taken to the waste inspection area, discharged and extinguished using water or suitable extinguishers.

After the weighbridge, vehicles are directed to shredding area or other areas of the site upon instructions of workers in charge. In this section special attention should paid to traffic in both direction. To avoid conflicts, drivers should be directed to specific places for tipping.

Upon shredding, which is done in compliance with all the procedures for health protection and the prevention of air pollutant emissions, waste is conveyed to energy cell. In the case of conveyer failure, alternative ways of transport should be established.

Land filling should be carried out to agreed and specific standards. No excavation of energy cells should be made, especially on partially decomposed material for the reason of odors emission
All the above described phases should be fully conversant with the adopted procedures! For effective site operation it is compulsory to have vital and efficient communication system!

3.3. Environmental Monitoring

The following should be monitored during the sanitary landfill exploitation:

- the volume of waste layers sagging (subsidence);
- the channeling of leachate produced on the landfill and its possible hazardous impact;
- the quality of air on the landfill and the surrounding area;
- the coastal seawater;
- the extraction and burning of the produced landfill gas and elimination of its toxicity.

The plan for maintenance and control should include the following operations:

1. Maintaining of the facility for the regulation of the landfill hydraulics, of the facility for pumping and storing leachate and the aspiration and landfill gas treatment unit;
2. Leachate and landfill gas monitoring as well as the monitoring of the waste subsidence;
3. Leachate channeling monitoring.

The monitoring of leachate quality is represented on following table:

Table 3.3/1 Leachate monitoring

Parameter	Frequency
Leachate level	Weekly
pH	Weekly
Chlorides	Weekly
Conductivity	Weekly
COD	Every 6 months
BOD	Every 6 months
Total organic carbon	Every 6 months
Other parameters	Every 12 months

The air is a very important aspect of the environment in relation to the landfill location and therefore it is necessary that landfill gas on the dump be controlled regularly, as well as the landfill gas emission from the surface cover and the air quality in the surrounding area. The most significant risks associated with landfill gas derive from the potential for flammable gases, such as methane and hydrogen, to form flammable mixtures in air when these gases are present within certain concentration. The critical concentration limits are known commonly as the “Lower Explosive Limit” (LEL) and the “Upper Explosive Limit” (UEL). The flammable ranges are:

- 5% to 15% by volume for methane; and
- 0.4% to 74% by volume for hydrogen.

In the open air, for example at the boundary of the landfill, such relatively high levels of gas should not occur because of the effects of dilution and dispersion. Gas concentration should be monitored however to control gas mitigation from the site.
The two levels of gas concentration should be established that will trigger different courses of action

- A threshold level will indicate a potential landfill gas problem and will initiate more frequent gas monitoring;
- A higher trigger level (action level) will initiate appropriate remedial action to control gas migration.

The concentrations proposed for there levels are:

- threshold level – 5% of LEL; and
- action level – 20 % of LEL.

The points from which the samples will be taken should be close to the gas collection system. The aim of gas sampling is to determine its chemical composition and the gas quality, whereas on the basis of these analyses possible uses for this gas will be suggested. At the same time, the analysis should determine the evolution of the MSW decomposition. It is necessary to control eventual landfill gas leakage into the covering layers on the landfill sanitary cells and to assess the constancy of the covering. The air quality direct control should also have an estimate of the effects caused by the emissions from the sanitary cells relating to gas pollutants and dust, as well as to the influence of trucks on the landfill roads. These analyses will be carried out on quarterly basis.

On basis of research carried out so far and the terrain configuration on the Možura site, it the existence of no groundwater sources was identified.

The noise of a particular level could also represent an issue at the landfill during its rehabilitation, and therefore it is necessary to record the noise from time to time, so that an estimate of the acoustic impact could be made in accordance with the applicable EU regulations. These recordings will be made on the landfill and beside the roads. The World Bank Environmental Guidelines suggest that a noise limit of 1 hour/70 dB would be acceptable for the unpopulated area around the Možura site

During the rehabilitation and after the closing of a sanitary cell, the volume of terrain subsidence should be recorded.

Another aspect that could have an impact on the environmental quality is related to the monitoring of fires, usually caused by inadequate behavior which set landfill gas on fire, and that is why this location must be under constant surveillance in the surrounding area.

The existence of a controlled landfill presupposes that if there is a fire in the surrounding area, this should be immediately reported to a firefighting team, for an emergency intervention in order to put the fire out. The landfill administration should constantly and comprehensively control the area in relation to the abovementioned problem, which means

that not only will it be reported to the fire department, but a permanent fire-fighting team will be engaged on the landfill.

When it comes to ecological indicators, it is very important to monitor the interaction of the sanitary cell with the landfill and the interaction of the landfill with its environment. Special emphasis should be put here on macro invertebrates in the soil, but previously, the methodology should be specified and locations just beside the sanitary cells and at some distance needed for these observations.

At the end, it is important to add that in the phase of the landfill revitalization, it is necessary to implement a plan for the landfill maintenance and control, which should encompass the maintenance of the final landfill cover and vegetation that was planted in the revitalization phase, including landfill restoration in the case of rockslides, elimination of crevices resulting from subsidence and the replacement of withered plants.
The summary review of the monitoring of the foregoing parameters, according to the priorities and frequency, is given in the following table:

Table 3.3/2 Monitoring Review Summary

No.	Parameter	Frequency
1	Leachate drainage	Weekly
2	Leachate quality	Monthly, and in accordance with recommendations in Table 3.3/1.
3	Coastal seawater quality	Monthly
4	Biogas monitoring	Monthly
5	Subsidence volume	Monthly
6	Air quality	Quarterly
7	Soil quality monitoring	Yearly

For all these inspections, an inspection control programme must be devised to cover a wide span of environmental effects that can be measured and compared. The obtained data must be recorded and used for notification, intervention or warning in emergency situations for a particular segment of the landfill.

3.4. Implementation

To provide for a better overview of implementation of the measures, the following key issues are presented in the table 3.4/1 below, serving as a model for presentation and approval.

- Monitoring authority
- Proposed measure and its purpose
- Anticipated costs
- Measurement-related responsibilities
- Timing for specific stages

Table 3.4/1 EMP Outline

Measure	Cost ($)	Timing	Responsibility	Monitoring
Public relations – presentation of benefits of this kind of landfill	None	Immediately	Landfill management	The Public Regional Water Utility Company for the Montenegrin Coast (PEW)
Health checks and vaccinations for employed staff	3,500	Every year throughout the landfill operation	Institute for Health and Landfill Management	PEW
Mitigating the effects of taking soil for daily cover	30,000/year	Throughout the landfill operating	PEW	PEW
Development and enforcement of safer materials for the recovery system	None	During the design phase	Designers	PEW
Engineering ditches and settlement ponds to collect the surface runoff water from the landfill site	10,000	During the construction	Contractor	PEW
Testing possible ground water sources in the area	2,000	During the design phase	PEW	PEW

Landfill gas related monitoring (quality, quantity...)	5,000/year	Throughout the period of landfill operation	Landfill management	PEW
Procedures to limit odor and dust-suppression measures included as a part of the OMP	2,000/year	During the design phase	Landfill management and design engineers	PEW
Regular monitoring of noise	2,000	During the design, the construction works and landfill operation	Landfill management and design engineers	PEW PEW
Maintenance of vehicles	3,000/year	Throughout the period of landfill operation	Landfill management	PEW
Investigation well drilling	8,000	During the design phase	Contractor	PEW
Preservation of the surrounding natural resources	None	During the construction phase	Landfill management and design engineers	PEW
Establishment of a protective vegetation belt and the selection of	3,000	During the design phase	Contractor	PEW

suitable plants for the terrain				
Installation of a small automated meteorological station at the site	5.000	During the construction phase	Landfill management and design engineers	PEW

3.5. Environmental Management Plan during the Construction Phase

A detailed EMP for the construction phased will be provided by the contractors. A qualified scientist/engineer should be employed on part-time basis to monitor the implementation of the plan, once it has been approved. An outline of the environmental management plan is provided in Table 3.5/1 below.

Table 3.5/1 Construction EMP Outline

Subject	Negative Impact	Management Plan	Responsibility
AIR	Dust generation	▪ Employ dust suppression measures ▪ Enclose areas with embankments	Contractor
	Dust generation - vehicle	▪ Use traffic routing ▪ Routine control ▪ Dust-suppressing measures	Contractor
AIR	Vehicle emission (mobile)	▪ Traffic-routing arrangements ▪ Routine vehicle control	Contractor
	Vehicle and engine emission (mobile)	▪ Run when required ▪ Routine vehicle control	Contractor
WATER	Release of suspended solids into the water courses	▪ Restrict surface runoff from the site ▪ Install a water runoff lagoon ▪ Emptying of water ponds	Contractor

	Possible fuel spilling	▪ Storage tanks should be stored on a low-permeability base ▪ Reclaim land as soon as possible	Contractor
NOISE	Noise generation	▪ Construct noise barriers ▪ Work during daylight hours ▪ Noisy operations as far as possible from the sensitive areas ▪ Equipment with noise silencers ▪ Equipment operated only when necessary	Contractor
WASTE	Construction waste	▪ Minimize the waste generation ▪ Use appropriate methods for storage ▪ Dispose on appropriate site	Contractor
TRAFFIC IMPACTS	Congestion	▪ Use specific traffic routes designated for all heavy vehicles	Contractor
SAFETY	Public Safety	▪ Pedestrian access ▪ Safety barriers and signs	Contractor
VISUAL	Visual Impact	▪ Screen site area wherever possible ▪ Vegetation protection belt	Contractor

As for the frequency of measurements, those should be carried out once a week for the dust and noise, as an ongoing activity.
The costs of the proposed environmental management plan and project monitoring will be low (approximately 0.3% of the capital expenditures)

Monitoring and environmental management reports will be produced on monthly basis by the implementing agency on the basis of information provided by the monitoring system and the contractor. The consultant who will ensure that the Environmental Management Plan is implemented by the Contractor will be selected following a tender procedure to be implemented by PEW, as the implementing agency. Implementation of the investment activity will be supervised by PEW.

Special emphasis will be placed on the manner of checking of all project documentation, which must be public and transparent, both in the phase of project design and execution of works, as well as during the following landfill operation. This means that a permanent surveillance and control will be carried out by the responsible officials. of the LLC "Mozura d.o.o." which was jointly established by the Municipalities of Bar and Ulcinj. The landfill staff will communicate with the local community and deal with possible complaints, as well as organize on-site visits for all interested parts (school group tours, students, civil servants and employees of other Public Enterprises). The LLC "Možura d.o.o." will be the project owner in the phase of landfill construction and operation, as the investor. The public will be able to address grievances, in case of non-compliance issues, to the LLC "Možura d.o.o" and the Municipalities of Bar and Ulcinj.

ANNEXES

- **THE REPORT ON THE ORGANIZATION OF A PUBLIC REVIEW AND PUBLIC CONSULTATIONS ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE REGIONAL SANITARY LANDFILL FOR THE MUNICIPALITIES OF BAR AND ULCINJ**

- **MINUTES OF THE PUBLIC CONSULTATION MEETING ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE REGIONAL SANITARY LANDFILL FOR THE MUNICIPALITIES OF BAR AND ULCINJ**

THE REPORT ON THE ORGANIZATION OF A PUBLIC REVIEW AND PUBLIC CONSULTATIONS ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE REGIONAL SANITARY LANDFILL FOR THE MUNICIPALITIES OF BAR AND ULCINJ

- The procedure to assess the impact of the regional sanitary landfill for the Municipalities of Bar and Ulcinj on the environment, which is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje ("KO Kunje"), the Municipality of Bar, was conducted in accordance with the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05) which is harmonized with the EU Directives (EU Directive 97/11/EC; EU Directive 2003/35/EC ; EU Directive 2003/4/EC; EESPO/1991).

- This Law stipulates that the competent authority is obliged to keep records, in the form of a public book, on the conducted procedures and decisions made in the process of environmental impact assessment, as well as to make all information relating to the conducted procedure available for review by the concerned authorities, organizations and the public on the basis of their request. The environmental impact assessment procedure is transparent and the concerned authorities, organizations and the public can take part in it and provide their related comments and opinions, while the competent authority is obliged to take the provided opinions into consideration in the decision making process.

- On 9 December 2008, the bearers of the project, the Municipalities of Bar and Ulcinj, submitted the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj, which is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar, to the Ministry of Tourism and Environmental Protection for approval.

- On 16 December 2008, the Ministry of Tourism and Environmental Protection, pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05) (stipulating that the competent authority, within ten days following the submission of an application for the EIA approval, shall notify the concerned authorities, organizations and the public about the manner, time and place of the public consultations on the EIA) notified the concerned authorities, organizations and the public of the submission of an application.

- When, pursuant to this Law, the competent authority is obliged to notify the public, this notification shall be published in at least one local or daily newspaper that is distributed in the area which may be affected by the planned project, as well as announced by electronic media. The concerned public was notified by placing an announcement on the Ministry's website and by having it published in the daily newspapers "Pobjeda", "Vijesti" and "Dan", whereat it has to be pointed out that those are the most read newspapers in Montenegro and that this announcement was published in several daily editions (please see enclosed the announcements

published in the foregoing daily newspapers, as Annexes 1, 2, 3 and 4). The announcement was also made on the local radio (Annex 5).

- The Environmental Impact Assessment was made available for review by the concerned public in the premises of the Environmental Protection Agency, the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment, the Municipality of Bar, and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj. 11 January 2009 was set as the time limit for the public review and the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection.

- In the process of public consultations, the EIA was not reviewed by the representatives of the concerned authorities, organizations and the public.

- Pursuant to Article 20 of the Law on Environmental Impact Assessment, public consultations can be held at the earliest 20 days as of the notification of the concerned authorities, organizations and the public. On 16 January 2009, starting at 13:00 hours, a public consultations meeting on the object Environmental Impact Assessment was held in the conference room of the Municipality of Bar. Besides the representatives of the Ministry of Tourism and Environmental Protection, the project bearers and the EIA designer, the public consultations meeting was attended by no representative of the concerned public, which was stated in the public meeting minutes.

- Following the organization of the public consultations, the Environmental Impact Assessment, enclosed with the associated documentation, was submitted, according to the Law, to the Commission for the Environmental Impact Assessment Evaluation that was appointed by the Decision of the Ministry of Tourism and Environmental Assessment number 01-1255/14 of 23 January 2009. Pursuant to Article 24 of the Law, on the basis of the report and recommendations of the Commission for EIA Evaluation, the competent authority decides on whether to accept of refuse the request for EIA approval.

Prepared by:
Sava Vuletić, Senior Advisor I

Annex 1

Daily Newspaper "Pobjeda", 24 December 2008

Montenegro
The Ministry of Tourism and Environmental Protection

Number: 01-1255/11
Podgorica, 16 December 2008

Pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), the Ministry of Tourism and Environmental Protection hereby

NOTIFIES
The Concerned Public

That the Municipalities of Bar and Ulcinj submitted a request for approval of the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

Following the foregoing, the concerned public is hereby invited to review the provided documentation at the following premises: the Environmental Protection Agency, Street IV proleterske 19, office 10, floor I, every working day from 10 a.m. to 1 p.m.; the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment of the Municipality of Bar, office 201, floor II; and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj, office 79, floor I, every working day from 11 a.m. to 2 p.m.

The time limit for the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection is 11 January 2009.

A public consultations meeting regarding the object EIA will be held at the conference room of the Municipality of Bar on 16 January 2009 st 13:00 hours.

„Pobjeda"
24.12.2008.god.

Crna Gora

Ministarstvo turizma i zaštite životne sredine

Broj: 01-1255/11
Podgorica. 16.12.2008.god.

"Na osnovu člana 20 Zakona o procjeni uticaja na životnu sredinu ("Službeni list RCG", broj 80/05) Ministarstvo turizma i zaštite životne sredine

OBAVJEŠTAVA

zainteresovanu javnost

da su Opštine Bar i Ulcinj, podnijele zahtjev za davanje saglasnosti na Elaborat o procjeni uticaja Regionalne sanitarne deponije za Opštine Bar i Ulcinj, na životnu sredinu, čiija se i realizacija planira na katastarskoj parceli 2416/1 KO Kunje, Opština Bar.

U vezi sa navedenim pozivamo zainteresovanu javnost da izvrši uvid u dostavljenu dokumentaciju u prostorijama Agencije *za* zaštitu životne sredine, ul. IV proleterske br. 19, kancelarija broj 10, I sprat, radnim danima od 10 do 13 časova, u Sekretarijatu za uređenje prostora, stambeno-komunalne poslove i zaštitu životne sredine, kancelarija broj 201, II sprat, u zgradi Opštine Bar, kao i u Sekretarijatu za planiranje i uređenje prostora, kancelarija broj 79 na I spratu u zgradi Opštine Ulcinj, radnim danima od 11 do 14 časova.

Rok za javni uvid i dostavljanje primjedbi i mišljenja u pisanoj formi, na adresu Ministarstva turizma i zaštite životne sredine je 11.januar 2009. godine.

Javna rasprava o predmetnom elaboratu održaće se u sali Skupštine Opštine Bar, dana 16.01.2009. godine sa početkom u 13 časova.

Annex 2

Daily Newspaper "Pobjeda", 25 December 2008

Montenegro
The Ministry of Tourism and Environmental Protection

Number: 01-1255/11
Podgorica, 16 December 2008

Pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), the Ministry of Tourism and Environmental Protection hereby

NOTIFIES
The Concerned Public

That the Municipalities of Bar and Ulcinj submitted a request for approval of the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

Following the foregoing, the concerned public is hereby invited to review the provided documentation at the following premises: the Environmental Protection Agency, Street IV proleterske 19, office 10, floor I, every working day from 10 a.m. to 1 p.m.; the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment of the Municipality of Bar, office 201, floor II; and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj, office 79, floor I, every working day from 11 a.m. to 2 p.m.

The time limit for the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection is 11 January 2009.

A public consultations meeting regarding the object EIA will be held at the conference room of the Municipality of Bar on 16 January 2009 st 13:00 hours.

"Pobjeda"
25. 12. 2008. god.

Crna Gora

Ministarstvo turizma i zaštite životne sredine

Broj: 01-1255/11
Podgorica. 16.12.2008.god.

"Na osnovu člana 20 Zakona o procjeni uticaja na životnu sredinu ("Službeni list RCG", broj 80/05) Ministarstvo turizma i zaštite životne sredine

OBAVJEŠTAVA

zainteresovanu javnost

da su Opštine Bar i Ulcinj, podnijele zahtjev za davanje saglasnosti na Elaborat o procjeni uticaja Regionalne sanitarne deponije za Opštine Bar i Ulcinj, na životnu sredinu, čiija se i realizacija planira na katastarskoj parceli 2416/1 KO Kunje, Opština Bar.

U vezi sa navedenim pozivamo zainteresovanu javnost da izvrši uvid u dostavljenu dokumentaciju u prostorijama Agencije *za* zaštitu životne sredine, ul. IV proleterske br. 19, kancelarija broj 10, I sprat, radnim danima od 10 do 13 časova, u Sekretarijatu za uređenje prostora, stambeno-komunalne poslove i zaštitu životne sredine, kancelarija broj 201, II sprat, u zgradi Opštine Bar, kao i u Sekretarijatu za planiranje i uređenje prostora, kancelarija broj 79 na I spratu u zgradi Opštine Ulcinj, radnim danima od 11 do 14 časova.

Rok za javni uvid i dostavljanje primjedbi i mišljenja u pisanoj formi, na adresu Ministarstva turizma i zaštite životne sredine je 11.januar 2009. godine.

Javna rasprava o predmetnom elaboratu održaće se u sali Skupštine Opštine Bar, dana 16.01.2009. godine sa početkom u 13 časova.

Annex 3

Daily Newspaper "Dan", 26 December 2008

Montenegro
The Ministry of Tourism and Environmental Protection

Number: 01-1255/11
Podgorica, 16 December 2008

Pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), the Ministry of Tourism and Environmental Protection hereby

NOTIFIES

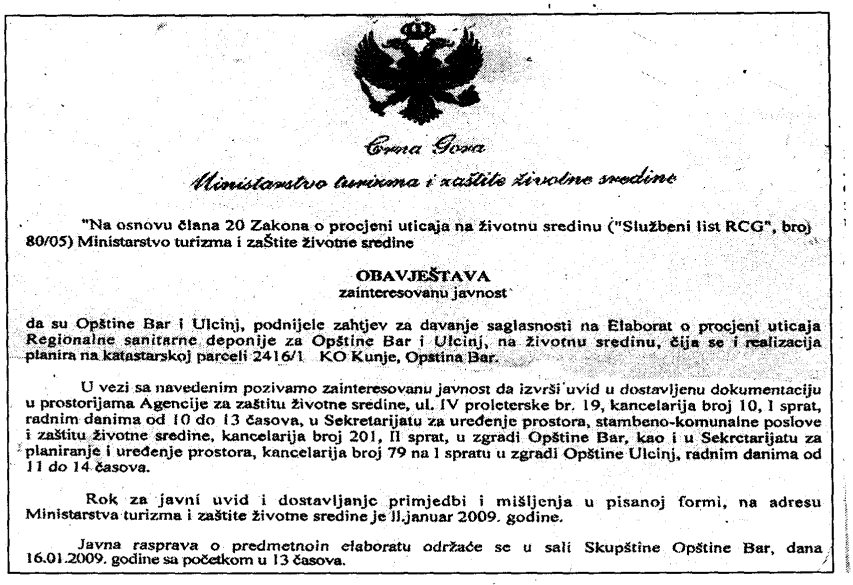
The concerned public

That the Municipalities of Bar and Ulcinj submitted a request for approval of the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

Following the foregoing, the concerned public is hereby invited to review the provided documentation at the following premises: the Environmental Protection Agency, Street IV proleterske 19, office 10, floor I, every working day from 10 a.m. to 1 p.m.; the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment of the Municipality of Bar, office 201, floor II; and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj, office 79, floor I, every working day from 11 a.m. to 2 p.m.

The time limit for the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection is 11 January 2009.

A public consultations meeting regarding the object EIA will be held at the conference room of the Municipality of Bar on 16 January 2009 st 13:00 hours.



Crna Gora

Ministarstvo turizma i zaštite životne sredine

"Na osnovu člana 20 Zakona o procjeni uticaja na životnu sredinu ("Službeni list RCG", broj 80/05) Ministarstvo turizma i zaŠtite životne sredine

OBAVJEŠTAVA
zainteresovanu javnost

da su Opštine Bar i Ulcinj, podnijele zahtjev za davanje saglasnosti na Elaborat o procjeni uticaja Regionalne sanitarne deponije za Opštine Bar i Ulcinj, na životnu sredinu, čija se i realizacija planira na katastarskoj parceli 2416/1 KO Kunje, Opstina Bar.

U vezi sa navedenim pozivamo zainteresovanu javnost da izvrši uvid u dostavljenu dokumentaciju u prostorijama Agencije za zaštitu životne sredine, ul. IV proleterske br. 19, kancelarija broj 10, I sprat, radnim danima od 10 do 13 časova, u Sekretarijatu za uređenje prostora, stambeno-komunalne poslove i zaštitu životne sredine, kancelarija broj 201, II sprat, u zgradi Opštine Bar, kao i u Sekrctarijatu za planiranje i uređenje prostora, kancelarija broj 79 na I spratu u zgradi Opštine Ulcinj, radnim danima od 11 do 14 časova.

Rok za javni uvid i dostavljanjc primjedbi i mišljenja u pisanoj formi, na adresu Ministarstva turizma i zaštite životne sredine je 11.januar 2009. godine.

Javna rasprava o predmetnoin elaboratu održaće se u sali Skupštine Opštine Bar, dana 16.01.2009. godine sa početkom u 13 časova.

26.12.2008. Dan

Annex 4

Daily Newspaper "Vijesti", Saturday, 27 December 2008

Montenegro
The Ministry of Tourism and Environmental Protection

Number: 01-1255/11
Podgorica, 16 December 2008

Pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), the Ministry of Tourism and Environmental Protection hereby

NOTIFIES
The concerned public

That the Municipalities of Bar and Ulcinj submitted a request for approval of the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

Following the foregoing, the concerned public is hereby invited to review the provided documentation at the following premises: the Environmental Protection Agency, Street IV proleterske 19, office 10, floor I, every working day from 10 a.m. to 1 p.m.; the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment of the Municipality of Bar, office 201, floor II; and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj, office 79, floor I, every working day from 11 a.m. to 2 p.m.

The time limit for the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection is 11 January 2009.

A public consultations meeting regarding the object EIA will be held at the conference room of the Municipality of Bar on 16 January 2009 st 13:00 hours.

Daily Newspaper "Vijesti", Saturday, 28 December 2008

Montenegro
The Ministry of Tourism and Environmental Protection

Number: 01-1255/11
Podgorica, 16 December 2008

Pursuant to Article 20 of the Law on Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/05), the Ministry of Tourism and Environmental Protection hereby

NOTIFIES
The concerned public

That the Municipalities of Bar and Ulcinj submitted a request for approval of the Environmental Impact Assessment for the regional sanitary landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje, the Municipality of Bar.

Following the foregoing, the concerned public is hereby invited to review the provided documentation at the following premises: the Environmental Protection Agency, Street IV proleterske 19, office 10, floor I, every working day from 10 a.m. to 1 p.m.; the Secretariat for Spatial Planning, Housing and Communal Activities and the Environment of the Municipality of Bar, office 201, floor II; and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj, office 79, floor I, every working day from 11 a.m. to 2 p.m.

The time limit for the submission of comments and opinions in writing to the address of the Ministry of Tourism and Environmental Protection is 11 January 2009.

A public consultations meeting regarding the object EIA will be held at the conference room of the Municipality of Bar on 16 January 2009 st 13:00 hours.

Crna Gora
Ministarstvo turizma i
zaštite životne sredine

Na osnovu člana 20 Zakona o procjeni uticaja na životnu sredinu („Službeni list RCG" broj 80/05) Ministarstvo turizma i zaštite životne sredine

OBAVJEŠTAVA
zainteresovanu javnost

da su Opštine Bar i Ulcinj, podnijele zahtjev za davanje saglasnosti na Elaborat o procjeni uticaja Regionalne sanitarne deponije za Opštine Bar i Ulcinj, na životnu sredinu, čija se realizacija planira na katastarskoj parceli 2416/1 KO Kunje, Opština Bar.
U vezi sa navedenim pozivamo zainteresovanu javnost da izvrši uvid u dostavljenu dokumentaciju u prostorijama Agencije za zaštitu životne sredine ul. IV proleterske br. 19, kancelarija broj 10, I sprat radnim danima od 10 do 13 časova, u Sekretarijatu za uređenje prostora, stambeno komunalne poslove i zaštitu životne sredine, kancelarija broj 201, II sprat, u zgradi Opštine Bar, kao i Sekretarijatu za planiranje i uređenje prostora, kancelarija broj 79 na I spratu u zgradi Opštine Ulcinj, radnim danima od 11 do 14 časova.
Rok za javni uvid i dostavljanje primjedbi i mišljenja u pisanoj formi, na adresu Ministarstva turizma i zaštite životne sredine je 11. januar 2009. godine.
Javna rasprava o predmetnom elaboratu održaće se u Sali Skupštine Opštine Bar, dana 16. 1. 2009. godine sa početkom u 13 časova.

„Vijesti"
28.12.2008. god.

Crna Gora
Ministarstvo turizma i
zaštite životne sredine

Na osnovu člana 20 Zakona o procjeni uticaja na životnu sredinu („Službeni list RCG" broj 80/05) Ministarstvo turizma i zaštite životne sredine

OBAVJEŠTAVA
zainteresovanu javnost

da su Opštine Bar i Ulcinj, podnijele zahtjev za davanje saglasnosti na Elaborat o procjeni uticaja Regionalne sanitarne deponije za Opštine Bar i Ulcinj, na životnu sredinu, čija se realizacija planira na katastarskoj parceli 2416/1 KO Kunje, Opština Bar.
U vezi sa navedenim pozivamo zainteresovanu javnost da izvrši uvid u dostavljenu dokumentaciju u prostorijama Agencije za zaštitu životne sredine ul. IV proleterske br. 19, kancelarija broj 10, I sprat radnim danima od 10 do 13 časova, u Sekretarijatu za uređenje prostora, stambeno komunalne poslove i zaštitu životne sredine, kancelarija broj 201, II sprat, u zgradi Opštine Bar, kao i Sekretarijatu za planiranje i uređenje prostora, kancelarija broj 79 na I spratu u zgradi Opštine Ulcinj, radnim danima od 11 do 14 časova.
Rok za javni uvid i dostavljanje primjedbi i mišljenja u pisanoj formi, na adresu Ministarstva turizma i zaštite životne sredine je 11. januar 2009. godine.
Javna rasprava o predmetnom elaboratu održaće se u Sali Skupštine Opštine Bar, dana 16. 1. 2009. godine sa početkom u 13 časova.

Vijesti, 28.12.08

Annex 5

Montenegro
THE MUNICIPALITY OF BAR

The Secretariat for Spatial Planning, Communal and Housing Activities and Environmental Protection

Number: 032-07___
Bar, 18 February 2008

"THE PUBLIC LOCAL RADIO DIFFISION SERVICE"

B A R

Please announce the enclosed notification issued by the Ministry of Spatial Planning and Environmental Protection on the "Radio Bar" on the two days to follow.

Sincerely,

Secretary,

Djuro Karanikic

The following stamp is affixed to this document:
The Republic of Montenegro; The Secretariat for Spatial Planning, Communal and Housing Activities and Environmental Protection; The Municipality of Bar, 1 (with the Coat-of-Arms of the Municipality of Bar in the center).

Crna Gora
O P Š T I N A B A R

Sekretarijat za uređenje prostora, komunalno-stambene poslove
i zaštitu životne sredine

Broj: 032-07_____
Bar, 18.02.2008 god

"JAVNI LOKALNI RADIO DIFUZNI SERVIS"

B A R

Molimo Vas da preko talasa "Radio Bara" u naredna dva dana objavite obavještenje Ministarstva turizma i zaštite životne sredine koje Vam u prilogu dostavljamo.

S poštovanjem,

Sekretar,
Đoko Karanikić

Bulevar Revolucije br. 1 • 85000 Bar • tel +381(0)85 312945 • e-mail: uredjenje.prostora@opstinabar.cg.yu • www.bar.cg.yu

MINUTES
OF THE PUBLIC CONSULTATION MEETING ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE REGIONAL SANITARY LANDFILL FOR THE MUNICIPALITIES OF BAR AND ULCINJ

The Ministry of Tourism and Environmental Protection organized a public consultation meeting on the Environmental Impact Assessment for the Regional Sanitary Landfill for the Municipalities of Bar and Ulcinj that is planned to be constructed on the cadastre lot 2416/1, the Cadastral Area of Kunje ("KO Kunje"), the Municipality of Bar.

The public consultation meeting on the object EIA was held in the conference room of the Municipality of Bar on 16 January 2009 at 13:00 hours.

At the beginning of the public consultation meeting the attendees were welcomed on behalf of the Ministry of Tourism and Environmental Protection by Ms. Sava Vuletić who chaired the public meeting. Providing a brief introduction, she advised the attendees about the procedure for environmental impact assessment relating to the object EIA, which had preceded the public consultation meeting, also indicating that: the Request for EIA approval had been submitted to the Ministry, enclosed with the EIA, on 9 December 2008; the period for public review had lasted until 11 January 2009; and the public consultation meeting had been scheduled in agreement with the project bearer, to be held in 16 January 2009.

The Ministry notified the concerned public, authorities and organizations, in accordance with the Law, about the time and place of holding of the public review and the public consultation meeting. The submitted documentation was available for public review at the premises of the Environmental Protection Agency, the Secretariat for Spatial Planning, Housing and Communal Activities and Environmental Protection of the Municipality of Bar, and the Secretariat for Spatial Planning and Organization of the Municipality of Ulcinj. It was pointed out that the announcement had been published in three daily newspapers and made on the local radio, although during the period of public review no public review of the object EIA had been carried out. It was also stated that, according to the Law, the object EIA would be submitted to the Commission for EIA Evaluation, enclosed with the Minutes of the public consultation meeting, and that the Commission, having assessed the object EIA, would deliver its decision on whether to accept or refuse the request for approval to the Ministry.

The public consultation meeting was attended by the representatives of the project bearer, Mr. Đuro Karanikić, Secretary of the Secretariat for Spatial Planning, Housing and Communal Activities and Environmental Protection of the Municipality of Bar, and Mr. Milo, Advisor to this Secretariat, and on behalf of the Company "Energoprojekt Hidroinženjering", which had designed the object EIA, the meeting was attended by Ms. Milena Tomašević, Ms. Irena Babović and Mr. Dušan Krstić, MSc. The meeting was attended by no representative of the concerned public.

The EIA designer briefly explained the characteristics of the project and the anticipated measures to reduce an impact on the environment.

Considering that the public consultation meeting was attended by no representative of the concerned public, and as no further discussions were required, Ms. Sava Vuletić, the chair person, thanked the attendees and the public meeting was adjourned.

The public consultation meeting was adjourned at 14:10 hours.

Podgorica, 16 January 2009

Minutes prepared by:
Sava Vuletić