MONTENEGRIN TRANSPORT ADMINISTRATION

RAPID BIODIVERSITY ASSESSMENT

RECONSTRUCTION OF THE MAIN ROAD M-2 SECTION ROZAJE - SPILJANI

November, 2019.

CONTENTS

GENERAL INFORMATION

Description: Survey on flora, habitats and fauna in the area of influence of the Main Roads Reconstruction Project for the M2 road section Rozaje – Spiljani.

Document title: Report on flora, habitats and fauna (fish, amphibians, reptiles, avifauna, mammals) in the area of influence of the Main Roads Reconstruction Project for the M2 road section Rozaje - Spiljani.

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Field work date: October 2019.

1. FLORA AND HABITAT SURVEY

INTRODUCTION

The field survey of flora and habitats on the main road Ibar, section Rozaje - Spiljani was carried out in October (two days).

Limitations of the survey: Growing season of plants was over.

1.1. KEY FINDINGS

1.1.1. Flora

During the field survey, no plant taxa from Annex II of the Habitat Directive, the Bern Convention, or plants on the IUCN red list were recorded. Also, species that are protected by the national legislation are not recognized.

1.1.2. Existing Habitats

Rozaje - Spiljani road mostly passes through the area characterized by residential and agricultural type of land, which generally has limited ecological value. In the villages and hamlets, around the houses and gardens, there are meadows that are traditionally cut and grazed by cattle. These semi-natural habitats are significant for reptiles, small mammals, insects and invertebrates. In the section stretching from Rozaje to Dracenovac, the road follows the Ibar Canyon with its tributaries. In general, the Ibar river is under anthropogenic impact and is often a dumpsite. A city landfill Mostina is also located along the existing road. The only exceptions are the deepest parts of the canyon, away from the road, which have exceptional ecological value. Riparian forest or scrubs along rivers and streams are mostly degraded and occur in fragments, but are significant as corridors for amphibians, reptiles, small mammals and invertebrates. Logging degrades other forest habitats along the road, but forests outside the road zone at higher positions are in good condition and represent important habitats and corridors for birds and mammals. The entire area from Rozaje to the Dracenovac border crossing was degraded by human impact, which affected the ecological value of the habitat and overall biodiversity.

1.1.3. Aquatic habitats

No aquatic habitats have been reported and there is no literature data on these habitats.

1.1.4. Terrestrial habitats

In total 8 terrestrial habitat types were identified within the area Rozaje - Spiljani:

Terrestrial habitats	Eunis code	NATURA code
Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	E2.2, E2.22, E2.23	6510
*Tilio-Acerion forests of slopes, screes and ravines	G1.A4, G1.A46, G1. A463	9180
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)	G1.1, G1.111, G1.12, G1.121, G1.2, G1.21, G1.211, G1.212, G1.213	91E0
91K0 Illyrian *Fagus sylvatica* forests (*Aremonio-Fa*gion)		91K0
Acidophilous *Picea* forests of the montane to alpine level (*Vaccinio-Picea*tea)	G3.1, G3.1B	9410
Arable land and market gardens	I1	
Residential buildings of villages and urban peripheries	J1.2	
Road networks	J4.2	
Waste deposits	J6	

Five of the abovementioned species are listed in Annex I of the Habitats Directive, but because of the fact that these types of habitats are degraded and mostly devastated by cutting and garbage or waste disposal, they are not considered to be priority biodiversity features. Also, the entire road will be widened from the current 6.0m to 6.50m (25cm on each side), with the exception of the additional 300m long lanes, which will be built in each direction respectively at the border crossing Dracenovac. Habitats will not be significantly affected and the impact on them will remain low.

1.1.5. Review of the habitats

6150 - Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*).

Lowland mesophilic high meadows develop in deep soils under the direct influence of flood and groundwater. The soils in them are mostly rich in mineral substances and have a favourable water regime throughout the growing season, so the production of plant mass in them is very large. Therefore, these communities represent the main hay meadows and therefore they have very high importance for people. As a rule, have secondary origin, and they occur in areas of former deciduous forests, but in habitats where the land is not eroded.

Today, in many places they are cultivated by fertilizing, irrigating and sowing selected combinations of crops, so that in this way people significantly contribute to their ecological and floristic diversity.

This type of habitat is present in villages around the houses, mainly in mosaics with arable land (Balotici, Kacapore, Kajevici, Bac, Besnik, Dracenovac) and it is represented by different types of plant communications (*Festuco-Agrostidetum, Arrhenatherum elatioris, Taraxaci-Trifolietum pratensis, Festucetum pratensis, Rhinanthi-Trifolietum pratensis*), whereby the following species are predominantly present in the area: (*Arrhenatherum elatius, Briza media, Festuca pratensis, Knautia arvensis, Trifolium pratense, T. repens*, *Phleum pretense, Poa pratensis*).

Point Dracenovac (meadow with line of trees): *Mentha longifolia, Plantago lanceolata, Trifolium pratense, Leontodon autumnalis, Leucanthemum vulgare, Colchicum autumnale, Achillea millefolium, Cornus mas, Euonymus europaeus, Alnus incanna, Acer campestre, Coryllus avellana, Prunus sp., Crataegus monogyna.*

Point Kacapore (steep meadow in line of road): *Brachypodium sylvaticum, Briza media, Dactylis glomerata, Viola tricolor, Leontodon autumnalis, Knautia arvensis, Achillea millefolium, Centaurea scabiosa, Filipendula vulgaris, Scabiosa* sp., *Festuca pratensis, Danthonia alpina, Ononis spinosa, Leucanthemum vulgare* agg., *Silene sendtneri, Agrostis capillaris, Pteridium aquilinum, Potentilla reptans, Clinopodium vulgare, Hypericum hirsutum*.

Representativity of the habitat is B-D. Also, this type of habitat covers a small area. At the same time this is a common type of habitat in Montenegro.

Vulnerability to Project Impacts

This type of habitat will be under direct impact. Effect of the impact will result in minor loss of habitat. However, this type of habitat is common in the wider area. Impacts associated with loss of these habitats during construction are considered to be low.

Sensitivity on habitat fragmentation

Magnitude of fragmentation in hay meadows is minor with low sensitivity.

9180 **Tilio-Acerion* forests of slopes, screes and ravines

Mixed forests of secondary species (*Acer pseudoplatanus, Fraxinus excelsior, Ulmus glabra, Tilia cordata*) are located on steep slopes, cliffs and canyons, developed on the slopes, rocky slopes, mostly on limestone, and rarely on silicate. Basically, communities in cold and humid habitats dominated by mesophilic maples (*Acer pseudoplatanus*, *A. platanoides*), and communities on dry and warm slopes dominated by linden (*Tilia* sp.) and other xerophilic deciduous trees. However, polydominant forests that have a significantly higher thermophilic character than the alliance *Ostryo carpinifoliae* - Tilion platyphylli are predominant in gorges, canyons, and steep slopes of SE Europe.

This type of habitat beech extends to the Ibar river canyon and it is characterised by a few plant associations (*Orno-Ostryetum carpinifoliae, Seslerio-Ostryetum carpinifoliae, Orno-Cotinetum coggygriae*).

Dominant species in higher cliffs and rocks in the canyon is European smoketree *Cotinus coggygria* with maple *Acer campestre*, european hop hornbeam *Ostrya carpinifolia*, manna ash *Fraxinus ornus*, common hazel *Corylus avellana,* strawberry-bush *Euonymus verrucosa*, *Cornus sanguinea, Prunus mahaleb, Pinus nigra,* common hawthorn *Crataegus monogyna, Populus tremula.*

The bridge across Ibar canyon (Ibar 1): *Rhus cottinus, Ostrya carpinifolia, Pinus nigra*, *Acer campestre, Betula pendula, Picea abies, Fagus sylvatica, Pinus pinaster, Cornus mas, Rosa canina, Sorbus torminalis, Brachypodium pinnatum, Clinopodium vulgare, Dactylis glomerata, Digitalis ferruginea, Cytisus hirsutus.*

Representativity of the habitat is B-C. There is not much phytocoenological information on this type of habitat in Montenegro, but good stands of these forests have been seen in deep canyons and gorges of Montenegro.

Vulnerability to Project Impacts

This type of habitat will be under direct and indirect impact. These impacts will be recognised in minor loss of habitat. Impacts associated with loss of these habitats during construction are considered to be low.

Sensitivity on habitat fragmentation

Magnitude of fragmentation in ravine slope forests is minor with low sensitivity.

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Grey alder with wood sorrel (*Oxali-Alnetum incanae*) forests occur in the part of Montenegro where morphological conditions of the relief do not allow the formation of wetlands. Forests with grey alder belong to the order of *Populetalia albae* and class *Salici purpureae-Populetea nigrae*. Riparian forest along Ibar river and tributaries are represented with dominant *Alnus incana* and other trees like *Acer pseudoplatanus, Fraxinus excelsior, Picea abies, Rhamnus fallax, Salix alba, Salix purpurea*, *Salix fragilis*… When it comes to the herb layer, the most dominant species are: *Aegopodium podaagraria, Agrimonia eupatoria, Asarum europaeum, Geranium robertianum, Lamiastrum galeobdolon, Scrophularia nodosa, Tussilago farfara, Petasites hybridus, Oxalis acetosellla.*

Fragments of the riparian forest with willows *Salix alba* and *Salix fragilis* (*Salicetum albo-fragilis*) occur along banks of the Ibar river. *Salix* scrubs extend on alluvial deposits where the valley of the Ibar widens after leaving the canyon (Kajevici, Dracenovac).

Point Ibar 1 bridge: *Alnus inana, Salix fragilis, Rhamnus fallax, Salix alba, Picea abies, Fraxinus excelsior, Sambucus nigra, Aegopodium podagraria, Mentha longifolia*, Salvia glutinosa, *Tussilago farfara*.

Point Dracenovac: *Salix fragilis, Salix alba, Salix purpurea, Petasites hybridus, Tussilago farfara, Mentha longifolia.*

Representativity of the habitat is B-C. Habitat is degraded by garbage deposits.

Vulnerability to Project Impacts
This type of habitat will be under indirect impact. Impacts during construction are considered to be low.

Sensitivity on habitat fragmentation
Magnitude of fragmentation in riparian forests is minor with low sensitivity.

91K0 Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*)

Beech forests of the Dinarides and adjacent mountain ranges extending to the SE Alps, SW Carpathian Mountains and the Pannonian Hills, which are in contact zone towards the Central European beech forests. They are widespread in all parts of Montenegro, while they are only not represented in the Mediterranean and lower sub-Mediterranean areas.

This type of forest represents the most widespread type of forest along the road and they have been very degraded by cutting. This type of habitat is represented by two plants (*Fagetum montanum, Abieto - Fagetum*). Dominant species is beech *(Fagus sylvatica)*. In these forests, besides beech, *Picea abies, Populus tremula, Corylus avellana, Betula pendula, Quercus cerris, Carpinus betulus* occur with small abundance. Herb layer: *Aremonia agrimonoides, Calamintha grandiflora, Corylus Cyclamen purpurascens, Dentaria enneaphyllos, Euphorbia amygdaloides, Lonicera nigra, Sesleria autumnalis*.

Dracenovac: *Fagus sylvatica, Abies alba, Robinia pseudoacacia, Salix eleagnos, Clematis vitalba, Hieracium pillosela, Daucus carota, Thymus serpyllifolius, Corylus avellana, Cornus sanguinea, Ostrya carpinifolia, Rhus cottinus, Asarum europeum, Festuca heterophylla*.

Representativity of the habitat is C-D. Habitat is degraded by cutting.

Vulnerability to Project Impacts

This type of habitat will be under direct and indirect impact. Impacts during construction are considered to be low.

Sensitivity on habitat fragmentation

Magnitude of fragmentation in beech forests is minor with low sensitivity.

9410 Acidophilous *Picea* forests of the montane to alpine level (*Vaccinio-Piceetea*)

Spruce communities occupy predominantly flat and slightly sloping habitats with a deeper humus profile. In addition to spruce, there is also silver fir, sometimes white pine, while beech occurs slightly less commonly. On the ground floor, in addition to the common forest species, there are also *Vaccinium myrtillus* and *Daphne blagayana*. Spruce forest with beech and silver fir are widespread on the mountains of the Rozaje surroundings. This type of habitat occurs along the road on two localities (Balotici) with different composition of the trees and herb layers. Dominant tree species is spruce *Picea abie*s, while species that have much lower representation are: *Abies alba*, *Fagus sylvatica*, *Coryllus avellana*, *Carpinus betulus*, *Betula pendula, Populus tremula, Sorbus aucupari*a. The herb layer is poorly developed: *Gentiana asclepiadea*, *Hieracium* sp., *Luzula luzuloides*, *Galium rotundifolium*.

Representativity of the habitat is B-C. Habitat is degraded by cutting.

Vulnerability to Project Impacts

This type of habitat will be under indirect impact. Impact will be recognised in a minor loss of habitat. Impacts associated with loss of these habitats during construction are considered to be low.

Sensitivity on habitat fragmentation

Magnitude of fragmentation in spruce forests is minor with low sensitivity.

1.2. IMPACT ASSESSMENT

1.2.1. Assessment Criteria

The impact assessment has taken into account the magnitude of the potential impact arising.

The following criteria have therefore been used for the assessment of impacts:

Negligible Impact	Low Impact	Medium Impact	High Impact	Very High Impact
The activity is not expected to result in observable impact on species or habitats.	The activity may have limited impacts on species or habitats of low sensitivity. No observable impacts on species of medium or high sensitivity.	No observable impacts are expected on species of high sensitivity. Limited impacts may occur at an individual level to species or habitats of medium sensitivity. Impacts may occur to species or habitats of low sensitivity.	Limited impacts may occur at an individual level to species or habitats of high sensitivity. Impacts may occur to species or habitats of medium sensitivity that are significant enough to reduce the ability to sustain population levels of affected species or habitats.	Impacts may occur to species or habitats of high sensitivity that are significant enough to reduce the ability to sustain the habitats, complex of habitats and/or the population levels of species of interest.

Impacts to receptors of Low Sensitivity will be managed through the implementation of Good Industry Practice (GIP) mitigation.

Good International Practice: generic mitigation to be adhered to throughout the enabling and construction period.

The following generic impacts and sources of impact have been identified:

Direct Impacts	Construction Sources	Operational Sources
• Habitat loss; degradation and simplification. • Habitat Fragmentation. • Changes in water conditions (hydrological impacts). • Habitat pollution. • Direct mortality.	• Vehicle mobilization, including transport of people and equipment within the works area. • Compounds working camp construction and operation, including wastes and indirect pressure of workers presence • Working corridor vegetation clearance and topsoil removal.	• Increase in hunting or predation utilising the road for access. • Spread of non-native invasive species along the road. • Impacts on habitats and species, directly resulting from the road maintenance. • Increased disturbance due to increased accessibility.

Direct Impacts	Construction Sources	Operational Sources
• Spread of non-native or invasive species.	• Construction activities including disturbance of soils & pollution from construction, including river crossings. • Unplanned Events.	• Visual, noise and air quality issues related to the operation of the road and associated areas. • Impacts from habitat severance.

For each of these potential generic impacts, the following table identifies potential construction sources of impact, proposed generic mitigation to avoid or reduce the impact and the potential for residual significant adverse effects to important ecological receptors.

1.3. HABITAT IMPACTS AND MITIGATION

Impact	Effect	Proposed Mitigation	Significance (post mitigation)
Habitat loss; degradation and simplification.	Vegetation clearance for the preparation of the working corridor, and supporting infrastructure (construction camp, laydown areas etc). Degradation from soil compaction and erosion, dust and temporary roads and access areas.	Land outside of the direct project footprint will be restored as soon as practical following construction, so most impacts are expected to be short-term only.	Low
Habitat Fragmentation.	Disruption to general fauna movement through the landscape (physical and disturbance).	Specific mitigation for amphibian, reptile, bird and mammal species is included.	Low
Changes in surface water conditions.	Impacts to aquatic species (surface waters).	Project routing seeks to avoid any major hydrological issues. Appropriate pollution prevention measures will be put in places where the bridges will be reconstructed.	Low
Habitat pollution; including deposition and runoff.	**Nitrogen deposition** from vehicles can affect sensitive habitats (woodland, a grasslands and riparian areas). **Dust** can impact vegetation and affect productivity and/or change local soil PH levels.	GIP mitigation will be used to minimize impacts from run off. Impacts from dust (with appropriate damping down and other mitigation) are expected to be reduced to a distance of 25m from the works and are unlikely to be significant Salt spray should	Low

Impact	Effect	Proposed Mitigation	Significance (post mitigation)
	Pollution (including salt) from road run off and de-icing may affect habitats and create surface water films.	be monitored.	
Spread of non-native/invasive species.	Spread of non-native invasive species will reduce the ecological value of an area.	Pre-clearance site surveys combined with the demarcation and treatment of non-native species will prevent their spread. Post-Construction Monitoring will ensure that newly restored areas are not colonised by non-native species (*Ambrosia artemisiifolia, Robinia pseudoaccacia*) from adjacent areas.	Low

1.3.1. Other Impacts

Construction works may also result in impacts from:

- Air emissions, including dust from earthworks and material transfer;
- Noise from machine operation and vehicle movement;
- Loss of soil structure, including erosion of the upper territorial horizon, leaching of construction sites and soil pollution from waste.

Degradation of the quality of surface or groundwater due to discharges from the areas where earthworks are being carried out or because of water pollution by substances used in the construction phase.

Impacts on habitats during operation will be restricted to impacts from road run-off, dust etc. Such impacts are considered to be low.

Habitat Loss and Fragmentation

Habitats along the road are degraded and mostly devastated by cutting and garbage or waste disposal. Also, the entire road will be widened from the current 6.0 m to 6.50 m (25 cm on either side), with the exception of two additional 300m long lanes which will be built in each direction at the border crossing Dracenovac. Habitats will not be significantly affected and the impact on them will remain low.

Watercourse Pollution

During reconstruction of the tunnels and bridges there is risk of erosion and abrasion of material into the watercourses. Further impacts may occur through accidental infilling of watercourses including by uncontrolled or accidental unloading of earthen material.

Photo Log/Photos from subject area

Figure 1. Spruce forest, Balotici

Figure 2. Garbage in Ibar river and mixed spruce-fir forest above

Figure 3. Ibar Canyon, ravine forest and landfill Mostina

Figure 4. Degradated beech forest along the road

Figure 5. Rocks along the road with mesh and sparsely vegetation

Figure 6. Ravine slopes in the Ibar Canyon

Figure 7. Mixed spruce-beech forest along the road

Figure 8. Beech forest and valley of Ibar

Figure 9. Meadows in Kajevici

Figure 10. Degraded beech forest and riparian forest along Ibar in Drecanovac

Figure 11. Ibar Canyon after crossing border Drecanovac

2. BATRACHOFAUNA AND HERPETOFAUNA (AMPHIBIANS AND REPTILES)

Summary

Field surveys of amphibians (batracho fauna) and reptiles (herpetofauna) in the area of influence of the project of reconstruction of the Main Road 2 section Rozaje - Spiljani for a quick assessment of the possible impact of the project on these groups of animals were carried out at the end of September 2019. The field survey lasted 2 days. The field survey was carried out in 10 selected locations, with the emphasis on the belts where the road crosses rivers and streams, and where the greatest impact of the project on the habitats of amphibians and reptiles is assumed based on the Terms of Reference. The presence of four species of amphibians and two species of reptiles has been recorded: *Bufo bufo* (Common Toad), *Bombina variegata* (Yellow-bellied Toad), *Pelophylax ridibundus* (Marsh Frog), *Rana graeca* (Greek Stream Frog), *Podarcis muralis* (Common Wall Lizard) and *Vipera ammodytes* (Nose-horned Viper). *Rana graeca* is endemic to the Balkan Peninsula, while other detected species are widely distributed in Europe or Euro-Asia. Detected species are not considered endangered taxa by IUCN categorization. *Bombina variegata* is on Annex II of the Habitats Directive. Just as the *Vipera ammodytes* species, which is not protected by the law while other species are protected. The report abstracts the key risks during construction phase and exploitation phase, as well as proposed protection measures.

Detected species:

Latin name	Montenegrin name	English name
Bufo bufo	Krastaca	Common Toad
Bombina variegata	Zutotrbi mukac	Yellow–bellied Toad
Pelophylax ridibundus	Velika zelena zaba	Marsh Frog
Rana graeca	Grcka zaba	Greek Stream Frog
Podarcis muralis	Zidni guster	Common Wall Lizard
Vipera ammodytes	Poskok	Nose-horned Viper

Potential species based on literature:

Latin name	Montenegrin name	English name
Rana temporaria	Zaba travnjaca	European Common Frog
Zootoca vivipara	Planinski guster	Viviparous Lizard

INTRODUCTION

The Project involves reconstruction of the 20 km long section of the Main Road M2, section Rozaje – Spiljani, which stretches from the intersection "Vuca" to the border with Serbia. The works are as follows:

- Reconstruction of intersection of the Main Road M2 with regional road to the settlement Vuca.
- Reconstruction of the entire section Rozaje – Spiljani, which involves widening of the road from the current 6m to 6.5m in total, rehabilitation of slopes, installation of new traffic signs and other equipment.
- Construction of additional traffic lanes (one in each direction) in the length of 300m at the border crossing Dracenovac.
- Reconstruction of 12 tunnels. This part includes extension of the tunnels, placing of hydro-isolation, which will allow safer conditions in traffic.
- Reconstruction of 11 bridges and pedestrian crossings, whereby they will be strengthened, the concrete coating will be repaired, and pedestrian lanes will be built.

The route of the Main Road M2, section Rozaje-Spiljani, passes through the mountainous area at an altitude of 800 - 1000 m asl, characterized by the Ibar river, which runs parallel to the road route. The route is characterised by sections of the river which are defined by widened valley areas (at the beginning and end of the road route), as well as the canyon section (middle section of the road route), whereby these parts of landscape are mixed with other types of habitats, such as: pastures, mixed forests, vegetation of limestone rocks, and semi-natural meadows and bushy vegetation in rural and urbanised sections of the route.

Given the characteristics of the area through which the route passes, it is assumed that reptiles which populate dry habitats of rocky in the canyon part, or which populate the areas along the edges of fields, forests, pastures, hedges and roads are present in this area. Additionally, it is assumed that amphibians and reptiles which prefer rivers and streams are present in this area. The route is located in the north-eastern part of Montenegro, and less diversity of these groups of animals is expected compared to the southern regions (Ljubisavljevic et al, 2018).

Preparation for the survey

Preparations for the survey included review of References on amphibians and reptiles in the subject area and determination of their location on map. In accordance with this data, and inspection of the route, the locations for carrying out the survey were selected (Table 1 and Figures 1-11 in the Appendix). In addition to emphasis of the areas in which the road crosses rivers and streams, and where the greatest impact of the project is assumed on the habitats of amphibians and reptiles on the basis of the Terms of Reference, i.e. during reconstruction of bridges (locations 1 - 3 and 5 - 8), natural or semi-natural zones of wet and aquatic habitats important for the existence of amphibians and reptiles were selected, whereby these zones are located along the road route and/or are located in the area of influence (locations 4, 9 and 10).

Limitations of the survey

Survey was time-bound, thus the time period dedicated to field survey was limited (early autumn), the period when activity of amphibians and reptiles is reduced before hibernation (hibernation during the cold period), while the hibernation period begins earlier in mountainous, northern regions. Given that a quick review of the project area of influence had to be done, there were also limitations in regard to the short timeframe within which the survey had to be completed. Field survey of amphibians and reptiles that populate high altitude areas, at the beginning of autumn, could only be done during warm and sunny days when these groups of animals are active. Therefore, this report should also be interpreted as a result of a quick inspection of the route, and the number of species and the impact that the existing route, i.e. impact of the reconstructed route will have/may have on amphibians and reptiles should be interpreted accordingly.

Table 1. Locations selected for amphibian and reptile survey

No.	Number (mark) on the map	Location description	Altitude	Coordinates
1	1	Intersection Vuca	998 m	42.853220°, 20.182247°
2	2	Bridge at the Crnja stream	996 m	42.856067°, 20.185233°
3	3	The first bridge on the Ibar river (mouth of Plunski stream)	963 m	42.851131°, 20.197829°
4	4	The gorge of Ibar	968 m	42.854583°, 20.209133°
5	5	The second bridge on the Ibar river	997 m	42.862662°, 20.217896°
6	6	Bridge on Njeguski stream	986 m	42.879083°, 20.248600°
7	7	Besnik, bridge at the Barski stream	983 m	42.878883°, 20.260183°
8	8	Bac, bridge at the Bacanski stream	895 m	42.884233°, 20.299050°
9	9	Kajevici, the Vrelo spring	823 m	42.894400°, 20.307933°
10	10	Dracenovac	825 m	42.902183°, 20.317783°

2.1. METHODOLOGY

Field surveys of amphibian species (batrahofauna) and reptile species (herpetofauna) in the area of influence of the Main Road M2, section Rozaje – Spiljani, for the purpose of determining project's possible impact on these groups of animals, were carried out on September 28th and September 29th 2019.

The process of determining presence of the expected amphibian and reptile species in favourable habitats in the subject area was carried out by the means of visual transects, as well as by the method of surveying with fishing nets, all of which was done in line with the standard methods for assessment of diversity of batrachofauna and herpetofauna. Surveying with fishing nets was carried out only in specific cases, when it was used for the purpose of determining the species. After completing the process of determining the species, the species were immediately returned to the habitat. Where possible, site survey covered a 500m wide area at certain survey points, whereby the surveyed area included a 500m wide zone along the left and the right side of the road, which represents the project area of influence.

2.2. PRESENTATION OF RESULTS

2.2.1. Assumed species

Literature review showed that there is very limited information on the amphibians and reptiles in the Project area (Table 2). The data provided date back to the 1970s, and one source of information which dates back to the early twentieth century is questionable (finding *Zootoca vivipara*, Kopstein and Wettsten 1921 in Ljubisavljevic et al., 2018). There are no recent literature resources. Based on the mentioned literature, two amphibian species and two reptile species can be found in the project area of influence (Table 2).

Table 2. Assumed amphibian and reptile species in the project area of influence, based on information obtained from literature.

Species	Location	Year of the find	Literature
Amphibians (Amphibia)			
Bombina variegata (Yellow-bellied Toad)	Rozaje: Ibar river	1974	Dzukic et al., 2015
Rana temporaria (European Common frog)	Rozaje: Ibar river	1974	Dzukic et al., 2015
Reptiles (Reptilia)			
Podarcis muralis (Common Wall Lizard)	Rozaje	1974	Dzukic et al., 2017
Zootoca vivipara (Viviparous Lizard)	Rozaje	1921	Kopstein and Wettstein, 1921

2.2.2. Determined species

During two days of field survey in the end of September 2019, it was determined that 4 amphibian species and 2 reptile species are present in the project area of influence (Table 3, Figure 12 – 17, in Annex). Out of all the potentially present amphibian and reptile species in the Project area, presence of *Rana temporaria* (European Common Frog) and *Zootoca vivipara* (Viviparous Lizard) was not confirmed. Discrepancies between the available data may be the result of (I) the date when these resources were written, (II) carrying out field survey in a short period of time at the beginning of autumn when there is little possibility of detecting amphibians and reptiles, especially in respect to adult specimens, due to their reduced activity. During the field survey, majority of the detected species were juvenile amphibians.

However, three amphibian species and one reptile species, which have not been listed so far in the available literature, were recorded during the survey. These findings are not unexpected given the range of these species in the neighboring countries and in Montenegro, as well as the types of habitats they populate.

Table 3. Amphibians and reptiles identified in the project area of influence based on surveys carried out this year.

Amphibians (Amphibia)	Reptiles (Reptilia)
Bufo bufo (Common Toad)	*Podarcis muralis* (Common Wall Lizard)
Bombina variegata (Yellow-bellied Toad)	*Vipera ammodytes* (Nose-horned Viper)
Pelophylax ridibundus (Marsh Frog)	
Rana graeca (Greek Stream Frog)	

2.2.3. Assessment of the conservation status of the identified species

Rana graeca (Greek Stream Frog) is endemic to the Balkan Peninsula, while other registered species are characterised by wider distribution in Europe and Eurasia. The registered species do not belong to the endangered taxons which are defined by the IUCN categorisation. *Bombina variegata* (Yellow-bellied Toad) is on Annex II of the EU Habitats Directive. *Bombina variegata* and *Vipera ammodytes* (Nose-horned Viper) are not protected by law in Montenegro, while other species are protected (Table 4).

Table 4. Conservation status of the identified amphibian and reptile species

Species	National legislation	Endemism	IUCN	Habitats Directive	Note
Amphibians (Amphibia)					
Bufo bufo (Common Toad)	protected species	—	LC	—	
Bombina variegata (Yellow-bellied Toad)	—	—	LC	II, IV	
Pelophylax ridibundus (Marsh Frog)	* protected species	—	LC	V	* just as *Rana ridibunda*
Rana graeca (Greek Stream Frog)	protected species	Balkan endemic species	LC	IV	
Reptiles (Reptilia)					
Podarcis muralis (Common Wall Lizard)	protected species	—	LC	IV	
Vipera ammodytes (Nose-horned Viper)	—	—	LC	IV	

LC- least concern**; II, IV, V** – species may be found in the abovementioned appendix or annex; **national legislation**: "Decision on enforcing protection for certain plant and animal species", Official Gazette 76/06; **IUCN** (International Union for Conservation of Nature) **red List**; **Habitats Directive** - Council of European Communities (1992): Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wildlife and flora Habitats Directive - 92/43/EEC.

2.4. OVERVIEW OF THE SURVEYED LOCATIONS AT THE ROAD SECTION M2 ROZAJE - SPILJANI, INCLUDING THE IDENTIFIED SPECIES AND THE COORDINATES OF THEIR LOCATIONS

Coordinates of the survey locations at which amphibians and reptiles were identified are shown in Table 5. Their location on the map is shown in Figures 18 - 21 in the Annex. Amphibians and reptiles were not identified in the area of influence at locations 6 and 8 (zone of the Njeguski stream and zone the Bacanski stream). The most commonly recorded species was the Common Wall Lizard *(Podarcis muralis)*, which was detected at 8 survey locations, while the other species were detected at one or two surveyed locations. The Common Wall Lizard is a common species in anthropogenically modified regions, which is the case with the subject area.

Most of the surveyed locations are heavily influenced by urbanization, which has affected the modification or disturbance of the natural habitats of amphibians and reptiles. The following negative factors in respect to biodiversity have been identified: pollution of the Ibar river, its tributaries and the surrounding terrain by solid waste (locations 1, 2, 3, 4, 8, 9 and 10), pollution by wastewater (locations 1, 2 and 3), gravel exploitation from the river (location 4), filling the riverbed with concrete and other construction materials (location 3 – the Crnja stream), urbanization (locations 1,2,3, 7,8,9 and 10).

Table 5. Overview of the detected species, including coordinates of the area of influence at surveyed locations

No	Location	*Bufo bufo*	*Bombina variegata*	*Pelophylax ridibundus*	*Rana graeca*	*Podarcis muralis*	*Vipera ammodytes*
1	Intersection Vuca					42.854067°20.181800° 42.853417° 20.181900°	
2	Bridge at the Crnja stream					42.852900° 20.185483°	
3	The first bridge on the Ibar river (mouth of Plunski stream)				42.849800° 20.198617°	42.851367° 20.197167° 42.851183° 20.198250° 42.849683° 20.198383°	
4	The gorge of Ibar	42.854816° 20.208173°	42.854583° 20.209133° 42.854500° 20.209067°		42.855117° 20.208333°	42.855017° 20.207067°	42.854533° 20.208067°
5	The second bridge on the Ibar river					42.861817° 20.215767° 42.861983° 20.215917°	
6	Bridge on						

No	Location	*Bufo bufo*	*Bombina variegata*	*Pelophylax ridibundus*	*Rana graeca*	*Podarcis muralis*	*Vipera ammodytes*
	Njeguski stream						
7	Besnik, bridge at the Barski stream					42.878883° 20.260183° 42.880217° 20.261383°	
8	Bac, bridge at the Bacanski stream						
9	Kajevici, the Vrelo spring			42.893817° 20.308300° 42.893783° 20.307933°	42.894400° 20.307933°	42.894467° 20.307883°	
10	Border crossing Dracenovac	42.902567° 20.318567°				42.902183° 20.317783°	

2.4. SUGGESTED PROTECTIVE MEASURES

Key risks during the construction phase

- Given the fact that the project envisages widening of the existing route in the total width of 50cm, and that most of the route passes through an anthropogenic modified area, it is estimated that *there will be no major loss of surface of existing terrestrial habitats of amphibians and reptiles in the zone of influence.* The section along the Dracenovac border crossing, at which it is planned to build two additional lanes in the length of 300m (600m in total), will also cover anthropogenically modified areas where no amphibians and reptiles were identified during the quick survey.
- Given the small area of the intervention, it is estimated that preparation of the terrain, removal of vegetation, flattening of the soil and compaction of soil will not significantly affect the reduction of prey, shelter and hibernation sites for detected amphibians and reptiles.
- During the reconstruction of bridges, crossings and intersections planned by the project, degradation of aquatic habitats and disturbance of individuals may occur.
- It may happen that some specimens leave the area which is defined as the area of activity, which could be caused as a reaction to noise and vibration during the works execution.
- Inadequate or untimely implementing of protection measures, i.e. reducing the impact of the project on sensitive areas such as rivers and streams in the area in project location, can lead to contamination of the

habitat by the emission of dust and pollutants caused by work of construction machinery, waste or other materials during the works.
- Parking area and transport of mechanization and storing of materials on land outside of the existing roads and urbanized areas can endanger the habitats of amphibians and reptiles living in the area.
- Given the seasonal and time restrictions imposed by the rapid review of the project impact zone, it cannot be assessed whether there may be an increased mortality of adult and juvenile individuals when crossing the road under reconstruction or whether there are currently points with high wildlife mortality. Significant increase in mortality of Common Toad *(Bufo Bufo)* during migration, when this species is not expected to be encountered across the road while the road is under reconstruction, since their migration takes place at dusk and during the night, when the execution of construction works is not foreseen. Given the abovementioned restrictions, it is not possible to assess whether there are points on the existing road where the mortality of this species is at high level.

Key risks during the exploitation phase (road use)

Due to the above-mentioned limitations during the survey, it is not known whether there are points characterised by significant mortality rate of certain species, caused by crossing the Main Road which is planned to be reconstructed. Given the fact that the road which animals have to cross safely is going to be wider than the existing road, this risk may be higher to some extent during the operation phase.

Specific protective measures for the endangered species (VU, EN, CR)

Species identified during this survey, as well as species mentioned in the reviewed literature (see part of the assumed species) do not belong to the categories of endangered species (VU, EN, CR), nor Near Threatened (NT) species defined by the IUCN.

Other protective measures

Protective measures during construction

- Prevent the possibility of accidental contamination of watercourses in the project area - maintenance or refuelling of mechanization, replacement of oil, etc. shall not be conducted near watercourses, while soil, construction and other types of waste shall not be disposed along the banks.
- Movement of heavy machinery should be strictly limited to the minimum necessary manoeuvring area, whereby the existing areas and side roads should be used in order to avoid further fragmentation and degradation of the habitats and in order to minimize soil compaction.
- Vegetation removal shall be limited to the minimum extent necessary.
- Areas temporarily used during road construction shall be covered with soil, which would allow the restoration of indigenous vegetation and reptiles as well as undisturbed spring and autumn migration of amphibians.
- Protect riverbeds while reconstructing bridges and crossings.

- As survey was carried out at the beginning of autumn and in a short period of time, the precise locations of possible migration routes of the *Bufo bufo* Common Toad and the position of possible culverts for this species could not be determined.

Protective measures during the exploitation phase

Monitoring of frequency of mortality in the appropriate season (spring - summer) shall be carried out after completion of works, whereby additional protective measures should be defined if necessary.

Photo Log / Locations selected for survey of amphibians and reptiles

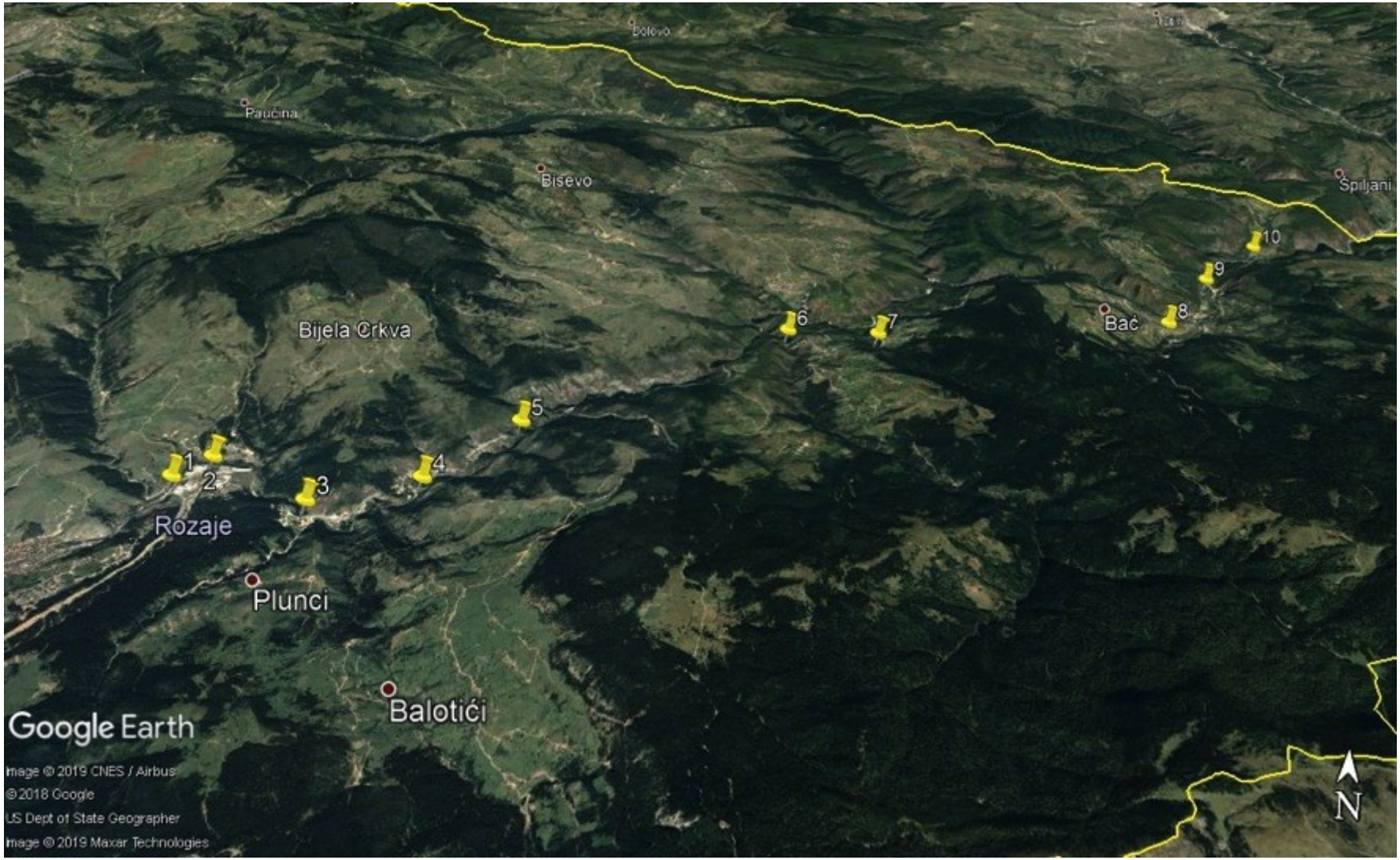


Figure 1. Position of the survey locations. The names are given in Table 1

Figure 2. Selected location 1 - survey of amphibians and reptiles – Intersection Vuca. Intersection (left) and the Ibar river near the intersection in the project area of influence (right)

Figure 3. Selected location 2 –survey of amphibians and reptiles – Bridge on the Crnja stream. Bridge (left) and the Crnja stream in the project area of influence (right)

Figure 4. Selected location 3 –survey of amphibians and reptiles – The first bridge at the Ibar river. Bridge (left) and mouth of Plunski stream and Ibar river in project area of influence (right)

Figure 5. Selected location 4 –survey of amphibians and reptiles – Gorge of Ibar below the road in the project area of influence (left) and the Ibar river with gravel excavations (right)

Figure 6. Selected location 5 –survey of amphibians and reptiles – The second bridge at the Ibar river. Bridge (left) and the Ibar river in the project area of influence (right)

Figure 7. Selected location 6 –survey of amphibians and reptiles – Bridge on the Njeguski stream. Bridge (left) and the Njeguski stream in the project area of influence (right)

Figure 8. Selected location 7 –survey of amphibians and reptiles – Besnik, bridge on the Barski stream. Bridge (left) and the Barski stream in the project area of influence (right)

Figure 9. Selected location 8 - survey of amphibians and reptiles – Bac, bridge on the Bacanski stream. Bridge (left) and the Bacanski stream in the project area of influence (right)

Figure 10. Selected location 9 - survey of amphibians and reptiles – Kajevici, the Vrelo spring. Stream of the Vrelo spring (left) and mouth of stream and Ibar river in project area of influence (right)

Figure 11. Selected location 10 - survey of amphibians and reptiles – border crossing Dracenovac. Ibar River near the border crossing point in the project area of influence

Figure 12. Common Toad - *Bufo bufo,* juvenile individual, location 10 – bank of the Ibar River near the border crossing Dracenovac

Figure 13. Yellow-bellied Toad – *Bombina variegata*, location 4 – Gorge of Ibar

Figure 14. Marsh Frog *Pelophylax ridibundus*, location 9 – Kajevici, the Vrelo spring, along the bank of Ibar

Figure 16. Common Wall Lizard *Podarcis muralis*, location 5 – the second bridge at the Ibar river

Figure 15. Greek Stream Frog *Rana graeca*, juvenile individual, location 9 – Kajevici, the Vrelo spring, along the bank of Ibar

Figure 17. Nose-horned Viper *Vipera ammodytes,* location 4 – Gorge of Ibar

Figure 18. Position of the first three survey locations (intersection Vuca, the Crnja stream, the first bridge at the Ibar river) and detected species. Mark: blue – Greek Stream Frog, yellow – Common Wall Lizard

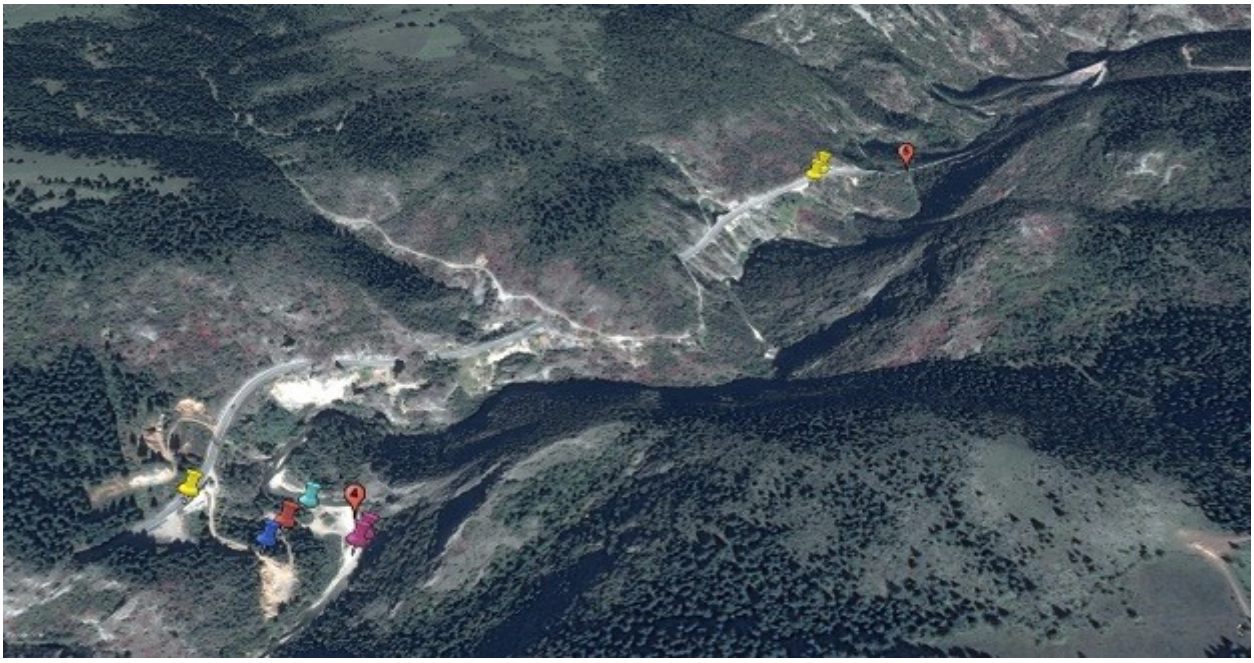


Figure 19. Position of survey locations 4 and 5 (Gorge of Ibar and the second bridge at the Ibar river) and detected species. Mark: red – Common Toad, purple – Yellow-bellied Toad, light blue – Greek Stream Frog, yellow – Common Wall Lizard, dark blue – Nose-horned Viper

Figure 20. Position of survey locations 6, 7 and 8 (Njeguski, Barski and Bacanski stream) and detected species. Mark: yellow – Common Wall Lizard

Figure 21. Position of survey locations 9 and 10 (the Vrelo spring and Dracenovac) and detected species. Mark: red – Common Toad, green – Marsh Frog, light blue – Greek Stream Frog, yellow – Common Wall Lizard

3. ICHTHYOFAUNA SURVEY

INTRODUCTION

Fish survey (ichthyofauna) was carried out during October 2019 in the area of influence (AoI) of Reconstruction of the Main Road Rozaje-Spiljani, along the section stretching from the "Vuca" intersection (1148km+200) up to the border with Serbia (1168km+200), which has the total length of 20km. Site observation and selection of locations for the ichthyological survey in the AoI of Reconstruction of the Main Road Rozaje-Spiljani was carried out on the basis of direct observation during the site visit, as well as on the basis of the data obtained literature review of resources about the subject area. The site survey provided an estimate of the locations at which impact on ichthyofauna is expected to be highest during construction, while this survey also helped identify the locations at which additional ichthyofauna surveys will be carried out. The site survey was carried out along the course of the Ibar River, whereby the survey was carried out downstream. Map of the critical locations may be found in the Appendix.

Sampling was not carried out at all the selected critical locations. In fact, critical locations are places which should be protected with special attention and for which adequate protective measures should be defined, because it is highly likely that some impact will be caused by reconstruction, thus, due to the proximity of Ibar riverbed, it is possible that certain impact in respect to pollution will be caused as well.
Areas in which bridges are most commonly located represent the critical locations for ichthyofauna. When it comes to the road section Rozaje-Spiljani, three bridges (in the total length of 244 m) will be reconstructed, while it is planned to carry out rehabilitation of 8 bridges and concrete slabs. The site survey and visual observations provided enough information for estimating 6 locations as points which will be critical during the construction phase.

Site observation and selection of locations for fish survey in the AoI for Reconstruction of the Main Road Rozaje-Spiljani was carried out on 2nd October 2019. Site surveys were carried out on 03rd and 04th October 2019. Selection of locations and site survey was facilitated by highly useful information which were provided by the Sport-Fishing Association Rozaje, based on their vast experience.

3.1. SITE SURVEY CONSTRAINTS

Time limitations related to the site survey and inaccessible terrain represented some of the main constraints of the subject site survey, which is the reason why sampling was carried out at two locations (location 4 – "Belocrkvansko vrelo" and location 6 – border with Serbia).

Ibar River is a typical limestone karst river which runs through the Project area, whereby its course runs through a steep canyon, parallel to the road M-2 which connects Rozaje to Spiljani.

Table 1. Locations selected for ichthyofauna surveys

No.	Number (mark) on the map	Location description	Altitude	Coordinates
1	Location 1	Bridge on the Ibar River, section before the storage yard	970m	42°51'4.10"N20°11'51.49"E
2	Location 2	Bridge after the gas station, before the first tunnel	1003m	42°51'12.20"N 20°12'15.29"E
3	Location 3	Road section before the second tunnel	1012m	42°51'23.27"N20°12'26.39"E
4	Location 4	Road section between the third and fourth tunnel, "Belocrkvansko vrelo"	987m	42°51'26.88"N 20°12'37.88"E
5	Location 5	Bridge on the Ibar River	982m	42°51'45.41"N 20°13'4.41"E
6	Location 6	Border crossing "Dracenovac"	826m	42°54'6.70"N20°19'4.70"E

3.1. METHODOLOGY

Sampling was carried out by the means of low voltage generator (Figure 24). The specimens were photographed, species of each specimen was defined, after which they were returned to the river.

3.2. PRESENTATION OF THE RESULTS

Species which are assumed to be found at the selected locations were defined on the basis of data obtained from literature (Maric & Milosevic, 2011), (Kottelat, M. And J. Freyhof. 2007).

Table 2. List of species which are assumed and determined to be present in the surveyed area

No.	Species name (Latin name)	Common name	Endemism	Conservation status (IUCN)	Determined species
1.	*Salmo labrax (*Pallas, 1814)	Crnomorska pastrmka-blatnjaca (Black Sea Salmon)		LC	Location 4
2.	*Hucho hucho* (Linnaeus, 1758)	Mladica (Huchen)	Endemic species of the Danube River basin	EN	Location 6
3.	*Thymallus thymallus* (Linnaeus, 1758)	Lipljen (Grayling)		LC	Location 6
4.	*Barbus balcanicus* (Linnaeus, 1758)	Potocna mrena (Danube barbel)		LC	Locations 4 and 6
5.	*Chondrostoma nasus* (Linnaeus, 1758)	Skobalj (Common nase)		LC	Location 6
6.	*Squalius cephalus* (Linnaeus, 1758)	Klijen (Chub)		LC	Location 6

According to data obtained from literature (Maric and MIlosevic, 2011), data from the Spatial and Urban Plan of Municipality Rozaje (2013-2020), and data provided by the Fishing Association Rozaje, 6 fish species are represented in the Ibar river – 3 Salmonidae species: Black Sea Salmon ***Salmo labrax*** (Pallas, 1814), Grayling ***Thymallus thymalus*** (Linnaeus, 1758), and Huchen ***Hucho hucho*** (Linnaeus, 1758); and 3 whitefish species: Danube barbel ***Barbus balcanicus*** (Linnaeus, 1758), Common nase ***Chondrostoma nasus*** (Linnaeus, 1758), Chub ***Squalius cephalus*** (Linnaeus, 1758). Assumptions regarding presence of the abovementioned species in the Ibar River were confirmed through the site survey and sampling. Huchen ***Hucho hucho*** is listed on the IUCN list, and it is categorized as an endangered species **EN** (endangered), which implies that special protection measured should be implemented during the construction phase. All the other species are categorized as LC (Least concern) and they do not belong to the group of endangered species. Sampling was carried out at two locations-location 4 and location 6. Location 4 belongs to the upper course of the Ibar River, while location 6 belongs to the lower course of the Ibar river.

3.2.1. Description of the selected locations

Visual observation of the terrain, which was carried out via Google Maps, helped to determine 6 locations as the critical points in respect to project impact on ichthyofauna. Due to their proximity to the Ibar River, these locations are susceptible to potential impacts of reconstruction activities, which is why it is necessary to implement special protection measures in order to preserve the fishing stock. Five out of six locations are located on the left side of the road (direction Rozaje-Spiljani), i.e. the upper course in which only two species are represented Black Sea Salmon (Figure 19) and Danube barbel (Figure 21), while the last critical point (location 6) is located along the right side, close to the border crossing, and it belongs to the lower course of the river, whereby 5 fish species are represented in this section Grayling (Figure 18), Huchen (Figure 20), Danube barbel (Figure 21), Common nase (Figure 23) and Chub (Figure 22).

Location 1, 42°51'04.3"N 20°11'52.6"E represents the location of a bridge near the storage yard. The bridge is situated at the altitude of 970 m asl. The location itself is already under anthropogenic impact (Figure 3 and Figure 4). Water turbidity was identified in this section, which indicates that there is already some kind of pollution in the water, and this pollution is mostly likely caused by the storage yard which is not implementing protective measures. Judging by the colour of water, it may be concluded that a place for washing concrete mixing machines is located at the abovementioned spot or nearby, since there were visible traces of concrete in the water. This location belongs to the upper course of Ibar, which is populated by Black Sea Salmon (Salmo labrax) and Danube barbell (Barbus balcanicus). It was not possible to carry out sampling at this location because the water was too dirty. According to information provided by the Fishing Association of Rozaje, turbidity occur occasionally, while Danube barbel and common barbel may also be caught at this location, which mostly occurs when the water level is higher and when there is no turbidity.

Location 2, 42°51'12.20"N 20°12'15.29"E represents the location of bridge before the first tunnel and it is located at the altitude of 1003 m asl (Figure 6 and Figure 7). The bridge is located right along the Ibar River. The entire riverbed is located in the project AoI. The water is clear, and it is characterised by torrential flow. This part of the river is populated by Danube barbel and common barbel. The abovementioned information was confirmed by the Fishing Association Rozaje. It is necessary to protect the river with a retaining wall.

Location 3, 42°51'23.27"N20°12'26.39"E represents a 100m long road section before the second tunnel (Rozaje-Spiljani direction) (Figure 8 and Figure 9). It is located at the altitude of 1012 m asl. Just as it was the case with the location 2, location 3 represents the road section which is located just along the Ibra riverbed.

Due to proximity of the road, this section of the Ibar river is highly exposed to impacts which will be caused by reconstruction, and it is necessary to implement special protection measures since a special, sensitive Salmonidae species is present in this section – Danube Barbel. It is necessary to protect this section with a retaining wall.

Location 4, 42°51'26.88"N 20°12'37.88"E represents the road section which stretches from the second up to the third tunnel (Rozaje-Spiljani direction), and it is known by the name "Belocrkvansko vrelo" (Figure 10, Figure 11, Figure 12, Figure 13). This section is located at the altitude of 987 m asl. The riverbed is very close to the road and impact which will be caused by reconstruction is going to be rather high, taking into account that this entire section of the riverbed is located in the project AoI. This section of the river is full of whirlpools and rapids, which are populated by Danube barbel and common barbel. Sampling at this location was carried out on 03rd October 2019, and low voltage generator was used for this purpose. Length of the transect was around 300 m. Presence of the abovementioned two species was confirmed.

It is necessary to protect this section with a retaining wall.

Location 5, 42°51'45.41"N 20°13'4.41"E represents the location of the large bridge on the Ibar River (Figure 14 and Figure 15). Altitude of this section is 982 m asl. The Ibar River runs just under this bridge. Just as it was the case with the abovementioned locations in the upper course of the river, this section is also full of rapids which are populated by Danube barbel and common barbel (information provided by the Fishing Association Rozaje). This location is also highly critical in terms of fish fauna, and since impact caused by reconstruction will be rather prominent, it is necessary to implement protective measures aimed at protecting Black Sea Salmon.

After this bridge, the river course is located along the left side of the road (Rozaje-Spiljani direction). Impact is much lower on this side of the road, which is caused by the relief. Middle course of the river starts already at this section. Points which should especially be defined as threatened were not recognised, which was the case with the remaining section of the river all the way up to the border, which was defined as the critical location 6.

Location 6 42°54'6.70"N20°19'4.70"E represents the border crossing Dracenovac (Figure 16 and Figure 17). This section is located at the altitude of 826 m asl, and it is situated in vicinity of the lower course of the Ibar River. Sampling was carried out at this location, and the transect included a 300 m long upstream section. It is planned to widen the road along both sides of the road, whereby each side would be widened in the length of 300 m. Sampling was carried out on 04th October 2019. The transect included a 300m long upstream section. Presence of the following species was determined: huchen, Mediterranean barbel, common nase, chub and grayling. The specimens which were caught we photographed and returned to the ecosystem.

All protective measures must be implemented at this location in order to preserve huchen, which has the status of a critically threatened species according to the IUCN, and which is highly sensitive to pollution in the environment.

According to data which the Fishing Association Rozaje has at its disposal, the number of fish in the Ibar River is high. Despite organic pollution, which is especially prominent in the upper course of Ibar, fishing is also present in the section which runs through the urban centre (Figure 1 and Figure 2). Water level was not high in the period when this survey was carried out, which definitely provided conditions for carrying out the site survey and sampling more easily.

3.2.2. Key risks during the construction phase

Impact on fish fauna in the Ibar river caused by water used in construction

Impact on fish fauna in the Ibar river may be reflected in the presence of:

- Temporary and increased turbidity of the Ibar river caused by construction works which will be carried out as part of reconstruction of the main road Rozaje - Spiljani (downstream).
- The potential occurrence of wastewater from the tunnel. The treated water is discharged into the Ibar river through the system for additional treatment and drainage (precipitator and separator). If a WWTS are planned to be installed at the construction site, the impact of wastewater from WWTS at camp sites and concrete mix plants is also considered.
- In case the installing a concrete mix plant is planned on the site, the impact of wastewater from the canal in the zone of the plant is possible.

3.3. SUGGESTED PROTECTION MEASURES

Measure 1

The fact which should be taken into account is that, according to its flow regime and change in quality, the Ibar river corresponds to the classic torrential-mountain watercourses. After heavy precipitation, natural turbidity in the Ibar river can be much higher than turbidity of water which runs out of sedimentation pools. In case similar circumstances occur, the contractor shall carry out sampling in order to determine natural turbidity of water in the Ibar river, whereby this should be carried out in the section located above the area where construction works are going to be carried out, in order to compare it with results from construction zone.

Also, if there is a WWTS on the site, a mud sedimented in the waste water treatment system shall be deposited in mud tanks, and then transported to the location designated for disposal of construction waste, whereby this location must be approved of by the competent local authorities from Rozaje. Contractor must to designate the location for deposition of mud generated in the sedimentation pools.

Measure 2

In case the Contractor plans to install WWTS on the construction site, it is necessary to regularly monitor the operation of the system through review testing and maintenance of the system, as well as through monthly analysis of wastewater from the system, all of which should be done prior to discharging wastewater into the Ibar river, thus creating a controlled process. Monitoring of wastewater quality and the monitoring schedule are defined in the Environmental Protection Monitoring Programme. Quality Testing of wastewater from the system must be carried out continuously by an accredited laboratory from the beginning of the works, on a monthly basis.

Measure 3

In case the Contractor plans to install a concrete mix plant, it is necessary to regular clean and maintain the canals located in the camp, as well as the platform of the concrete mix plant. It is not allowed to use chemicals for washing the machines on platform of the concrete mix plant, while the number of the machines which are going to be washed on this platform was reduced.

Measure 4

In order to reduce turbidity in the zone of the Ibar river as much as possible, whereby turbidity will be caused by different activities which are going to be carried out as part of reconstruction of the main road Rozaje - Spiljani (downstream), the methods of sedimentation or infiltration should be taken into consideration, if necessary. As part of the regular control of condition of biodiversity in the Ibar river, the contractor must carry out additional analyses at two locations (outside of the AoI and in the section where the river is affected by project activities) with the aim of creating a realistic overview of the condition of biodiversity, whereby the possibility of adding specimens to fishing stock should be kept open in case the fishing stock is reduced at the subject locations.

3.3.1. Protection measures defined for the endangered species *Hucho hucho* (huchen)

General environmental information about the *Hucho Hucho* species (huchen)

This species belongs to the Salmonidae family (trout family), thus it represents the largest species from this family (fish which has the highest biomass increment). It is well known that huchen represents one of the endemic species of the Danube basin and this is the only part of Europe in which it may be found (apart from the Danube basin), i.e. the only part of the world. Among other attributes which make this

species extraordinary is the fact that this species is phylogenetically very old, and it represents a rarity, which may especially be attributed to the fact that this species is one of the most attractive species in the context of recreational fishing. Consequently, this species has the status of a highly valuable trophy fish species in recreational fishing, and it thus attracts great attention in regard to recreational fishing in the context of tourism. Many countries in Europe have recognised that they are very fortunate to have this extraordinary fish in their rivers.

Certain biological attributes confirm the fact that this species is extremely sensitive. This species is characterised by very low reproductive potential, which may be recognised in the number of eggs laid by the sexually mature specimens during spawning. Huchen lays 1000 of eggs per 1kg of body weight, which much less than the number of eggs laid by *Cyprinidae* species. Percentage of spawn fertilisation is just around 20-30%. The survival rate of hatched larvae followed by them reaching their full reproductive potential in natural conditions is 2-4%. Additionally, conditions for development of the hatched fry are very poor. The fact that this species cannot tolerate disturbance of its natural habitat represents a significant addition to the overall circumstances, and today more than ever we are witnessing many activities which cause destruction of its permanent habitats and spawning ground (building barriers in watercourses for the purpose of construction of dams and various permanent objects). Life expectancy of this species is more than 20 years (Maric&Milosevic, 2011). When it comes to conditions for mating and spawning, this species requires ice cold water abundant in oxygen, while the optimal temperature ranges from 6 to 10 °C. Incubation lasts between 16 and 24 days, after which insect-eating larva hatches from the eggs.

Up until its third year of life, Huchen eats insect larvae, but at the point when it reaches the grows enough, it becomes the "ruler" of the rivers and it turns to a very powerful fish which is capable of eating even smaller rodents. According to the IUCN list, it has the status of a critically endangered (CR) species.

Impact on huchen

Huchen is a Salmonidae species which is very sensitive to all types of environmental pollution. Project impact on this species may be recognised in degradation and pollution of habitats. Construction works have an impact on disruption of quality of aquatic habitats, which is mostly caused by:

- PHYSICAL CHANGES OF THE RIVER BANK AND THE RIVERBED.

Clarification

Rocky and pebbly river bank represent a breeding area (natural spawning pond), as well as a very important food resource for other aquatic organisms.

- TEMPORARY POLLUTION, TURBIDITY OR VIBRATIONS DURING CONSTRUCTION (huchen is a particularly sensitive trout species and it does not tolerant to changes in quality of water-pollution, it requires clear and clean water, rich in oxygen).

Clarification

Turbidity of water caused by sedimentary particles causes a number of undesirable problems, primarily possibility of passing of light through the water, reduced visibility, reduction of possibility of dissolution of oxygen, increase in water temperature, reduction of plankton production, lower availability of fish food, reduced growth capacity of fish, and it may cause spawn and fry to suffocate, or it can lead to reduction of the volume of fishing water. (Popovic, J.,2010. Management of Fishing Water. Croatian Sportfishing Association (Croatia. Zagreb)).

Increased acidity i.e. pH value causes a more prominent effect of toxicity of many types of metal, aluminium, cadmium, zinc, iron and copper. All these types of metal cause morphological changes on gills, thus reducing their respiratory and osmoregulation efficiency. Additionally, this type of pollution also slows down spawning and development of fertilised fish eggs, and it increases mortality rate of fish embryos and larvae.

- ACCIDENTS (effusion of harmful chemical matters into the environment, e.g. oil derivatives) may dying of fish species.

PROTECTION MEASURES FOR HUCHEN

Measure 1

During reconstruction of the road and bridges, it is necessary to protect the riverbed by construction of sustaining walls (location 6).

Measure 2

Construction works should be carried out when water level in the Ibar River is lower, i.e. during summer.

Measure 3

Reduction of turbidity Mud which is sedimented in the waste water treatment plant should be disposed of in mud tanks, and then transported to the location designated for disposal of construction waste, whereby this location must be approved of by the competent local authorities from Rozaje. The contractor must designate the location for deposition of mud generated in the sediment basins.

Measure 4

Reduction of pH level, if wastewater is generated at the construction site that is used in the process of manufacturing concrete. If necessary, reduction of pH level will be done through the use of HCL neutralization device. Laboratory analyses of wastewater which runs into the watercourses and rivers should be carried out semesterly. Sedimentation pool and separator should be used for wastewater treatment.

Measure 5

If the contractor installs a WWTP at the construction site, an analysis of the quality of wastewater from the wastewater treatment plant should be done. The analysis must be done in continuity by a certified laboratory, while these analyses should be carried out from the beginning of the project and they should be done monthly.

Measure 6

Regular cleaning and maintenance of canals which are located in the area of concrete manufacturing plant. Use of chemicals for washing the machines on the concrete manufacturing platform is prohibited, while the number of machines which are going to be washed on this platform was reduced.

Measure 7

As part of regular biodiversity monitoring in the Ibar River, the contractor must carry out additional measuring at two locations (outside of the AoI and in the section where the river is affected by project activities) with the aim of creating a realistic overview of the condition of biodiversity, whereby the possibility of adding fish to the fishing stock should be kept open in case the fishing stock is reduced at the subject locations.

3.4. CONCLUSION

Impacts on biodiversity represent the most sensitive aspect of the overall impacts, when considering the fact that biotopes should be regenerated in the way that their previous condition is reinstated. This means creation of conditions for return and functioning of the living world in the watercourse. Highest degree of risk is recognised in changes in morphology of the river bank and riverbed. In order to mitigate negative consequences in respect to the living world of fish and other aquatic species, prevention measures should be implemented (the abovementioned measures).

Brief overview of measures:

- Material and the excavated soil should be deposited a pre-designated disposal site.

- During excavation of soil and earthworks, it should be ensured that the water generated through precipitation does not have any impact on the environment. For this purpose, a temporary drainage channel should be provided, whereby this channel would be used for transporting and draining water from the given locations, and thus enable conditions for carrying out construction works uninterruptedly, prevent erosion and environmental impact.

- Wastewaters, if occur, will be treated through an system for additional treatment and drained via precipitator and separator.

- Temporary and occasional water turbidity should be regulated via the method of sedimentation or infiltration. It is not necessary to build fish ladder, except in case a an object is built across the riverbed, which would interrupt the food chain and the spawning route.

- Fish biodiversity monitoring programme should be carried out upon project is finished.

- It is possible to mitigate or avoid the abovementioned unfavourable impacts through good organisation of the construction site in the period when water level is low, i.e. during summer.

IT IS POSSIBLE THAT CERTAIN DISRUPTION OF QUALITY (WATER TURBIDITY, NOISE, VIBRATION) OR LOSS OF SMALLER AREAS OF HABITATS, DISTURBANCE OR CAUSING DEATH OF SOME SPECIMENS WILL BE CAUSED DURING CONSTRUCTION AND MAINTENANCE. TAKING INTO ACCOUNT THE SPATIAL LIMITATION OF THE AREA, AS WELL AS TEMPORARY NATURE OF THE ABOVEMENTIONED IMPACTS, IMPACT WHICH MAY BE CAUSED IN RESPECT TO THE ABOVEMENTIONED SPECIES WAS ESTIMATED AS ACCEPTABLE, THUS IT IS POSSIBLE TO ADDITIONALLY REDUCE THE IMPACT BY IMPLEMENTING MITIGATION MEASURES, WHICH SHALL BE DONE BY THE CONTRACTOR. IN THIS WAY, NEGATIVE IMPACTS WHICH HAVE POTENTIALLY MODERATE-HIGH SIGNIFICANCE WILL BE REDUCED TO LOW SIGNIFICANCE.

Photo log (Maps / figures)

Map showing locations of the ichthyofauna investigated

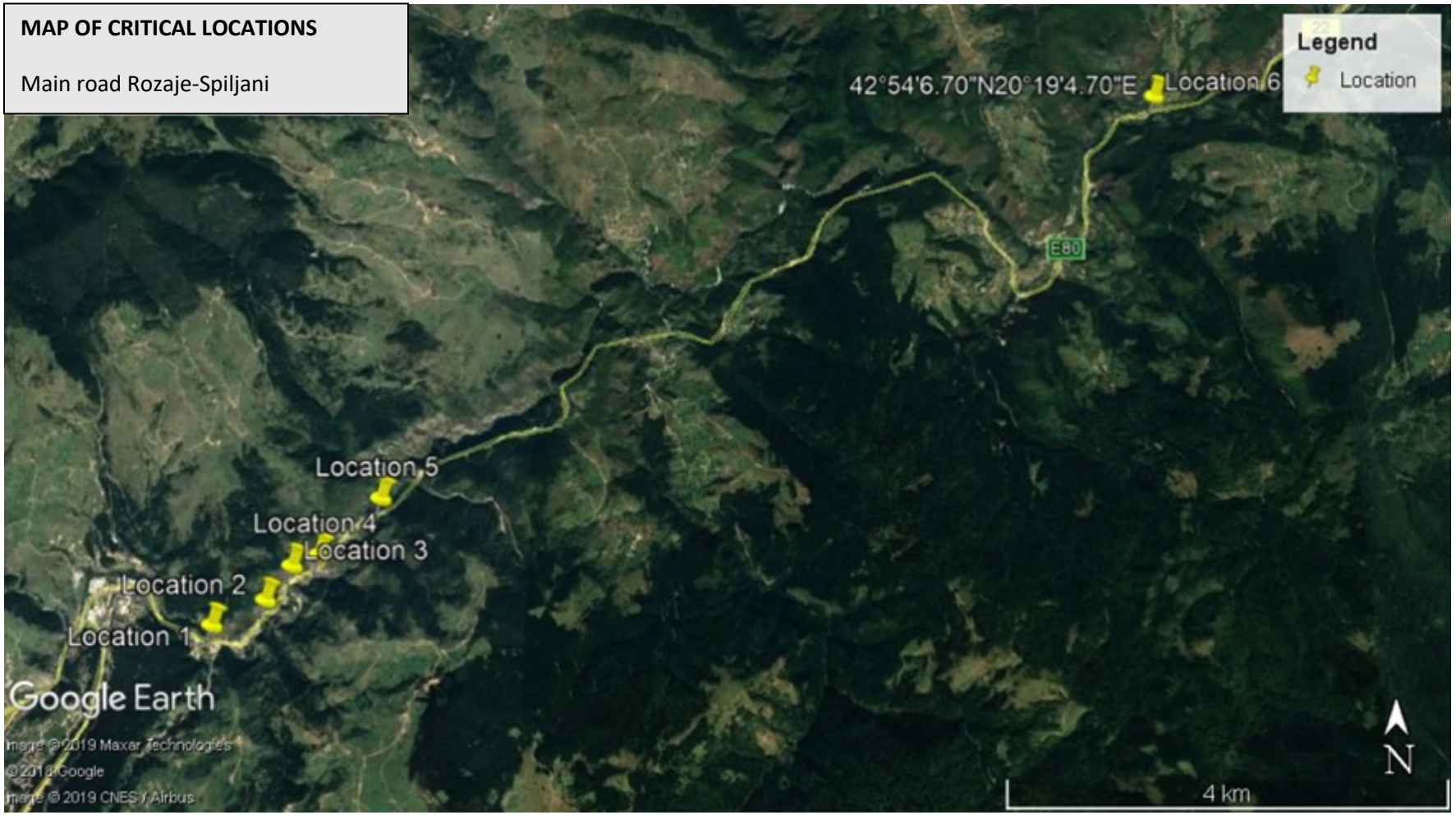


Figure 1. Ibar, the section which runs through the town

Figure 2. Ibar, the section which runs through the town

Figure 3. Location 1

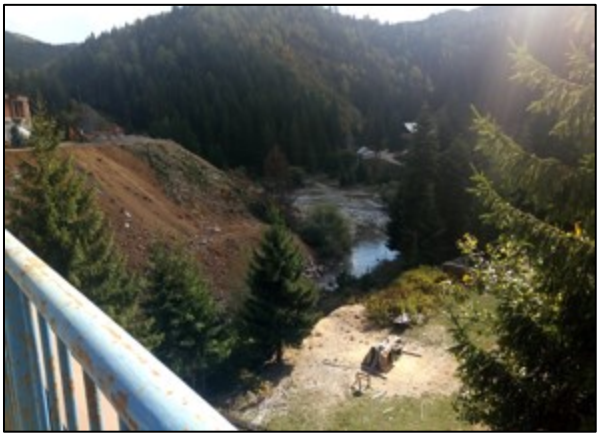


Figure 4. Location 1

Figure 5. Location 2

Figure 6. Location 2

Figure 7. Location 2

Figure 8. Location 3

Figure 9. Location 3

Figure 10. Location 4

Figure 11. Location 4

Figure 12. Location 4

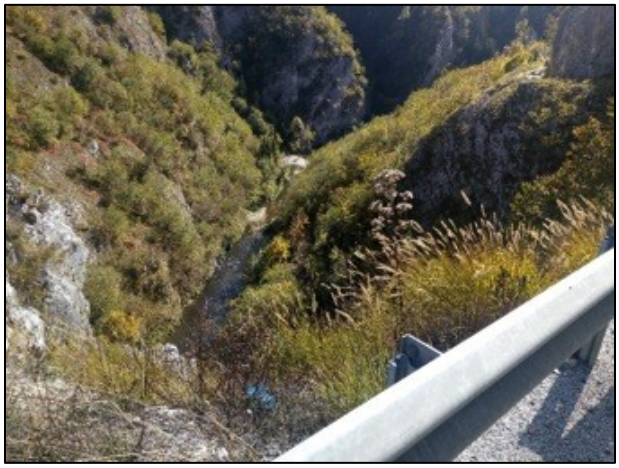


Figure 13. Location 4

Figure 14. Location 5

Figure 15. Location 5

Figure 16. Location 6

Figure 17. Location 6

Figure 18. Grayling (Thymallus thymallus) Location 6

Figure 19. Black sea salmon (Salmo labrax) Location 4

Figure 20. Huchen (Hucho hucho) Location 6

Figure 21. Danube barbel (Barbus balcanicus) Location 6

Figure 22. Chub (Squalius cephalus) Location 6

Figure 23. Common nase (Chondrostoma nasus) Location 6

Figure 24. Power generator

4. AVIFAUNA SURVEY

INTRODUCTION

As a consequence of the construction, changes in the natural environment inevitably occur, which is where important biodiversity centers of an area are sometimes located. When it comes to avifauna, infrastructure can become an artificial substitute for natural habitats in certain cases. However, a much more frequent case is that acquisition of the living space produces negative effects. The most important negative effects of road construction on wild birds are: loss and fragmentation of habitats, barrier effect and collision (crash).
Loss of habitats is the directly caused by vegetation clearing and groundworks during construction of the road corridors. In addition, construction can lead to further damage of the habitat due to soil erosion. Vegetation along the entire route is permanently removed, which can lead to decrease and disappearance of nesting birds and birds as residents, especially in the case of birds nesting on the ground and in the vegetation. Habitat fragmentation represents a significant negative effect in regard to terrestrial animals; construction of roads leads to change of the boundaries of couples or individuals, thereby reducing their potential for survival.

The barrier effect occurs in cases when artificial structures influence the movement of birds, may that be during their daytime feeding movements or during seasonal migration. This is especially prominent in case of construction on the so-called "bottlenecks" for bird migration, for example on mountain passes, river valleys and canyons, straits, etc. The barrier effect also leads to increased energy consumption and collision risk.

Collision (crash) with artificial structures is especially prominent in regard to large birds which do not have significant maneuverability during flight. Collision usually occurs at prominent relief points where the route crosses the migratory corridor or the point of flying, as well as on the sections that pass through the large bird gathering points, e.g. lakes or swamps, on viaducts, etc.

4.1. HABITAT DESCRIPTION

The area of the upper Ibar River belongs to the Alpine bio-geographical region, which is characterized by the presence of typical forest habitats. Most of the route runs through the valley of the Ibar River, which is within the impact zone of the construction of 250m. In addition to the torrential riverbed and alluvium habitat, the area of influence is characterised by coniferous forests of Silver fir and Spruce, deciduous and mixed forests of Beech, Oak and Hornbeam, and mostly anthropogenically modified mountain pastures and meadows. An overview of the woodland is shown in the figure.

According to the classification of relevant bird habitats, boreal and temperate forests, mountain pastures, agricultural and anthropogenic habitats and terrestrial wetlands have been identified in the subject area. The immediate reconstruction zone is dominated by anthropomorphic and forest habitats.

Table 1: Overview of habitats along the Rozaje - Spiljani road route

Habitats of Birds in Europe (Tucker, G.M. and Evans, M.I. 1997)	Corresponding localities on the road route:
Marine habitats	None
Coastal habitats	None
Inland wetlands	Ibar River with tributaries
Tundra, mires and moorland	None
Boreal and temperate forests	Deciduous and coniferous forests along the road
Mediterranean habitats	None
Agricultural and grassland habitats	Ibar Valley with gorges
Montane grassland	Pastures in the region of Besnik and Bac
Unclassified	Anthropomorphic habitats– settlements and cultivated areas

The reconstruction zone and the area of influence are located outside all protected areas according national and international legislation. The internationally recognized area of KBA Kopaonik is located in the wider area.

Figure 1: Overview of forest vegetation in surrounding of Rozaje and upper Ibar

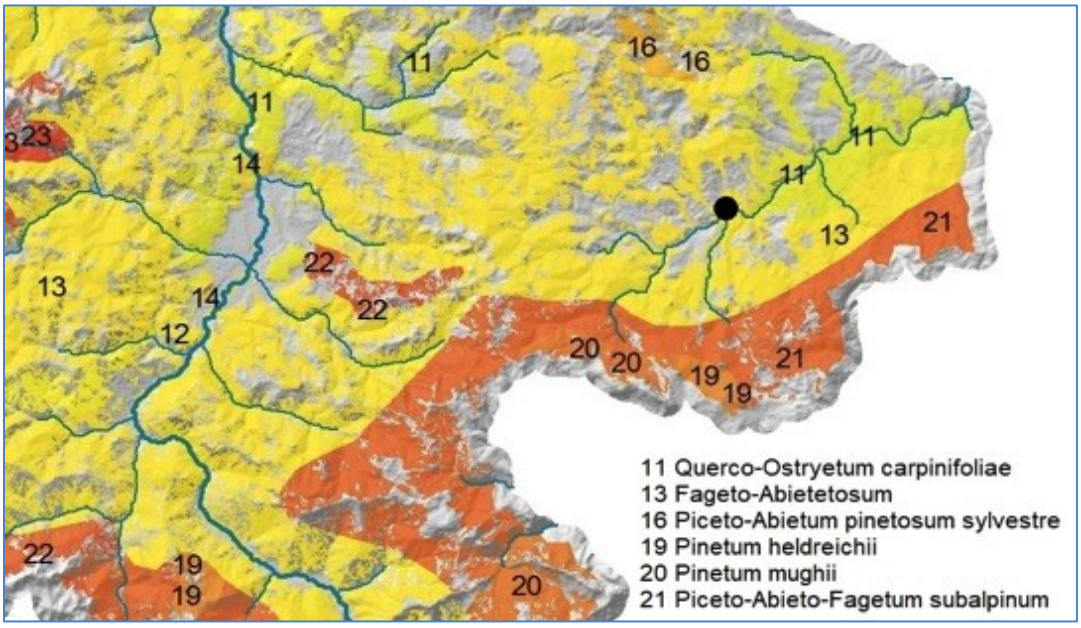
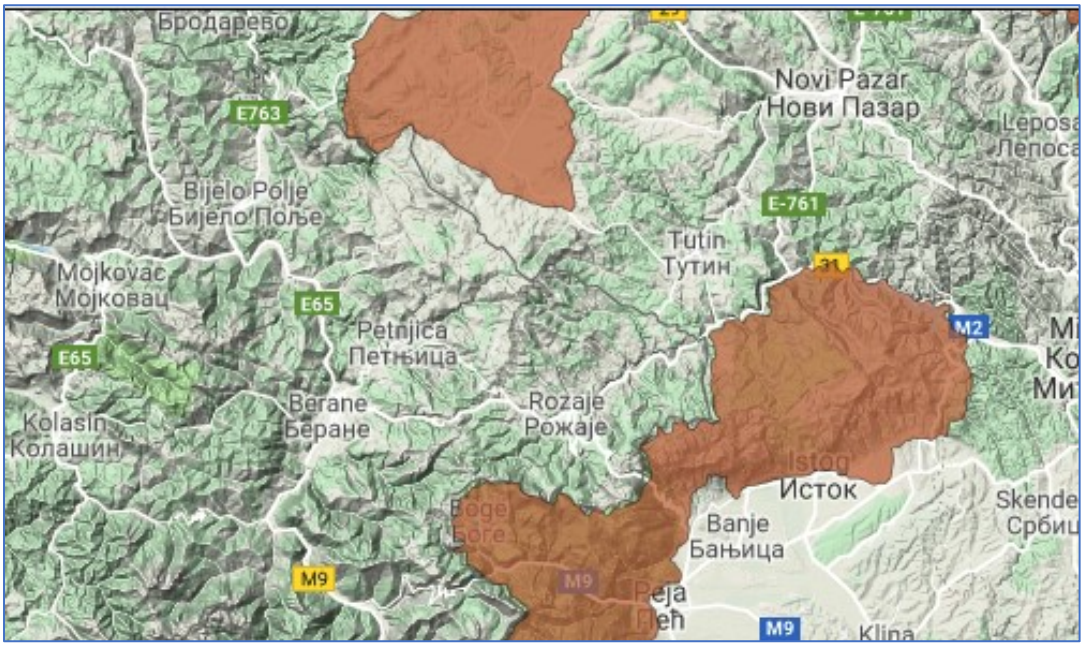


Figure 2: Overview of protected areas in the Rozaje region

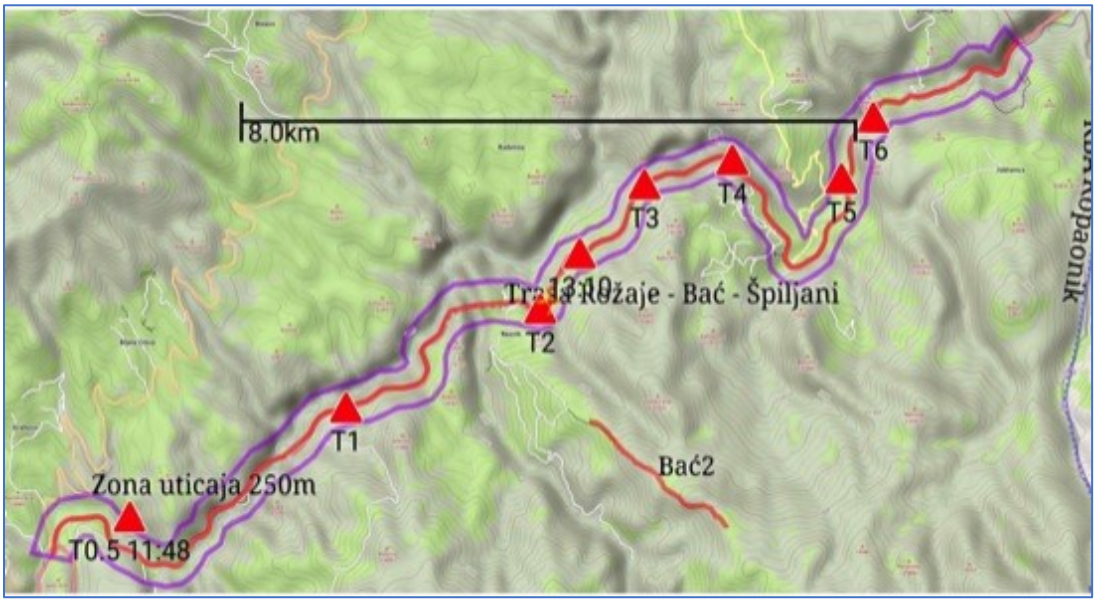


4.2. SURVEY METHODS

In order to carry out a rapid survey of the avifauna and to assess the potential negative effects of reconstruction of the Rozaje - Spiljani road, a one-day visit of this road was performed on September 25th 2019. The survey was carried out in the form of a point transect method, with the total of 7 observation points at locations pre-selected based on type of habitats and expected avifauna composition. Additional transect was performed in the wider area of Bac and Besnik, in order to determine the presence and abundance of forest species.

Optical and photographic equipment and audio identification equipment were used for identification. Inventory and point mapping were done using electronic cartography. In addition to fieldwork, the survey methods include cabinet work for literature review, data analysis, and Report development.

Figure 3: Overview of the survey points along the road Rozaje - Bac - Spiljani



4.3. SURVEY RESULTS

During fieldwork in September 2019, the total of 30 bird species were identified in the subject area, of which a total of 20 species were recorded along the route, while another 10 forest species were found in the control transect. The most numerous species belong to the polyvalent and synanthropic species: flocks of the Raven (*Corvus corax*) and the Rock Pigeon (*Columba livia*) species were identified near the landfill.

In addition, numerous species from Tit family were identified in coniferous woodlands along the route: Coal tit (*Parus ater*) and Willow tit (*Parus montanus*) and Song Thrush (*Turdus philomelos*), while the presence of a numerous of indicator species such as Woodpeckers (*Picoides tridactylus, Dryocopus martius*) and Predators (*Pernis apivorus, Aquila chrysaetos*) was identified in the wider project area. Characteristic species were also found in the riverbed: Kingfisher (*Alcedo atthis*), White-throated dipper (*Cinclus cinclus*) and Grey Wagtail (*Motacilla cinerea*). An overview of the species found, including the subject localities is given in the following table.

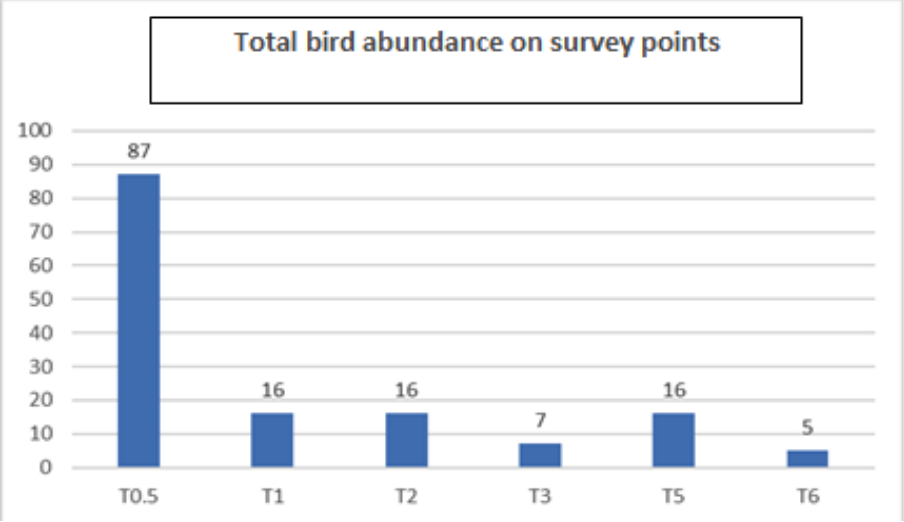
Table 2: Bird species identified on September 25th 2019 in the vicinity of the road Rozaje - Spiljani

Date	Locality	Point /Transect	Species	No
September 25th 2019	Bac - vicinity	Bac 2	Nucifraga caryocatactes	2
September 25th 2019	Bac - vicinity	Bac 2	Bonasa bonasia	1
September 25th 2019	Bac - vicinity	Bac 2	Accipiter gentilis	1
September 25th 2019	Bac - vicinity	Bac 2	Dendrocopos leucotos	1
September 25th 2019	Bac - vicinity	Bac 2	Dendrocopos leucotos	1
September 25th 2019	Bac - vicinity	Bac 2	Picoides tridactylus	1
September 25th 2019	Bac - vicinity	Bac 2	Dryocopus martius	1
September 25th 2019	Bac - vicinity	Bac 2	Ficedula albicollis	4

Date	Locality	Point /Transect	Species	No
September 25th 2019	Bac - vicinity	Bac 2	Picoides tridactylus	1
September 25th 2019	Bac - vicinity	Bac 2	Ficedula albicollis	1
September 25th 2019	Bac - vicinity	Bac 2	Picoides tridactylus	2
September 25th 2019	Bac - vicinity	Bac 2	Dendrocopos leucotos	1
September 25th 2019	Bac - vicinity	Bac 2	Buteo buteo	1
September 25th 2019	Bac - vicinity	Bac 2	Falco tinnunculus	2
September 25th 2019	Bac - vicinity	Bac 2	Serinus serinus	8
September 25th 2019	Bac - vicinity	Bac 2	Corvus corax	2
September 25th 2019	Bac - vicinity	Bac 2	Dryocopus martius	1
September 25th 2019	Bac route	T0.5	Pyrrhocorax graculus	4
September 25th 2019	Bac route	T0.5	Turdus philomelos	10
September 25th 2019	Bac route	T0.5	Corvus corax	21
September 25th 2019	Bac route	T0.5	Parus ater	3
September 25th 2019	Bac route	T0.5	Phylloscopus sibilatrix	3
September 25th 2019	Bac route	T0.5	Parus major	6
September 25th 2019	Bac route	T0.5	Columba livia	40
September 25th 2019	Bac route	T1	Columba livia	10
September 25th 2019	Bac route	T1	Garrulus glandarius	2
September 25th 2019	Bac route	T1	Corvus corax	2
September 25th 2019	Bac route	T1	Lophophanes cristaus	1
September 25th 2019	Bac route	T1	Turdus merula	1
September 25th 2019	Bac route	T2	Columba livia	10
September 25th 2019	Bac route	T2	Garrulus glandarius	1
September 25th 2019	Bac route	T2	Turdus merula	1
September 25th 2019	Bac route	T2	Parus montanus	4
September 25th 2019	Bac route	T3	Parus ater	3
September 25th 2019	Bac route	T3	Sylvia atricapilla	2
September 25th 2019	Bac route	T3	Garrulus glandarius	2
September 25th 2019	Bac route	T5	Garrulus glandarius	2
September 25th 2019	Bac route	T5	Alcedo atthis	1
September 25th 2019	Bac route	T5	Phylloscopus collybita	2
September 25th 2019	Bac route	T5	Motacila cinerea	1
September 25th 2019	Bac route	T5	Cinclus cinclus	2
September 25th 2019	Bac route	T5	Buteo buteo	3
September 25th 2019	Bac route	T5	Carduelis carduelis	5

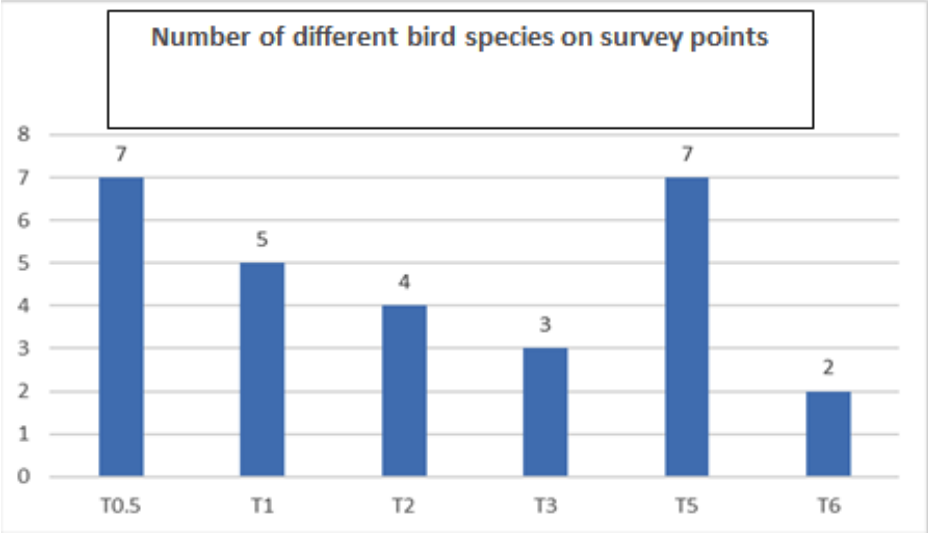
Distribution of the total number of specimens along the route is relatively even in the road section outside the settlements and the anthropogenically modified habitats. The area where most specimens were identified is in the vicinity of the dumpsite (T0.5), which attracted certain bird species. Distribution of specimens is relatively even in the section of the route which passes through uninhabited area, as may be seen even on such a small sample.

Figure 4: Overview of the number of bird specimens along the road, September 2019



When it comes to the number of different species, two maximums were recognized: at point T0.5, a larger number of species were recorded, which is a consequence of the greater diversity of anthropogenic and natural resources in that locality. A similar situation was recorded at point T5. which is located in the riverbed, where there are additional resources of wet habitats, and thus a greater number of species.

Figure 5: Overview of the number of specimens on survey points



4.4. OVERVIEW OF THREATENED SPECIES AND CRITICAL HABITATS

According to data obtained from literature data and other studies, the expected number of bird species residing in the Rozaje area throughout the year is 112. Out of this number, a total of 37 species represent indicators for potential IBA (Important Bird Area) within the Natura 2000 Network, while 21 species are listed in Annex I of the EU Birds Directive. Only one species, the Rock Partridge (Alectoris graeca), is on the list of the globally threatened species with NT Status (Near Threatened).

According to the current methodology, in order to designate an area as the area of significance for birds, the indicative species must meet the criteria in respect to the total number of specimens and species' presence in a given habitat within their life cycle. A detailed overview of all the expected species with threatened status is provided in the Annex.

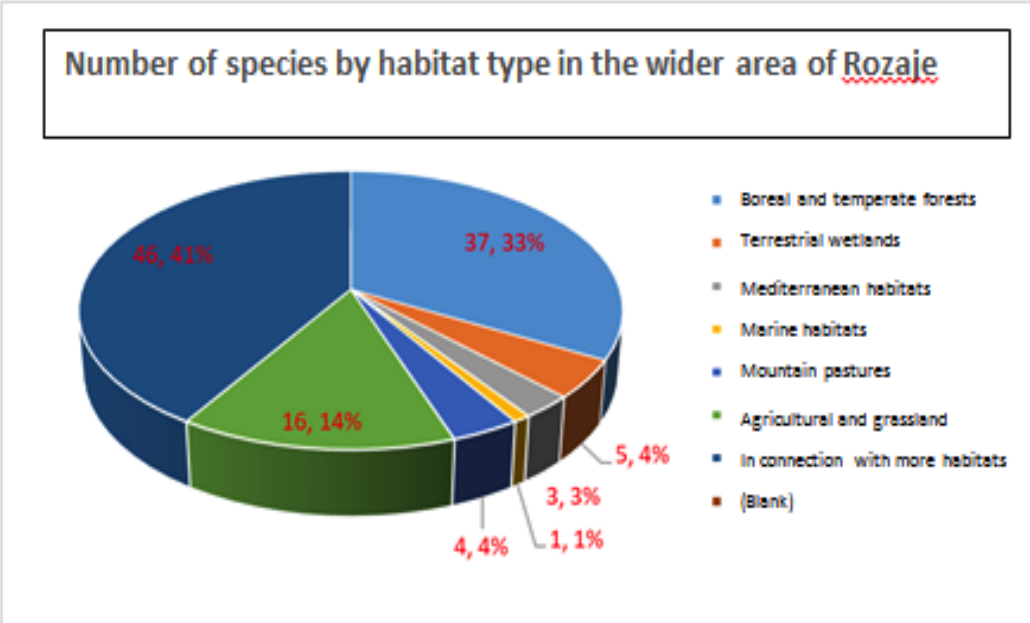
4.5. IMPACT ON AVIFAUNA

According to the description of the Project of Reconstruction of the Main Road Rozaje - Bac - Spiljani, it is planned to widen the road lanes for the total of 0.5meters, and to construct additional traffic lanes in the total length of 600 m, all the way up to border crossing Dracenovica. Based on field survey, habitat quality, composition and distribution of bird populations in the area of influence, we believe that *risk to avifauna is reduced to habitat loss*. The risks of creating a barrier effect and collision are negligible in the given area due to configuration of the terrain, i.e. the fact that the route follows the existing natural barriers and corridors, and that the reconstruction does not include construction of new corridors.

Habitat loss in the subject area mostly covers along the road which have already been modified and it does not pose a significant risk to avifauna.

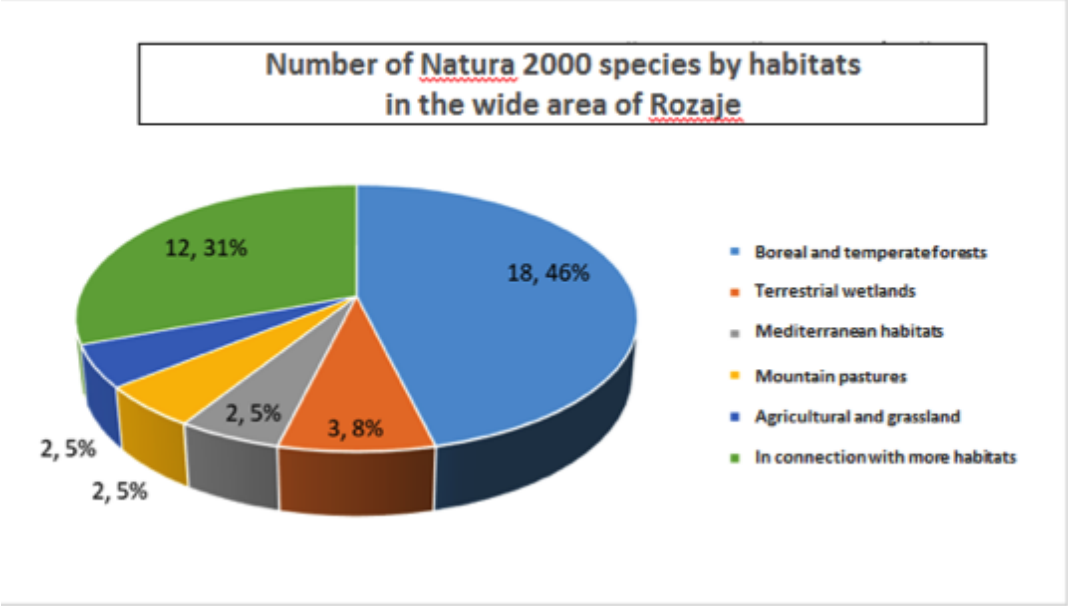
Analysis of bird species in the wider area showed that 83.74% of the total number of specimens belongs to the fauna of forests and mountain pastures, while other species belong to anthropomorphic habitats and terrestrial wetlands. The total of three species are associated with wetland habitats: Kingfisher (*Alcedo atthis*) and the White-throated dipper (*Cinclus cinclus*) ascertained at point 6, and the Western marsh harrier (*Circus aeruginosus*), which is not expected on the Ibar torrential stream because it is related to stagnant water. The only species with a global threat status is the Rocky Partridge (*Alectoris graeca*), whose habitats also are not in the area of influence.

Figure 5: Species by habitat type



When it comes to species which fall under the set criteria for protection of areas, most of those species are represented by forests and polyvalent species. The potential impact on avifauna is very limited, as expansion does not lead to loss of this type of habitat. Results of the survey confirmed that the main population of forest birds is located outside the area of influence.

Figure 6: Overview of "criteria species" by type of habitat



When it comes to wet habitats of the Ibar River, there is increased risk of blocking the riverbed with construction material, especially at points where the route runs just above the river (T6). Deposition of construction and waste material (especially materials which have cement and lime in their composition) at these points directly threatens the composition of water and riverbed, and thus it endangers the complete food chain.

4.6. MEASURES FOR MITIGATION OF IMPACT ON AVIFAUNA

Loss of habitats due to deposition of construction material in the riverbed has been identified as the highest risk for avifauna. In order to reduce the negative effects, it is proposed to form the least possible number of landfills, while the designated landfills would be established at the locations at which natural habitats have already been modified. In order to protect water and river benthos from chemical and particulate pollution, direct discharge of wastewater into the Ibar riverbed should be prevented during construction.

This Study helped determine that reconstruction of the road from Rozaje to the border crossing Dracenovica, according to the Project description, and under the condition that all the recommended protection measures are complied with, *is not going to not have significant consequences on the composition, abundance and distribution of the avifauna of this area.*

APPENDICES

List of birds in the vicinity of Rozaje with overview of threat and conservation status

Bird species in Montenegro	Name	Habitat Association	Natura2000 species	Bonn Convention	EU Directive (2009/147/EC)	Berne Convention	IUCN Status
Accipiter gentilis	Northern goshawk	Boreal and temperate forests	YES	II	I*	III	
Accipiter nisus	Eurasian sparrowhawk	In connection with more habitats		II	I*	III	
Aegithalos caudatus	Lon-tailed Tit	In connection with more habitats				III	
Aegolius funereus	Boreal owl	Boreal and temperate forests	YES		I	III	
Alauda arvensis	Skylark	Agricultural and grassland habitats			II/2	III	
Alcedo atthis	Kingfisher	Terrestrial wetlands	YES		I	III	
Alectoris graeca	Rock partridge	In connection with more habitats	YES		I*, II/1**	III	NT
Anthus spinoletta	Water pipit	Mountain pastures				III	
Apus apus	Common swift	In connection with more habitats				III	
Aquila chrysaetos	Golden eagle	In connection with more habitats	YES	I, II	I	III	
Ardea cinerea	Grey Heron	Terrestrial wetlands				III	
Asio otus	Long-eared owl	In connection with more habitats	YES			III	
Athene noctua	Little owl	Agricultural and grassland				III	
Bonasa bonasia	Hazel grouse	Boreal and temperate forests	YES		I, II/2	III	
Bubo bubo	Eagle Owl	In connection with more habitats	YES		I	III	
Buteo buteo	Common Buzzard	In connection with more habitats		II		III	
Caprimulgus europaeus	Nightjar	In connection with more habitats	YES		I	III	
Carduelis carduelis	European Goldfinch	Agricultural and grassland				III	
Chloris chloris	European greenfinch	In connection with more habitats				III	
Carduelis spinus	Eurasian Siskin	Boreal and temperate forests				III	
Certhia brachydactyla	Short-toed treecreeper	Boreal and temperate forests			I*	III	
Certhia familiaris	Eurasian treecreeper	Boreal and temperate forests				III	
Circaetus gallicus	Short-toed snake eagle	Mediterranean habitats	YES	II	I	III	
Circus aeruginosus	Western marsh harrier	Terrestrial wetlands	YES	II	I	III	
Cinclus cinclus	White-throated dipper	Terrestrial wetlands	YES			III	
Coccothraustes coccothraustes	Hawfinch	Boreal and temperate forests				III	
Columba livia	Rock Pigeon	In connection with more habitats			II/1	III	
Columba palumbus	Common wood pigeon	Agricultural and grassland			I*, II/1**, III/1	III	
Corvus corax	Raven	In connection with more habitats				III	
Corvus cornix	Hooded Crow	In connection with more habitats			II/2	III	
Corvus monedula	Eurasian jackdaw	In connection with more habitats			II/2	III	
Coturnix coturnix	Quail	Agricultural and grassland		II*	II/2	III	
Crex crex	Corn crake	Agricultural and grassland	YES	II	I	III	
Cuculus canorus	Common Cuckoo	In connection with more habitats				III	
Delichon urbicum	Common house martin	In connection with more habitats				III	
Dendrocopus leucotos	White-backed woodpecker	Boreal and temperate forests	YES		I	III	
Dendrocopus major	Great Spotted Woodpecker	In connection with more habitats	YES		I*	III	

Bird species in Montenegro	Name	Habitat Association	Natura2000 species	Bonn Convention	EU Directive (2009/147/EC)	Berne Convention	IUCN Status
Dendrocopus medius	Middle spotted woodpecker	Boreal and temperate forests	YES		I	III	
Dryobates minor	Lesser spotted woodpecker	Boreal and temperate forests	YES			III	
Dendrocopus syriacus	Syrian woodpecker	In connection with more habitats	YES		I	III	
Dryocopus martius	Black woodpecker	Boreal and temperate forests	YES		I	III	
Emberiza cia	Rock Bunting	In connection with more habitats				III	
Emberiza cirlus	Cirl Bunting	In connection with more habitats				III	
Emberiza citrinella	Yellowhammer	Agricultural and grassland				III	
Erithacus rubecula	Robin	In connection with more habitats		II		III	
Falco peregrinus	Peregrine falcon	In connection with more habitats	YES	II	I	III	
Falco subbuteo	Eurasian hobby	In connection with more habitats		II		III	
Falco tinnunculus	Eurasian kestrel	Agricultural and grassland		II		III	
Ficedula albicollis	Collared flycatcher	Boreal and temperate forests	YES	II	I	III	
Fringilla coelebs	Chaffinch	In connection with more habitats			I*	III	
Fringilla montifringilla	Brambling	Boreal and temperate forests	YES			III	
Galerida cristata	Crested Lark	Agricultural and grassland				III	
Garrulus glandarius	Eurasian Jay	Boreal and temperate forests			II/2	III	
Hirundo rupestris	Eurasian crag martin	Mediterranean habitats				III	
Hirundo rustica	Barn Swallow	Agricultural and grassland				III	
Jynx torquilla	Eurasian wryneck	Boreal and temperate forests				III	
Lanius collurio	Red-backed Shrike	Agricultural and grassland	YES		I	III	
Larus michahellis	Yellow-legged Gull	Marine habitats			II/2	III	
Larus ridibundus	Black-headed Gull	Terrestrial wetlands			II/2	III	
Loxia curvirostra	Red crossbill	Boreal and temperate forests	YES			III	
Lullula arborea	Wood Lark	Boreal and temperate forests	YES		I	III	
Luscinia megarhynchos	Common Nightingale	Boreal and temperate forests		II		III	
Monticola saxatilis	Common rock thrush	In connection with more habitats	YES	II		III	
Motacilla alba	White Wagtail	In connection with more habitats				III	
Motacilla cinerea	Grez Wagtail	Terrestrial wetlands				III	
Muscicapa striata	Spotted Flycatcher	Boreal and temperate forests		II		III	
Oenanthe oenanthe	Northern wheatear	In connection with more habitats		II		III	
Otus scops	Scops Owl	In connection with more habitats	YES			III	
Periparus ater	Coal tit	Boreal and temperate forests			I*	III	
Cyanistes caeruleus	Blue tit	Boreal and temperate forests				III	
Parus cristatus	Crested tit	In connection with more habitats				III	
Parus major	Great Tit	In connection with more habitats				III	
Parus montanus	Willow tit	Boreal and temperate forests				III	
Parus palustris	Marsh tit	Boreal and temperate forests				III	
Passer domesticus	House Sparrow	In connection with more habitats				III	
Passer montanus	Tree Sparrow	Agricultural and grassland				III	
Perdix perdix	Grey partridge	Agricultural and grassland			I*, II/1**,	III	
Pernis apivorus	European honey buzzard	Boreal and temperate forests	YES	II	I	III	
Phoenicurus ochruros	Black redstart	In connection with more habitats		II		III	
Phoenicurus phoenicurus	Common redstart	Boreal and temperate forests		II		III	
Phylloscopus bonelli	Western Bonelli's warbler	In connection with more habitats		II		III	

Bird species in Montenegro	Name	Habitat Association	Natura2000 species	Bonn Convention	EU Directive (2009/147/EC)	Berne Convention	IUCN Status
Phylloscopus collybita	Common Chiffchaff	Boreal and temperate forests		II		III	
Phylloscopus sibilatrix	Wood warbler	Boreal and temperate forests		II		III	
Pica pica	Magpie	In connection with more habitats			II/2	III	
Picoides tridactylus	Eurasian three-toed woodpecker	Boreal and temperate forests	YES		I	III	
Picus canus	Grey-faced woodpecker	Boreal and temperate forests	YES		I	III	
Picus viridis	European green woodpecker	Boreal and temperate forests				III	
Prunella collaris	Alpine accentor	Mountain pastures				III	
Prunella modularis	Dunnock	Boreal and temperate forests	YES			III	
Pyrrhocorax graculus	Yellow-billed chough	Mountain pastures	YES			III	
Pyrrhula pyrrhula	Eurasian bullfinch	Boreal and temperate forests				III	
Regulus ignicapillus	Common firecrest	In connection with more habitats		II		III	
Regulus regulus	Goldcrest	Boreal and temperate forests		II		III	
Saxicola rubetra	Whinchat	Agricultural and grassland		II		III	
Saxicola torquata	African stonechat	In connection with more habitats		II		III	
Serinus serinus	European serin	In connection with more habitats				III	
Sitta europaea	Common Nuthatch	Boreal and temperate forests				III	
Streptopeia decaocto	Collared Dove	In connection with more habitats	YES		II/2	III	
Strix aluco	Tawny Owl	Boreal and temperate forests	YES			III	
Strix uralensis	Ural owl	Boreal and temperate forests	YES		I	III	
Sturnus vulgaris	Starling	Agricultural and grassland			II/2	III	
Sylvia atricapilla	Blackcap	In connection with more habitats		II		III	
Sylvia curruca	Lesser Whitethroat	In connection with more habitats		II		III	
Sylvia melanocephala	Sardinian Warbler	Mediterranean habitats	YES	II		III	
Tachymarptis melba	Alpine Swift	In connection with more habitats				III	
Tetrao urogallus	Eurasian capercaillie	Boreal and temperate forests	YES		I, II/2, III/2	II*,III**	
Tichodroma muraria	Wallcreeper	Mountain pastures	YES			III	
Troglodytes troglodytes	Wren	In connection with more habitats			I*	III	
Turdus merula	Common Blackbird	In connection with more habitats		II	II/2	III	
Turdus philomelos	Song Thrush	In connection with more habitats		II	II/2	III	
Turdus pilaris	Fieldfare	Agricultural and grassland		II	II/2	III	
Turdus viscivorus	Mistle thrush	In connection with more habitats		II	II/2	III	
Upupa epops	Eurasian hoopoe	In connection with more habitats	YES			III	

5. MAMMALS SURVEY

INTRODUCTION

The reconstruction of the main road M-2, section Rozaje-Spiljani, is planned in the length of 20 km, as part of the project of reconstruction of the main roads in Montenegro. The route will be widened from the current 6.0 m to a total of 6.5 m. An additional traffic lane of 600m in total will be constructed at the Dracenovac border crossing (two lanes of 300m in each direction). Within the project, reconstruction of 12 tunnels (total length of 1,678m), three bridges (total length of 244m) will be performed, as well as the renovation of eight bridges (total length of 778m). The projected road speed will be 60 km/h (same as the current speed limit) and will be allowed access to the same vehicles types as on the current road.

According to requirements of the Terms of Reference, the impact assessment of the reconstruction of the Rozaje-Spiljani road on the mammal fauna was made, containing:

- data on the presence of mammals in the subject area (literature data, presumed and confirmed (field survey));
- data on potential negative impacts during the reconstruction and after the completion of works, i.e. after putting of the reconstructed road in function, relative to mammals;
- estimation of level of the negative impact during reconstruction and during operational phase (after construction);
- proposals of measures and activities for mitigation or compensation, in order to minimize the negative impacts.

5.1. DESCRIPTION OF THE SURVEYED AREA

The project section of the road Rozaje - Spiljani is located in the area of the Ibar valley, i.e. the road is parallel to the river Ibar from Rozaje to Spiljani. Upstream of Rozaje, the Ibar river flows through a 7 km long, narrow and inaccessible canyon, until the widening near the Bac village, caused by erosion. In this section, the main tributary of the Ibar river are: "Zupanica, the Limnicka river, Ibarac, the Grahovska river, the Bukovacka river, the Balticka river and the Backa river".

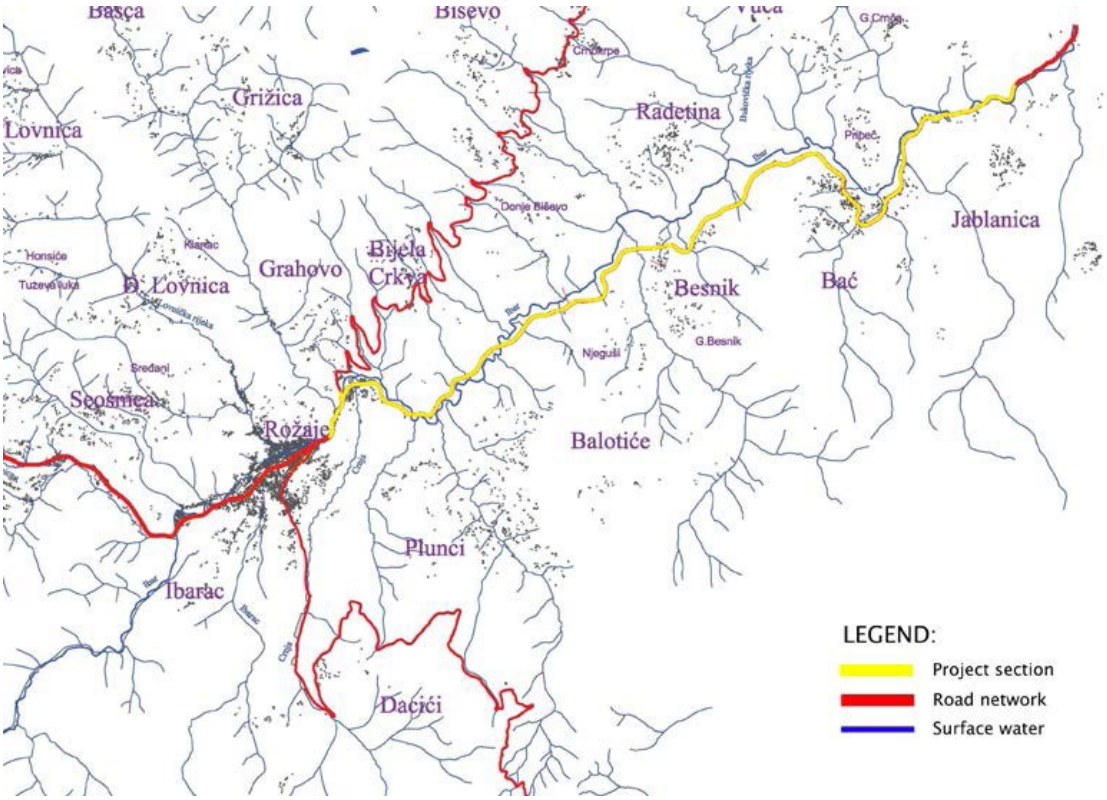
The upper part of the Ibar area is mostly covered by mixed forest, which is vertically zoned, from 800 m.a.s.l. to 2400 m asl. Different climates dominate in this wide zone, and the terrain structure varies from flattened hills and low mountains, to high mountains. This diversity of habitat provides livelihoods for many species of small and large mammals.

According to the habitat type, the subject location can be divided into three areas: Mountain - river valley with pastures and meadows and mixed forests (beech-spruce) under strong anthropogenic influence; canyon of the Ibar river overgrown with alder and ash forests on the banks, and in the higher parts with the forest beech, oak, hornbeam, silver fir and spruce, which is polluted by wastewater and waste (wild landfills and the "Mostina" landfill) and the last section of the road, from the erosive widening near the Bac village, which is covered by meadows, pastures and mixed forests.

The whole area is under anthropogenic influence and the same was devastated (by pollution of the Ibar river, wild landfills in the riverbed of the Ibar river and its tributaries, pronounced cutting of the forest in more distant areas in relation to the road).

In terms of mammal habitat, the area can be assessed as a good and favorable, especially the more distant areas from the road section, which are less devastated. Expressed devastation on the subject area has already resulted in a significant degradation of the quality areas in terms of mammal's habitat.

Figure 1. Project area



5.2. PREPARATIONS FOR THE SURVEY

During the preparatory phase, the available literature on species of mammals registered in the subject area as well as the surrounding environment was considered. Consultations have been conducted with hunting association "Hajla" that manage hunting ground on area of Besnik and Bac that gravitate along the main road, regarding the significance and value of this area as mammal habitats.
Legislation, guidelines, recommendations, both at national and international level, have been considered, relating to methodology, protection and mitigation measures. (see Literature).

5.2.1. The limitations during survey

There is no literature data on mammalian species in the subject area. Data on mammals that may be somewhat related to this section are also scarce, old and mostly for locations in the wider area (Hajla, Bjeluhe, Chakor).

Given that the survey of mammals in this area has not been carried out in the previous period, it was difficult to reach definitive conclusions regarding the status of species (population trend, movement corridors, residence, migration, etc.) and thus the potential negative impacts of road reconstruction on mammals.

5.3. METHODOLOGY

The prescribed methodology for each mammalian group was used to determine the presence of particular mammal species in the subject area.
The field surveys were carried out over a 5-day period (during October-17th, 18th, 19th, 26th and 27th). During that period, it has been carried out looking for mammal's activity signs in the subject area: traces, feces, feeding sites (overturned stones, broken fruit trees), places of den, shelters, holes, dead individuals.

For medium and large mammals, photo-traps (4 pcs.) were placed on locations where is the most frequency of these species (based on data from hunting association "Hajla" and locals) and expert estimates. Photo traps were at locations 3 or 2 days, continuously.

To determine the presence of small mammals, traps were used (live traps - Longwort and Sherman (20 pcs.), snap traps (20 pcs.) and 5 cage traps for dormice, squirrels, etc. The traps were set up at 5 locations before dusk and checked in the morning. Three or two days/nights were left at the locations, continuously.

The bats survey was performed with the help of an ultrasonic detector (Petterson D240x), H2 ZOOM recorder, and by looking for potential shelters in the area along the road and the surrounding, as well as by assessing the significance and value of the area in relation to bats. Bats' voices recorded were analyzed using a Petterson-BatSound softwer.

The bats survey began 1 hour before sunset. A temperature, humidity, wind speed, etc. were recorded for each transect/location. The bats survey was performed during all 5 field days, in period from 5 PM to 11.30 PM.

In addition to field survey, a literature data, observations and suggestions of representatives of the hunting association "Hajla", local population surveys, as well as conclusions based on the ecological characteristics of the area were used.

5.4. SURVEY RESULTS

5.4.1. Overview of literature and other data

It has not been carried out any systematic surveys of any mammal species in subject area or in the entire area of Municipality Rozaje. There is almost no literature data on mammal species present in the subject area (near and wide area). The existing literature is old, sporadic and mainly related to the wider area of the Municipality Rozaje.

According to some authors (Kalac, 2008) in the forests of this region, there are shelters and habitat for following species: weasel, polecat, marten, wild cat, fox, otter (near the forest streams and rivers) and wolf. When it comes to herbivores, there are present as follows: squirrel, rabbit, badger, chamois, wild boar and brown bear. In support of this claim, he cites the names - toponyms of certain parts of the Rozaje region, such as: „Jelenjak“, „Jelenčica“, „Mečkov do“, „Svinjske bare“, „Svinjski brod“, „Vukoser“, „Zekova Glava“, „Puhovača“, etc.

The Report presents all available data on mammal species in the wider area of Municipality Rozaje. In addition, data collected from media (personal documentation) regarding mammals that have been registered in the subject area and surrounding are presented.

Data obtained from the hunting association "Hajla" about the numerous states of wildlife in the territory of hunting ground of area Besnik and Bac which gravitates along the road also has been included.

According to the literature data, on the area of Municipality Rozaje following species have been recorded:

1. *Apodemus flavicolis* (Čakor; Bjeluha)
2. *Mus musculus* (Hajla)
3. *Clethrionomys glareolus*, (DN23 Rožaje: Ibar Spring, 1500 m - DN24 Rozaje: Đuranovića Luke, the Zupanica river, Marin Grob, 1150 m - DN33/34 Rozaje: Mt. Hajla, Dacica Skola, 1500 m.)
4. *Dinaromys bogdanovi* (Hajla 1900-2000 (DN23a), 1962.-(Mirić & Đulić) , Žljeb planina, Kula, 1800 m, 13.7.1978 (PMS) leg. B. Kryštufek & S. Brelih)
5. *Spalax leucodon* (Hajla, Boge 1600 (CN23), 1939.-(ZIN-Le (M.c))
6. *Glys glys* (Hajla)
7. *Mustela nivalis (*Podbijelje; Hajla)
8. *Vulpes vulpes* (Hajla)
9. *Ursus arctos* (Hajla 42.7879359N 20.1373972 E (B.Rubinič, 28.09.2017)
10. *Canis lupus (*Hajla)
11. *Lutra lutra* (the Ibarac stream)

Based on data from hunting association "Hajla" (manage hunting ground on area of Besnik and Bac that gravitate along the main road), the numerous conditions of wildlife in 2019 was as follow:

Wildlife species	Numerous condition (pcs.)
Bear (*Ursus arctos*)	5
Wolf (*Canis lupus*)	5
Fox (Vulpes *vulpes*)	30
Roe deer (*Capreolus capreolus*)	100
Wild boar (*Sus scrofa)*	30

On the basis of data collected from the media, the presence, i.e. appearance and hurting of bears and roe deer have been recorded, especially in the part of the road around the village of Bac.

Figure 2. „Snapshot of **two bears** on the way to the village of **Bac** in Rozaje."- 01. 12. 2018 (Source: https://www.youtube.com/watch?reload=9&v=J8X2OmckLyk)

Figure 3. „**A brown bear** on the road in Rozaje"- 02/03/2017 (Source: Rožaje today) https://www.facebook.com/p.vremeplov/videos/92)2085304606144/)

Figure 4. „Residents of the village of **Bisevo** in Rozaje claim **the bear** visiting the village for ten days. 23.05. 2017. (SOURCE: www.vijesti.me)

Figure 5. „**Roe deer** injured on a main road in the **village Bac**, near the school"- 04. 02. 2019. (Source:www.vijesti.me)

5.4.2. Survey results

The survey has been carried out in a total of 24 locations along the project section. Traps and photo traps was placed in a total of 5 locations. Ultrasonic detection was performed at 24 locations (combination of transect and observation point). Looking for signs of mammal presence has been conducted at all locations. At the same time, it was talked with the locals about the presence of mammals and suggestions regarding recommendations for sign placement, i.e. the places where the mammals crossing from one side to the other is most commonly observed.

Map 1. Overview of survey locations

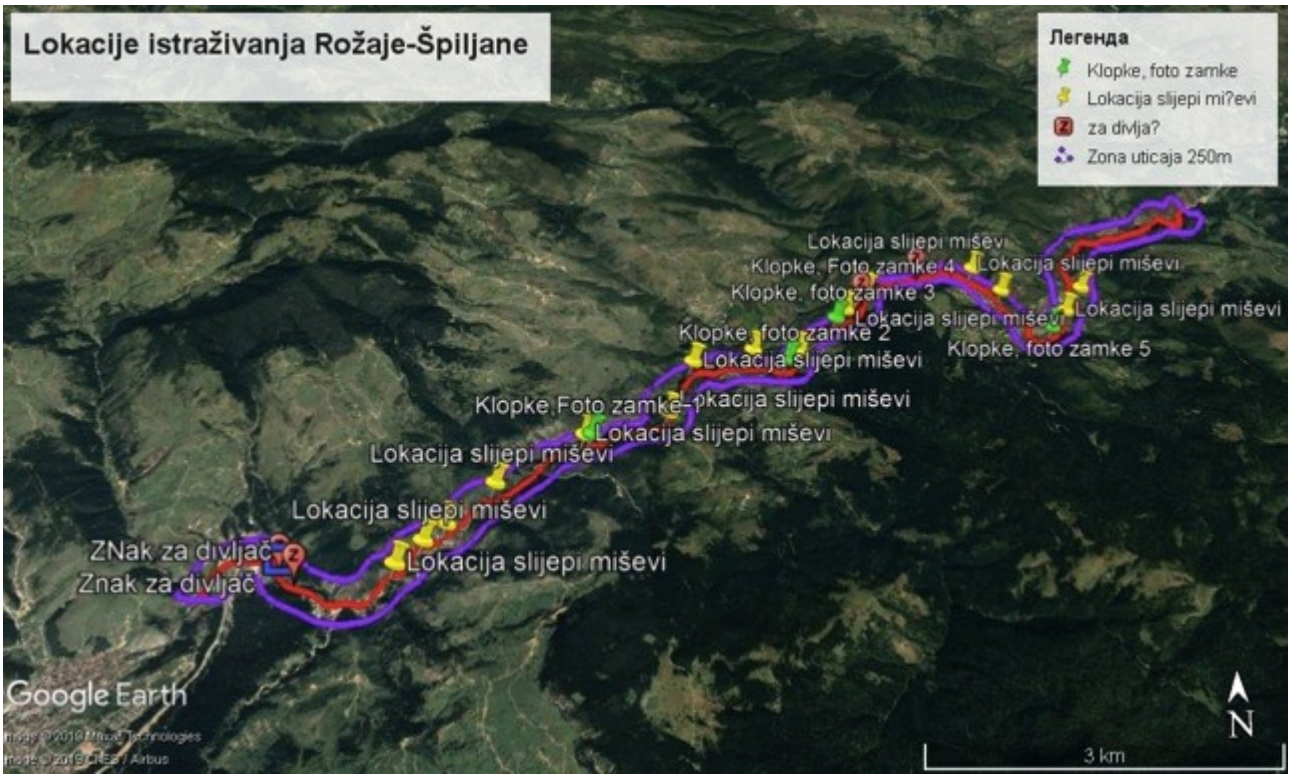


Table 1. Overview of survey locations (Map 1)

No. of location	Mark on map (from the direction of Rozaje)	Coordinates	Date (time and weather conditions – for bats)	Date (time and weather conditions – for bats)
1.	Sign for wildlife-Sign for wildlife	From 42.51 16 34 N 20. 11 27 08 E to 42. 51 11 61 N 20. 11 33 20	**17.10.2019.** 5 PM- 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM- 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
2.	Location bats	From 42. 51 11 92 N 20. 12 17 77 E	**17.10.2019.** 5 PM- 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM- 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
3.	Location bats	42. 51 21 23 N 20 12 29 19 E	**17.10.2019.** 5 PM- 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM- 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
4.	Location bats	42. 51 27 83 N 20. 12 39 10 E	**17.10.2019.** 5 PM- 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM- 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
5.	Location bats	42 51 45 50 N 20. 13 0 69 N the big bridge	**17.10.2019.** 5 PM- 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM- 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
6.	Location bats	42 52 5 16 N 20. 13 44 12 E	**17.10.2019.** 5 PM - 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity
7.	Traps, photo traps 1	42. 52 5 01 N 20 13 47 95 E	**17.10.2019.** 5 PM - 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	**25.10.2019.** 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
8.	Location bats	Underground passage 42. 52 15 18 N 20 14 27 03 E,	**17.10.2019.** 5 PM - 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature	**25.10.2019.** 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C

No. of location	Mark on map (from the direction of Rozaje)	Coordinates	Date (time and weather conditions – for bats)	Date (time and weather conditions – for bats)
			dropped to 16 C, and 83 % humidity, clear	,72% humidity, clear
9.	Location bats	42. 52 44 08 N 20. 14 42 37 E	17.10.2019. 5 PM - 24 C, weak wind, 50 % humidity, partly cloudy; until 11.30 PM, the temperature dropped to 16 C, and 83 % humidity, clear	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
10.	Location bats	42.52 49 49 N 20. 15 15 60 E Besnik	17.10.2019. 5 PM - 24 C, weak wind, 50 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
11.	Traps, photo traps 2	42. 52 42 88 N 20 15 33 01 E	18.10.2019. 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
12.	Location bats	42. 52 48 38 N 20 15 40 83 E	18.10.2019. 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
13.	Traps, photo traps 3	42. 53 5 71 N 20 16 4 15 E	18.10.2019. 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear
14	Location bats	42. 53 11 45 N 20. 16 11 04 E	18.10.2019. 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear.	25.10.2019. 5 PM - 24 C, no wind, 36%, clear; at 11.30 PM, 14 C ,72% humidity, clear.
15.	Sign for wildlife	42. 53 1215 N 20 16 17 62 E	18.10.2019. 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83	26.10.2019. 5 PM -25 C, weak wind, 36%

No. of location	Mark on map (from the direction of Rozaje)	Coordinates	Date (time and weather conditions – for bats)	Date (time and weather conditions – for bats)
			% humidity, clear.	humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
16.	Traps, photo traps 4	42. 53 21 45 N 20. 16 24 79 E	**18.10.2019.** 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear.	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
17.	Location bats	42. 53 27 87 N 20. 16 25 51 E	**18.10.2019.** 5 PM - 23 C, weak wind, 57 % humidity, partly cloudy; at 11.30 PM, 16 C, and 83 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
18.	Sign for wildlife	42. 53 27 14 N 20. 16 27 37 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
19.	Location bats	42 53 38 00 N 20 17 1 42 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
20.	Location bats	42 53 36 40 N 20 17 31 64 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
21.	Location bats	42 53 22 53 N 20 17 43 89 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30	**26.10.2019.** 5 PM -25 C, weak

No. of location	Mark on map (from the direction of Rozaje)	Coordinates	Date (time and weather conditions – for bats)	Date (time and weather conditions – for bats)
			PM, 14 C, 72 % humidity, clear	wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
22.	Traps, photo traps 5	42 53 1 01 N 20 18 5 34 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
23.	Location bats	42 53 11 73 N 20 18 18 08 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM - 13 C, 72% humidity, clear.
24.	Location bats	42 53 25 89 N 20 18 33 03 E	**19.10. 2019.** 5 PM, 24 C, no wind, 36%, clear; at 11.30 PM, 14 C, 72 % humidity, clear	**26.10.2019.** 5 PM -25 C, weak wind, 36% humidity, clear; at 11.30 PM- 13 C, 72% humidity, clear.

After preformed fieldwork, the presence of 10 mammal species were recorded at the subject area and surrounding.

Table 2. List of identified species in the subject area based on field survey

Locality	Latin name of the species	English name of the species	Endemism	Conservation status (IUCN)	Status on Habitat Directive
Along entire road section, especially in locations 6, 7	*Erinaceus roumanicus*	Hedgehog	no	-	-
Location 5, 14, 15, 16, 17	*Apodemus sylvaticus*	Long-tailed Field mouse	no	LC	-

Location 7	*Glys glys*	Edible dormouse	no	LC	-
Location 5,6,7,14,15,16,17	*Vulpes vulpes*	Red Fox	no	LC	-
Location 14,16,17	*Ursus arctos*	Brown bear	no	VU	Annex II and IV
Location 8, 10, 11, 13, 16 and 17	*Martes foina*	Beech, Stone marten	no	LC	-
Location 14, 15, 16, 17	*Capreolus capreolus*	European Roe Deer	no	LC	-
Location 6, 10, 11, 21, 23	*Pipistrellus pipistrellus*	Common Pipistrelle	no	NT	Annex IV
Location 10, 11	*Hypsugo savii*	Savi's Pipistrelle	no	-	Annex IV

5.4.3. Analysis of survey results

Location 1 (according Table 1):

Figure 6. Wildlife warning sign from the direction of Rozaje

Figure 7 Wildlife warning sign from the direction of Spiljani

The location has been assessed as suitable habitat (beech-spruce forests) for mammals, especially for large mammals (bear, roe deer), although it is under anthropogenic influence. No traces of the presence of mammals were found on the investigated area, and traps and photo traps were not installed because the terrain was inaccessible (private property fences) and the canyon on the other side. The presence of bats was not detected by the ultrasonic detector.

According to representatives of the hunting association, this is a location that mammals use for passing from one side of the road to the other. Local population survey: bear, wolf occasionally, roe deer, fox, rabbit. At this location, there is already a traffic sign - Wildlife warning sign.

Conclusion: Locations are assessed as important in terms of mammals. The planned reconstruction of the road will have a negligible to medium impact on this section, i.e. if apply measures the situation will be better than the current one. (see Chapter Measures).

Locations 2 and 3

Figure 8. Location bats

A transect walk to the coordinate 42 51 21 23 N 20. 12 29 19 E (through the tunnel) was carried out, using the 240 X Pattersson ultrasonic detector. The presence of bats was not detected on the section. Also, their shelters were not found (tunnel, below the viaduct).

No traces of other mammals were found.

Conclusion: The location has been assessed as irrelevant in terms of the bat's presence. Reconstruction of this road section will have a negligible impact on bats and mammal's fauna in general.

Location 4

Figure 9. Location bats

The voices of bats were not detected at the location. The presence of bats in a potential shelter (tunnel) was not detected on the section. No traces of other mammals were found.

Conclusion: The location has been assessed as irrelevant in terms of the bat's presence. Reconstruction of this road section will have a negligible impact on bats and mammal's fauna in general.

Location 5

Figure 10 Location of bats 5

The presence of bats was not detected by the ultrasonic detector. Traces of fox was found (faeces).

Conclusion: The location has been assessed as irrelevant in terms of the bat's presence. Reconstruction of this road section will have a negligible impact on bats and mammal's fauna in general.

Locations 6 i 7

Figure 11. Locations 6 and 7

Figure 12. Setting traps

In the spruce - beech forest, at site 42 52 5 01 20 13 47 95, traps for small mammals and a photo traps were installed. An ultrasonic detector was used to detect bats. A looking for traces of mammal's presence was carried out, as well as a looking for their shelters.

At this location, a trace of mammal's presence was detected (traces of foxes, holes from field mice).

Glys glys dormouse was caught in one trap. There were no mammals recording on the photo traps.

The presence of ***Pipistrellus pipistrellus*** was detected in the transect by an ultrasonic detector. About 2 hours were spent on the site and a total of 3 contacts of this type were registered during that time.

Figure 13. Glys glys- dormouse

Conclusion: The location has been assessed as interesting and moderately significant as mammal's habitat. Reconstruction of this road section will have a negligible impact on mammals' fauna.

Location 8

Figure 14. Location 8

At this location, a trace of mammal's presence was detected: fox, marten, Long-tailed field mouse (faeces, holes...). Sometimes, the local population notice a fox. At this location, the presence of bats was not detected by the ultrasonic detector.

Conclusion: The location has been assessed as suitable habitat for mammals.

Reconstruction of this road section will have a negligible impact on mammal fauna.

Figure 15. Traces of mammal presence

Location 9

Figure 16. Location 9

The voices of bats were not recorded. Their habitats also have not been found.

No traces of other mammals were found.

Conclusion: Reconstruction of this road section will have a negligible impact on mammals' fauna.

Locations 10 i 11

Figure 17. Location 10 Besnik

The presence of ***Pipistrellus pipistrellus and Hypsugo savii*** species has been recorded. At the location, the observation point (transect) lasted about 2 hours and during that time 3 contacts of pipistrellus pipistrellus species and 2 contacts of Hypsugo savii species were registered. The flight corridor of these species is not recorded near the road, but along the macadam and meadows with hedges closer to the village, i.e. about 2 km away from the location.

Local population survey: present species: bear, fox, rabbit, hedgehog, marten. A fox and a hedgehog were road killed a month ago (in September).

Traps and photo traps were placed at location 11, in the meadow and in the forest. There were no mammal catches/recording in them.

Conclusion: The location is a suitable habitat for mammals but urbanized. Reconstruction of this road section will have a negligible to moderate impact on mammal's fauna.

Location 12

Figure 18. Location bats

The voices of bats were not recorded. Their habitats also have not been found. No traces of other mammals were found.

Conclusion: Reconstruction of this road section will have a negligible impact on mammals' fauna.

Location 13

Figure 19. Location 13

Traps and photo trap were placed on the location. In the photo trap, it has been recorded two individuals of the species Susscrofa - wild boar.

There was no catch in the traps. Traces of the mammal's presence were found: feces of fox, feces of marten, holes from Long-tailed field mice. The presence of bats was not detected by the ultrasonic detector.

Figure 20. Sus scrofa- wild boar

Conclusion: The location is a suitable habitat for mammals. This area is under anthropogenic influence (cutting of tree). Reconstruction of this road section will have a negligible impact on mammals' fauna.

Location 14

Figure 21. Location 14

The presence of bats was not detected by the ultrasonic detector. In the forest, it was found traces of bear presence (peeled bark of tree), as well as holes from mice.

Local population survey: bear, fox and sometimes roe deer are present.

Conclusion: The location has been assessed as a suitable habitat for mammals (far away from the road). This area is under anthropogenic influence, especially parts along the road. Reconstruction of this road section will have a negligible impact on mammals' fauna.

Location 15

Figure 22. Location 15

According to a local population survey, as well as a hunting association data, from this section all the way to Location 18, begins the main corridor of mammal movement, i.e. corridor for passing the road from one side to the other (from the direction of Rozaje) for bears, roe deer, foxes and wild boar.

Traces of mammals were found at the location: fox feces, holes from Long-tailed field mouse. The presence of bats was not detected by the ultrasonic detector.

Conclusion: The location is a suitable and important habitat for mammals. With the application of appropriate measures, the existing condition can be improved during the reconstruction in terms of reducing the collision of mammals with vehicles.

Locations 16 and 17

Figure 23. The main passageway for mammals Location 16

This section of road is the main corridor for passing the road from one side to the other for bear, roe deer, fox and wild boar.

Collisions of mammals with vehicles were recorded in this area (roe deer, young bear, fox and marten road killed).

Traces of the presence of bears, foxes, holes from Long-tailed field mouse were found at the location. An individual of species *Apodemus sylvaticus* was caught in trap. The presence of bats was not detected by the ultrasonic detector

Conclusion: The location is assessed as an important habitat/movement corridor for mammals. With the application of appropriate measures, the existing condition can be improved during the reconstruction in terms of reducing the collision of mammals with vehicles.

Figure 24. Traces of foxes and bears

Figure 25. Holes from Long-tailed field mice and caught Long-tailed field mice (Apodemus sylvaticus)

Location 18

Figure 26. Wildlife warning sign

At this part of the road begins the main passage/ movement corridor of mammals (from the direction of Spiljani).

No traces of mammals were found. The presence of bats was not detected by the ultrasonic detector.

Conclusion: The location is assessed as a suitable and important habitat for mammals. With the application of appropriate measures, the existing condition can be improved during the reconstruction in terms of reducing the collision of mammals with vehicles.

Location 19

Figure 27. Location 19

The voices of bats were not detected. Also, their shelters were not found. No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

Location 20

Figure 28. Location 20

The voices of bats were not detected. Also, their shelters were not found. No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

Location 21

Figure 29. Location 21, Bac

Voices of species *Pipistrellus pipistrellus* were recorded at location. A total of 4 contacts were recorded during the transect. Bat shelters were not found.

No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

Location 22

Figure 30. Location 22

The voices of bats were not recorded. Also, their shelters were not found. No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

Location 23

Figure 31. Location 23, Kajevici

Voices of species *Pipistrellus pipistrellus* were recorded at location. A total of 2 contacts were recorded during the transect. Bat shelters were not found. No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

Location 24

Figure 32. Location 24, Jablanica

The voices of bats were not recorded. Also, their shelters were not found. No traces of other mammals were found.

Conclusion: Reconstruction of this section of road will have a negligible impact on mammal fauna.

5.5. NEGATIVE IMPACTS AND SUGGESTED PROTECTION MEASURES

Potential negative impacts that can occur during the reconstruction phase and operational phase of the road are:

- partial or complete loss of habitat;
- fragmentation of habitat (interruption of habitat);
- pollution and disturbing;
- mortality due collision with vehicles.

Habitat loss and fragmentation

Mammals need a relatively large area of habitat. Their movement corridors can be up to 50 km (bear, wolf). The road infrastructure (especially highways) often lead to fragmentation of their habitats into more or less isolated parts.

In order to mitigate these negative impacts, during designing a transport infrastructure it is especially necessary to pay attention to ensuring passage and crossing through the roads for individuals, in order to ensure the habitat continuity.

Pollution and disturbing

During construction, as well as the operational phase of the roads, increased noise level, vibration, increased concentration of pollution in the form of exhaust gases, waste oils, light pollution can cause disturbance of animals in vicinity and wider surrounding. All of this have a negative effect on the process of reproduction, feeding, movement.

Mortality caused directly by traffic infrastructure

During construction of small roads, the animals often passing the existing road (in case they do not have a passage or crossing) directly across the road, which can lead to collisions with vehicles and cause injury or mortality to the individual, while also posing a high risk for other road users.

5.6. SUGGESTED PROTECTION MEASURES

In order to reduce, mitigate or eliminate adverse impacts on mammal fauna in the subject area, it has been provided an overview of the measures and activities that should be carried out before construction, during construction, and at the time of the operational phase also.
Measures, suggestions and recommendations are given in accordance with national legislation ("Rulebook on protection measures and method of maintaining the passage for wild animals" (Official Gazette of Montenegro No. 80 / 2010), European guidelines from COST 341 “Habitat fragmentation due to transportation infrastructure - (Wildlife and Transportation - Handbook for Identifying Conflicts and Designing Solutions)”, as well as in consultations with colleagues and representatives of hunting association “Hajla”.

After performed field surveys, analysis of the situation, suggestions and consultations with representatives of the hunting association "Hajla", it has been given the proposal of locations for the construction of new and widening of existing passages (under bridges, viaducts) for mammals, as well as for the set of traffic signalization/warning signs.

5.6.1. Proposed locations of wildlife warning signs

Location 1 – Wildlife warning sign

With the aim of improving current situation, i.e. with the aim of reducing the possibility of animals getting killed on the road, it is suggested to implement the following measures during reconstruction of the subject road section:

- A new wildlife warning sign should be placed at the location defined by coordinates 42.51 16 34 N 20. 11 27 08 E (in the direction from Rozaje to Spiljani). A 30 km/h speed limit sign should be installed several meters from the wildlife warning sign (50m) - (if possible, a flashing warning sign should be placed at this location).

- A new wildlife warning sign should be placed at the location defined by coordinates 42. 51 11 61 N 20. 11 33 20 E (in the direction from Spiljani to Rozaje). A 30 km/h speed limit sign should be installed several meters from the wildlife warning sign (50m) - (if possible, a flashing warning sign should be placed at this location).

Location 15 - Wildlife warning sign

This location was defined as the starting point of the main passage for mammals. With the aim of improving the current situation, i.e. with the aim of reducing the possibility of animals getting killed on the road, it is suggested to implement the following measures during reconstruction of this road section:

- Install a new wildlife warning sign at the location defined by coordinates 42 53 12 15 N 20 16 17 62 E. A 30 km/h speed limit sign-a flashing warning sign should be installed before the traffic signs which are placed at the entrance to settlements.

Location 18 - Wildlife warning sign

The main point of passage/movement corridor of mammals is located in this part of the road section (in the direction from Spiljani to Rozaje). With the aim of improving the current situation, i.e. with the aim of reducing the possibility of animals getting killed on the road, it is suggested to implement the following measures during reconstruction of this road section:

- Install a new wildlife warning sign at the location defined by coordinates 42. 53 27 14 N 20. 16 27 37 E. A 30 km/h speed limit sign-a flashing warning sign should be installed before the 50 km/h speed limit sign (in the direction from Spiljani to Rozaje).

5.6.2. Proposed measures regarding passages and fencing

- All the existing passages which are located under bridges and viaducts along the road section should be cleaned, and widened where possible;
- According to information about frequent roadkill's, which was provided by the Hunting Association"Hajla", and additionally confirmed by the members of the local community and media coverage, it is necessary to ensure conditions for safe passage of animals in the section of the main corridor/ passage for mammals which stretches from 42.51 16 34 N 20. 11 27 08 E to 42. 53 27 14 N 20. 16 27 37.

There is a passage under the road in the section which is defined by coordinates 42. 53 114 50 N 20 16 21 60 E, and according to information provided by members of the local community, this passage is used by mammals for crossing from the left to the right side of the road.

Figure 33. Passage 1

Another animal passage is located slightly further from the abovementioned passage, at the point between 42. 53 17 87 N 20. 16 23 34 E, whereby a small creek runs through this passage.

Figure 34. Passage 2, view from both sides of the road

Passage 1 should be widened and reinforced. It is not certain whether this passage is still going to be used by animals, considering the fact that a privately-owned object is located in proximity to the passage and that there are 8 kennels with dogs which can chase away the animals and prevent them from accessing this location.

Passage 2 should be considered as an alternative or supplementary solution, i.e. the existing passage should be widened if possible, which would thus enable passage of larger mammals.

Representatives of the local Hunting Association suggest that, if possible, a new, passage 3 (diameter of culvert 1,5m) should be built at the location defined by coordinates 42 53 22 44 N 20 16 24 71E, since they deem that would be the best solution.

Figure 35. Main passage 3

Protection fencing should be combined with the passages. Length of fencing depends on the type of area, and it is recommended to install fencing in the minimum length of 20m along each side of the passage. Additional information may be found in the European Handbook (Iuell et al, 2003) or in the German MAQ (FGSV, 2008).

5.6.3. Other protection measures

Table 3. Overview of protection and mitigation measures

Species	Time	Measure
Bats	Before construction	For lighting along the main road, it is recommended to use sodium lamps and directed light-shaded lamps that emit light to the horizontal level and which are relatively unattractive to insects. The use of mercury and halogen lamps is not recommended.
	During construction	It is recommended to preserve native vegetation along the road as much as possible.
	Operation phase	To carry out routine monitoring (identifying critical points where is a big frequency of collision of vehicles and bats), especially during the reproduction phase and migration.

Species	Time	Measure
Other mammals	Before construction	To plan widening of existing passages for animals or building new ones in places that have been determined as important in terms of conservation of habitat, corridor and increased mortality due to collision, according to the study. Existing passages need to be dimensioned based on information about the types of animals will mostly use them (Rulebook and COST). To plan the fence installation on place of the main passage – Locations 16 and 17. To plan putting of traffic signs and signalling for the drivers (blinking sign) with an animal sign in places that are determined as important for mammals through the study.
	During construction	During the construction of passages, it is necessary to preserve the surrounding flora along installed fence to enable the natural lead of animals to passage. Under bridges, it is necessary to permanently provide a dry part for the movement of small mammals (during high water levels also). To place a temporary fence around the construction site in places that the study assesses as important for mammals, to prevent their mortality caused by works of machines.
	Operation phase	To carry out routine monitoring (identifying critical points where is a big frequency of collision of vehicles and mammals).

Passages

During the planning of the reconstruction of the main road, and thus the existing crossings (passages) for water or especially for animals, it is obligatory to take into account the "("Rulebook on protection measures and method of maintaining the passage for wild animals" (Official Gazette of Montenegro No. 80/2010), ie. Article 5 and Article 6, as well as Article 9.

The Rulebook is not completely clear on the dimensions of passages/crosses, but the following can be stated based on the relevant literature (COST 341 and Group of authors, 2012: SRDM Manual for Roads Designing. Road and Environment 7.4 Passes and crosses for animals. “JP Putevi Srbije”, Belgrade):

- Passages can take different forms (rectangular, square, round, elliptical, round with flat bottom, with one or more pipes) and can be made of different materials (concrete, wood, plastic);
- The bottoms of the passage or pipe must be impregnated with a suitable substratum (soil, sand, stone), suitable and proper for the movement of animals;
- Passages must be made with a minimum longitudinal slope of 1% due to the need for drainage. The sloping surface must be rough. The bottom of the passage or pipe must be above the groundwater level;
- Entrance to the passage must be free and without artificial lighting;
- Animals should be directed to passages using direction guides;
- Generally, a passage of 1.5 m in diameter or 1 to 1.5 m slope passage is suitable for a large number of animal species.

Examples of passages

Example of crossing on the road surface: (a) for animals; (b) for amphibians

Arch culvert with fence for large mammals and lipped wall for amphibians (FHWA/US DOT, 2002)

Protective Fences

To ensure that smaller animals do not cross the fence, the net should be very dense (mesh holes up to 1 cm) and a sloping metal canopy should be installed above it.

One-way gates should be provided on the fences, which allowing animals caught on the road to leave the road. Doors with dimensions approximately 25 cm in height and 80 cm wide should be opened by pushing the body of the animal from the side of the road and then to be closed under its own weight.

Fences should be about 2 m high to prevent jumping. The lower part of the fence should be fixed to the ground or the ground should be covered in the width of 1 m.

The fence should always be visible, ie. it should never be overgrown with vegetation.

After placing the fence, it should be reinforced with carriers of scent unpleasant for animals (repellents), so that the animals can notice and get used about fence as quickly as possible.

Contrary to the previous practice of placing a fence on the boundary of the plot, leaving the canal inside, the fence should be placed so that the canal is on the outside of the fence, which multiplies its efficiency many times over.

5.7. IMPACT ASSESSMENT

Table 4. Impact assessment on mammal's due reconstruction of the Rozaje-Spiljani

Name of species	Type of impact	Impact assess with the application of measures
Chiroptera- Bats	Loss and fragmentation of habitat.	Negligible impact.
	Disturbance	Negligible impact.
	Mortality due collision with vehicles	Negligible impact.
Other mammals	Loss and fragmentation of habitat.	Negligible to medium impact
	Disturbance	Negligible to medium impact
	Mortality due collision with vehicles	Negligible to medium impact

5.8. CONCLUSION

At the subject area it was recorded about 10 mammal species. The field survey confirmed the permanent presence at certain locations of certain mammalian species: bear, roe deer, fox, herb field mouse, dormouse, hedgehog, marten and the species *Pipistrellus pipistrellus* and *Hypsugo savii*.
No bat shelters were registered on the surveyed area. There are indications that this area, i.e. the wider area, could be very interesting given that there are numerous caves in the Ibar Canyon, which could be their potential shelters.

The subject area is quite devastated by anthropogenic influence (waste, cutting of trees, pollution of the Ibar river). The presence of mixed forests in the near and wide area makes this area a suitable habitat for many mammal species.

There is no law protected natural areas at the location. The closest recognized location for conservation of nature is Mount Hajla, the EMERALD site and the important plant area, located 6 km away, south of

the subject location. The application of measures during reconstruction can provide an improvement in existing conditions / provide a corridor of movement for animals (warning signs, passages) for mammals.
In relation to the established list of species present at the subject location, that does not have a protected or endangered species, *it is estimated that the planned reconstruction of the Rozaje-Spiljani road section will not have a significant risk to the conservation status, survival and preservation of the present mammal species.*

The subject area is not assessed as crucial in relation to the total range of the listed species of mammals in Montenegro.

In accordance with the provisions of the EBRD PR6, it is estimated that the planned project in the subject area is acceptable with the application of protection and mitigation measures.

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