Financed under a specific grant agreement no 2018/402-850 from EU IPA II Multi-Beneficiary Programme for Albania, Bosnia and Herzegovina, North Macedonia, Kosovo*, Montenegro and Serbia

Western Balkans Investment Framework Infrastructure Project Facility Technical Assistance 8 (IPF 8)

TA2018148R0 IPA

Mediterranean Corridor, Bosnia and Herzegovina - Croatia CVc Road Interconnection, Subsection: Konjic (Ovcari) - Prenj Tunnel - Mostar North

Gap Analysis & ESIA Disclosure Pack

WB20-BiH-TRA-02 Component 1

Volume 2: Technical Annexes to the ESIA

Annex C-5: Mammals (Large Mammals)

October 2023

COWI | IPF

Western Balkans Investment Framework (WBIF)

Infrastructure Project Facility Technical Assistance 8 (IPF 8)

Infrastructures: Energy, Environment, Social, Transport and Digital Economy

TA2018148 R0 IPA

Volume 2: Technical Annexes to the ESIA

Annex C-5: Mammals (Large Mammals)

October 2023

The Infrastructure Project Facility (IPF) is a technical assistance instrument of the Western Balkans Investment Framework (WBIF) which is a joint initiative of the European Union, International Financial Institutions, bilateral donors and the governments of the Western Balkans which supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic infrastructure investments. This technical assistance operation is financed with EU funds.

PROJECT NO.	DOCUMENT NO.
WB20-BiH-TRA-02	

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	25/09/2021	Annex C-5: Mammals (Large mammals)	Team of experts	Irem Silajdžić Konstantin Siderovski	Richard Thadani
2	21/11/2022	Annex C-5: Mammals (Large mammals)	Team of experts	Irem Silajdžić	Richard Thadani
3	03/03/2023	Annex C-5: Mammals (Large mammals)	Team of experts	Irem Silajdžić	Richard Thadani
4	10/10/2023	Annex C-5: Mammals (Large mammals)	Team of experts	Irem Silajdžić	Richard Thadani

CONTENTS

1	Introduction	6
1.1	Project background	6
1.2	Site Locations	6
1.3	Reporting Purpose and Goals	7
2	Methodology	8
2.1	Survey Background	8
2.2	Survey Methodology	8
2.3	Assumptions and Limitations	10
2.4	Project Area of Influence	11
3	Results	11
3.1	Survey Results	11
4	Discussion and Recommendations	16
4.1	Summary of Main Findings	16
4.1.1	Sensitive Species	16
4.2	Mitigation Measures	16
4.2.1	Preconstruction Phase	16
4.2.2	Construction Phase	17
4.2.3	Operation Phase	17
4.3	Monitoring Measures	18
4.3.1	Preconstruction Phase	18
4.3.2	Construction Phase	18
4.3.3	Operation Phase	18
5	Annexes	19
5.1	Maps	19
5.2	Photograps of Habitats	20
5.3	Photographs of Species	21

List of tables

Table 1: Overview of site locations where the analysis was performed 8
Table 2: An overview of mammal species within the study area based on field surveys and literature data 13

List of figures

Figure 1: Map of surveyed localities 19
Figure 2: Habitats at the locality of Humilisani 20
Figure 3: Habitats at the locality of Podgorani 20
Figure 4: Habitats at the locality of Rakov Laz 21
Figure 5: Traces of digging characteristic for wild boar and peeled tree bark from deer cleaning their antler 21

1 Introduction

1.1 Project background

In August 2020, ENOVA was commissioned to conduct an environmental and social impact assessment referring to the Corridor Vc section Konjic (Ovcari) - Prenj Tunnel - Mostar North. The results of the previous biodiversity gap analysis indicated that additional information on biodiversity would be needed for an informed assessment of sensitive habitats and ecological characteristics. Additional information was obtained through field research and analysis of available literature and project documentation. The following field research has been done and is to be included in Annexes to the final Environmental and Social Impact Assessment Report:

- Annex A: Habitats, vegetation and invasive species
- Annex B: Invertebrates
- Annex C: Vertebrates
  - Annex C-1: Ichthyofauna
  - Annex C-2: Herpetofauna (amphibians and reptiles)
  - Annex C-3: Ornithofauna
  - Annex C-4: Mammals (Bats)
  - Annex C-5: Mammals (Large mammals).

This report presents the results of a field study of mammals, precisely large mammals.

1.2 Site Locations

This subproject includes three subsections between Konjic (Ovcari) and Mostar North along motorway Vc. According to the ToR, the subproject starts with the Konjic Intersection in Ovcari and ends with the Mostar North Interchange and the total length is 35.26 km, has six bridges and nine viaducts.

The motorway subsection Konjic (Ovcari) - Prenj Tunnel - Mostar North (Vrapcici) starts in settlement Ovcari with an interchange which will enable connection of the motorway and the existing main road M17. At the northern entrance to the City of Konjic, after the interchange, the motorway crosses the Sipad industrial zone. Further ahead, the subsection passes through the slopes where steep cuts are envisaged and where the Viaduct 3 over river Tresanica was designed to cross to the opposite side of the M17. Immediately after the end of Viaduct 3, the route enters the slope which passes through tunnels - Tunnel T1 and Tunnel T2.

After exiting the Tunnel T2, the route crosses over the Neretva River and the local road with Viaduct 4. Crossing to the opposite side, the motorway continues along the slopes at the rear of the settlement Bijela up to the settlement Mladeskovici, where the Konjic South interchange is positioned. Further on, the motorway route is laid at the foot of the slope above the settlements of Bijela

and Gornja Bijela all the way to the end of the section. The route further runs along the slopes parallel to the Rakov Laz shooting range, continues through the uninhabited green landscape to the slopes of Prenj Mountain, where the tunnel under Prenj (Tunnel T3) begins and terminates in the territory of the City of Mostar.

After exiting the tunnel through the Prenj mountain, the motorway route traverses mountain curves towards the south and the City of Mostar, through a system of cuts and bridges through uninhabited mountain areas. At the exit from the Prenj mountain range, the road crosses the valley on 300 m long embankment and enter the Klenova Draga Tunnel (Tunnel T3A) on the western cliffs of the gorge.

After the Klenova Draga Tunnel the next viaduct of approx. 800 m begins and turns into approx. 640 m long Tunnel T4. The viaduct over Badnjena Draga near Seliste, which stretches parallel to the settlement begins here.

The route continues northeast of the settlement and extends along the edges of the hill north of Podgorani, where the bridge over Seocka Draga begins and leads the route to Dolac, north of Humlisani. Further, the route continues in a slight semicircle around the settlement of Humilisani along the slopes of Porim. Below Humilisani, the route runs south and under Sljemen, it enters the 2,200-meter-long Tunnel T5, and exits into the Kuti area, the point where the Mostar (north) exit ramp has been envisaged.

The south connection to main road M17 (hereinafter: Konjic Bypass) is also a subject of this ESIA. Konjic bypass will connect the motorway at Ovcari Interchange with the M17 to Jablanica. This bypass will allow for M17 traffic to access the motorway directly without entering the urban area of Konjic. Konjic Bypass begins by turning off the motorway via the Ovcari Interchange. After that, motorway passes the next 100 m in an embankment and reach the first 80-meter-long viaduct. After the viaduct, it enters an 800-meter-long tunnel. After exiting the tunnel, the route goes for approx. 500 m through embankments and another 500 m through a cut with the highest point of approx. 30 m. The next 200 m of the route passes through embankments and cuts and reaches a 350-meter-long bridge that crosses the existing Sarajevo-Capljina railway, the Neretva River, and the main road M17. After 200 m, Konjic Bypass connects to M17.

1.3 Reporting Purpose and Goals

The main purpose of this task is to prepare a written report to serve as basis for Environmental and Social Impact Assessment (ESIA) Disclosure Package and the Biodiversity Management Plan (BMP). For this purpose to be met, this report has been written in accordance with the following objectives:

- Provide field research methodology and results;
- Assess the respective project and impact areas for the potential presence of sensitive species and species of conservation importance;
- Recommend mitigation measures and/or monitoring if necessary.

2 Methodology

2.1 Survey Background

Field surveys were conducted in 2020 and 2021: 24-25 October 2020, 7,9-10,17,27 March 2021; 4,15-16,23-24 April 2021; 2, 8-9, 16-17, 21-22 May 2021. The surveys have been carried out in optimal weather and during activities of the target fauna.

2.2 Survey Methodology

Mammal field research was conducted by methods of active field search and surveys. Field work consists of site inspection and active search for individuals, direct and indirect determination of the presence of species based on traces in snow, mud, hair remains, traces of cleaning antlers, faeces and other traces. In addition to the above, a survey was conducted with the local population and local hunting associations in order to determine the presence of certain species in the route area. Also, mammal species were monitored by waiting at sites within the area of influence. The research was conducted on 7 macro sites that included 60 micro sites (Table 1, Figure 1). Systematic field research was preceded by the collection of available literature data.

Table 1: Overview of site locations where the analysis was performed

Wider site location	Narrower site location	Coordinates
Kuti-Livac	Dubrava	43°23'12.23"N 17°53'7.00"E
	Dubrava_2	43°23'19.66"N 17°52'37.04"E
	Komic	43°22'51.79"N 17°53'43.17"E
	Budevci	43°22'56.75"N 17°53'26.37"E
	Susica	43°23'9.90"N 17°53'36.95"E
	Kuti	43°23'17.51"N 17°54'18.64"E
	Kuti_1	43°23'26.17"N 17°53'57.87"E
	Kuti_3	43°23'3.77"N 17°54'8.72"E
	Kutilivac	43°23'41.53"N 17°53'45.98"E
	Livac	43°24'11.60"N 17°53'26.72"E
	Orlov kuk	43°24'4.56"N 17°53'35.69"E
	Orlov kuk_2	43°24'47.91"N 17°53'48.07"E
Koritna draga	Koritna draga	43°23'22.56"N 17°54'42.32"E
	Orlinka	43°23'10.89"N 17°54'34.94"E
	Dobrusa	43°23'39.39"N 17°54'44.95"E
	Dobrusa_2	43°23'51.11"N 17°54'51.32"E
	Kuti_2	43°23'35.71"N 17°54'26.74"E
	Dobrusa_3	43°23'28.11"N 17°54'54.83"E

Wider site location	Narrower site location	Coordinates
	Dobrusa_4	43°23'46.15"N 17°54'42.90"E
Humi	Lisani	43°25'29.40"N 17°54'1.86"E
	Lisani_2	43°25'6.15"N 17°54'38.46"E
	Lisani_3	43°25'26.69"N 17°54'27.95"E
	Lisani_4	43°25'39.85"N 17°54'56.20"E
	Lisani_5	43°25'43.99"N 17°54'23.48"E
	Humi	43°26'7.13"N 17°53'49.68"E
	Humi_2	43°26'30.84"N 17°54'2.85"E
	Humi_3	43°26'9.90"N 17°54'32.64"E
	Humi_4	43°26'6.12"N 17°54'54.02"E
	Humi_5	43°26'21.12"N 17°54'45.37"E
	Humi_6	43°26'39.65"N 17°54'47.16"E
	Humi_7	43°26'47.87"N 17°54'25.54"E
Podgorani	Dolac	43°27'26.05"N 17°54'23.79"E
	Dolac_2	43°27'14.55"N 17°54'2.50"E
	Dolac_3	43°27'33.70"N 17°54'2.55"E
	Podgorani	43°27'34.23"N 17°53'20.29"E
	Podgorani_2	43°27'39.50"N 17°53'34.03"E
	Podgorani_3	43°27'46.95"N 17°53'45.20"E
	Podgorani_4	43°27'52.48"N 17°53'43.47"E
	Podgorani_5	43°27'54.06"N 17°53'11.79"E
	Podgorani_6	43°28'4.82"N 17°52'58.37"E
	Podgorani_7	43°28'22.39"N 17°52'59.06"E
	Podgorani_8	43°28'4.42"N 17°53'18.78"E
	Podgorani_9	43°28'4.99"N 17°53'34.78"E
Podporim/Porim	Podporim/Porim	43°27'0.04"N 17°55'47.49"E
	Podporim/Porim_2	43°27'13.77"N 17°56'9.18"E
	Podporim/Porim_3	43°27'14.43"N 17°56'13.07"E
	Podporim/Porim_4	43°27'18.37"N 17°56'30.51"E
	Podporim/Porim_5	43°27'21.78"N 17°56'49.98"E
	Podporim/Porim_6	43°27'26.20"N 17°56'53.87"E
	Podporim/Porim_7	43°27'31.90"N 17°57'7.01"E
	Podporim/Porim_8	43°27'27.17"N 17°57'22.76"E
Ovcari	Ovcari_1	43°40'1.35"N 17°59'11.77"E
	Ovcari_2	43°40'11.43"N 17°58'49.51"E
	Ovcari_3	43°40'2.52"N 17°58'58.34"E
	Ovcari_4	43°39'42.07"N 17°58'26.06"E
Polje Bijela	Polje_Bijela_1	43°38'5.64"N 17°58'55.69"E

Wider site location	Narrower site location	Coordinates
	Polje_Bijela_2	43°38'7.04"N 17°58'23.60"E
	Polje_Bijela_3	43°37'43.89"N 17°58'16.12"E
	Polje_Bijela_4	43°37'17.71"N 17°58'22.78"E
	Rakov_laz	43°34'14.25"N 17°55'38.71"E

The counting methodology is based on a linear transect, according to the formula D = n/2Lw; where the length of the transect line (L) is 500 and 1000 meters, and the width of the transect (w) 20 meters, n stands for number of individuals and D for population density.

Field trips were planned based on Google Earth programs and previous field research. The coordinates were taken on the field using a Garmin Oregon 600 handheld GPS device. The data was combined in the QGIS program and the polygons were generated in the Google Earth program and saved as KMZ files. The analysis of endangered fauna was carried out according to the Red List of the Federation of Bosnia and Herzegovina[1], global IUCN list and Habitats Directive[2].

The following standard abbrediations were used in the remainder of this report:

- IUCN – International Union for Conservation of Nature
- FBiH RL – Federation of Bosnia and Herzegovina Red List
- IUCN and FBiH RL conservation status abbreviations:
  - CR – Critically Endangered
  - EN – Endangered
  - VU – Vulnerable
  - NT – Near Threatened
  - LC – Least Concern
  - DD – Data Deficient
- HD – European Habitats Directive:
  - II – Annex II
  - IV – Annex IV
  - (*) - priority species.
- BC – Berne Convention

2.3 Assumptions and Limitations

The area is extremely difficult to move around, it is a dynamic terrain dominated by gorges, screes and cliffs. In the area where field research was conducted, there are minefields, therefore no transect inspections were performed in such areas. Exploration of mined areas as well as inaccessible habitats was not a

[1] Djug, S. (2013). Book 3 — The Red List of Fauna of the Federation of Bosnia and Herzegovina EU Greenway, Sarajevo.

[2] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

problem because the terrain was surveyed with binoculars. Habitats observed remotely were primarily preserved habitats represented by gorges, cliffs and scree of large slope, up to vertical cliffs at higher altitude.

2.4 Project Area of Influence

With regard to the project area of influence on mammals, a buffer of 500 meters measured on each side of the road route is considered appropriate taking into account habitat conditions and that the direct impacts of the project will be limited to the motorway route. However, mammals' biology requires separate determination of ecologically appropriate area of analysis that considers the size of the species' habitat, movement and behavioural patterns.

3 Results

3.1 Survey Results

According to the results of the previous study and other literature the presence of at least 15 species of mammals was suggested in the wider area of the motorway among which we highlight: wolf (*Canis lupus*), brown bear (*Ursus arctos*), otter (*Lutra lutra*), Eurasian lynx (*Lynx lynx*), and rodent Balkan snow vole (*Dinaromys bogdanovi*) (Table 2). The listed species are among the most sensitive species identified as part of the desk study, since the species are classified as vulnerable or endangered on the Red List of FBiH. Eurasian otter is also classified as near-threatened on the IUCN Red List, while Balkan snow vole is endemic to the peninsula and is classified as VU by the IUCN. Other species of large mammals identified in the literature review as part of this report are not on the IUCN Red List of critically endangered, endangered and vulnerable species.

Taking into account the importance of these species, research on habitat characteristics were performed during field surveys. From the aspect of species biology and habitats through which the section of Corridor Vc, Konjic (Ovcari) - Prenj Tunnel - Mostar North passes, the listed species were not found. Large mammals usually have wide areal which may stretch to e.g. 50 km or larger for some species, but having in mind the present conditions of the habitats in the project area and existing fragmentation of habitats due to the local roads, settlements and other infrastructure (such as ammunition testing grounds), it is considered that the project area has no potential to sustain large mammals as most natural habitats are already degraded and due to traffic noise of urban and semi-urban areas. Habitats on this route do not support the needs of animal species for breeding and feeding and the possibility of permanent residence of these species of large wildlife (game) is excluded.

The area of direct project impact for these species was observed from the aspect of the transit area and from the aspect of approaching the wildlife to settlements (corrals) for feeding. Given that there are no cattle breeders and a significant fund of domestic livestock in the area, the possibility that there are elements

that would indicate that the wildlife is grouping in the area due to food is excluded. From the aspect of hunting, there are no carcasses and hunting-technical facilities in the area from which large carnivores could be hunted. Therefore, the probability of the presence of large carnivores is reduced to a minimum, especially if we take into account the area that is represented along the Mt. Prenj with vertical scree and cliffs that are inaccessible and are not suitable habitats. Therefore, it is possible that the area and habitats along the route of Corridor Vc, Konjic (Ovcari) - Tunnel Prenj - Mostar North are only occasional routes for wildlife that have a wide territory.

In the route area, field research (directly and indirectly based on traces and biological traces of mammals) determined the permanent presence of eight species from the group of mammals.

The most numerous are the findings of the European hare (20 findings at 9 site locations), while the species of northern white-breasted hedgehog and European polecat were found on two site locations with one individual each. Several findings were registered at the Konjicka bijela and Bijela site locations, with 16 findings, while Podgorani and Podporim site locations had 30 findings. A number of records along the route were determined, so the sites closer to the foothill of the Mt. Prenj are richer in mammal findings. The pattern of wildlife grouping in the areas closer to the foothills and slopes of Mt. Prenj was recorded on the northern and southern slopes, i.e. Konjicka Bijela, Humilisani and Podgorani. All mammal species recorded during field work are in the LC category (least concern), whole four species are in Annex III of the Bern Convention (roe deer, rabbit, polecat and beech marten).

Table 2: An overview of mammal species within the study area based on field surveys and literature data

Species English Name	Scientific Name	Conservation status	Suitable Habitat in Survey Area?	Survey Finding - was species found?	Location (where)?	Reference (if it is a literature data)
European mole	*Talpa europaea*	IUCN LC, FBiH LC	Yes	Yes	Podgorani, Porim	
Northern white-breasted hedgehog	*Erinaceus roumanicus*	IUCN LC	Yes	Yes	Konjicka bijela (Rakov laz), Bijela	
European hare	*Lepus europaeus*	IUCN LC, FBiH LC, BC III	Yes	Yes	Podgorani, Porim, Konjicka bijela (Rakov laz), Bijela, Ovcari, Mladeskovici, Koritna draga, Humi, Kutilivac	
Roe deer	*Capreolus capreolus*	IUCN LC, FBiH LC, BC III	Yes	Yes	Podgorani, Podporim, Polje Bijela, Konjicka bijela, Mladeskovici	
Wild boar	*Sus scrofa*	IUCN LC, FBiH LC	Yes	Yes	Konjicka bijela (Rakov laz), Bijela, Podgorani, Podporim, Polje Bijela	
European polecat	*Mustela putorius*	IUCN LC, FBiH LC, BC III	Yes	Yes	Konjicka bijela (Rakov laz), Bijela	
Beech marten	*Martes foina*	IUCN LC, FBiH LC, BC III	Yes	Yes	Konjicka bijela (Rakov laz), Podgorani, Podporim	
Red fox	*Vulpes vulpes*	IUCN LC, FBiH LC	Yes	Yes	Konjicka bijela (Rakov laz), Bijela, Podgorani, Podporim, Koritna draga, Humi, Kutilivac	

Species English Name	Scientific Name	Conservation status	Suitable Habitat in Survey Area?	Survey Finding - was species found?	Location (where)?	Reference (if it is a literature data)
Eurasian otter	*Lutra lutra*	IUCN NT, FBiH EN, HD II, IV, BC II	No	No	Mt. Prenj	Support to the implementation of the Birds and Habitat Directive in Bosnia and Herzegovina, Federal Ministry of Environment and Tourism, 2012-2015.
Wolf	*Canis lupus*	IUCN LC, FBiH EN, HD II, IV(*), BC II	Yes	No	Mt. Prenj	As previous reference
Brown bear	*Ursus arctos*	IUCN LC, FBiH VU, HD II (*), BC II,	Yes	No	Mt. Prenj	As previous reference
Eurasian lynx	*Lynx lynx*	IUCN LC, FBiH VU, HD II, IV, V, BC II, III	Yes	No	Mt. Prenj	As previous reference
Balkan snow vole	*Dinaromys bogdanovi*	IUCN VU, FBiH VU, endemic	No	No	Mt. Prenj	As previous reference
Red squirrel	*Scirius vulgaris*	IUCN LC, FBiH LC, BC III	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey
Chamois	*Rupicapra rupicapra*	IUCN LC, FBiH VU, BC III	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey

Species English Name	Scientific Name	Conservation status	Suitable Habitat in Survey Area?	Survey Finding - was species found?	Location (where)?	Reference (if it is a literature data)
Europena wildcat	*Felis silvestris*	IUCN LC, FBiH LC, HD IV, BC II	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey
Golden jackal	*Canis aureus*	IUCN LC, FBiH LC	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey
Stoat	*Mustela erminea*	IUCN LC, FBiH LC, BC III	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey
European badger	*Meles meles*	IUCN LC, FBiH LC, BC III	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey
European pine marten	*Martes martes*	IUCN LC, FBiH LC, BC III	Yes	No	Present in hunting area Sections Bijelo Polje, Podgorani i Humilisani	Hunting association survey

It should be considered that the plateau of the Prenj-Cvsnica-Cabulja massif is a very important habitat for large carnivores, especially for wolves and brown bears, and that the indirect pressure of the motorway on these species is twofold: a) due to possible habitat fragmentation and disruption of game routes; b) opening previously inaccessible areas to mountaineers, hunters and tourists, which will increase the pressure on large carnivores in the long run, as mountain areas will become more easily accessible. The area that will be indirectly affected by the construction of roads along the route is designated as an area of direct impact of the EAAA, and represents previously preserved and closed wilderness areas that were not easily accessible and will now be in the zone of direct impact or indirectly by construction of access roads.

4 Discussion and Recommendations

4.1 Summary of Main Findings

During field research conducted in 2020/21 in the EAAA of project Corridor Vc, Konjic (Ovcari) - Prenj Tunnel - Mostar North, no confirmed species from Annex II/IV HD, VU, EN, CR have been identified on the Red List of Fauna of FBiH and IUCN Red List. Based on literature data and surveys of local hunting organizations, the analysis of the area of influence of the motorway was extended to habitats important for large carnivores such as wolf, bear, Eurasian lynx and Balkan snow vole, for these species the area of indirect impact of the motorway is caused by two factors: (a) changes in the movement of large carnivores due to works and increased human presence; (b) changes that will occur with the construction of access roads that will enable easier access to the Mt. Prenj for tourists, hunters and investors in tourist facilities.

4.1.1 Sensitive Species

No mammal species with the IUCN status VU, EN, CR on the global, European and federal level nor species of importance for the European Union were found in the direct area of influence of the motorway section.

4.2 Mitigation Measures

4.2.1 Preconstruction Phase

Mitigation measures during the construction period refer to avoiding mining works in the period from March to May, when the largest number of species give birth to offspring. This ensures peace in the hunting area and a period of wildlife getting used to the new conditions in the habitat. Impact and mitigation measures have a negligible effect due to the possibility of wildlife migration and the fact that this is an area that is not recognized as an important habitat for mammals, the habitats of direct impact of the Corridor are the potential transit zone for wildlife.

4.2.2 Construction Phase

During the construction period, three key pressures are defined: a) habitat fragmentation, b) wildlife mortality on the construction site, and c) wildlife grouping on the construction site due to organic waste disposal.

- Habitat fragmentation will be most noticeable during the period of motorway construction because the constant, long-term presence of construction operations with noise and physical barriers will prevent the passage of wildlife through parts of the hunting area. The effect on wildlife during the construction period will disappear after the completed works, so roads and passages for wildlife will be re-established during operation phase. Although the effect of habitat fragmentation during the construction phase is negative, it affects a small number of species in the area of direct impact of the project. Given the fact that the effect of construction is temporary in terms of noise and the presence of people, it is not necessary to implement mitigation measures.
- During the construction phase, significant construction work such as excavation and trenching works will be carried out in the area of physical and direct area of influence of the motorway. It is expected that in the conditions of disturbed habitat structure and game movement, there will be game mortality (most likely deer, rabbits and foxes). It is recommended that the contractor fences all parts of the area where significant earthworks and excavations will be carried out.
- Long-term works on the Prenj tunnel can lead to accumulation of organic waste that will attract carnivorous species, which could have negative effects on local species of carnivores. It is recommended that landfills not be formed along the subsection of the motorway, in that way human-wildlife contact will be avoided.

4.2.3 Operation Phase

Motor vehicle noise is a constant but not limiting factor. Adapting to noise and conditioning to emerging conditions is a phase in adaptation for local populations of mammal species. It is not necessary to implement mitigation measures.

Habitat fragmentation after construction remains one of the biggest negative pressures on mammal species. The area of the Prenj tunnel passes through a very dynamic landscape, and due to the large number of viaducts, bridges and tunnels the subsection is discontinuous in terms of possible passage of wildlife under infrastructure or in the case of the Prenj tunnel, the entire Prenj plateau, through which the processes of wildlife movement take place undisturbed, remains intact.

However, due to the extensive works that will be performed, the habitat structure around the bridges will be negativelyaffected, so it is necessary to recultivate the habitat around the bridges and overpasses in order to create wildlife corridors. The research determined the highest frequency of wildlife in

the slope areas of Mt. Prenj. Having in mind the dynamics of the terrain and the number of structures (bridges, viaducts and tunnels) that will be built on the slopes, the fact that the presence of small game and herbivores has been determined in the area, construction of additional passages for wildlife would be redundant. By preserving the entire plateau of the Mt. Prenj, the habitats of large carnivores have been preserved in the context of structural integrity. The determined higher frequency of low game, primarily rabbit, fox and roe deer game shows that these are species that do not have a wide territory and do not show patterns of seasonal migration.

4.3 Monitoring Measures

4.3.1 Preconstruction Phase

In the preconstruction phase, it is not necessary to perform wildlife monitoring activities.

4.3.2 Construction Phase

During the construction phase, through the Biodiversity Management Plan, implement monitoring of large and small wildlife species, in order to determine the possible mortality of wildlife along the construction site. Measures need to be implemented by wildlife surveillance cameras and field trips. During the construction phase, there will be no significant loss of forest habitats important for large carnivores and other types of high forests.

Recultivate excavation landfills with native species in order to bring the vegetation to the climax phase as quickly as possible.

4.3.3 Operation Phase

Perform continuous monitoring of wildlife during the first three years of exploitation, in order to analyze the dynamics and structure of the population of wild species. It is necessary to pay special attention to cases of wildlife mortality on the section, especially representatives of martens and weasels that can pass through the wire fence of the motorway. The second task of the ecologist is to determine the scope of wildlife activity near the motorway section and the use of recultivated areas under viaducts and bridges as passages for animals, and if necessary implement measures to optimize the conditions for wildlife passage or prevent grouping of species along the motorway fence. This means that it is necessary to remove the vegetation along the fence in a belt of 2 meters from the fence.

During the operational phase, the habitats that will be devastated will go through various phases of succession and overgrowth. In the first phases of overgrowth, it is not necessary to carry out cultivation measures, until the stage of formation of bush vegetation and young forest when it will be necessary,

according to the needs of the route, to clear bushes and maintain samplings that are native to the area.

Recultivation of vegetation under the viaducts aims to mitigate habitat fragmentation that will occur with the construction of the motorway. Therefore, it is necessary to: 1. Plan the construction of a fence under overpasses and bridges to allow passage under them; 2. Recultivate the area under viaducts and bridges to ensure continuity of vegetation corresponding to surrounding habitats outside the impact zone.

5 Annexes

5.1 Maps

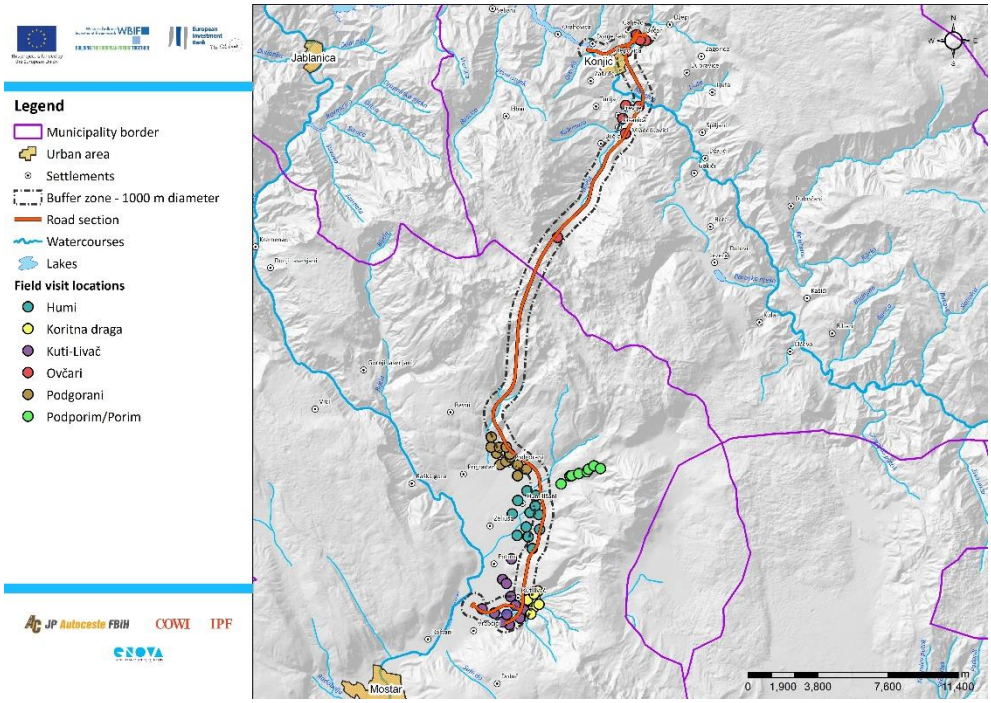

Figure 1: Map of surveyed localities

5.2 Photograps of Habitats

Figure 2: Habitats at the locality of Humilisani

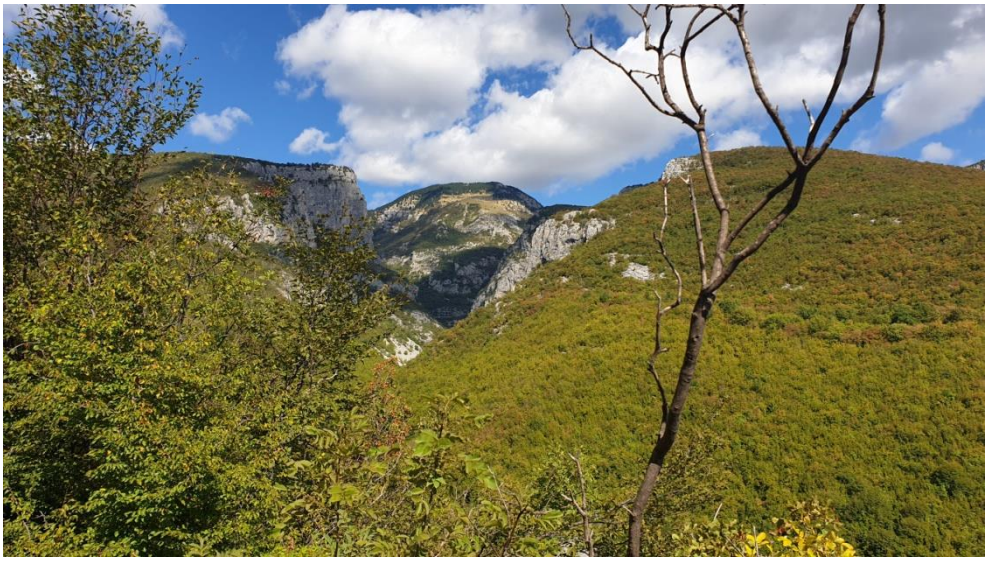

Figure 3: Habitats at the locality of Podgorani

Figure 4: Habitats at the locality of Rakov Laz

5.3 Photographs of Species

Figure 5: Traces of digging characteristic for wild boar and peeled tree bark from deer cleaning their antlers