



# Local Cross-Sectoral Operational Plan

## Rila-Verila-Kraishte Pilot Area (Bulgaria)

Part of Output T2.2 “Local Cross-Sectoral Operational Plans”

December, 2022



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We would like to thank all our partners, key stakeholders and experts contributing to the project!

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## **Part of Output T2.2 “Local Cross-Sectoral Operational Plans”**

SaveGREEN “Safeguarding the functionality of transnationally important ecological corridors in the Danube basin”

Danube Transnational Programme, DTP3-314-2.3

December 2022



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## About SaveGREEN

The SaveGREEN project, funded by the Interreg Danube Transnational Programme is focused on the identification, collection, and promotion of the best solutions for safeguarding ecological corridors in the Carpathians and further mountain ranges in the Danube region. Currently, ecological corridors in the region are under threat due to the lack of adequate planning of economic development initiatives. Therefore, basing its work on integrated planning, SaveGREEN will monitor the impact of mitigation measures in 8 pilot areas and derive proper recommendations for follow-up actions and policy design.

[www.interreg-danube.eu/savegreen](http://www.interreg-danube.eu/savegreen)

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# CHAPTER 1

# General Introduction



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**T**he main objective of the SaveGREEN project was to develop concrete solutions to preserve, improve or restore the functionality of key ecological corridors in Carpathian, Alpine and Bulgarian mountain valleys, where human activities as well as critical points for wildlife migration concentrate and thus conflicts are the highest.

As the proposed approach is to foster cross-sectoral and transnational cooperation and building of knowhow for integrated planning at landscape level, general pressures or threats to be considered when landscape connectivity is of concern was paired with connectivity-specific objectives.

By screening each sector of interest, we highlighted the potential sectoral impacts - an important reference for managers to investigate present or future problems that needs to be addressed by targeted measures. At pilot area level, the local experts worked with stakeholders to identify and prioritize these problems and to propose measures to overcome them through concrete actions, informed also by the situations in the other project pilot areas and by constant collaboration with project partners and external experts.

This common logical framework which facilitates the logical path from pressures / threats to concrete actions forms the structure of the Cross Sectoral Operational Plans (CSOPs) which represents the original response of SaveGREEN to threats to connectivity and the basis for implementation of practical measures in the 8 pilot areas of the project.

Working directly with stakeholder groups in the pilot areas and involve them actively, in a participatory manner, in the development of the CSOPs of the pilot areas should create long-lasting ownership of the plans and ease the future implementation.

The CSOPs are addressing the complex issue of landscape connectivity and should be considering a medium to long-term effort. While some of the actions have been (partially)

implemented during the SaveGREEN project, most of them need to be implemented in the future. Moreover, constant assessment and adaptation of the actions is needed in order to respond to the dynamic of the multitude of factors affecting the landscapes, as well as to the capacity, resources and available knowhow of the stakeholders.

SaveGREEN proposed the CSOPs as an informal tool to foster inter-sectoral cooperation and synchronized concrete actions at landscape level. Working directly with stakeholder groups in the pilot areas and involve them actively, in a participatory manner, in the development of the CSOPs of the pilot areas should create long-lasting ownership of the plans and ease the future implementation, irrespective of the formal agreements.

At the same time, the logical framework of the CSOPs will ensure an easy integration within local / regional sectoral (management) plans while ensuring synergies between them, which is a significant lack at present. By filtering CSOPs by any of the sector of interest, one will have available a sectoral action plan for connectivity. Of course, whenever the case, the measures of CSOPs could be taken on board by protected areas management plans.

By identifying the specific problems and needed actions on the ground, CSOPs are valuable instruments to pinpoint potential gaps and lacks at legislative, capacity of funding levels which should fundament adaptation at national or European level.

Paired with the multi-sectoral online datasets for the pilot areas, with the On-line library of multi-sectoral solutions for ensuring functionality of ecological corridors available in the Carpathian Countries Integrated Biodiversity Information System (CCIBIS) and with SaveGREEN's Handbook of best practices, we hope that the CSOPs will become a significant resource for replication and adaptation in the Danube Region and beyond, whenever the scope is to safeguard the connectivity at landscape level.

## CHAPTER 2

# Short Description of the Rila-Verila-Kraishte Pilot Area



Phototrap



## 2.1 A short description of the Rila-Verila-Kraishte Pilot Area and its relevance

- » The pilot area in Bulgaria is located in the deep Dupnitsa Valley drained by the Struma River and tributaries and flanked by the mountains Rila, Verila and some other ranges to the south west of the capital city of Sofia. A 16-kilometer stretch of Section 1 of the Struma Motorway, with 15 facilities for wildlife (3 of them large – overpass, viaduct and underpass), runs across it. Their effectiveness and sufficiency as mitigation measures, individually and as an integrated system for limiting the fragmentation effect, can be addressed by the project and suggested improvements.
- » The area is important as a pilot area because it is highly fragmented, located on the route of important ecological corridors – three of the main ecological corridors in Bulgaria, and at the same time on some local migratory routes in the mountain area. It is significant for migration of large and medium size mammals (brown bear, jackal, wolf, fox, wild cat, roe deer, wild boar, marten, badger etc.) inhabiting adjacent mountains and protected areas. The area is described as a bottleneck from the ecological viewpoint in the Bulgarian road and rail road network (Van der Grift et al., 2009). Despite this, there are limited data regarding the species occurrence and distribution, and the way that fragmentation influences their populations. Nevertheless, mitigation measures have been prescribed and partially implemented. The area has two distinct patches: in the first one, the predominant landscape is composed of arable land and pastures, influenced by settlements and industrial activities; in the second patch, forests fragmented by pastures are the dominant feature. Large open areas and the proximity of settlements, grazing, poaching and linear transport infrastructure are the factors influencing the fragmentation. The stretch is a conflict point of motorway, a parallel 1st class road, country roads, railroad, and further mitigation measures are necessary.
- » A large number of the Natura 2000 sites are present. East of the corridor is Rila –Verila region. This is a non-fragmented mountain range of Rila, Verila and Vitosha mountains with 5 SACs/SCIs Rila BG0000495 (National Park Rila), Rilski manastir BG0000496, Niska Rila BG0000636, Verila BG0000308, Vitosha BG0000113– protecting key breeding populations of brown bear and wolf. West of the corridor is Kraishte region with a number of SACs/SCIs, e.g. Konyavska planina BG0000298, also protecting breeding wolf population, and where occasional migration of brown bear has been noted. The last site plays a role as a stepping stone towards an unfragmented Kraishte mountain range and number of SACs/SCIs there situated near or at the border with the Serbia and Northern Macedonia – Zemen BG0001012, Karshalevo BG0000294, Dolni Koriten BG0000295, Karvav kamak BG0001017, Osogovska planina BG0001011, Ruy BG0000313. In Kraishte, there are breeding populations of wolf and lynx and potential bear habitats (the last species is restricted there due to a high level of poaching). The project area is the only potential biocorridor between the mountain ranges of Rila-Verila and Kraishte for providing connectivity for wolf and for spreading and restoration of populations of bear and lynx in their historical range.
- » The area is fragmented by Section 1 of the Struma Motorway with heavy traffic associated with the proximity of the capital city and some busy smaller roads, as well as a railroad. Intensively used agricultural lands and pastures, 4 towns and 28 villages in the wider area. These are considerable barriers for wildlife. It is a mountain area crossed by the motorway, local road and

railway and surrounded by a mixture of shrubby pastures, arable lands and small patches of forest. In the close vicinity (several hundred meters to 5-6 km) from both sides are situated forested mountain slopes and, thus, providing a potential possibility for restoration of connectivity between SACs/ SCIs situated west and east of the area.

- » The mitigation measures implemented on the 16-km Section 1 of the Struma Motorway in the form of system for improved wildlife crossings and fences aiming to reduce wildlife and human mortality – can be regarded as part of the measures necessary to mitigate the

negative effects of fragmentation. The main facilities include: an overpass for large mammals at km 314+070; an underpass for small and middle mammals at km 315+900; a non-specialized viaduct at km 314+400; bridges with dry paths, tube culverts for reptiles and amphibians, rabbit fences and guiding concrete fences for amphibians. The functionality and effectiveness of the facilities, the technical state of the facilities and their functioning so as to achieve the functional connectivity of the landscape are studied and assessed as part of the project.

- » The measures developed by the SaveGREEN partners under other projects e.g. TRANS-

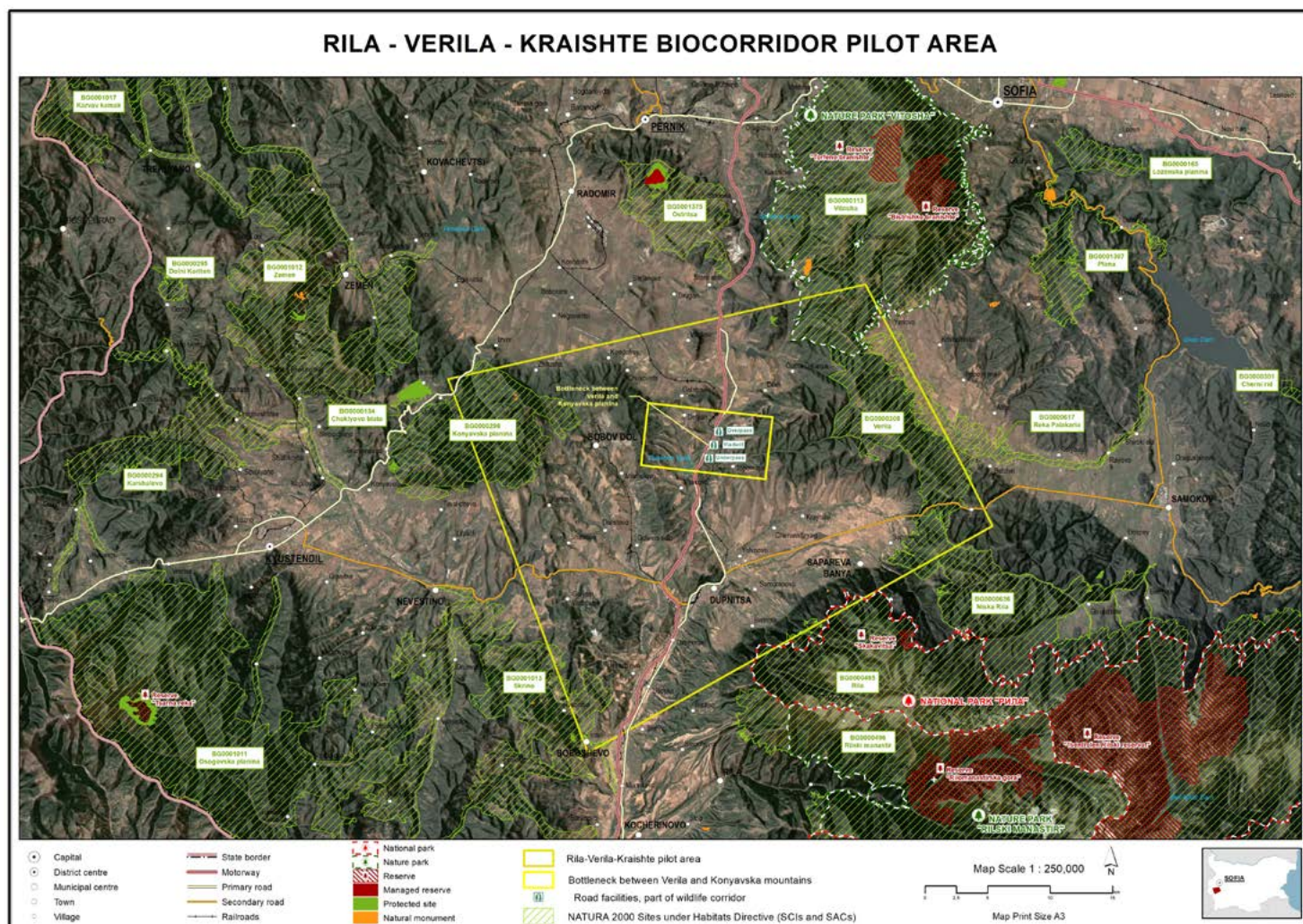


Fig 2. A general overview of Rila-Verila-Kraishte Pilot Area including SACs/SCIs, transport infrastructure, and a bottleneck area (© BBF).

GREEN should be studied and adapted to the local conditions in Bulgaria. As the Struma Motorway is a part of the Trans-European Transport Network (TEN-T) as Orient/East-Med Corridor – axis 4, their significance is essential for the mitigation effect.

- » The measures identified for the pilot area in Bulgaria need to be integrated in operational plans and programmes to become effective and functional.

## 2.2 List of the Natura 2000 sites (SACs/SCIs only) and protected areas (national and nature parks) in the pilot area

NAME and CODE	Type of Natura 2000 site	Protected area category
Vitosha BG0000113	SAC/SCI	Nature Park
Ostritsa BG1375	SAC/SCI	
Verila BG0000308	SAC/SCI	
Reka Palakaria BG0000617		SAC/SCI
Rila BG0000495	SAC/SCI	National Park
Niska Rila BG0000636	SAC/SCI	
Rilski manastir BG0000496	SAC/SCI	Nature Park
Konyavska planina BG0000298	SAC/SCI	
Choklyovo blato BG0000134	SAC/SCI	
Osogovska planina BG0001011	SAC/SCI	
Skrino BG0001013	SAC/SCI	
Zemen BG0001012	SAC/SCI	
Karshalevo BG0000294	SAC/SCI	
Dolni Koriten BG0000295	SAC/SCI	
Karvav kamak BG0001017	SAC/SCI	
Ruy BG0000313	SAC/SCI	



Fig 3. Key defragmentation facilities of the Struma Motorway with the conflicting 1st class road and railroad. (© BBF).

## 2.3 Typical species which could be affected by transport infrastructure in the pilot area

Group/Type of species	Species
Large carnivores	Brown bear ( <i>Ursus arctos</i> ), grey wolf ( <i>Canis lupus</i> ), golden jackal ( <i>Canis aureus</i> )
Large herbivores	Red deer ( <i>Cervus elaphus</i> ), Roe deer ( <i>Capreolus capreolus</i> ), wild-boar ( <i>Sus scrofa</i> )
Medium-sized mammals	red fox ( <i>Vulpes vulpes</i> ), European otter ( <i>Lutra lutra</i> ), European badger ( <i>Meles meles</i> ), European wildcat ( <i>Felis silvestris</i> ), European hare ( <i>Lepus europaeus</i> ), beech marten ( <i>Martes foina</i> ), European pine marten ( <i>Martes martes</i> )
Small-sized mammals	red squirrel ( <i>Sciurus vulgaris</i> ), polecat ( <i>Mustela putorius</i> ), hedgehog ( <i>Erinaceus concolor</i> ), least weasel ( <i>Mustela nivalis</i> ), dormice and voles
Bats	Greater mouse-eared bat ( <i>Myotis myotis</i> ), Lesser horseshoe bat ( <i>Rhinolophus hipposideros</i> ), barbastelle ( <i>Barbastella barbastellus</i> )
Reptiles and Amphibians	smooth newt ( <i>Lissotriton vulgaris</i> ), yellow-bellied toad ( <i>Bombina variegata</i> ), common toad ( <i>Bufo bufo</i> ), green toad ( <i>Bufo viridis</i> ), European tree frog ( <i>Hyla arborea</i> ), agile frog ( <i>Rana dalmatina</i> ), marsh frog ( <i>Pelophylax ridibundus</i> ), European pond turtle ( <i>Emys orbicularis</i> ), spur-thighed Tortoise ( <i>Testudo graeca</i> ), Hermann's tortoise ( <i>Testudo hermanni</i> ), green lizard ( <i>Lacerta viridis</i> ), sand lizard ( <i>Lacerta agilis</i> ), common wall lizard ( <i>Podarcis muralis</i> ), meadow lizard ( <i>Darevskia praticola</i> ), slow-worm ( <i>Anguis colchica</i> ), Aesculapian snake ( <i>Zamenis longissimus</i> ), grass snake ( <i>Natrix natrix</i> ), smooth snake ( <i>Coronella austriaca</i> ), caspian whipsnake ( <i>Dolichophis caspius</i> ), horned viper ( <i>Vipera ammodytes</i> ),

## 2.4 Relationship with other EU-funded projects:

Project	Funded by	Status	Relevant Actions	Relation with SaveGREEN
HARMON	DTP Small Grants	Completed	Green corridors and transport infrastructure issues and planning for mitigation measures in general terms	Preparatory activity for SaveGREEN

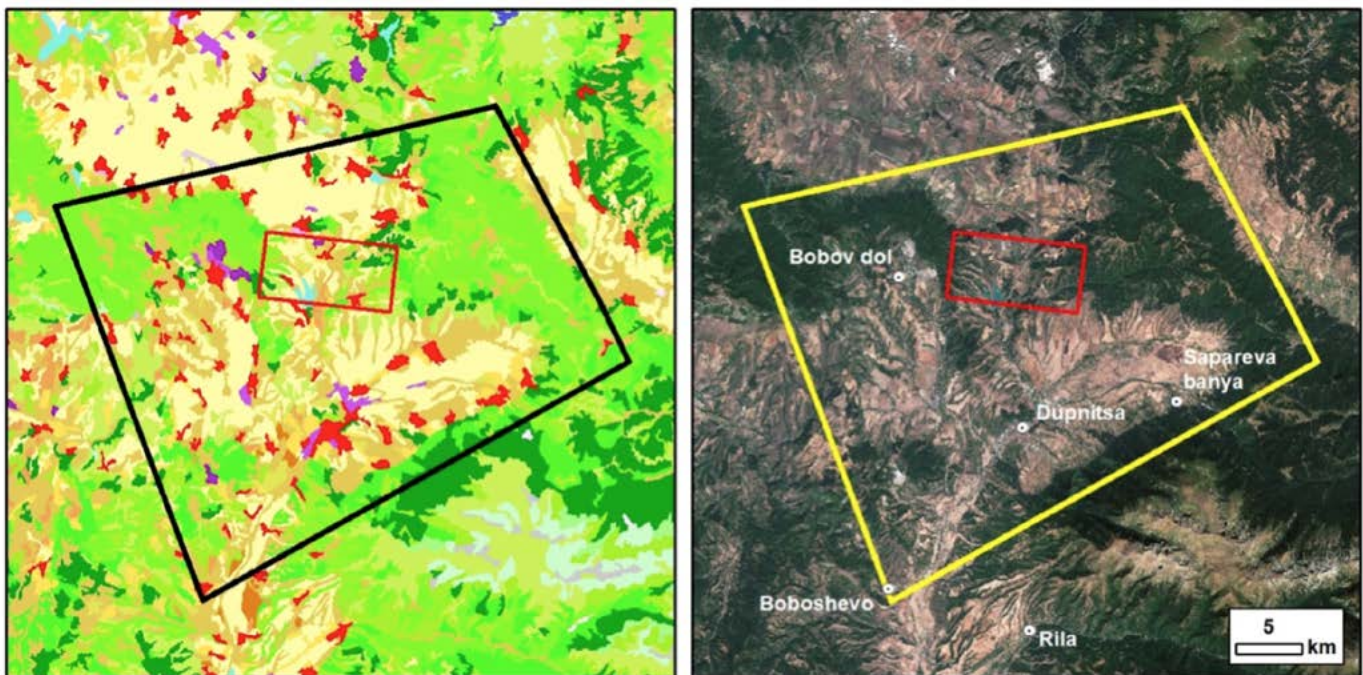
## 2.5 Description of the landscape elements, land use and land ownership

The Rila – Verila – Kraishte pilot area is occupied almost evenly by agricultural areas on the one hand, and forests and semi natural lands on the other. Each land cover type represents about 47% of the total research area. Artificial surfaces cover 6%, and less than 1% are water bodies. (Fig 4)

Agricultural areas almost entirely include non-irrigated arable land and so-called

heterogeneous agricultural areas (complex cultivation patterns and land principally occupied by agriculture, with significant areas of natural vegetation). They cover the flat and low-mountainous area up to 1,000 m above sea level. The difference between them is that complex cultivated lands occupy more compact territories, while the others are more fragmented. The pastures and permanent crops cover a relatively small area, respectively 3% and 1% of the entire studied territory, and they have a fragmented location.

Forests cover the middle- and high-mountainous areas and occupy about 30% of the studied area. The areas with scrub and/or herbaceous vegetation compose 10%, located next to the forest areas; these are highly fragmented. In terms of forests, broad-leaved forest predomi-



- |  |   |  |
|--|---|--|
| 112: Discontinuous urban fabric        | 243: Land principally occupied by agriculture, with significant areas of natural vegetation | Red rectangle: Bottleneck between Verila and Konyavska planina |
| 121: Industrial or commercial units    | 311: Broad-leaved forest  |  |
| 124: Airports                          | 312: Coniferous forest  |  |
| 131: Mineral extraction sites          | 313: Mixed forest   |  |
| 141: Green urban areas                 | 321: Natural grasslands   |  |
| 211: Non-irrigated arable land         | 324: Transitional woodland-shrub  |  |
| 221: Vineyards                         | 332: Bare rocks   |  |
| 222: Fruit trees and berry plantations | 333: Sparsely vegetated areas   |  |
| 231: Pastures                          | 512: Water bodies   |  |
| 242: Complex cultivation patterns      |   |  |

Fig 4. Landscape features of Rila-Verila-Kraishte pilot area (© BBF).

nates (60% of forest areas and 20% of the pilot area). Mixed and coniferous forests have a more limited distribution, often fragmented, and occupy respectively 7% and 5% of the studied area.

With regard to the artificial surfaces, they are mostly occupied with settlements. There are 59 populated places in the study area, of which 4 larger cities (Bobov dol (4,793 population), Dupnitsa (29,134 population), Sapareva banya (3,502 population) and Boboshevo (1,145 population)). The rest of the settlements are villages, the largest of which (with a population of over 1,000) are located in the southern part of the pilot area on the lowest slopes of the Rila Mountain and the Dupnishka valley. The majority of the villages have the population of under 100.

A small part of the artificial surfaces are occupied by industrial sites – mainly around the

towns of Bobov dol and Dupnitsa, as well as by mineral extraction sites – around Bobov dol.

Among the water bodies, the largest dams are Dyakovo and Dolna Dikanya; the rest are small ones with only local significance.

### 2.5.1 Land use

Additional research was carried out in a small area, located south of the Delyan village on both sides of the Struma motorway. It has an area of 5,000 ha and plays the role of so-called bottleneck between the Verila and Konyavska mountains. The expert analysis and observations show that this area has a high potential to be considered as part of a biocorridor. Three important road facilities are located within the considered area: overpass

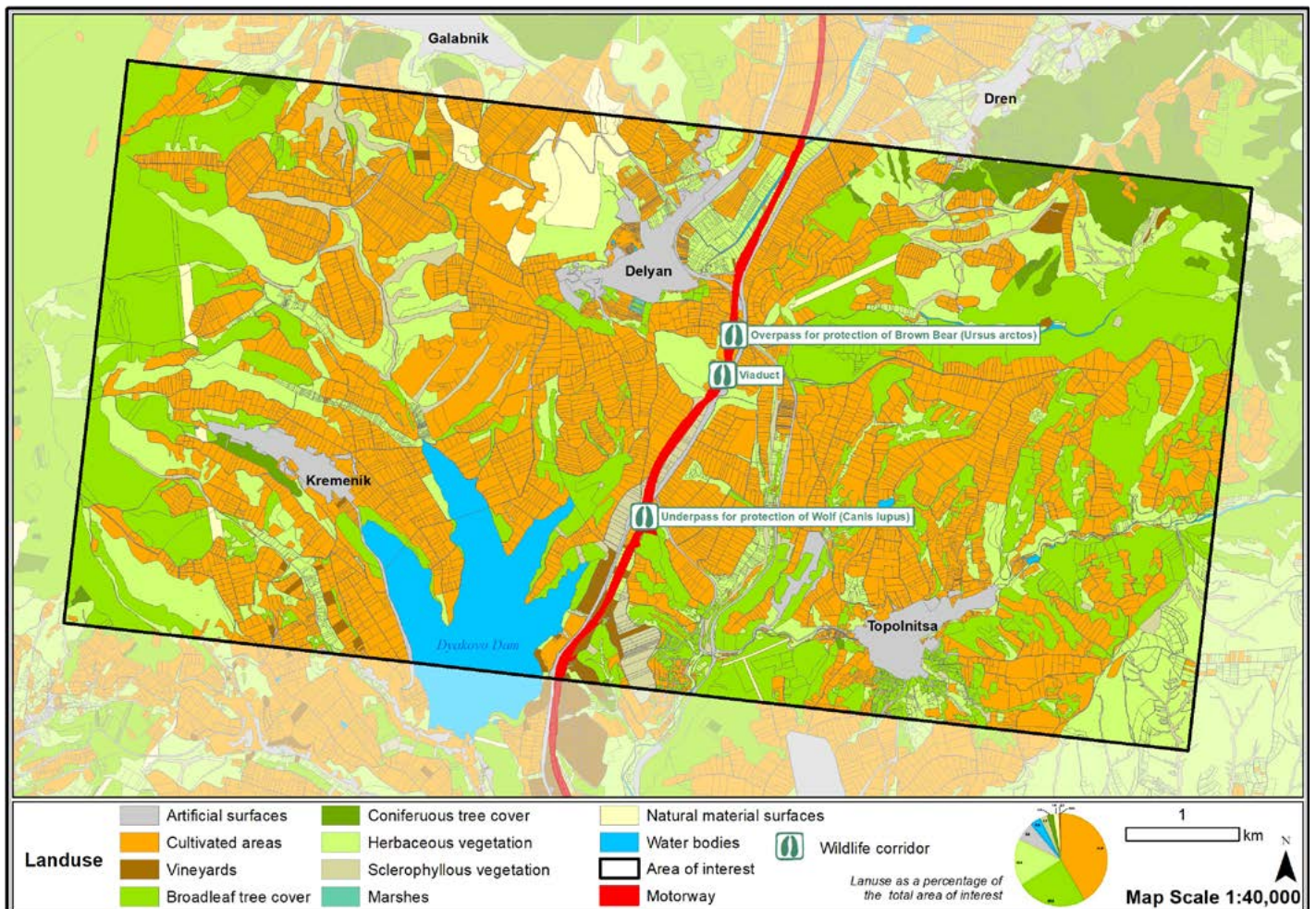


Fig 5. Land-use classes within the bottleneck area of Rila-Verila-Kraishte biocorridor (© BBF).

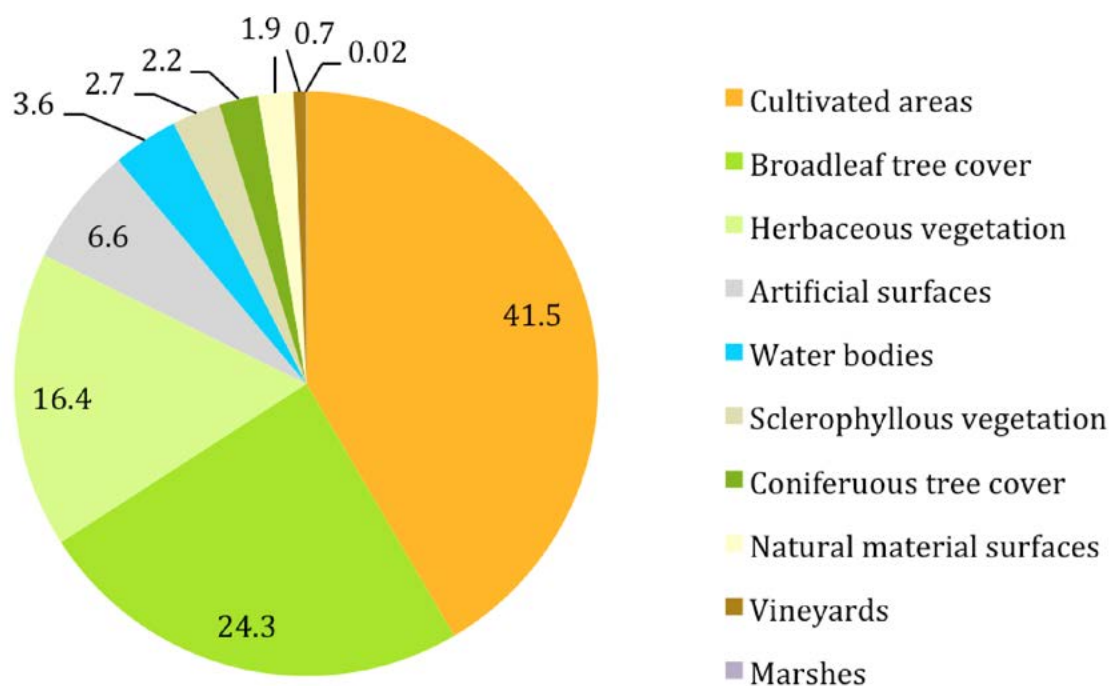


Chart 01. Land-use classes as a percentage of the bottleneck area of Rila-Verila-Kraishte ciocorridor (© BBF).

Code	Land use type	Area (ha)	Percent of total area
73	Cultivated areas	2077.3	41.5
82	Broadleaf tree cover	1217.0	24.3
102	Herbaceous vegetation	818.4	16.4
62	Artificial surfaces	330.0	6.6
162	Water bodies	182.2	3.6
104	Sclerophyllous vegetation	134.4	2.7
83	Coniferous tree cover	108.4	2.2
121	Natural material surfaces	97.5	1.9
75	Vineyards	34.0	0.7
105	Marshes	1.0	0.02

for protection of brown bear (*Ursus arctos*), viaduct and underpass for protection of wolf (*Canis lupus*). (Fig 5)

In order to improve the spatial accuracy, cadastral data with information on the permanent use-type were used for the analysis. Use-type classes are equated to their corresponding ones used in the Guidelines

for a standardised monitoring of structural connectivity.

The analysis of land use shows that the territory is mainly occupied by agricultural lands (41.5%) (Chart 01). The share of broad-leaved forests and herbaceous vegetation is significant, respectively 24.3% and 16.4%. Most of the Dyakovo dam falls within the

study area. The share of urban territory is small (6.6%), represented by Kremenik, Delyan and Topolnitsa villages. The settlements are sparsely populated – Kremenik (43 population), Delyan (76 population) and Topolnitsa (90 population). They are not densely built up and have large yards and gardens. Distribution of land use type can be seen in the table below.

### 2.5.2 Land ownership

Land ownership is an important aspect to consider when defining biocorridors and planning mitigation measures in this direction. The current ownership analysis is based on the latest cadastral map of Bulgaria and refers to the bottleneck area of interest.

The largest share falls within a private ownership (43.9%). Two more types of ownership can be attributed to it, which in total occupy a little over 1% - private (public organizations) and private (religious organizations). It should be mentioned that a cadastral map of Bulgaria has not been prepared for all settlements and for those where it is still missing, the ownership in the urban territories is marked as joint ownership. This is the case with the three settlements that fall within the considered area – Kremenik, Delyan and Topolnitsa villages – a total of 3% of the territory. The next types of ownership that occupy a significant percentage of the total area are state private, municipal public and municipal private, 19.7%, 12% and 11.3% respectively.

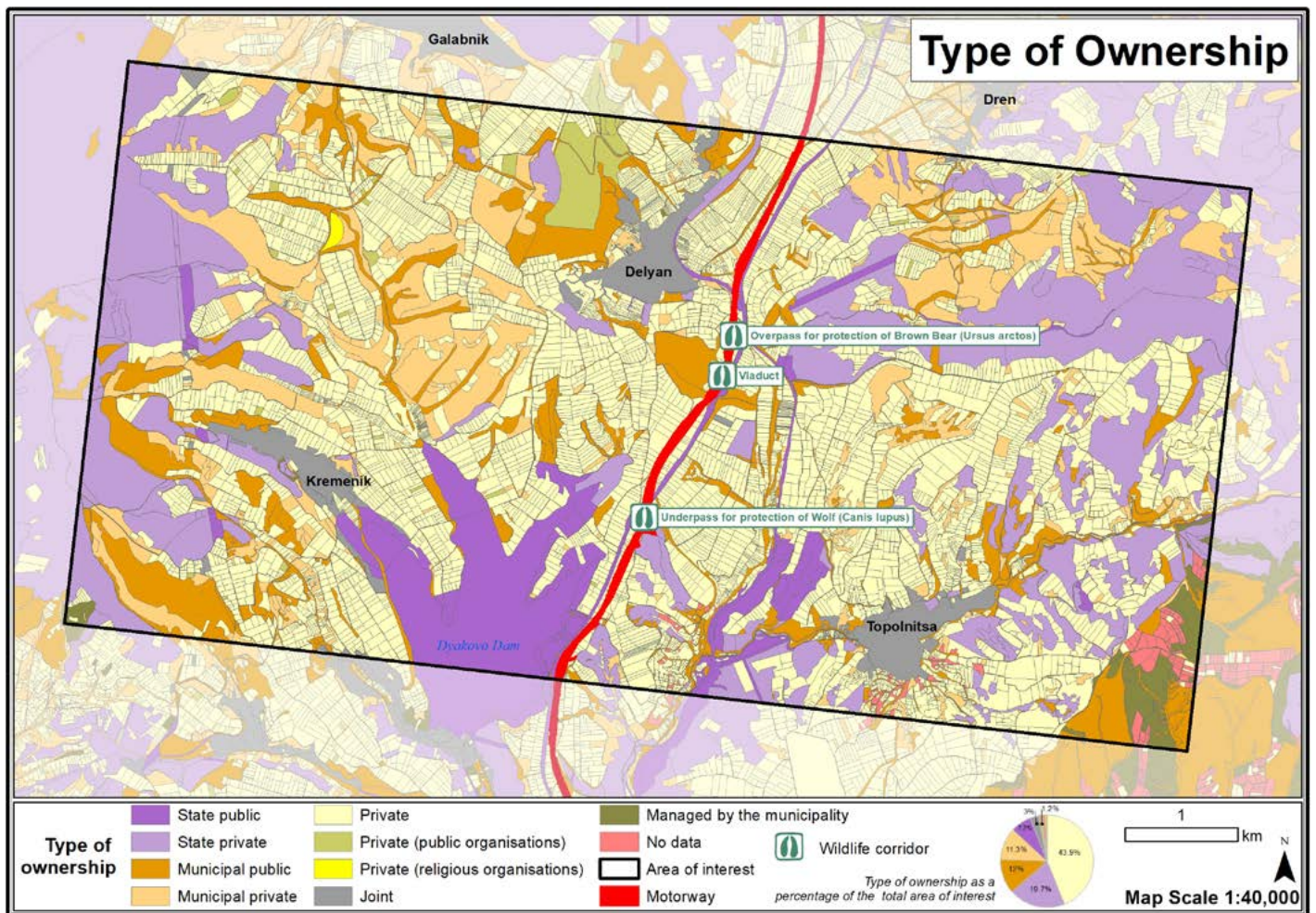


Fig 6. Type of landownership within the bottleneck area of Rila-Verila-Kraishte biocorridor (© BBF).



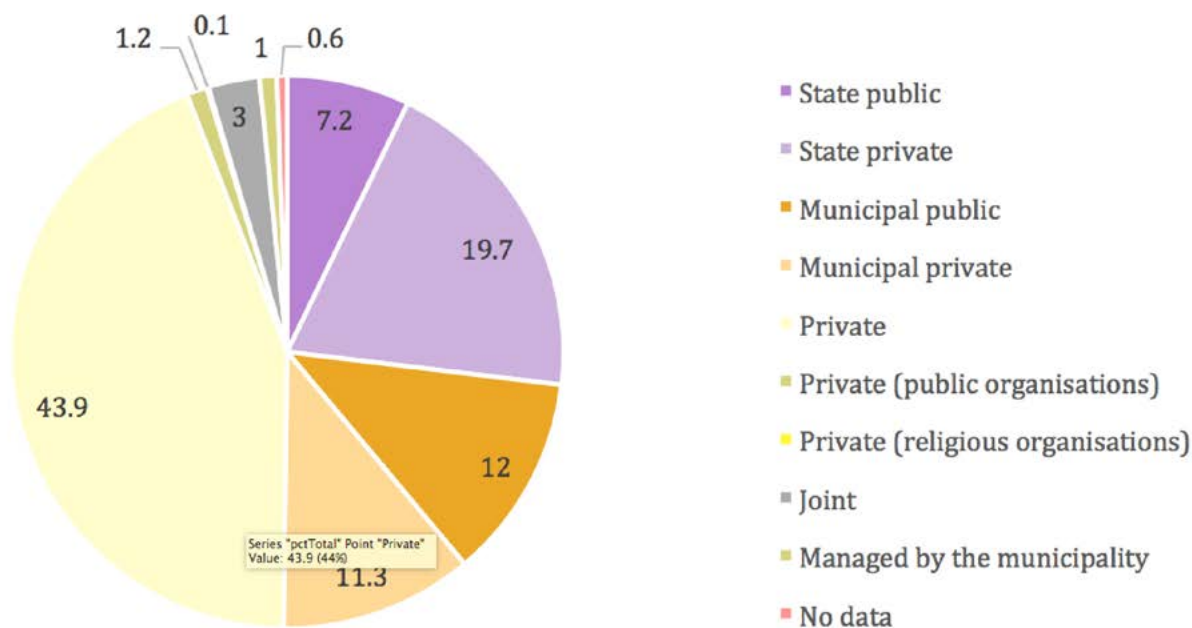


Chart 02. Type of landownership as a percentage of the bottleneck area of Rila-Verila-Kraishte biocorridor (© BBF).

Code	Ownership	Area (ha)	Percentage of total area (%)
1	State public	361.8961181	7.2
2	State private	985.1895415	19.7
3	Municipal public	601.1950785	12
4	Municipal private	566.3483714	11.3
5	Private	2,192.945911	43.9
7	Private (public organizations)	59.16116567	1.2
10	Private (religious organizations)	3.199462818	0.1
11	Joint	151.7141586	3
99	Managed by the municipality	47.1290969	1
100	No data	31.22107818	0.6

Another aspect of land ownership analysis is revealed by the number of cadastral parcels. The private parcels, besides occupying the largest area, are also the largest in number – 6,545 units or 74% of all parcels. In terms of their area, the most numerous are private parcels with a small area: 25% of private parcels are under 0.1 ha,

between 0.1 and 0.5 ha are 54%, between 0.5 and 1 ha are 16% and over 1 ha are only 5%.

The spatial distribution of ownership type can be seen on the map below, and in the table and chart – the exact area in ha and the percentage expression compared to the total area of the studied area.

### 2.5.3 Land use & Land ownership

Another aspect of the analysis presents the consideration of land use in the context of land ownership.

Cultivated areas, which occupy nearly half of the bottleneck area, include 87% of their area as a private land. The remaining 10% is municipal private ownership.

The forests that occupy the remaining half of the studied area; about 72% of these are state private, less than 10% are state public, municipal private and municipal public.

Regarding the territories with herbaceous vegetation (mainly pastures and abandoned lands), the ownership is mainly municipal – municipal public (38%) and municipal private (33%), as well as private (19%). Areas with sclerophyllous vegetation have a small relative area, but are an important habitat

for the studied species. 69% of their area is municipal public, and another 27% is private.

The spatial distribution of ownership type can be seen on the map below, and in the table and chart – the exact area in ha and the percentage expression compared to the total area of the studied area.

You can find more about the distribution of land-use types according to the type of ownership in the table below.

For the analyses of land use and landownership of the bottleneck areas, the following data sources were used: Land Parcel Identification System (2021), Ministry of Agriculture; Cadaster (2017), Geodesy, Cartography and Cadaster Agency; Orthophoto, Ministry of Agriculture; Road Network, Open Street Maps; River Network and Reservoirs, Geopolymorphic Ltd.

Land use	State public	State private	Municipal public	Municipal private	Private	Private (public organisations)	Private (religious organisations)	Joint	Managed by the municipality	No data	Total area (ha)
Artificial surfaces	71.6	11.6	113.4	0.0	8.5	0.02		124.6	0.3		330.0
Cultivated areas	8.9	6.1	1.0	209.7	1,805.2	13.7	3.2	27.2	2.1	0.2	2,077.3
Vineyards	1.3			7.4	24.7	0.6			0.04	8.0	42.0
Broadleaf tree cover	75.8	867.6	55.0	77.1	133.1	0.2					1208.9
Coniferous tree cover		76.9		3.4	28.1						108.4
Herbaceous vegetation	4.5	9.8	313.2	267.1	155.8	0.4			44.6	23.0	818.4
Sclerophyllous vegetation	3.2	1.2	92.3	1.1	36.6						134.4
Marshes					1.0						1.0
Natural material surfaces	18.3	11.9	22.9			44.3					97.5

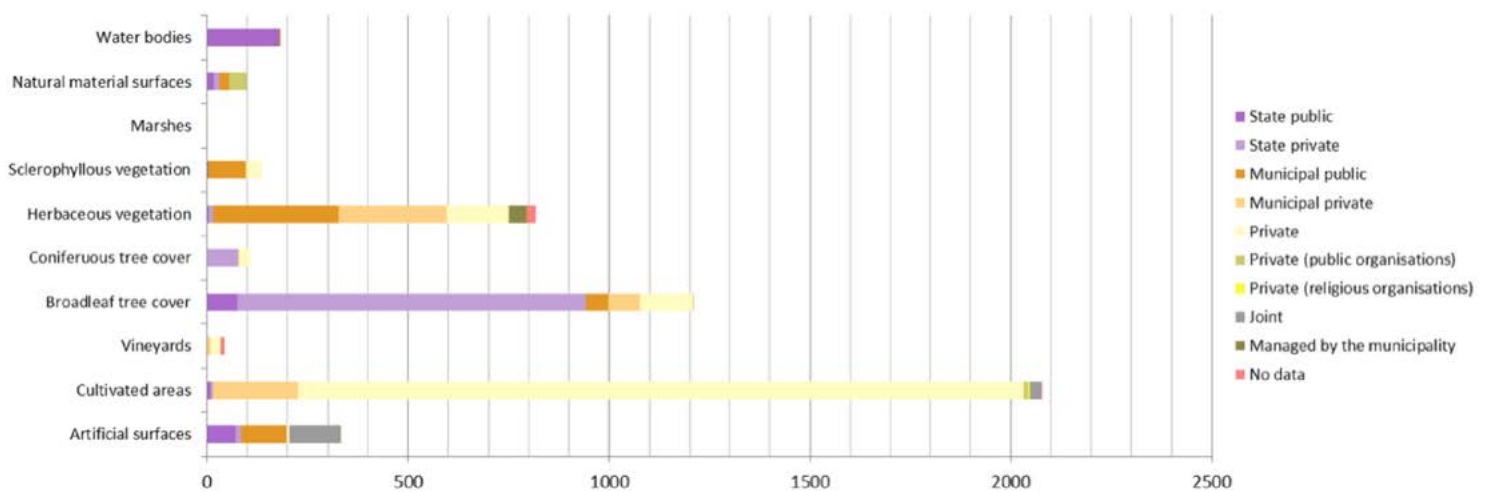


Chart 03. Land use & Land ownership within the bottleneck area of Rila-Verila-Kraishte biocorridor (© BBF).

### List of the main linear infrastructures that require attention during SaveGREEN (as they are not visible in CORINE)

Struma Motorway Section 1, a Parallel 1<sup>st</sup> class road, Intersecting country roads, the National railway

### List of Sectors to be addressed in SaveGREEN

- » Transport;
- » Agriculture;
- » Forestry;
- » Hunting and human-wildlife conflicts;
- » Natura 2000 sites management

### Group of species relevant for SaveGREEN

- » Mammals (large carnivores and herbivores, and medium-size mammals);
- » Reptiles & amphibians.



## CHAPTER 3

CROSS-SECTORAL OPERATIONAL PLAN FOR  
THE RILA-VERILA-KRAISHTE PILOT AREA:

# Logframe

© Petko Tzvetkov

# Threat/Pressure 1: New infrastructure projects may increase the barrier effect

## Objective 1.1. Ensure the functionality of underpasses

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1a. The designed sizes and/or number of objects (culverts, bridges) are being reduced during the design &amp; build approach, in order to reduce costs. As a result, in reality, the fragmentation impact becomes higher compared with the assessment based on the initial design plans.</p> <p>p1b: There is no overall monitoring programme addressing the functionality of all underpasses</p>	<p><b>1.1.1. All potential-ly-functional under-passes are included in the environment permits as wildlife-crossing structures</b></p>	<p>a. Assess and include all connectivity-relevant objects into the environmental permits;</p> <p>b. Specify this requirement within the EIA/EA procedures;</p> <p>c. Abandon design &amp; build approach in favour of producing detailed final technical plans that will be followed by building contractors and monitored by environmental authorities;</p> <p>d. Include all mitigation and defragmentation measures coming from EIA/AA procedures in building permits and include these in subsequent independent technical building control of construction processes;</p> <p>e. Classify the suitability of underpasses for different species groups;</p> <p>f. Design and develop an overall monitoring plan (standards, protocols, guidelines, responsibilities, tasks, infrastructure, budgets, database, and reports) for infrastructure which will include object-based monitoring protocols;</p> <p>g. Include the monitoring actions within the Natura 2000 management plans</p>
<p>p2a. There is little experience in Bulgaria in adjusting constructive details of objects in order to increase their functionality for wildlife.</p>	<p><b>1.1.2. Design and constructive specification are adjusted in order to maximize the functionality of under-passes</b></p>	<p>a. Develop guidelines on the functionality of underpasses and necessary technical design details;</p>
<p>p3a. Many underpasses are blocked by fences and other elements;</p>	<p><b>1.1.3. Structural barriers on objects, including those not designed primarily as wildlife-crossing structures, are avoided/removed</b></p>	<p>a. Develop an intervention programme (linked to the monitoring programme) aiming to maintain/enhance the functionality of underpasses;</p> <p>b. Include the measure within the Natura 2000 management plans;</p> <p>c. Document the impact of the measure as part of the object-based monitoring protocol, included in the overall infrastructure monitoring programme.</p>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p4. There is little experience in Bulgaria on the <b>integration of wildlife underpasses in landscape</b>, in order to increase their functionality for wildlife.</p>	<p><b>1.1.4. Underpasses are included into the surrounding green infrastructure</b></p>	<ul style="list-style-type: none"> <li>a. Develop guidelines on landscaping and build a capacity through know-how exchange;</li> <li>b. Include landscaping into the EIA/AA procedures and environmental permits, including the request to connect the underpasses with the existing green infrastructure;</li> <li>c. Include the measure within the Natura 2000 management plans;</li> <li>d. Develop pilot-projects focusing on specific management/restoration of green infrastructure to maximize the functionality of underpasses on the Sofia-Kulata railway, Struma motorway and other infrastructure projects through landscaping.</li> </ul>
<p>p5. <i>Noise and light pollution may impact the functionality of wildlife underpasses.</i></p>	<p><b>1.1.5. Design and constructive details are adapted to mitigate the noise and artificial lighting impacts (if the case)</b></p>	<ul style="list-style-type: none"> <li>a. Develop guidelines on noise/light pollution mitigation and build a capacity through know-how exchange;</li> <li>b. Include noise/light mitigation related to important objects within the EIA/AA procedures and environmental permits;</li> <li>c. Include noise/light mitigation related to important objects as a measure within the Natura 2000 management plans;</li> <li>d. Identify critical locations;</li> <li>e. Develop pilot-projects focusing on noise/light mitigation to maximize the functionality of objects on the Sofia-Kulata railway, Struma motorway and other infrastructure projects.</li> </ul>

## Objective 1.2. Ensure the functionality of overpasses

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. During the construction phase, the functionality of the corridor may be impacted significantly</p>	<p><b>1.2.1. The permeability of the terrain on top of tunnels is maintained during the construction</b></p>	<ul style="list-style-type: none"> <li>a. Develop guidelines on the functionality of overpasses – including on maintaining the permeability of tunnel tops during construction and build the expert capacity through know-how exchange;</li> <li>b. Include specific requests (based on guidelines) concerning the permeability of tunnel tops into the EIA/AA procedures and environmental permits;</li> <li>c. Include the permeability of tunnel tops as a measure within the Natura 2000 management plans;</li> <li>d. Include the monitoring of connectivity-relevant features as part of the tunnel tops management.</li> </ul>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p2. There are no plans in place to manage the surface of the green bridges and tunnels-top surface in order to maximize their functionality for wildlife	<b>1.2.2. Green bridges (including tunnel-top surfaces) are being managed in order to maximize their functionality for wildlife</b>	<ul style="list-style-type: none"> <li>a. Check the legal status of the land parcels;</li> <li>b. Produce suitability models for relevant species as a support for management plans;</li> <li>c. Produce management plans for overpasses;</li> <li>d. Develop guidelines on the management of the green bridges and build the expert capacity through know-how exchange;</li> <li>e. Include the green-bridges top-area management into the EIA/AA procedures and environmental permits;</li> <li>f. Include the management and monitoring as a measure within the Natura 2000 management plans;</li> <li>g. Develop procedures/legislation related to human access onto the green-bridges and tunnels and enforce regulations, inclusively as the Natura 2000 regulations;</li> <li>h. Develop pilot-projects focusing on specific management/maintenance and monitoring on green-bridges and tunnels of the Struma motorway and Sofia-Kulata railway as key elements of green infrastructure, in order to maximize their functionality and expand local experience.</li> </ul>
p3. There are no plans set for integrating the surface of the green bridges (including tunnel-top surfaces) within the surrounding landscape	<b>1.2.3. Overpasses are included into the surrounding green infrastructure</b>	<ul style="list-style-type: none"> <li>a. Develop guidelines on landscaping and build the expert capacity through know-how exchange;</li> <li>b. Include landscaping into EIA/AA procedures and environmental permits;</li> <li>c. Include landscaping as a measure within the Natura 2000 management plans;</li> <li>d. Develop pilot-projects focusing on specific management/restoration of green infrastructure to maximize the functionality of green-bridges on the Strauma motorway through landscaping, including long-term lease/acquiring land for conservation.</li> </ul>
p4. The Struma Section 1 motorway green-bridge leads wildlife into the E79 county road, as there was no integrated solution being adopted	<b>1.2.4. A solution to mitigate E79 county road at the Struma Section 1 motorway green-bridge has been agreed and implemented</b>	<ul style="list-style-type: none"> <li>a. Discuss potential solutions for the E79, based on the existing know-how;</li> <li>b. Develop a project to implement the solution.</li> </ul>

**Objective 1.3. Assign legal status and develop coherent regulations for providing ecological connectivity and defragmentation of linear infrastructure, e.g. for wildlife passages and biocorridors**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Insufficient legal framework to provide ecological connectivity and defragmentation of the linear infrastructure</p>	<p><b>1.3.1. The legal framework on connectivity and defragmentation is strengthened and enforced. Biocorridors are recognised at national level.</b></p>	<ul style="list-style-type: none"> <li>a. Adopt regulations with clear and binding procedures for implementing the general prescriptions of the legal norms of Art. 29&amp;30 of the Biodiversity Law;</li> <li>b. Develop a methodology of mapping the biocorridors at national level;</li> <li>c. Map the biocorridors and their official approval;</li> <li>d. Approve the standards with horizontal measures for the protection of biocorridors;</li> <li>e. Reflect the biocorridors in the official property cadastre;</li> <li>f. Elaborate clear procedural rules and regulations for the visualization and reflection of the biocorridors and their measures in the master plans and plans for the management of forests and agricultural lands;</li> <li>g. Create legal regulations allowing the implementation of measures in the biocorridors based on these plans – developed easement law or “ecological easements”;</li> <li>h. Create norms and guidelines for reflecting the biocorridors and measures for their protection in the SEA, EIA and AA decisions;</li> <li>i. Create the official technical standards and guidelines for planning, construction and maintenance of defragmentation facilities;</li> <li>j. Make changes in the legislation and integration of the topic in the territorial planning laws and include the requirements for defragmentation within the scope of construction quality control.</li> </ul>
<p>p2. The wildlife passing structures has no legal status in line with their critical ecological role – nor in the spatial planning, sectoral management or within green infrastructure</p>	<p><b>1.3.2. The important passing structures (tunnels, green-bridges, bridges, viaducts, underpasses) are included in a dedicated register and into spatial and sectoral plans, mentioning their (primary or secondary) functions for connectivity</b></p>	<ul style="list-style-type: none"> <li>a. Map Green Infrastructure elements and assess them in relation with land-use categories and sectoral plans;</li> <li>b. Assess wildlife passages/permeable sectors and assign ecological roles, draft a dedicated register;</li> <li>c. Agree upon specific sets of measures included in the spatial planning and sectoral management plans.</li> <li>d. Implement demonstrative harmonization of Green Infrastructure with land-use and sectoral plans and develop guidelines;</li> <li>e. Develop and implement upscaling projects.</li> </ul>



<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p3. The wildlife passing structures has no standard technical characteristics and requirements to provide their ecological functions.	<b>1.3.3. All types of wildlife passing structures (tunnels, green-bridges, bridges, viaducts, underpasses) are properly described with their technical requirements and characteristic and easements over the adjacent territories, including biocorridors.</b>	<ul style="list-style-type: none"> <li>a. Develop technical guidelines of identification of proper locations, planning, technical/engineer certificates and requirements of maintenance of defragmentation facilities;</li> <li>b. Adopt the official engineering regulations with technical standards for planning and construction of defragmentation structures;</li> <li>c. Integrate the mitigation measures of the EIA/AA permits into the building permits and thus ensure further regular technical monitoring of their implementation by independent building control (now outside of it);</li> <li>d. analyse and propose a system of easements over the adjacent territories of defragmentation facilities/wildlife passing structures, including biocorridors.</li> </ul>
p4. The wildlife passing structures or the permeable sectors are not included in the Natura 2000 management as having a critical ecological role	<b>1.3.4. Important passing structures (tunnels, green-bridges, bridges, viaducts, other large underpasses) and important permeable sectors of linear features are included into the Natura 2000 management plans with assigned measures for the land management, usage regulations and monitoring</b>	<ul style="list-style-type: none"> <li>a. Develop guidelines and implement the Natura 2000 sites specific conservation measures and regulations in order to maintain/enhance functionality;</li> <li>b. Integrate conservation measures and regulations into the updated Natura 2000 management plans;</li> <li>c. Integrate conservation measures, regulations and monitoring into coherent operational plans for regional action plans (i.e. the bear &amp; wolf regional action plans of LIFE LCC);</li> <li>d. Develop projects to implement measures, regulations and monitoring in the Natura 2000 sites;</li> <li>e. Produce the national EIA/AA guidelines related to permeability, adopted by the Road Infrastructure Agency and the Ministry of Environment and Water.</li> </ul>

### **Objective 1.4. Provide sufficient permeability of the new high speed railway Sofia-Kulata project**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. The environmental permit of the project of the new Sofia-Kulata high speed railway expired and the new EIA/AA procedure should be carried out	<b>1.4.1. The new high speed railway including the route, embankments, etc. is providing a wildlife passage at the best possible level.</b>	<ul style="list-style-type: none"> <li>a. The new EIA/AA procedure for the project should be initiated including reviewing and assessment of possible alternatives;</li> <li>b. Prepare and adopt a nature restoration plan for the old rail infrastructure;</li> <li>c. Plan new effective defragmentation structures as mitigation measures to the adopted alternative in relation to defragmentation with the adjacent motorway and local road.</li> </ul>

## Threat/Pressure 2: Structural interventions on the existing transport and other linear infrastructure (TLI)

...(maintenance, upgrading without changing the category/class of the infrastructure etc.)  
**and on other linear features may increase the barrier effect at landscape level.**

### **Objective 2.1. Maintain and enhance the permeability of the existing “bear” overpass km 314+070 (65 meters wide overpass, 42.376528°, 23.112775°)**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Missing micro-habitats and animal shelters on the surface of the overpass, improper management and decreased permeability of the facility for different animal species.</p>	<p><b>2.1.1. Installation and construction facilities providing micro-habitats and animal shelters on the surface of the overpass and enhancing its multi-functionality for different animal groups</b></p>	<p>a. Planting a strip of bushes along the edge of the facility and 2 interrupted strips of bushes crossing the facility. When planting, leave a continuous middle and two narrower side strips of grass. Maintain against overgrowing. The types of bushes should be low growing, with a shallow root system, drought-resistant and representatives of the local flora. Shrub vegetation should provide cover and refuges for various species of mammals and reptiles, as well as a micro-habitat for invertebrates.</p> <p>b. Building small reservoirs (fed by rainwater and highway runoff) serving as a watering hole for wild animals and attracting them to the overpass. Location of one or both overpass exits. Preventing their use by livestock – placing information signs, building a watering hole for domestic animals on the side and at a distance from the facility.</p> <p>c. Building small aquatic micro-habitats on the surface of the overpass for amphibians fed by rainwater. Their construction should be specified with specialists, but it may resemble the characteristic drinking troughs for animals from arid mountainous regions (a usual habitat for amphibians in such regions) – small but deep mini-water reservoirs with a sloping outlet and covered from the sunlight with stone walls and a stone roof.</p> <p>d. Building small stone micro-habitats on the surface of the overpass for reptile shelters. Their construction should be specified with specialists.</p> <p>e. Maintaining sound and light proof panels on both sides of the overpass – protecting also the area of entrances.</p> <p>f. Preventing a possible use of the overpass by people and domestic animals.</p>

**Objective 2.2. Maintain and enhance the permeability of the existing small viaduct km 314+400 (220 meters wide, 15 meters high small viaduct, 42.373297°, 23.111717°)**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Missing micro-habitats and animal shelters on the surface below the viaduct, improper management and decreased permeability of the facility for different animal species.	<b>2.2.1. Installation and construction facilities providing micro-habitats and animal shelters</b>	<p>a. Build small reservoirs (one or more, fed by rainwater and highway runoff) serving as a watering hole for wild animals and attracting them to the viaduct. Prevent their use by livestock – place information signs, build a watering hole for domestic animals on the side and at a distance from the facility.</p> <p>b. Build small aquatic micro-habitats below the viaduct for amphibians fed by rainwater. Their construction should be specified by experts.</p> <p>c. Ensure watering of the surface under the viaduct from the highway runoff. Planting shade-loving grass and shrub vegetation.</p> <p>d. Prevent possible regular use of surfaces below the viaduct by people and domestic animals.</p>
P2. Noise and light pollution – no mitigation measures undertaken to reduce them.	<b>2.2.2. Taking measures to reduce noise and light pollution to the maximum extent possible.</b>	<p>a. Install noise- and light-proof panels on both sides of the overpass.</p> <p>b. Repair and silence the facilities on the motorway surface that produce loud noise when vehicles pass on the highway.</p> <p>c. Develop and apply a monitoring plan and establish monitoring facilities (camera traps, sand strips). Monitor with proper methods all reliable species groups.</p>
P3. The existence of retaining wall hindering the free movement of animals on about 50% of the viaduct length	<b>2.2.3. Removal of vertical barriers to animal movement</b>	<p>a. Fill the space next to the retaining wall with earth, create a slope of no more than 40% and plant vegetation.</p>

**Objective 2.3. Maintain and enhance the permeability of the existing underpass for wolves km 315+900 (15 meters wide, 15 meters high, 42.361769°, 23.104056°)**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Missing micro-habitats and animal shelters on the surface of the underpass, improper management and decreased permeability of the facility for different animal species.	<b>2.3.1. Installation and construction facilities providing micro-habitats and animal shelters</b>	<p>a. Maintain the existing small reservoir as a watering hole for wild animals and attract them to the underpass.</p>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
P2. Noise and light pollution – no mitigation measures undertaken to reduce them.	<b>2.3.2. Taking measures to reduce noise and light pollution to the maximum extent possible.</b>	<p>b. Install noise- and light-proof panels on both sides of the underpass.</p> <p>c. Repair and silence the facilities on the motorway surface that produce loud noise when vehicles pass on the highway.</p>
P3. Use of the underpass as a sunproof resting and watering place for livestock	<b>2.3.3. Elimination of permanent human and domestic animal presence in the underpass</b>	d. Take measures to prevent a possible regular use of the surfaces below the underpass by people and domestic animals. Place information signs, build a resting place and watering hole for domestic animals on the side and at a distance from the facility.

**Objective 2.4. Maintain and enhance the permeability of the habitats of the highway in the immediate vicinity of the 3 defragmentation facilities in the section of the highway between km km 313+700 (42.379875°, 23.112631°) и km 317+330 (42.350314°, 23.096403°) in this section are the main connecting habitats and the corridor between NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina”**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Maintenance and proper management of the vegetation	<b>2.4.1. Provide suitable conditions for animals to approach the area of facilities and guide them to the entrances of the defragmentation facilities</b>	<p>a. Maintain naturally growing shrub and tree vegetation from cutting/clearing</p> <p>b. Plant feeding plants at the entrances – wild fruit and nut trees to attract herbivores to the entrances of the facilities. Plant guiding bush hedges and other guiding landscape structures.</p> <p>c. Prevent any future constructions in the section and/or night lighting of the motorway</p>
p2. High level of regular human and livestock presence in the area	<b>2.4.2. Reduce the human and livestock presence and prevent regular impact of this type and, thus, prevent wildlife avoidance.</b>	<p>d. Ban the use of the area by livestock – informing farmers, putting signs etc.</p> <p>e. Create alternative watering and resting places for livestock – outside the area.</p> <p>f. Limit possibilities for off-road activities by placing the facilities that prevent the entrance of vehicles in the defragmentation facilities.</p> <p>g. Plant shrub hedges (natural spiny species) between the local roads and the defragmentation facilities at the motorway and prevent easy human access to the area.</p> <p>h. Put permanent camera photo-traps and place signs informing that poaching/hunting is prohibited and the area is under permanent observation.</p>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
P3. Possible cumulative fragmentation from fragmented local road passing in the vicinity of the motorway.	<b>2.4.3. Assess the importance of fragmentation arising from the local road, and if necessary, undertake defragmentation measures</b>	<ul style="list-style-type: none"> <li>i. Establish a continuous monitoring programme and assess the level of additional fragmentation caused by the local road;</li> <li>j. Plan possible construction in the future of overpasses and underpasses connected to the 3 existing defragmentation facilities in the motorway section.</li> </ul>

**Objective 2.5. Providing future assessment and planning defragmentation measures along the motorway section in the rest of potential connectivity area, between mountains west and east of the motorway Struma and outside the evaluated in detail priority section – the motorway section between km 317+330 and km 329+140.**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. The existing motorway facilities, which can provide defragmentation are not planned and maintained as such by the authorities.</p> <p>These facilities are as follows:</p> <ul style="list-style-type: none"> <li>- Farmers underpass at km 317+330 (42.350314°, 23.096403°)</li> <li>- Viaduct at km 320+650 (42.321617°, 23.095092°)</li> <li>- Farmers underpass at km 321+345 (42.315403°, 23.095856°)</li> <li>- River channel km 321+500 (42.313914°, 23.096406°)</li> <li>- Viaduct km 322+400 (42.305969°, 23.094481°)</li> <li>- Tunnel from km 324+460 to km 324+840 (42.287036°, 23.086492°)</li> <li>- Viaduct km 327+050 (42.269558°, 23.070372°)</li> <li>- Viaduct km 328+750 (42.256647°, 23.077233°)</li> <li>- Viaduct km 329+140 (42.254617°, 23.081344°)</li> </ul>	<b>2.5.1. Developing and application of plan for defragmentation based on the existing motorway facilities</b>	<ul style="list-style-type: none"> <li>a. Assessment of construction and surrounding habitats in each facility</li> <li>b. Planning necessary measures to improve and maintain permeability</li> <li>c. Adoption of plan by the road authorities</li> </ul>

## Threat/Pressure 3: Linear transport infrastructures (including electric power lines) cause wildlife mortalities

**Objective 3.1. Implement an adequate fencing system in the section of the Struma motorway between km 313+700 (42.379875°, 23.112631°) and km 329+140 (42.2546167°, 023.0813444°)**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. The existing fences in subsection km 313+700 (42.379875°, 23.112631°) and km 317+330 (42.350314°, 23.096403°) are not effective and proofed for species like bear, wolf and large herbivores. Escape facilities are missing et all. In this section, the main connecting habitats and the corridor between NATURA 2000 sites are BG0000305 "Verila" and BG0000298 "Konyavska planina"</p>	<p><b>3.1.1. Provide bear-proof fencing that prevents road accidents and guides animals toward defragmentation facilities</b></p>	<p>a. Re-install and provide new bear-proof fences in this section            b. Assess the place to install escape gates            c. Include the monitoring and maintenance of this fencing facilities as part of regular road-safety audits, according the article 3 of the Directive 2008/96/EC on road safety and integration of both policies.</p>
<p>p2. There are no efforts to prevent mortality of small mammal species and reptiles</p>	<p><b>3.1.2. Provide the fencing properly designed for small species of animals (tortoises as umbrella species)</b></p>	<p>a. Construct and maintain a solid vertical fence with height 30 cm from the ground and dig into the surface, where suitable habitats for small animal species are crossed. Provide escaping surface on the side of the motorway with no more than 40-degree slope. The construction of such fences can be integrated and included in the construction of roadside ditches.            b. Provide additional fencing for small mammals like rabbits etc. as a small opening mesh raised up to 50 cm above the ground level, combined and attached to the main fence for the big mammals.            c. Provide necessary defragmentation facilities – small underpasses and culverts (also through adopting the existing ones) with the minimum size of 1.5 meters and the minimum distance of 200 meters. Guiding structures towards culverts/small underpasses should be provided. The entrances of the culverts/small underpasses should be properly connected to the surface with no steep slopes leading up to them.            d. Provide monitoring of the effectiveness of these culverts.</p>

### Objective 3.2. Direct animals towards functional underpasses

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. For unfenced infrastructure (national roads, railways), the possibility for wildlife to cross over embankments is still present. As discussed, the priority would be to make so many functional underpasses that the collision risk would be minimized. The fencing sectors where functional underpasses are located will increase the chance for medium/large-sized mammals to use those underpasses.</p>	<p><b>3.2.1. Fencing areas above the functional underpasses for medium/large mammals is being considered</b></p>	<p>a. Design solutions and specifications for the fencing, based on expertise exchange;            b. Develop a pilot project to implement the solutions on the railway;            c. Map underpasses and assess traffic/wildlife incidents on roads after the motorway completion;            d. Develop a pilot project to implement the solutions on the national roads, if necessary.</p>
<p>p2. A system of guiding elements for amphibians, reptiles and small mammals is not in place.</p>	<p><b>3.2.2. A dedicated system of solutions to guide amphibians, reptiles and small mammals towards functional underpasses is set in place for the motorway, railway and roads</b></p>	<p>a. Implement solutions requested by environmental permits;            b. Map traffic-kill sectors significant for amphibians and reptiles;            c. Develop a pilot project to identify important areas for amphibians/reptiles/small-size animals and high mortality risk zones;            d. Implement solutions on the railway, roads and motorway.</p>

### Objective 3.3. Warning drivers on roadkill/accident-prone areas

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. The high-risk areas are not being regularly assessed and identified based on robust data collection. The completion of motorway will affect traffic in the area and may affect the location of the roadkill/accident-prone sectors.</p>	<p><b>3.3.1. Efficient warning signs are installed in accident-prone areas on the roads</b></p>	<p>a. Extend data collection and identification of high-risk areas on the roads;            b. Develop a pilot project to implement traffic signs in high-risk areas;            c. Monitor the reaction of drivers to the classic traffic-warning signs.</p>
<p>p2. Classic warning signs may not trigger the expected reactions from drivers as they get used to them with time. In this respect, new type of signs or detectors should be tested.</p>	<p><b>3.3.2. New types of warning devices, including automatic animal-detectors on the roads are being tested and implemented</b></p>	<p>a. Monitor the efficiency of classic and alternative traffic signs;            b. Develop a pilot project to implement alternative traffic signs;            c. Test and implement automatic animal detectors.</p>

### Objective 3.4. Collect and process data to identify incident-/accident-critical sectors on roads, motorways and railways

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Currently, there are no officially accepted coherent procedures of collecting traffic-kill data on railways and motorways and, thus, there is no assessment of black-spots and investigation of causes in order to prevent further incidents.</p>	<p><b>3.4.1. A standardized mobile app for professional monitoring is being developed, information is being collected informing a dedicated database with records on incidents on the roads, motorways and railways</b></p>	<ul style="list-style-type: none"> <li>a. Develop methodologies, a mobile app and a support database for the official data collection and assessments based on the exchange of expertise;</li> <li>b. Develop pilot projects to implement data collection and develop best practices;</li> <li>c. Support building a database and produce assessment results;</li> <li>d. Develop country/regional/European scale projects with a coherent data input.</li> </ul>
<p>p2. Currently, there are a number of project-based data reporting cases which are open to general public, but there is no operational open mobile-application aiming to collect data related to roadkills.</p>	<p><b>3.4.2. A traffic-kill mobile application for citizen-science is available and linked with a managed database</b></p>	<ul style="list-style-type: none"> <li>a. collection and assessment based on the exchange of expertise;</li> <li>b. Develop pilot-projects to test and implement data collection and develop best practices;</li> <li>c. Promote the mobile app to drivers;</li> <li>d. Support building a database and produce assessment results;</li> <li>e. Develop country/regional/European scale projects with a coherent data input.</li> </ul>
<p>p3. Currently, there are no coherent procedures of collecting traffic-kill data from accidents reported to the police or insurance companies or from other authorities, such as protected area managers, agencies, and game managers.</p>	<p>3.4.3. Data from the police, insurance companies and other authorities (game managers, different agencies, ...) are synchronized</p>	<ul style="list-style-type: none"> <li>a. Develop protocols of collaboration and exchange of data;</li> <li>b. Develop pilot projects to implement data collection and develop best practices;</li> <li>c. Support building a database and produce assessment results;</li> <li>d. Develop country/regional/European scale projects with a coherent data input.</li> </ul>



**Objective 3.5. Create and/or train /equip specialized teams/specialised employees in Regional Road departments to deal with wildlife-related incidents on motorways, railways, roads, including emergency interventions**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Large (and medium-sized – i.e. the wild boar) mammals entering the motorway may lead to accident-prone situations and needs rapid and specialized interventions in order to stop the traffic, drive the animal towards an exit, tranquilize and relocate or even kill the animal in order to prevent human casualties</p>	<p><b>3.5.1. Specialized teams are operational</b></p>	<p>a. Create a working group with a motorway company and stakeholders in order to identify working scenarios;            b. Draft integrated standard procedures and identify the needs – resources, training, equipment, collaboration protocols with other authorities/responsible;            c. Expertise exchange with other countries;            d. Develop and implement pilot-projects to create best-practices;            e. Address legislation update.</p>

**Objective 3.6. Develop and use an integrated database as a decision-support tool to address traffic incidents** (for implementing/adjusting measures to prevent wildlife traffic-kills/damage/human casualties)

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. There is a lack of integrated data collection and integrated assessment to identify and understand the causes, the favouring factors and to adjust the existing measures or implement new ones in order to reduce traffic-related incidents.</p>	<p><b>3.6.1. Collect and input all relevant data into an integrated database</b>  <b>3.6.2. Identify, monitor and assess causes favouring black-sectors</b>  <b>3.6.3. Assess the impact of the adjusted/new measures being implemented to prevent traffic-kills</b></p>	<p>a. Develop and support an integrated database, data-collection and validation protocols;            b. Support studies to understand the dynamic of traffic-related incidents;            c. Develop pilot projects to assess the impact of adjusted/new measures being implemented to prevent traffic-kills.</p>

## Threat/Pressure 4: Changes of the land-use category may reduce landscape permeability

### Objective 4.1. Enforce/update legislation preventing changes of land-use category towards less permeable categories (including compensatory measures targeting connectivity)

(potential) Problems	Proposed Measures / Targets	Actions
p1 Non implementation of art. 10 of Directive 92/43 on improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape, which are of major importance for wild fauna and flora, including migration.	<b>4.1.1. Development of legal, administrative and information management tools for application of art. 10 of Directive 92/43</b>	<p>a. Develop the official GIS database and incorporate in the Cadastre of biocorridors and important landscape features for habitat connectivity at national scale</p> <p>b. Develop regulations for implementing art. 10 in spatial planning and other sector's decisions, including forestry, agriculture, mining, etc., reflecting ecological requirements of different groups of species, including: steppe species, open spaces (non-forest, shrub lands, mosaic landscape) species, water-dependent species, small, medium and large-sized species, and subMediterranean/ Mediterranean species.</p> <p>c. Develop legal provisions to prevent negative changes of land use within biocorridors;</p> <p>d. Develop active measures at national level for land use improvement within biocorridors.</p>
P2. The SEA/EIA/AA procedures do not acknowledge the connectivity-related impacts of various sectors, including transport, forestry, agriculture, mining, etc	<b>4.1.2. Plans and projects of different sectors are being assessed for connectivity-impact part of the SEA/EIA/AA procedures</b>	<p>a. Include connectivity-related objectives into the SEA/EIA/AA procedure;</p> <p>b. Develop and adopt the national guidelines.</p>

### Objective 4.2. Facilitate/support changes of land-use category toward more permeable categories (i.e. through agricultural/Natura 2000 payments sensitive to connectivity)

(potential) Problems	Proposed Measures / Targets	Actions
p1. Missing and fragmented forest cover or ploughing of arable land in the vicinity of motorway defragmentation facilities	<b>4.2.1. Land purchase programme or other measures developed (reforestation, contracts with owners etc.) to provide long-term restoration of suitable permeable habitats in the biocorridor through the Struma motorway</b>	<p>a. Lobby for addressing the issue in the national road and environment authorities planning process – as part of finalizing of the TEN-T project of the Struma motorway</p> <p>b. Propose a project under the “Green Deal” financial programme.</p> <p>c. Developing projects and independent fundraising by NGOs – as an alternative.</p> <p>d. Justify this and similar measures with the EU “Biodiversity strategy 2030” and the new EU restoration law</p>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p2. Natura 2000 payments sensitive to connectivity are not identified, developed or implemented	<b>4.2.2. Natura 2000 payments sensitive to connectivity are set and implemented</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Develop case-study projects to evaluate cost-benefits;</li> <li>c. Develop guidelines;</li> <li>d. Develop Natura 2000 measures and payment schemes;</li> <li>e. Implement and monitor the schemes efficiency.</li> </ul>

## Threat/Pressure 5a: Changes in land management – fencing\* - may reduce landscape permeability

*\*This does not refer to fencing of transport infrastructures.*

### Objective 5a.1. Set fencing regulations and promoting unfenced areas

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Permanent fencing units are being built without permits or without any environmental assessment (currently, in most cases, fencing is not a subject of any procedure or is approved by only screening with decision not to make an assessment)	<b>5a.1.1. Legislation on building permanent fencing is enforced</b>	<ul style="list-style-type: none"> <li>a. Develop a map with the existing permanent fences in critical areas;</li> <li>b. Inform responsible authorities;</li> <li>c. Assess permanent fencing impact during the SEA/EIA/AA. Develop official regulations for a screening phase of the SEA/EIA/AA – when the fencing requires full assessment;</li> <li>d. Enforce Article 145 of the Bulgarian Forestry Act which prohibits fencing in forests and agricultural lands without permission</li> <li>e. Adoption a regulation for fencing and wildlife permeability in agricultural lands</li> </ul>
p2. There are no incentives for voluntary unfenced zones within connectivity-important areas	<b>5a.1.2. Voluntary unfenced zones are supported</b>	<ul style="list-style-type: none"> <li>a. Include in the guidelines special agri-measures and renaturation in corridors with no permanent fencing.</li> </ul>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p3. Regulation of fencing is not part of the Natura 2000 sites, nor corridor management or Natura 2000 payments	<b>5a.1.3. Fencing-related measures are included into the Natura 2000 sites and corridor area management &amp; payments</b>	a. Develop good practices and payment schemes; b. Assess permanent fencing impact during the AA; c. Reflect the threat from permanent facing (inside and outside in biocorridors to the sites) in conservation priorities/goals of the NATURA 2000 sites and relevant conservation measures.
p4. Fencing of adjacent land to passageways on transport infrastructure is not being considered as a problem to solve	<b>5a.1.4. Agreements with landowners &amp; compensatory payments are in place to secure unfenced areas in close proximity of wildlife passageways (objects and sectors) on transport infrastructure</b>	a. Develop guidelines of good practices; b. Include it as mitigation (respecting mitigation hierarchy) requirements regarding the EIA/AA procedures.

### **Objective 5a.2. Develop guidelines and impose fencing-related conditions linked with agriculture, forestry subsidies or other specific programmes**

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. A certain percentage of unfenced areas is not imposed on the cultivated land as a voluntary condition for agricultural subsidies	<b>5a.2.1. State Fund for Agriculture payments includes a percent of not-fenced area of cultivated area as a condition for voluntary subsidies</b>	a. Relate with the responsible authorities; b. Update the legislation, if needed; c. Impose the legislation.
p2. Specific legislation regarding wildlife damage prevention does not impose conditions to prevent significant barriers	<b>5a.2.2. Large electric-fencing barriers are a subject of environmental assessment procedure on potential connectivity impact</b>	a. Assess practices; b. Evaluate the potential impacts; c. Propose conditions to be included in the specific legislation; d. Relate with the responsible authorities.
p3. Forestry legislation does not impose conditions to prevent significant barriers	<b>5a.2.3. Fencing in forest or afforestation areas are a subject of environmental assessment procedure on potential connectivity impact</b>	a. Assess practices; b. Evaluate the potential impacts; c. Propose conditions to be included in specific legislation; d. Relate with the responsible authorities.

## Threat/Pressure 5b: Changes in land management – crop cultivation/natural vegetation management – may reduce landscape permeability

### Objective 5b.1. Prevent large-scale monocultures and/or facilitate & support mosaic cultivation

(potential) Problems	Proposed Measures / Targets	Actions
p1. Cultivation patterns sensitive to connectivity are not attractive for farmers from the business perspective	<b>5b.1.1. Subsidies for hay meadows in connectivity areas are attractive for farmers</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Explore future inclusion of special subsidies for hay meadows in the connectivity areas;</li> <li>c. Monitor the impact.</li> </ul>
p2. Cultivation patterns sensitive to connectivity are not attractive for farmers from the business perspective	<b>5b.1.2. Subsidies for mosaic-type of cultivations in connectivity areas are attractive for farmers</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Explore future inclusion of special subsidies for mosaic-type of cultivation in connectivity areas;</li> <li>c. Monitor the impact.</li> </ul>
p3. Options for funding to secure land for connectivity are limited.	<b>5b.1.3. Land-acquisition for ecological connectivity is supported</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Explore future inclusion of land-acquisition for ecological connectivity in the funding programmes;</li> <li>c. Develop guidelines;</li> <li>d. Implement a pilot project and monitor the impact;</li> <li>f. Scale-up and monitor the impact.</li> </ul>

### Objective 5b.2. Support adequate management of natural features & marginal habitats

(potential) Problems	Proposed Measures / Targets	Actions
p1. The existing connectivity-sensitive agriculture norms are not fully implemented	<b>5b.2.1. GAEC/SMR norms on protection of natural features and vegetation are being implemented and controlled</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Develop an overview of issues;</li> <li>c. Implement the legislation.</li> </ul>

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p2. The agricultural norms are not adapted to support the protection of green infrastructure elements	<b>5b.2.2. Management norms in agriculture are harmonized with green infrastructure protection</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Implement pilot projects;</li> <li>c. Evaluate cost-benefits;</li> <li>d. Develop norms/guidelines of best practices;</li> <li>e. Implement the updated legislation.</li> </ul>
p3. Pastures with trees are not covered by any conservation-sensitive legislation and, therefore, transformed either into pastures or into forests	<b>5b.2.3. Management norms for forested pastures are set in-line with conservation needs of these habitats</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Develop an overview of issues;</li> <li>c. Develop norms/guidelines of best practices;</li> <li>d. Develop specific legislation or update the one on agriculture;</li> <li>e. Implement the updated legislation.</li> </ul>
p4. The existing connectivity-sensitive forestry norms are not fully implemented	<b>5b.2.4. Forestry norms on the protection of natural features important for connectivity are being implemented and controlled</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Develop an overview of issues;</li> <li>c. Implement the legislation.</li> </ul>
p5. The forestry norms are not adapted to support the protection of green infrastructure elements	<b>5b.2.5. Forest management best practices in the Natura 2000 sites and connectivity areas are available</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Implement pilot projects;</li> <li>c. Evaluate cost-benefits;</li> <li>d. Develop norms/guidelines of best practices;</li> <li>e. Implement the updated legislation.</li> </ul>
p6. The existing norms are not considering forested windbreaks as the multifunctional green infrastructure elements	<b>5b.2.6. Guidelines for multifunctional (green infrastructure role) forested windbreaks are available</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Develop an overview of issues;</li> <li>c. Implement pilot projects;</li> <li>d. Evaluate cost-benefits;</li> <li>e. Develop norms/guidelines of best practices;</li> <li>f. Implement the updated legislation.</li> </ul>

### Objective 5b.3. Promote and support development of good-practice examples of connectivity-sensible agriculture, water management and forestry practices

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. There are no incentives for farmers to conduct close-to-nature and connectivity-sensible agricultural management	<b>5b.3.1. Close-to-nature and connectivity-sensible agricultural management is promoted and supported</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Set-up dedicated funding programmes;</li> <li>c. Promote new approaches.</li> </ul>
p2. There are no incentives for foresters to conduct close-to-nature and connectivity-sensible forestry management	<b>5b.3.2. Close-to-nature and connectivity-sensible forestry management is promoted and supported</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities;</li> <li>b. Set-up dedicated funding programmes;</li> <li>c. Promote new approaches.</li> </ul>

### Objective 5b.4. Providing connectivity for key species Brown bear (*Ursus arctos*), Wolf (*Canis lupus*), Red deer (*Cervus elaphus*) between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina” – the biocorridor is situated west and east of motorway section between km 313+700 and km 317+330.

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Current conditions in the biocorridor between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina” are unfavourable for easily-disturbed species of Brown bear ( <i>Ursus arctos</i> ), Wolf ( <i>Canis lupus</i> ), and Red deer ( <i>Cervus elaphus</i> ). Disturbance/intensive hunting and lack of continuous forest vegetation providing shelters in some areas disturb permeability of the habitats of the biocorridor between the 2 NATURA sites.	<b>5b.4.1. Restoration of favourable conditions in the biocorridor between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina” for key species of Brown bear (<i>Ursus arctos</i>), Wolf (<i>Canis lupus</i>), Red deer (<i>Cervus elaphus</i>)</b>	<ul style="list-style-type: none"> <li>e. Protect the existing forest and shrubby patches from intensification of human activities and clearance of forest/shrubby vegetation west and east of this motorway section. Particularly important for the low mountain and hilly areas at distance up to 4 km (after these continuous mountain forest starts) west of the section of the motorway in the outskirts of Konyavska mountain and between the village of Delyan to the north and Dyakovo pond and the village of Kremenik to the south. Such measure is also important for the area east of this section.</li> <li>f. Gradually replace the arable lands with forests vegetation in the area of the biocorridor west and east of the motorway. The areas in the close vicinity of the motorway section are of primary importance (purchasing lands, contracts with land owners), thus, provide shelters for the species with protective and escaping behaviour in condition of intensive poaching.</li> <li>g. Plant wild fruit and nut tree species to attract bears and other herbivores to the biocorridor.</li> <li>h. Make official mapping of the biocorridor and officially define areas falling within.</li> </ul>

## Threat/Pressure 5c: Land management causing degradation of natural habitats may reduce landscape permeability

### Objective 5c.1. Prevent field arsons/enforce legislation regarding fire incidence

(potential) Problems	Proposed Measures / Targets	Actions
p1. Although specific legislation exists, it has not been enforced. With climate change fire incidence risk is increasing	<b>5c.1.1. Legislation on fire incidence is enforced, field arsons are being reduced and the fire prevention measures are defined</b>	<ul style="list-style-type: none"> <li>a. Relate with the responsible authorities.</li> <li>b. Increase the efficiency of enforcement through correlation field controls and satellite imagery monitoring with the <b>State Fund for Agriculture</b> ownership databases.</li> <li>b. Develop specially-trained teams to respond to major fire outbreaks.</li> <li>d. Support the local council-based fire teams to implement fire prevention measures.</li> </ul>

## Threat/Pressure 6a: Other anthropogenic activities – game management – may reduce landscape permeability

### Objective 6a.1. Harmonize game management with Natura 2000 and connectivity-related objectives

(potential) Problems	Proposed Measures / Targets	Actions
p1. Game management is not harmonized with Natura 2000 and with connectivity-related objectives	<b>6a.1.1. Game management is harmonized with Natura 2000 and connectivity-related objectives</b>	<ul style="list-style-type: none"> <li>a. Develop a good-practices guideline for game management in the Natura 2000 areas and for corridors (correlated with other relevant sectors – conservation, agriculture, forestry, development, damage-prevention, tourism, ...);</li> <li>b. Adapt hunting management to include no-hunting zones and no-drive zones in the critical connectivity areas.</li> </ul>
p2. Intensive game management including fencing and repelling of carnivores and specific guidelines in applying the SEA/EIA/AA procedures for game management plans have not been applied for game management plans (GMPs).	<b>6a.1.2. Develop coherent game management plans; SEA/EIA/AA procedures are applied</b>	<ul style="list-style-type: none"> <li>a. Develop the SEA/EIA/AA guidelines for game management plans;</li> <li>b. Implement procedures and practical implementation/law enforcement.</li> </ul>



## Objective 6a.2. Facilitate data-collection on key-species

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Census and monitoring methodologies implemented by the Forestry/ Game management authorities and hunters are unreliable and need improvements</p>	<p><b>6a.2.1. Develop a monitoring programme on game species and improve census methodologies as well as collaboration with game management authorities and hunters</b></p>	<p>a. Develop and implement a game species monitoring programme</p>
<p>p2. There is no system in place to integrate hunters' data into an overall database at landscape level.</p>	<p><b>6a.2.2. Data collected by hunters are incorporated into an overall database at landscape level</b></p>	<p>a. Raise awareness of hunters on non-resident (large carnivore or invasive) species;            b. Clarify and regulate the reported implications of non-resident species, accidental and poaching-related mortalities;            c. Develop and implement data-collection procedures, application and a database;            d. Develop collaborative monitoring programmes, including the ones for genetic and disease database.</p>

## Objective 6a.3. Implement poaching/poisoning prevention and control and reduction of hunting pressure in biocorridors

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
<p>p1. Poaching of target species of bears, lynx and ungulates is present in and out of the core areas, the population density and the spreading potential of these species is reduced. Poaching and intensive hunting may represents a significant pressure within the biocorridors.</p>	<p><b>6a.3.1. Effective Law enforcement and control is achieved</b></p>	<p>a. Develop and implement a collaborative anti-poaching programme;            b. Implement agreements on no-hunting or the information on hunting occurrence;            c. Develop and implement an electronic hunting license database;            d. Support specialized anti-poaching field-investigation teams;            e. Develop specialized cross-sectoral specialized teams (prosecutors, police, gendarmes, forensic, intelligence).</p>

## Threat/Pressure 6b: Other anthropogenic activities – human-wildlife conflicts – may reduce landscape permeability

### Objective 6b.1. Facilitate the implementation of legislation on damage compensations

(potential) Problems	Proposed Measures / Targets	Actions
P1. Damage compensations are not fully efficient; as a result, in some cases, farmers are taking illegal retaliation measures against wildlife. Damage compensations on wolves are not available.	<b>6b.1.1. Damage compensations are adequate and implemented</b>	<ul style="list-style-type: none"> <li>a. Assess and update the legislation.</li> <li>b. Develop compensation measures for wolves;</li> <li>c. Raise awareness, information and training activities for the responsible bodies and farmers;</li> <li>d. Monitor the implementation of legislation and collect feedback.</li> </ul>

### Objective 6b.2. Integrate connectivity issues into species action plans for large carnivores

(potential) Problems	Proposed Measures / Targets	Actions
p1. Connectivity is not addressed systematically in the species action plans.	<b>6b.2.1. Adequate species action plans with connectivity measures developed.</b>	<ul style="list-style-type: none"> <li>a. Update of the regulation for species action plan development, including the development of a special chapter on connectivity;</li> <li>b. Revise SAPs</li> <li>c. Develop guidelines and trainings on traditional shepherding techniques;</li> <li>d. Facilitate the usage of local breeds of shepherding dogs;</li> <li>e. Develop guidelines and grasslands management plans for sustainable/close to nature grassland management – also for Natura 2000 areas and biocorridors;</li> <li>f. Facilitate additional income from shepherding/husbandry/beekeeping within Natura 2000 and biocorridors;</li> <li>g. Facilitate traditional transient shepherding;</li> <li>h. Demonstrate the usage of integrated methods of prevention in critical areas;</li> <li>i. Organise intersectoral rapid intervention system/teams in the case of human-LC/LH conflicts.</li> </ul>

## Threat/Pressure 7: Lack of coherent monitoring at landscape level and adaptation of solutions

### Objective 7.1. Facilitate implementation of an integrated monitoring programme – procedures, database, indicators, and assessments

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Biodiversity- and connectivity-related indicators have not been fully integrated into the sectoral management (agriculture, forestry, water & game management, transports)	<b>7.1.1. Biodiversity- and connectivity-related indicators are developed and integrated into the sectoral management</b>	<ul style="list-style-type: none"> <li>a. Relate with authorities and stakeholders;</li> <li>b. Draft sectoral indicators;</li> <li>c. Discuss cross-sectoral correlation;</li> <li>d. Adopt indicators within the sectoral management.</li> </ul>
p2. Sectoral databases are not compatible/synchronized and the monitoring methods and tools are not shared	<b>7.1.2. Monitoring is integrated at landscape level</b>	<ul style="list-style-type: none"> <li>a. Relate with authorities and stakeholders;</li> <li>b. Identify the needs, gaps and resources;</li> <li>c. Develop compatible pilot-monitoring systems (methodologies, procedures, tools, indicators, database, evaluation etc.);</li> <li>d. Assess results and up-scale;</li> <li>e. Adapt sectoral procedures.</li> </ul>
p3. Monitoring results are not used to adapt the management or solutions	<b>7.1.3. Strategies, programmes, plans, projects and activities are being assessed and adapted based on the monitoring results</b>	<ul style="list-style-type: none"> <li>a. Relate with authorities and stakeholders;</li> <li>b. Add success indicators/thresholds to the monitoring plans;</li> <li>c. Integrate risk assessment and contingency plans into the sectoral practices;</li> <li>d. Include the need to adapt the implementation of plans/activities based on the monitoring results.</li> </ul>

## Objective 7.2. Providing regular monitoring for Struma motorway Section 1

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Lack of systematic official monitoring of road mortality	<b>7.2.1. Providing regular and scientifically proved data on road mortality for Struma motorway Section 1</b>	d. Adoption and implementation of plan for regular road mortality monitoring for both – the motorway section and the local road in the area. e. Develop a mobile application for citizens.
P2. Lack of systematic official monitoring of efficiency of defragmentation measures	<b>7.2.2. Providing regular and scientifically proved data on efficiency of defragmentation measures for Struma motorway Section 1</b>	d. Adoption and implementation of plan for regular road mortality monitoring for both – the motorway section and the local road in the area e. Installing facilities for constant collection of data – photo traps, sand strips, hair traps etc. f. Providing resources for implementing the monitoring plan as part of the regular maintenance of road infrastructure
P3. No data on railway mortality exist.	<b>7.2.3. Monitoring of mortality on railways performed</b>	a. Include the staff and field workers of Bulgarian Rail Company into the monitoring processes b. Establish database on railway mortality as a part of a joint database
p4. New threats to connectivity are constantly occurring. Monitoring of the concepts and projects considered for the SEA and EIA must be constantly performed to prevent the risks for connectivity.	<b>7.2.4. Monitoring of SEA, EIA, AA decisions implementation</b>	a. Constantly monitor concepts and projects considered for the SEA and EIA.

**Threat/Pressure 8:** The support of stakeholders for a cross-sectoral & integrated approach at landscape level is reduced

### Objective 8.1. Facilitate networking and develop a common platform and database

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. There is a lack of regular communication between stakeholders and cross-sectoral cooperation	<b>8.1.1. A platform for regional stakeholders is available as support for interaction</b>	a. Engage stakeholders and create local / regional networks of stakeholders, e.g. local/national work group/s; b. Develop a relevant database and an interactive platform.

## Objective 8.2. Facilitate information, awareness, education, communication

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Connectivity is a complex topic and hard to communicate with different types of stakeholders	<b>8.2.1. A dedicated outreach programme is set in place</b>	<ul style="list-style-type: none"> <li>a. Create and share content across stakeholders – also through innovative methods;</li> <li>b. Engage professionals in communication and train stakeholders in communication;</li> <li>c. Engage public opinion vectors and media;</li> <li>d. Engage with universities/schools/research centres/businesses /NGOs/public bodies.</li> </ul>
p2. The problem of connectivity is still not well-known among the general public.	<b>8.2.2. Raised awareness of the general public on the connectivity</b>	<ul style="list-style-type: none"> <li>a. Maintain species-oriented online communication on social media and include topics related to connectivity.</li> <li>b. Organize lectures, discussions and info days for the general public.</li> </ul>

## Objective 8.3. Support research and applied studies focused on connectivity; facilitate inter-sectoral capacity building and development of new professional opportunities (mainstream biodiversity to other sectors)

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Connectivity is not yet fully recognized as a major research topic, applied studied or as an opportunity to support inter-sectoral capacity building	<b>8.3.1. Connectivity is promoted as an important topic of research and applied studies</b>	<ul style="list-style-type: none"> <li>a. Facilitate integrated/inter-sectoral studies and research in environment, biodiversity, agriculture, forestry, hunting, tourism, transports, culture etc.</li> <li>b. Facilitate cross-sectoral capacity building and trainings based on stakeholders/local needs.</li> </ul>

## Objective 8.4. Facilitate and support complementary initiatives (connectivity as one of the topics)

<b>(potential) Problems</b>	<b>Proposed Measures / Targets</b>	<b>Actions</b>
p1. Connectivity as a topic is not yet recognized as being of significant importance for the region	<b>8.4.1. Connectivity-sensitive initiatives are being implemented</b>	<ul style="list-style-type: none"> <li>a. Develop tailor-made funding facilities addressing the local needs/opportunities aligned with the local/regional strategies;</li> <li>b. Develop project-models and promote them as case-studies;</li> <li>c. Develop constant training and knowledge exchange.</li> </ul>



## CHAPTER 4

CROSS-SECTORAL OPERATIONAL PLAN FOR  
THE RILA-VERILA-KRAISHTE PILOT AREA:

# **Descriptive Part**

# Threat/Pressure 1:

## New/planned infrastructure projects may increase the barrier effect

### Description:

The Rila-Verila Kraishte pilot area in Bulgaria is crossed by the Orient/East-Med Corridor of the EU, the priority axes number 4 of TEN-T. New major transport infrastructure projects being planned and implemented in the area are the **Struma motorway** and the **Sofia-Kulata high-speed railway**.

### Aims:

- » The first measure to address the permeability of new transport infrastructure is to maximize the defragmentation role of objects/facilities (underpasses & overpasses) designed for construction reasons. With this purpose, these objects should be assigned an environmental role and any changes of building specifications should be subject to a revised environmental permit, as a decrease in permeability of these objects may require extra-special solutions for wildlife.
- » Facilities specially designed to ensure wildlife crossing should be build and managed in order to maximize their ecological function, including integration with the adjacent land, which requires cross-sectoral measures.
- » As a new high-speed railway line Sofia-Kulata is being planned to replace the existing one, it should pass the new EIA and AA while considering all the possible alternatives. A previous assessment permission of the project has expired.

### Description of particular issues:

- » **There is no overall monitoring programme addressing the functionality of all underpasses, viaducts and**

**overpasses.** An object-based monitoring methodology and a GIS tool has been designed and developed during SaveGREEN as a pilot approach for an integrated monitoring at landscape scale.

- » **There is little experience in Bulgaria in adjusting constructive details of facilities in order to increase their functionality for wildlife.** The problematic locations have been documented during SaveGREEN to support a future intervention programme, linked with the monitoring programme, aiming to maintain/enhance the functionality of underpasses.
- » **There is little experience in Bulgaria regarding the integration of wildlife underpasses into the landscape, in order to increase their functionality for wildlife.** Objects functional for wildlife passages are critical elements of Green Infrastructure and, thus, there is a need for a focused and integrated approach in this matter. Although this requires a case-by-case approach, there is a necessity for guidelines, trainings and experience exchange instances on how to maximize the functionality of underpasses through design, construction and sensitive land management. As the functionality of the object is dependent on the surrounding terrain, and is, therefore, beyond the jurisdiction/responsibility of the infrastructure administrators, landscaping/integration into the landscape should be part of the EIA/AA procedures and environmental permits, including the request to connect the underpasses with the existing green infrastructure.
- » **Noise and light pollution may impact the functionality of wildlife underpasses.** To minimize disturbance effects, light and noise associated with the traffic needs to be mitigated for objects that are important for wildlife passing. For the railway, as the traffic is less constant, the impact of noise might be less relevant. There are no data on whether the bridges will be lightened; the impact needs to be checked and addressed

if the case (with particular attention to mammals).

- » **There are no plans in place to manage the surface of the green bridges and tunnel-top surfaces in order to maximize their functionality for wildlife and integrate them within the surrounding landscape.** There is no practical experience in Bulgaria in adapting constructive details of green-bridges or management of the area on the tops of green-bridges in order to increase their functionality for wildlife. Although this is a matter of case-by-case approach, there is a need for guidelines, trainings and experience exchange on how to maximize the functionality of green-bridges through design, construction and specific land management on the tops of green-bridges. The technical details should refer to constructive elements such as fencing, noise/light barriers, but also to landscape elements – soil, water, vegetation,

micro-habitats and elements like stones, wood etc. – important to enhance the functionality for the wildlife and deter them from unwanted usage (vehicle use etc.).

- » Another important topic related to the surface management is to **properly incorporate the monitoring equipment and design a way that the human access to the green-bridges will be regulated.** As tunnels and green-bridges represent critical wildlife passages, they are also very important elements of Green Infrastructure; therefore, there is a need for a focused and integrated approach to their management, considering the relevant species within the particular landscape. Mapping and modelling the area of and around green bridges for suitability based on different groups of species is recommended in order to develop a functional mosaic of micro-habitats aimed to attract species within the landscape to safely use the passageways.



Fig 7. The tunnel at the Struma Motorway Section 2 is functioning as a non-specific ecoduct from km 324+460 up to km 324+840, 42°17'13.33" 23° 5'11.37"





Fig 8. The land use on the surface of the Struma Motorway Section 2 tunnel is complex; overgrazing is followed by erosion of the grasslands; therefore, adequate management regulations are mandatory to be established in order to ensure functional connectivity. Chart 01. Land use in the bottleneck area of the Rila-Verila-Kraishte biocorridor (© BBF. Background © GoogleEarth).

» In Bulgaria, **the legal framework is insufficient regarding the issue of connectivity and defragmentation of the linear infrastructure**. Art. 29 and 30 of the National Law on Biodiversity states that the master plans and other plans also include measures to protect the elements of the landscape significant for the connectivity between the NATURA 2000 sites as well as for migration, geographical distribution and genetic exchange in plant and animal populations and species – in this way, the law actually defines the concept of a “biocorridor”. So far, however, these general texts have not been practically implemented. In order to strengthen the implementation of the existing legal norm for the protection of biocorridors, it is necessary to carry out the following 10 key actions: 1) Adopt regulations with clear and binding procedures for the application of these general legal norms;

2) Develop a methodology of mapping biocorridors at national level; 3) Map the biocorridors and their official approval; 4) Approve of standards with the horizontal measures for the protection of biocorridors; 5) Reflect the biocorridors in the official property cadastre; 6) Clear the procedural rules and regulations for the visualization and reflection of the biocorridors and their measures in the master plans and plans for the management of forests and agricultural lands; 7) Create legal regulations allowing the implementation of measures in the biocorridors based on these plans – developed easement law or “ecological easements”; 8) Create norms and guidelines for reflecting biocorridors and measures for their protection in the SEA, EIA and AA decisions; 9) Create the official technical standards and guidelines for planning, construction and maintenance of

defragmentation facilities; 10) Make changes in the legislation and integration of the topic in the territorial planning laws and inclusion of the requirements for defragmentation within the scope of construction quality control.

**Objectives** set to address the threat and proposed targets are:

### **Objective 1.1.** **Ensure the functionality of underpasses**

1.1.1. All the potentially functional underpasses are included in the environment permits as wildlife-crossing structures

1.1.2. Design and constructive specification are adjusted in order to maximize the functionality of underpasses

1.1.3. Structural barriers on objects, including those not designed primarily as wildlife-crossing structures, are avoided/removed

1.1.4. Underpasses are included into the surrounding green infrastructure

1.1.5. Design and constructive details are adapted to mitigate noise and artificial lighting impacts (if the case)

### **Objective 1.2.** **Ensure the functionality of overpasses**

1.2.1. The permeability of the terrain on top of tunnels is maintained during the construction

1.2.2. Green bridges (including tunnel-top surfaces) are being managed in order to maximize their functionality for wildlife

1.2.3. Overpasses are included into the surrounding green infrastructure

1.2.4. A solution to mitigate E79 county road at the Struma Section 1 motorway green-bridge is agreed and implemented

### **Objective 1.3.** **Assign a legal status and develop coherent regulations for providing ecological connectivity and defragmentation of linear infrastructure, e.g. for wildlife passages and biocorridors**

1.3.1. The legal framework on connectivity and defragmentation is strengthened and enforced. Bio corridors are recognised at national level.

1.3.2. Important passing structures (tunnels, green-bridges, bridges, viaducts, and underpasses) are included in a dedicated register and into the spatial and sectoral plans, mentioning their (primary or secondary) functions for connectivity.

1.3.3. All types of wildlife passing structures (tunnels, green-bridges, bridges, viaducts, and underpasses) are properly described with their technical requirements and characteristic and easements over the adjacent territories, including biocorridors.

1.3.4. Important passing structures (tunnels, green-bridges, bridges, viaducts, and other large underpasses) and important permeable sectors of linear features are included into the Natura 2000 management plans with assigned measures for the land management, usage regulations and monitoring.

### **Objective 1.4.** **Provide sufficient permeability of the new high-speed railway Sofia-Kulata project**

1.4.1. The new high-speed railway including the route, embankments, etc. is providing a wildlife passage at best possible level.

## Threat/Pressure 2: Structural interventions on the existing transport and other linear infrastructure (TLI)

...(maintenance, upgrading without changing the category/class of the infrastructure etc.)

**and on other linear features may increase the barrier effect at landscape level.**

### Description:

The Rila-Verila-Kraishte biocorridor is crossed by a key transport infrastructure – the Struma Motorway (Section 1 and partially 2), parallel national/regional 1<sup>st</sup> class road and railway, followed by the secondary (country, communal and local) roads accessing them. The ecological linkage role of the Rila-Verila-Kraishte, and more specifically the area of watershed ridge between Arkata and Topolnitsa rivers is important for *transversal connectivity* between the adjacent core areas/forested areas in the east (Verila Mnts.) and the west (Konyavska Mnts. – part of Kraishte).

The existing infrastructure is already causing barriers to wildlife.

At present, the connectivity role is not fully acknowledged and not considered during structural interventions with the existing infrastructure and the environmental procedures are not prioritising the connectivity topic.

### Aims:

- » Improve the current level of transversal permeability of the existing defragmentation and other infrastructure elements of the Struma Motorway Section 1 that allow safe crossing of wildlife between the eastern and western forested areas and core zones and reduce the bottle-neck effect on the structural and functional

connectivity of the Rila-Verila-Kraishte Bio corridor.

### Description of particular issues:

- » The “bear overpass” was designed according to the EIA decision No. 1-1 of 2008 for the construction of the “Struma” motorway, as a facility aimed at ensuring connectivity for various species – as a “multi” species overpass, although for the selection of the location, the main key species was the bear and potential permeability of adjacent habitats for this species. The EIA decision contains the following requirements for the construction and maintenance of this overpass:

- o *The width of the overpass should be at least 70-80 meters.* During the implementation of the project, this requirement was not fulfilled and, although slightly, the actual width was reduced to 65 meters.
- o *The construction of noise barriers on the overpass and the approaches to it with a height of at least 2 meters.* This essential design requirement has been met and the noise barriers currently are in a good condition. Action 2.1.1.e. of the plan requires continuous maintenance of the noise barriers.
- o *The slope of the terrain at the exits and approach habitats should be up to 25-30 degrees.* This design requirement was met. These are the main justifications for the action 2.1.1.a. in the plan.
- o *The overpass entrances should not be blocked by the highway fences.* This design requirement was met.
- o *Limiting people's access to the facility.* This facility maintenance requirement has not been met. On the surface of the overpass, there are traces of human presence, including traces of motor vehicles and its use by domestic animals. A number of species, especially bear, wolf, red deer –

are highly vulnerable to human presence. Due to the very high levels of hunting pressure on them, they have developed a behaviour of avoiding areas with constant human presence. This is the justification for the action 2.1.1.f. of the plan (see the table) and this is a necessary condition to guarantee the functionality of the overpass and prevent the avoidance of the most vulnerable species to human presence.

*o Planting of groups of bushes on the surface of the viaduct and providing soil cover deep at least 0.6 m. This facility maintenance requirement has not been met. On the surface of the overpass there is only grass vegetation. Shrub vegetation is necessary both to provide a shelter for large mammal species crossing the overpass and to create a suitable habitat for small species of mammals and as well as for reptiles and inverte-*



Fig 9. An overpass for bears at Struma Motorway Section 1 with missing micro-habitats and hiding structures. (© BBF).



Fig 10. A low non-specialized viaduct at Struma Motorway Section at 1 km 314+400, 42°22'23.87", 23° 6'42.18" serves as an effective wildlife crossing, but needs some improvements. (© BBF).

brates. These are the main justifications for the action 2.1.1.a. of the plan (see the table).

- » Essential requirements have been added to the plan in order to achieve multifunctionality of the overpass:
  - o Activity 2.1.1.b. prescribes the construction of small water reservoirs at the exits of the overpass. This action has several functions. First, it is a watering place for large and medium-sized mammals, especially in the dry summer period (July-September). Thus, it will attract movements of large and medium-sized mammals to the entrances of the overpass. Secondly, such small reservoirs are the habitats of a number of small animal species (with small individual territories), creating suitable habitats for them at the entrance of the overpass – from amphibians to small mammals and reptiles.
  - o Activity 2.1.1.c. prescribes the construction of small micro-reservoirs on the surface of

the overpass. This will create conditions for its use by small species of amphibians and in the dry season also for reptiles and small mammals.

- o Activity 2.1.1.d. prescribes the construction of small patches of stone habitats on the surface of the overpass. This will create conditions for shelters and habitats for different species of reptiles.
- » The low viaduct at the Struma Motorway section at 1 km 314+400, 42°22'23.87", 23° 6'42.18" was not considered at all when preparing the EIA of the motorway in 2008. At the preliminary level of motorway design at that time, a high road embankment was planned at this location. In the subsequent detailed technical design, the embankment was replaced by a low viaduct. This significant change has not gone through the EIA and the facility itself is not planned to perform a defragmentation role. However, with adequate maintenance and adaptation, it significantly increases the permeability

of the highway. Its width is 220 meters, and its height is mostly above 4 meters up to 15 meters, and provides a very good coefficient of permeability for different species of animals including large mammals. In this sense, several measures and related actions are listed in this plan/document.

- o Measure 2.2.1 prescribes several actions aiming at proper maintenance of the surface below the viaduct and in adjacent areas providing proper vegetation and shelter, limiting human and domestic animals' presence to prevent avoidance from the target species and water micro-habitats attracting different groups of wild animals.

- o Measure 2.2.2 prescribes actions aiming to reduce noise and light pollution and, thus, to prevent repelling of animals from the facility.

- o Measure 2.2.3 prescribes an action for adapting a small retention wall, aiming

to make it permeable for big and small animals.

- » The "wolf underpass" was designed according to the EIA decision No. 1-1 of 2008 for the construction of the "Struma" motorway, as a facility aimed at ensuring the connectivity for various species – as a "multi" species underpass, although for the selection of the location, the main key species was the wolf, and the potential permeability of adjacent habitats for this species.

- » The EIA decision contains the following requirements for the construction and maintenance of this underpass:

- o *The width of the underpass should be at least 15 meters wide and its height should be at least 4 meters.* During the planning and the construction this requirement was fulfilled.

- o *The construction of noise barriers over the underpass.* This essential design



Fig 11. Noise pollution and bare surface in the non-specialized viaduct at the Struma Motorway section at 1 km 314+400, 42°22'23.87", 23° 6'42.18" might reduce the permeability of large carnivores and herbivores. (© BBF).



Fig 12. Concrete wall blocks 50% of the northern site of the viaduct of Struma Motorway Section 1 (© BBF).



Fig 13. An underpass for wolves at Struma Section at 1 km 315+900, 42°21'42.37" 23° 6'14.60" Concrete wall blocks 50% of the northern site of the viaduct of Struma Motorway Section 1 (© BBF).

requirement and mitigation measure from the EIA decision No. 1-1 of 2008 has not been met. Noise barriers over the underpass are not installed yet. Action 2.3.2.b. repeatedly mentions this requirement.

o *The overpass entrances should not be blocked by the highway fences.* This design requirement has been met.

o *Limiting people's access to the facility.* This facility maintenance requirement coming from the EIA decision is not met. Under the underpass and at its exits, there are abundant traces of the constant presence of domestic animals, which use it for daytime shelter. In this regard, action 2.3.3.d specifies the measures to prevent this impact and to lower the level of human presence and activities there.

» Essential requirements have been added to the plan in order to achieve multifunctionality of the underpass:

o Activity 2.3.1.a. prescribes the maintenance of the existing small water reservoirs at the exit of the underpass. This action has several functions. First, it is a watering place for large and medium-sized mammals, especially in the dry summer period (July-September). Thus, it will attract movements of all species of medium and big mammals to the entrances of the overpass. Secondly, such small reservoirs are the habitats of a number of small animal species (with small individual territories), creating suitable habitats for them at the entrance of the overpass – from amphibians to small mammals and reptiles.

o Activity 2.3.2.c. prescribes an action related to reducing noise by proper maintenance of the motorway surface.

» The EIA decision No. 1-1 of 2008 has adopted mitigation measures aiming at proper management of the habitats in the immediate neighbourhood of the



Fig 14. A bare surface in the underpass for wolves at Struma Section at 1 km 315+900, 42°21'42.37" 23° 6'14.60" (© BBF).





Fig 15. Human&cattle presence in the vicinity as well as in the underpass is observed especially during the hot summer season. A herd of cattle has been discovered in the shade and coolness of the underpass and rests there periodically. (© BBF).

defragmentation facilities – in a distance of 200 meters from them. Here we will briefly review the implementation of these measures and how we have reflected this in the defragmentation plan. The EIA decision contains the following requirements for the maintenance of habitats in the perimeter of 200 meters aside of the facilities:

- o *Proper management of vegetation – maintenance of about 70% of coverage of forest and/or bushes and about 30% grassland.* These EIA design and maintenance requirements are not met. Action 2.4.1 is directed to a simple measure in that direction.

- o *Lack of constant human presence and activities.* This maintenance requirement is not met. There are quite a lot of signs of human activities on and in around of the facilities – grazing, watering and resting domestic livestock, passing off-road vehicles etc. The actions from 2.4.2.d

to 2.4.2.h are aiming to minimize those threats.

- o *Lack of other non-defragmented linear infrastructure.* This EIA requirement is not met. There are 2 linear infrastructure elements in the nearest vicinity of the motorway line – a local road and a railway.

- » The 1<sup>st</sup> class road passes very near to each of the 3 defragmentation facilities assessed in the plan – at a distance of 75 to 100 meters. Therefore, it could have a cumulative fragmentation effect. There are no defragmentation efforts made along the local road in this section. Moreover, the local road could be an easy way for directing people to access the facilities and thus having an additional negative wildlife avoidance effect. The issue is covered in the measure 2.4.3 and the related actions.

- » The railway passes near the area of the “bear” overpass at a distance of about 80 meters – but almost entirely, it is in a



Fig 16. A bear overpass at Struma Motorway Section 1 viewed from above. Ploughing of the adjacent arable land on the left western side and the presence of the 1st class road as well as the lack of guiding vegetation on the right eastern side of the overpass further reduce the permeability of the transport infrastructure (© BBF).

350-meter long tunnel, thus providing a good level of coherence between both defragmentation facilities. From a small viaduct and the “wolf” underpass, it is at a distance of more than 900 meters and above. Considering the low levels of traffic on the railway and its low speed– it could not have a cumulative fragmenting impact. Serious consideration, however, should be expected regarding the construction of busy high-speed train line – issue reflected in the plan in measure 1.4.1 and the related actions.

o *Lack of buildings or artificial lighting.* This requirement has been fulfilled; however, action 2.4.1.c repeats it as a necessary measure/condition for the best of the future management of this area.

o *Developing guiding structures and vegetation towards the entrance of the*

*defragmentation facilities – bush hedges, small earth dikes.* This requirement of the EIA has not been implemented. Action 2.4.1.b again indicates the necessary measures for the future management of the area.

- » The EIA decision No 1-1 of 2008 prescribes the construction of culverts with a diameter of at least 1.5 meters if tubes are used and at distance of at least 200 meters, where suitable habitats of tortoises (as “umbrella species” for other small animals) are crossed. The entrances of the culverts should be properly connected to the surface with no steep slopes to them. The effectiveness of this measure has not been assessed so far. Moreover, no proper fencing (as prescribed in the EIA) has been installed. The issue is reflected in measure 3.1.3 and in actions 3.1.3.f and 3.1.3.g, respectively.



Fig 17. Other existing wildlife crossing facilities at Struma Motorway Section 1 that serve or could serve as defragmentation facilities (© BBF).

**Objectives** set to address the threat and proposed targets are:

**Objective 2.1.**  
**Maintain and enhance the permeability of the existing “bear” overpass at km 314+070 (65 meters wide overpass, 42.376528°, 23.112775°)**

*2.1.1. Installation and construction facilities providing micro-habitats and animal shelters on the surface of the overpass and enhancing its multi-functionality for different animal groups*

**Objective 2.2.**  
**Maintain and enhance the permeability of the existing small viaduct km 314+400 (220 meters wide, 15 meters high small viaduct, 42.373297°, 23.111717°)**

*2.2.1. Installation and construction facilities providing micro-habitats and animal shelters*

*2.2.2. Taking measures to reduce noise and light pollution to the maximum extent possible.*

*2.2.3. Removal of vertical barriers to animal movement*

**Objective 2.3.**  
**Maintain and enhance the permeability of the existing underpass for wolves at km 315+900 (15 meters wide, 15 meters high, 42.361769°, 23.104056°)**

*2.3.1. Installation and construction facilities providing micro-habitats and animal shelters*

*2.3.2 Taking measures to reduce noise and light pollution to the maximum extent possible.*

2.3.3. Elimination of permanent human and domestic animal presence in the underpass

#### **Objective 2.4.**

**Maintain and enhance the permeability of the highway habitats in the immediate vicinity of the 3 defragmentation facilities in the section of the highway between km 313+700 (42.379875°, 23.112631°) and km 317+330 (42.350314°, 23.096403°); in this section are the main connecting habitats and the corridor between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina”**

2.4.1. Provide suitable conditions for animals to approach the area of facilities and guide them to the entrances of the defragmentation facilities.

2.4.2. Reduce human and livestock presence and prevent regular impact of this type and, thus, prevent wildlife avoidance.

2.4.3. Assess the importance of fragmentation arising from the local road and, if necessary, undertake defragmentation measures.

#### **Objective 2.5.**

**Providing future assessment and planning defragmentation measures along the motorway section in the rest of potential connectivity area, between the mountains west and east of the Struma motorway and outside the priority section evaluated in detail – the motorway section between km 317+330 and km 329+140.**

2.5.1. Developing and application of plan for defragmentation based on the existing motorway facilities.

## **Threat/Pressure 3:**

Linear transport infrastructures (including electric power lines) cause wildlife mortalities

#### **Description:**

Wildlife mortalities associated with linear infrastructures are considered one of the major anthropogenic impacts, but in Bulgaria, it has not been studied too much. However, the implications do not only concern biodiversity, but are also related to traffic safety, damage and even human casualties; therefore, proper mitigation measures should be taken seriously.

As new major infrastructure is developing and high levels of traffic are swapping from the National roads towards motorways and trains will achieve significantly higher speeds, wildlife-traffic dynamic is expected to change as well (number of incidents, locations, frequencies, severity – damage and potential human casualties).

#### **Aims:**

- » The first aim will be to prevent wildlife from entering the motorway by implementing an adequate fencing system, including escape gates for animals that accidentally enter motorways. For unfenced infrastructure, the objective is to implement traffic safety measures, direct the wildlife towards safe passages and prevent animals from being trapped inside tunnels or on large bridges where accidents are difficult to avoid.
- » A specialized intervention team should be available to respond to wildlife-related situations on motorways, especially as large mammals could cause incidents when trapped between fences trying to cross the motorway.



Fig 18. The existing fence is not bear-proof and not well fixed to the background, and not maintained regularly (© BBF).

- » A system of collecting the data and assessments of situations is mandatory as a decision-making tool.

**Description of particular issues:**

- » **The fencing systems of motorways are not regularly maintained in order to prevent access of wildlife or domestic animals onto the motorway. No special bear-proof fence is requested by the environmental permit of the Struma motorway and the installed fences are not well fixed to the background,**

**or are even missing in some areas.** In addition, it is important to add escape gates for mammals which entered the motorways. Other high-risk areas are the junction areas where animals can enter the motorways; therefore, the existing fences should be replaced, well fixed to the background and escape-gates should be implemented here as well. Specifications of a bear-proof fence based on the EGNATIA highway experience on expanding bear-proof fencing are available in the TRANSGREEN guidelines.

- » The EIA decision No 1-1 of 2008 does not prescribe any mitigation measures towards proper fencing of the motorway – particularly for the middle and big mammal species. Measure 3.1.1 and the related actions in the plan reflect this gap.

There are, however, mitigation measures in the EIA decision No 1-1 of 2008 against mortality of small species like tortoises. They require providing a solid vertical fence of 30 cm in height, with an escaping surface on the side of the motorway for small animals. This mitigation measure was not implemented at all. Measure 3.1.3 and actions 3.1.3.d and 3.1.3.e in the plan reflect this gap.

- » **For unfenced infrastructure (national roads, railways), the possibility for wildlife to cross over embankments is still present.** The proposed solution is to envisage a sufficient number of functional underpasses so that the collision risk would be minimized. Fencing sectors where functional underpasses are located may increase the chance for medium/large-sized mammals to use those underpasses. The measure is important on the new planned high-speed railway as the collision risks

would be higher compared to the actual situation when trains are circulating at low speed and frequencies. Location of the Struma Section 1 motorway underpasses are available at the GIS database.

- » **A system of guiding amphibians, reptiles and small mammals towards passageways is not in place and should be established and implemented.**
- » **One solution to prevent road-kill/accidents/incidents related to the wildlife in traffic is to signal high-risk areas for the drivers.** These high-risk areas should be identified based on robust data collection. The completion of motorway will affect traffic in the area and may affect the location of the road-kill/accident-prone sectors. High-risk areas have been identified based on road-kill records collected and are available in the GIS database. Locations of traffic signs have been proposed. Recommendations are available in the TRANSGREEN guidelines.
- » **Classic warning signs may not trigger the expected reactions from drivers as they get used to them with time.** In this respect, new type of signs or detectors



Fig 19. A road-kill on a secondary unfenced road (© BBF).



Fig 20. The existing data on road-kill animals can inform authorities about high-risk areas on roads (© BBF).

should be tested. Other potential solutions are to implement automatic animal-detectors (either detecting the animals' presence and alerting the drivers, or alerting the animals about the approaching cars). The efficiency of these solutions is still debatable and depends on the local context.

- » **The potential high-risk sectors on the newly planned railway (low-visibility sectors, at entrances/exits of tunnels and long bridges) need to be assessed and mitigated.** Therefore, the measures under this objective correlate with the complementary ones addressing visibility etc. The signals may be classic (physical signs along the railway) or may be automatic warning signals inside the locomotive when approaching high-risk sectors. The measure is important on the new railway as the collision risks with wildlife and domestic animals would be higher compared to the actual situation when trains are circulating at low speed and frequencies. The potential high-risk sectors are on curves, at entrances/exits of tunnels and long bridges and in the

vicinity of dense vegetation areas. Thus the measures under this objective correlate with the complementary ones addressing visibility etc. The signals may be classic (physical signs along the railway) or may be automatic warning signals inside the locomotive when approaching high-risk sectors.

- » **Standardized and easy electronic data collection and reporting needs to be set in place.** In several countries, train conductors need to report every incident related to wildlife collisions. In Bulgaria, there is permanent guarding patrolling on motorways which may present an opportunity for data collection. The data should be linked with an integrated platform in order to be able to support informed decisions. Further collaboration with platforms such as GreenWeb is to be developed and extended.
- » **A lot of data are collected by professionals of different expertise (species, habitats) in different contexts (research, university, protected area management, impact studies etc.), but the data are not collated or available in a**

**form that would benefit the professional community and support decision-making.** With advancing mobile phones (GPS, camera, storage capacity, and usage of online and customized maps), there is an opportunity to create mobile forms that can be used in the field and uploaded into a managed database. Such tool has been developed in the SaveGREEN project.

**Objectives** set to address the threat and proposed **targets** are:

**Objective 3.1.**  
**Implement an adequate fencing system in the section of the Struma motorway between km 313+700 (42.379875°, 23.112631°) and km 329+140 (42.350314°, 23.096403°)**

3.1.1. Provide bear-proof fencing that prevents road accidents and guides animals towards defragmentation facilities

3.1.2. Provide fencing that is properly designed for small species of animals (tortoises as umbrella species)

**Objective 3.2.**  
**Direct animals towards functional underpasses**

3.2.1. Fencing areas above the functional underpasses for medium/large mammals is being considered

3.2.2. A dedicated system of solutions to guide amphibians, reptiles and small mammals towards functional underpasses is set in place for motorway, railway and roads

**Objective 3.3.**  
**Warning drivers on road-kill-/ accident-prone areas**

3.3.1. Efficient warning signs are installed in accident-prone areas on roads

3.3.2. New types of warning devices, including automatic animal-detectors on roads are being tested and implemented

**Objective 3.4.**  
**Collect and process data to identify incident-/accident-critical sectors on roads, motorways and railways**

3.4.1. A standardized mobile app for professional monitoring is being developed, information is being collected and is informing a dedicated database with records on incidents on the roads, motorways and railways

3.4.2. A traffic-kill mobile application for citizen-science is available and linked with a managed database

3.4.3. Data from the police, insurance companies and other authorities (game managers, different agencies,...) are synchronized

**Objective 3.5.**  
**Create and/or train/equip specialized teams/ employees in the Regional Road departments to deal with wildlife-related incidents on motorways, railways, roads, including emergency interventions**

3.5.1. Specialized teams are operational

**Objective 3.6.**  
**Develop and use an integrated database as a decision-support tool to address traffic incidents (for implementing/adjusting measures to prevent wildlife traffic-kills/damage/ human casualties)**

3.6.1. Collect and input all the relevant data into an integrated database

3.6.2. Identify, monitor and assess causes favouring black-sectors



3.6.3. Assess the impact of adjusted/new measures being implemented to prevent traffic-kills

## Threat/Pressure 4: Changes of the land-use category may reduce landscape permeability

### Description:

Changes of the land-use category may reduce the landscape permeability and, therefore, the functional connectivity of the corridors for different species.

New infrastructure projects may trigger a cascade change. Dedicated wildlife passages may become non-functional if adjacent lands are or become non-permeable.

### Aims:

- » Identify the status-quo in terms of land use and ownership;
- » Assess the triggers for land-use change and the existing solutions to prevent changes towards less permeable usage;
- » Model scenarios of land-use dynamics;
- » Identify and communicate the critical areas within the landscape (micro-corridors, stepping-stones, core-areas etc.)
- » Identify specially-tailored measures to prevent detrimental changes and incentivise for changes towards more permeable usage types.

### Description of particular issues:

- » **(Semi-) natural grasslands are important for a variety of plant and animal species, but are impacted by natural successions to forested areas or by human**

### interventions that transform them into arable land or even into building areas or photovoltaic fields.

A thorough analysis of the drivers and a dedicated action plan for safeguarding the grasslands is urgently needed. Specialized pastures management plans are prepared for the national parks in connection with the application of the Pastoralism agro-environmental (AE) measure. Unfortunately, this measure has not been implemented properly until now and has led to a significant negative impact on the mountain ecosystems within the three national parks, e.g. overgrazing, erosion and nitrogen pollution of soil and water. A transitional period of three years has been proposed, including year 2025. Afterwards, the payments of this measure to the herders will be cancelled for grazing into the National parks. On the contrary, the pastoralism measure for grazing within all the other Natura 2000 sites will be applied, but only after Natura 2000 management plans are developed and approved. A subsidy for grazing above 1,800 m asl for the mountains in southern Bulgaria and above 1,500 m asl for the entire Stara planina mountains will not be subsidized. The number of domestic animals per ha has to be further limited. This proposal within the draft Rural Development Plan (RDP) for the current planning period is made by the SEA Report. The draft RDP and the SEA report need to be discussed and approved by the High Environmental Expert Council of the MoEW and signed by the Ministry of Environment.

- » **Forested areas outside the forest cadastre are under weak protection as they could be easily clear-cut and, therefore, in many cases, valuable habitats are being lost, especially in areas low in forest cover.** Agricultural lands comprise over 300,000 ha in Bulgarian forests. This is about 10% of all forests in Bulgaria. Until now, logging in them is permitted by the municipalities. They issue permits for use in agricultural lands under the Law on the Protection of

Agricultural Property, very often without informing the regional inspectorates on environment and water RIEW and without carrying out the AA procedures under the Law on Biological Diversity and EIA under the Law on Environmental Protection. This circumstance is in violation of environmental legislation and leads to abuses in the deforestation of agricultural lands and ultimately to illegal deforestation. In April 2022, the Ministry of Environment and Water issued instructions to all RIEW that projects for felling forests on agricultural lands should undergo the EIA screening procedure. This requirement stems from a decision of the Court of Justice of the EU in the case C-329/17, which interprets the term “deforestation” under the EIA Directive.

An analysis of the deforestation of agricultural territories in our country in recent years shows that it is mainly carried out for intensive agricultural purposes (arable land and intensification of pastures) or urbanization for the purpose of installation or building energy production, mining, transport or recreational facilities. Such a practice of deforestation falls under Appendix 2 of the Environmental Protection Act and is a subject of screening for the need of EIA. By carrying out a preventive assessment of the environmental consequences of logging in these cases, the environmental legislation will be enforced. The instructions of the Ministry oblige the directors of RIEW to inform the municipalities within their territorial scope about the newly introduced requirement.

A thorough analysis of the drivers and a dedicated action plan to safeguard the forested areas is urgently needed, complementing the afforestation efforts and plans addressing the climate change and green infrastructure.

- » **Despite sectoral recommendations, the tendency is to maximize the “productive” surface of agricultural land by**

### **eliminating a critical green infrastructure element from the agricultural landscape.**

The corridor areas need to be addressed by a set of agro-environmental measures that will incentivise farmers to voluntarily transform crop fields into pastures of afforested land.

- » **Although Natura 2000 payments are a crucial instrument to support the implementation of biodiversity-sensitive measures, they are not properly implemented in Bulgaria.**

**Objectives** set to address the threat and proposed targets are:

### **Objective 4.1. Enforce/update legislation that prevents changes of land-use category towards less permeable categories (including compensatory measures targeting connectivity)**

4.1.1. *Development of legal, administrative and information management tools for application of art. 10 of Directive 92/43*

4.1.2. *Plans and projects of different sectors are being assessed for connectivity-impact part of the SEA/EIA/AA procedures*

### **Objective 4.2. Facilitate/support changes of land-use category toward more permeable categories (i.e. through agricultural/ Natura 2000 payments sensitive to connectivity)**

4.2.1 *Land purchase programme or other measures developed (reforestation, contracts with owners etc.) to provide long-term restoration of suitable permeable habitats in the biocorridor through/across the Struma motorway*

4.2.2. *Natura 2000 payments sensitive to connectivity are set and implemented*

## Threat/Pressure 5a: Changes in land management – fencing\* - may reduce landscape permeability

*\*This does not refer to fencing of transport infrastructures.*

### **Description:**

Land fencing may reduce the landscape permeability and, thus, the functional connectivity of the corridors for large/medium mammal species.

### **Aims:**

- » Identify the status-quo in relation to land use and ownership;
- » Assess the triggers for fencing and the existing solutions to prevent it;
- » Identify and communicate the critical areas within the landscape (micro-corridors, stepping-stones, core-areas etc.)
- » Identify specially-tailored measures to prevent fencing and incentivise for changes towards land usage types that would not require fencing.

### **Description of particular issues:**

- » Permanent fencing could impact significantly the permeability of landscape, especially if they are being built over large areas or in critical connectivity zones, sometimes even making the dedicated wildlife passageways of large infrastructure non-functional. The negative impact of permanent fencing on the connectivity and migration of animals is not popular among the public and administration, despite the fact that some legal requirements need to be followed; however, only in case it is recognised as a construction. According the Natura 2000 AA, it is a subject of a screening procedure but in most cases it is permitted as a rule.

- » A special requirement to not fence the green infrastructure elements is needed to support its functionality. A similar condition should be imposed on electric fencing against wildlife damage for large barriers;
- » Sometime, large tracks of forests are fenced for different reasons, e.g. intensive game management/breeding without being a subject of an environmental impact assessment of connectivity impact.

**Objectives** set to address the threat and proposed targets are:

### **Objective 5a.1. Set fencing regulations and promote unfenced areas**

*5a.1.1. Legislation/Regulation on building permanent fencing is reviewed and enforced.*

*5a.1.2. Voluntary unfenced zones are supported*

*5a.1.3. Fencing-related measures are included into the Natura 2000 sites and corridor areas management & payments*

*5a.1.4. Agreements with landowners & compensatory payments are in place to secure unfenced areas within close proximity of wildlife passageways (objects and sectors) on transport infrastructure.*

### **Objective 5a.2. Develop guidelines and impose fencing-related conditions linked with agriculture, forestry subsidies or other specific programmes**

*5a.2.1. State Fund for Agriculture payments includes a percent of not-fenced area of cultivated area as a condition for voluntary subsidies*

*5a.2.2. Large electric-fencing barriers are a subject of environmental assessment on potential connectivity impact*

5a.2.3. Fencing in forest or afforestation areas are a subject of environmental assessment on potential connectivity impact

## Threat/Pressure 5b: Changes in land management - crop cultivation/ natural vegetation management – may reduce landscape permeability

### Description:

Different crop patterns and improper management of natural vegetation may reduce the landscape permeability and, therefore, the functional connectivity of the corridors for different species.

### Aims:

- » Identify the status-quo in relation to land use and ownership;
- » Assess the triggers for changes in crop cultivation patterns;
- » Identify and communicate critical areas within the landscape (micro-corridors, stepping-stones, core-areas etc.)
- » Identify specially-tailored measures to prevent large-scale monocultures and incentivise for changes towards a more mosaic cultivation patterns with the inclusion of natural features and marginal habitats.
- » Promote good practices also linked with supporting wild pollinators.

### Description of particular issues:

- » **The EIA decision No 1-1 of 2008 does**

**not postulate any mitigation measures towards restoring the overall permeability of the biocorridor between Verila and Plana Mountains and NATURA sites placed there.** However, the AA report in this procedure reflected the threat of low coverage of forest vegetation in the biocorridor as a threat to the effectiveness of the planned “bear” overpass and “wolf” underpass. The AA report prescribed as a mitigation measure implementing the programmes and actions for reforestation in the biocorridor. As this measure was not reflected in the final EIA decision (without any justification) – it is also not implemented in the field. There is a clear need of such a measure, especially to provide connectivity for easily disturbed species like Brown bear (*Ursus arctos*), Wolf (*Canis lupus*), Red deer (*Cervus elaphus*). The gap is reflected in measure 5b.4.1 and related actions of the plan.

- » **Cultivation patterns more sensitive to connectivity (i.e., pasture to hay meadows, uniform crops to mosaic cultivation) are not attractive for farmers from the business perspective. Funding that is dedicated to acquiring land for safeguarding connectivity is not easily available.**
- » **Although the sectoral norms/guidelines exist, in practice, the protection of important micro-habitats/green infrastructure elements is not considered a priority.** A guideline for harmonizing the forest management and Natura 2000 objectives is available.
- » **Forested pastures are not considered a specific type of habitat in the sectoral management** (agriculture or forestry); therefore, this type of important habitat is transformed by the existing practices either into a pasture (with or without isolated trees), or to closed-canopy forests. A special measure has been proposed to be implemented with the National CAP Strategic Plan 2023-2027 in order to introduce for direct payments up to

between 20-40% of overgrown/forested areas of the territory to be considered as territories eligible for payment. A scheme is envisaged to support the restoration and preservation of landscape elements/green infrastructure between plots or within the property. It is also proposed to carry out intermediate and final monitoring of the impact effect of the schemes/interventions/ and environmental measures. Nearly 100 different interventions are foreseen with the plan. The measures are/have been proposed through the Appropriate Assessment AA procedure and the AA report. The EU Regulation regarding the development of CAP Strategic Plans envisage Biodiversity and Climate Strategic Targets to be achieved, but through the Local/Nationally Tailored Interventions. In the AA Report of the Bulgaria's CAP plan, it is proposed that field shredders should be phased out as brush clearing machines in pastures due to the harmful effects on wildlife. These prescriptions should be approved and implemented properly.

- » **Forested windbreaks are being planned and created without considering their important potential role as green infrastructure.**
- » **Close-to-nature sectoral management steps are not being encouraged as an alternative to business-as-usual practices.**

**Objectives** set to address the threat and the proposed targets are:

**Objective 5b.1.**  
**Prevent large-scale monocultures and/or facilitate & support mosaic cultivation**

*5b.1.1. Subsidies for hay meadows in connectivity-areas are attractive for farmers*

*5b.1.2. Subsidies for mosaic-type of cultivations in connectivity-areas are attractive for farmers*

*5b.1.3. Land-acquisition for ecological connectivity is supported*

**Objective 5b.2.**  
**Support adequate management of natural features & marginal habitats**

*5b.2.1. GAEC/SMR norms on the protection of natural features and vegetation are being implemented and controlled*

*5b.2.2. Management norms in agriculture are harmonized with green infrastructure protection*

*5b.2.3. Management norms for forested pastures are set in-line with conservation needs of these habitats*

*5b.2.4. Forestry norms on the protection of natural features important for connectivity are being implemented and controlled*

*5b.2.5. Forest management best practices in the Natura 2000 sites and connectivity areas are available*

*5b.2.6. Guidelines for multifunctional (a green infrastructure role) forested windbreaks are available*

**Objective 5b.3.**  
**Support and promote the development of good-practice examples of connectivity-sensible agriculture, water management and forestry practices**

*5b.3.1. Close-to-nature and connectivity-sensible agricultural management is promoted and supported*

*5b.3.2. Close-to-nature and connectivity-sensible forestry management is promoted and supported*

#### **Objective 5b.4.**

**Providing connectivity for key species of Brown bear (*Ursus arctos*), Wolf (*Canis lupus*), and Red deer (*Cervus elaphus*) between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina” – the biocorridor is situated west and east of motorway section between km 313+700 and km 317+330.**

*5b.4.1. Restoration of favourable conditions in the biocorridor between the NATURA 2000 sites BG0000305 “Verila” and BG0000298 “Konyavska planina” for key species of Brown bear (*Ursus arctos*), Wolf (*Canis lupus*), and Red deer (*Cervus elaphus*)*

### **Threat/Pressure 5c:** Land management causing degradation of natural habitats may reduce landscape permeability

Improper land management may reduce the landscape suitability for native species.

#### **Aims:**

- » Identify the status-quo in relation to land use and ownership;
- » Assess the triggers for improper land management;
- » Present the negative impacts;
- » Identify and communicate the critical areas within the landscape (micro-corridors, stepping-stones, core-areas etc.)
- » Identify specially tailored measures to reduce /prevent improper land management.

#### **Description of particular issues:**

- » For many species, connectivity is strictly related to habitat suitability as individuals are linked with specific habitat requirements; therefore, degradation of habitats will fragment the populations as well;
- » Dedicated programmes aiming for proper renaturation of degraded land are needed as well as better management of waste and dumping sites.
- » **Illegal vegetation arsons are becoming a common practice that degrade the natural habitats, alter soils and hydrology, favour succession to other type of habitats including the invasion of allochthones plant species and are killing significant amounts of wildlife.** Arsons near roads/railways may pose risks for the traffic as well.

**Objectives** set to address the threat and proposed targets are:

#### **5c.1. Prevent/enforce legislation on fire incidence**

*5c.2.1. Legislation on fire is enforced and field arsons are being reduced*

### **Threat/Pressure 6a:** Other anthropogenic activities – game management - may reduce landscape permeability

#### **Description:**

Game management and hunting may directly affect some mammal and bird species and indirectly others, due to changes inflicted in natural habitats either by high densities of game

species or by human intervention to favour the target game species and hunting activities.

**Aims:**

- » Harmonize and implement game management plans aligned with biodiversity and connectivity objectives, and Natura 2000, if the case;
- » Collaborate with hunters and game managers in data collection and in data-based game management at landscape scale;
- » Reduce poaching and hunting pressure, and reduce wildlife conflicts with local communities or other stakeholders.

**Description of particular issues:**

- » Game management is not harmonized with Natura 2000 and connectivity related objectives;
- » SEA/EIA/AA procedures are not applied in game management planning;
- » Dynamic of fragmentation is changing the movement patterns of wildlife and the conflict patterns; therefore, game management needs to be adapted to this new context;
- » Adaptation of game management is needed in order to increase the functionality of new wildlife passageways and prevent poaching at mandatory crossings for wildlife;
- » Game management is not addressing transient individuals as this does not reflect a local interest.

**Objectives set to address the threats are:**  
**6a.1. Harmonize game management with Natura 2000 and connectivity-related objectives**

*6a.1.1. Game management is harmonized with Natura 2000 and connectivity-related objectives*

*6a.1.2. Develop coherent game management plans and the SEA/EIA/AA procedures are applied*

**6a.2. Facilitate data collection on key species**

*6a.2.1. Develop a monitoring programme on game species and improve census methodologies and collaboration with game management authorities and hunters*

*6a.2.2. Data collected by hunters are incorporated into an overall database at landscape level*

**6a.3. Implement poaching/poisoning prevention, control, and reduction of hunting pressure in biocorridors**

*6a.3.1. Effective Law enforcement and control is achieved*

## **Threat/Pressure 6b:** Other anthropogenic activities – human-wildlife conflicts - may reduce landscape permeability

**Description:**

The dynamic of fragmentation is changing the movement patterns of wildlife and the conflict patterns which may result in retaliation towards wildlife, thus reducing the functional connectivity. Anthropogenic activities related to natural resource usage (forestry, hunting, mushrooms/wild fruits picking, livestock and transient beekeeping), if not properly regulated may increase the level of conflicts.

**Aims:**

- » Understand and map the conflict zones and periods;

- » Understand the drivers and identify adapted methods to reduce wildlife conflicts;
- » Include corridor areas as priority zones to prevent and compensate for wildlife damage and support a reasonable level of tolerance;
- » Integrate connectivity objectives into large carnivore action plans, including the measures for a reduction in human-wildlife conflict prevention, rapid intervention, etc.;

#### **Description of particular issues:**

- » **Intensive grazing is replacing sustainable traditional shepherding, increasing the risk of conflicts.** Dedicated programmes to support traditional shepherding for the biocorridors paired with modern damage prevention techniques are not set in place. Damage compensations are not fully efficient and damage compensation for wolf attacks is not installed; as a result, in some cases, farmers are taking illegal retaliation measures against wildlife;
- » **Husbandry/beekeeping in large carnivore habitats has higher costs for farmers; therefore, without a large a dedicated subsidy system, the tolerance for large carnivores will decrease abruptly;**
- » **Competition for natural resources and habituated individuals may increase the level of conflicts with wildlife;**
- » **In special situations related to wild animals, rapid interventions are needed, but the capacity and procedures are not fully functional/efficient at present.**
- » **Connectivity is not addressed systematically in the large carnivores (species) action plans.** In the Regulation No5 on species action plan development, there is no special requirement to develop a chapter on ecological connectivity. Such information on connectivity requirements, assessments and mapping of the

biocorridors for the specific species should be carefully described. In the best scenario, connectivity requirements of one species should be integrated with other species plans.

**Objectives** set to address the threat and proposed targets are:

#### **6b.1. Facilitate the implementation of legislation on damage compensations**

*6b.1.1. Damage compensations are adequate and implemented*

#### **6b.2. Integrate connectivity issues into species action plans for large carnivores**

*6b.2.1. Adequate species action plans with connectivity measures developed.*

## **Threat/Pressure 7:** Lack of coherent monitoring at landscape level and adaptation of solutions

#### **Description:**

Monitoring at landscape level is complex, and different methodologies, tools and database need to be aligned and synchronized in order to support coherent decision-making.

#### **Aims:**

- » Sectoral management to include biodiversity and connectivity related indicators is included into the monitoring plans;
- » Sectoral monitoring plans to be developed in line with the agreed best practices (i.e. before-after-control approach) and linked with risk assessments and contingency plans to be implemented based on the monitoring results;
- » Monitoring methodologies to be compatible across sectors and scientifically sound;



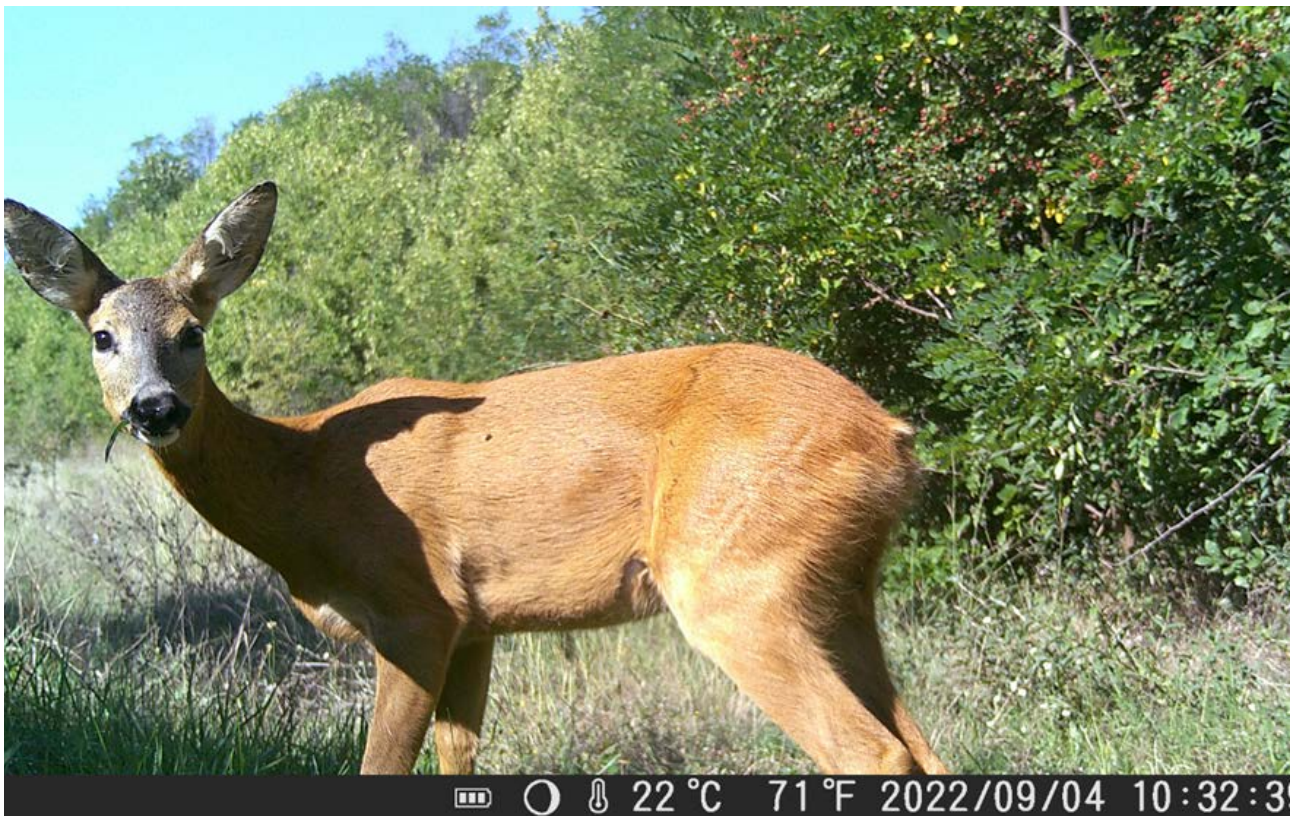


Fig 21.a and 21b Monitoring of mammals by applying different methodologies - recording of activity signs as well as by installation of camera traps in the area of the defragmentation facilities and corridors (© BBF).

- » Monitoring tools to be adapted to the needs and to support the development of database
- » A coherent database management should be discussed and used as a transparent decision-making tool for adaptation/harmonization of sectoral strategies, programmes, plans and practices;
- » Develop a lesson-learned mechanism among stakeholders at landscape level.
- » Regular monitoring in the pilot area with a focus on *road and railway mortality, efficiency of defragmentation measures for the Struma motorway*
- » Special attention should be paid to monitor the implementation of the SEA, EIA, AA permissions/decisions of the particular infrastructure.

**Description of particular issues:**

- » Although many sectoral plans and activities are a subject of environmental assessment procedures, there are no agreed sets of measurable indicators that should tailor the implementation of activities/current management based on the monitoring results;
- » Different entities are using different monitoring methodologies, tools and the results are not available or not compatible. SaveGREEN worked with specialists to identify the needs on monitoring different species groups and introduce connectivity-related parameters into monitoring. A GIS tool – QField & QGIS – was tested and developed and the first version of a monitoring plan was tested and implemented during SaveGREEN, to be further developed.

**Objectives** set to address the threat and proposed targets are:

**Objective 7.1.  
Facilitate the implementation of an integrated monitoring programme – procedures, database, indicators, and assessments**

*7.1.1. Biodiversity- and connectivity-related indicators are developed and integrated in sectoral management*

*7.1.2. Monitoring is integrated at landscape level*

*7.1.3. Strategies, programmes, plans, projects and activities are being assessed and adapted based on the monitoring results*

**Objective 7.2.  
Providing regular monitoring for the Struma motorway Section 1**

*7.2.1. Providing regular and scientifically proved data on road mortality for the Struma motorway Section 1*

*7.2.2. Providing regular and scientifically proved data on efficiency of defragmentation measures for the Struma motorway Section 1*

*7.2.3. Monitoring of mortality on railways performed*

*7.2.4. Monitoring of the SEA, EIA, AA decisions implementation*

**Threat/Pressure 8:  
The support of stakeholders for a cross-sectoral & integrated approach at landscape level is reduced**

**Description:**

The limited support of stakeholders at landscape level is either caused by a lack of knowledge related to the connectivity related topics, or a lack of interest and/or resources, (personal, organisational) reticence in engaging other entities.

**Aims:**

- » Increase the knowledge on connectivity topics and facilitate the communication between

stakeholders, within and between sectors;

- » Identify sectoral pioneers that would like to develop pilot projects and advertise these as good-practices; engage with the research community;
- » Develop landscape-level sense of identity based on the connectivity topics and support complementary projects at landscape scale.

### **Description of particular issues:**

- » **Although recognised as a critical issue, connectivity is not properly addressed by research and applied studies.** The SaveGREEN project has paired scientists with local managers in developing monitoring tools; an international workshop organized in Dupnitsa in May 2022 supported by SaveGREEN aimed for a better knowledge transfer among experts and stakeholders;
- » **Landscape approach is not a major concern for stakeholders and they are not aware of the sectoral impacts on connectivity.** SaveGREEN developed a simple stakeholder engagement recommendation and the supporting info explaining these topics in

order to facilitate the outreach effort (Stakeholder Analysis Report);

### **Note:**

*During the SaveGREEN project, we informed the stakeholders from the transport, forestry and game management, environmental protection sector on the approach of the project and we focused on interacting with local sectoral stakeholders who we identified as key for ensuring the functionality of passageways on transport infrastructure – agriculture, game management, forestry and local communities. In parallel, we engaged with the local, national and international media in explaining the importance of the landscape approach, the impacts on connectivity and benefits for the people and wildlife from the construction and maintenance of defragmentation measures.*

*Gaining trust of the stakeholders is a crucial element, and before explaining what the project “needs or aims for”, it is important to be able to understand each stakeholder well and see what the project may provide for them. For a meaningful dialog, language should not become a barrier in the sense that one needs to be accustomed with the specific terminology used within*



Fig 22. Studying functional connectivity of the defragmentation facilities (© BBF).



Fig 23. Discussing the impact of barrier effect of noise and light over the migrating animals during the SaveGREEN international workshop in the Rila-Verila-Kraishte pilot area (© BBF).

each sector. We have found that being able to engage with some of the stakeholders has led to a multiplying effect as they acted as promoters of the concept within their own groups.

» **In order for connectivity to be mainstreamed into the regional policies, it should be included in the development strategies, which would, thus, support connectivity-sensitive initiatives.**

**Objectives** set to address the threat and proposed targets are:

**Objective 8.1.**  
**Facilitate networking and develop a common platform and database**

8.1.1. A platform for regional stakeholders is available as a support for interaction

**Objective 8.2.**  
**Facilitate information, awareness, education, communication**

8.2.1. A dedicated outreach programme is set in place

8.2.2. Raised awareness of general public on connectivity raised.

**Objective 8.3.**  
**Support research and studies focused on connectivity; facilitate inter-sectoral capacity building and development of new professional opportunities (mainstream biodiversity to other sectors)**

8.3.1. Connectivity is promoted as an important topic of research and applied studies

**Objective 8.4.**  
**Facilitate and support complementary initiatives (connectivity as one of the topics)**

8.4.1. Connectivity-sensitive initiatives are being implemented

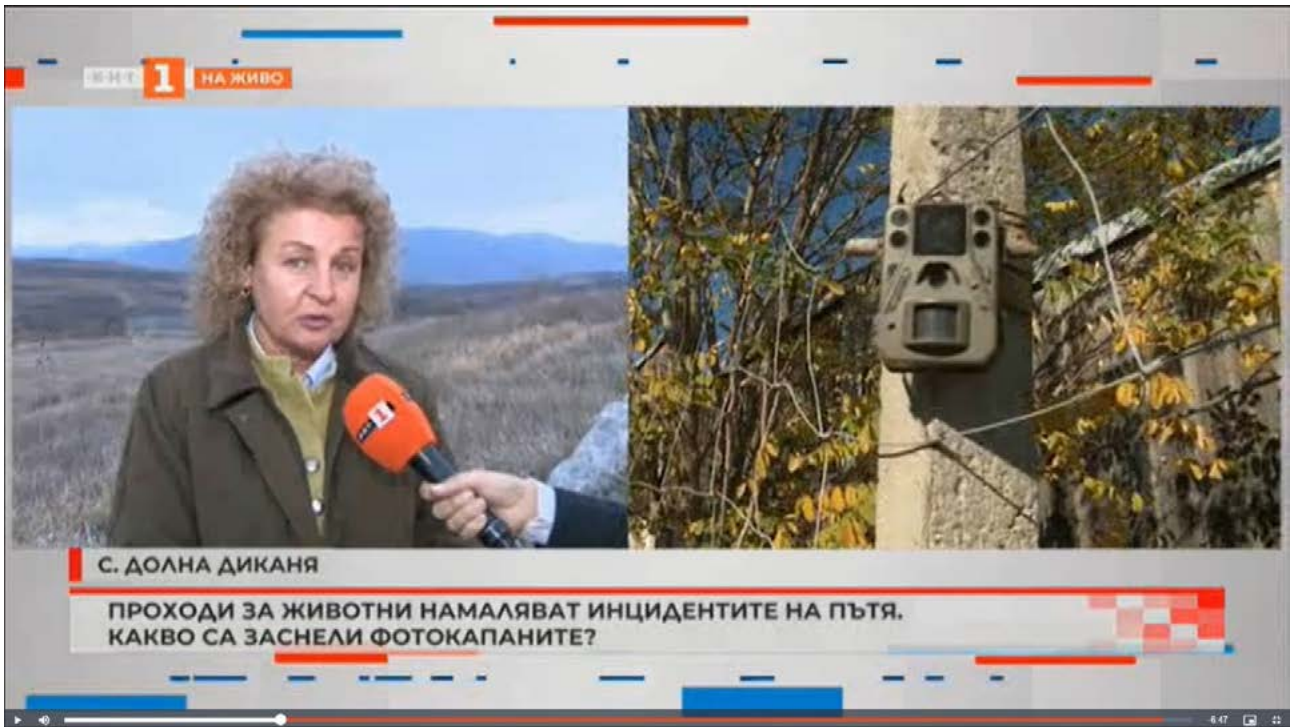


Fig 24. Presenting the importance of wildlife passages for the security of animals and people in Rila-Verila Kraishte Pilot area by Vanya Kamenova , SWSE – Associate Strategic Partner in the SaveGREEN Project to the wider audience of Channel 1 of the National Public Television (© BBF).



Fig 25. Promotional material of ecological connectivity with a good potential to become a local product and support local economy/initiatives, while at the same time spreading the information about the biocorridors and their role (© BBF).

**5.1 Main Sectoral Stakeholders in the Rila-Verila-Kraishte Pilot Area**

**5.2 Local Monitoring Plan Rila-Verila-Kraishte Pilot Area**

**5.3 Sectoral Impacts and General Threats or Pressures to Connectivity**

**5.4 GIS database: <https://metadata.savegreen.at>**



**5.5 Library of resources: <https://ccibis.org/catalogue-2>**

**5.6 Glossary**



## PILOT AREAS:

### **Austria**

- 1 Kobernausser forest
- 2 Pötsching (Alpine-Carpathian Corridor)

### **Czech Republic/Slovakia**

- 3 Beskydy-Kysuce CZ-SK cross-border area

### **Hungary/Slovakia**

- 4 Novohrad-Nógrád SK-HU cross-border area

### **Ukraine**

- 5 Zakarpattia region

### **Romania**

- 6 Mureş valley (Arad-Deva)
- 7 Mureş Valley (Târgu Mureş – Târgu Neamţ)

### **Bulgaria**

- 8 Rila-Verila-Kraishte corridor



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### Project partners:

**Austria:** WWF Central and Eastern Europe (Lead Partner), Environment Agency Austria

**Bulgaria:** Black Sea NGO Network, Bulgarian Biodiversity Foundation

**Czech Republic:** Friends of the Earth Czech Republic – Carnivore Conservation Programme, Transport Research Centre Czech Republic

**Hungary:** CEEweb for Biodiversity, Hungarian University for Agriculture and Life Sciences

**Romania:** Zarand Association, EPC Environmental Consultancy Ltd., WWF Romania

**Slovakia:** Slovak University of Technology in Bratislava – SPECTRA Centre of Excellence of EU

### Associated Strategic Partners:

**Austria:** Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology

**Bulgaria:** Ministry of Agriculture, Food and Forestry – Executive Forest Agency, Southwestern State Enterprise SE – Blagoevgrad

**Czech Republic:** Ministry of the Environment, Nature Conservation Agency

**France:** Infrastructure and Ecology Network Europe (IENE)

**Germany:** Bavarian State Ministry of the Environment and Consumer Protection

**Greece:** Egnatia ODOS S.A.

**Hungary:** National Infrastructure Developing Private Company Ltd. (NIF Ltd.), Ministry of Agriculture, Danube-Ipoly National Park Directorate

**Romania:** Ministry of Environment, Waters and Forests, Ministry of Public Works, Development and Administration, Ministry of Transport, Infrastructure and Communications

**Slovakia:** State Nature Conservancy, Ministry of Environment, Ministry of Transport and Construction, National Motorway Company

**Ukraine:** M.P. Shulgin State Road Research Institute State Enterprise – DerzhdorNDI SE, Department of Ecology and Nature Resources of Zakarpattia Oblast Administration

SaveGREEN “Safeguarding the functionality of transnationally important ecological corridors in the Danube basin”

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