

ACTION A4. ANALYSIS AND MAPPING OF EXISTING CROSSING STRUCTURES FOR POTENTIAL USE BY THE TARGET SPECIES AND OTHER INTERVENTIONS ON THE ROADS.

ACTION REPORT/2020 – Romania

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1.INTRODUCTION

The action A4 was a preparatory action to identify the crossing structures to be readapted in the frame of Action C2 in order to favour their use by the target species.

In the frame of this action the following activities were carried out:

- Mapping the crossing structures present in the project area;
- Characterization of the crossing structures;
- Monitor the use of the crossing structures; by the target species;
- Selection of the crossing structures to be readapted.

The action A4 lasted from March 2019 to September 2020.

2. PROJECT AREA

The project area, located in the central area of Romania, in South-Eastern Carpathians, hosts the highest density of the brown bear population of the country.

The road segments included in the frame of Action A4 were the same of Action A5 (tab. 1 and fig. 1):

- DN1 Brasov – Comarnic: DN 1 it's the main road from Brasov to Bucharest it crosses an important area for the brown bear population, being located between 2 of the biggest Natura 2000 sites in the project area, and also being one of the most crowded roads in Romania.
- DN1A Cheia - Brasov is an alternative of the DN1 being used in daytime for the big trucks, and in weekend for lowering the car numbers from DN1.
- DN13 Padurea Bogatii - Brasov is the main road, which connects Brasov from the central part of the country.
- DN1 Vladeni Brasov is also a very busy road, being also part of the main road from Bucharest to the border to Hungary.

Road code/nr.	Length of segment
Padurea bogatii, DN13	20km
Brasov - Comarnic DN 1	40km
DN 1 A – Cheia-Brasov	40km
Brasov - Vladeni E68, DN1	20km

Table 1. List and length of the monitored road segments

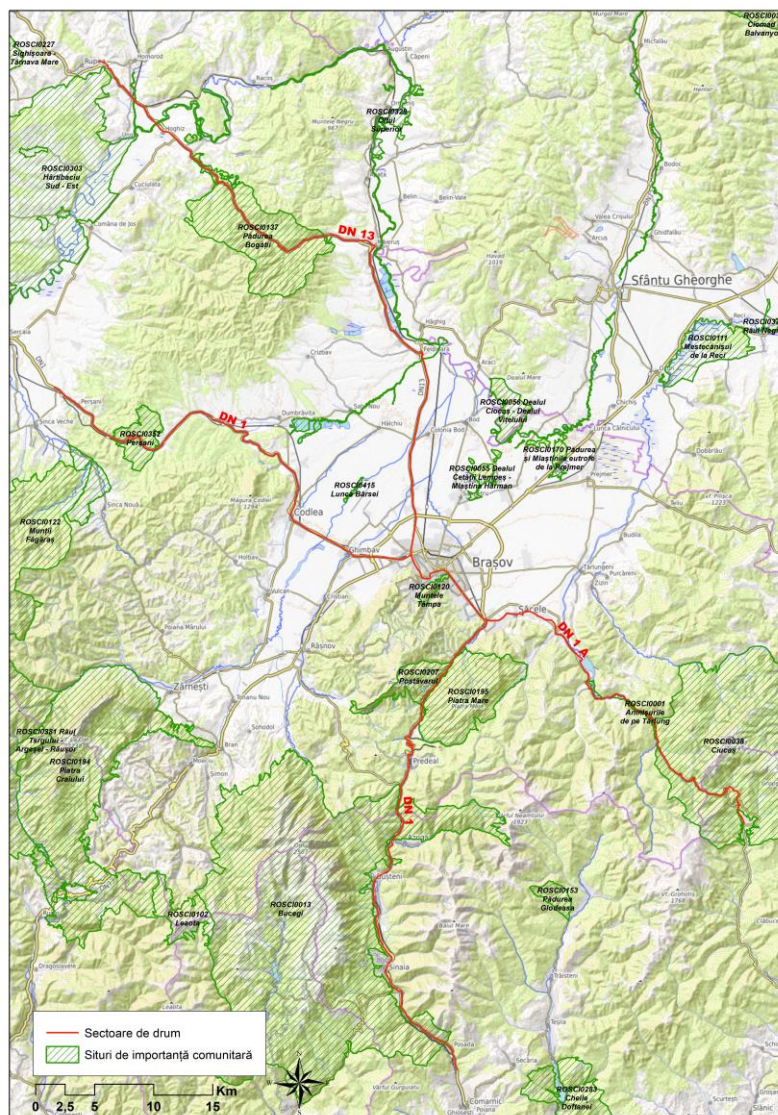


Figure 1: Road segments monitored in the project area

3. METHODS

The action was developed following the indications included in the “Guidelines to adapt transversal structures and increase use by large carnivores and other wildlife” developed by the project partner Minuartia.

Mapping and characterization of the crossing structures

Starting from March 2019 we made GIS analysis and specific field surveys to identify the already crossing structures in the project area.

The characterization of the crossing structures was based to the field form elaborated by minuartia (fig. 2).

Identification and location of the structure		STRUCTURE CODE:	
Road code:	PK:		
Road stretch:	Coordinates (X,Y):		
Main structural features			
Type of non-wildlife crossing structures <small>(With NO particular adaptations for wildlife)</small>		Type of Wildlife crossing <small>(Specific for wildlife or adapted to allow fauna use)</small>	
<input type="checkbox"/> Tunnel (TUN) <input type="checkbox"/> Overpass (OVP) <input type="checkbox"/> Viaduct (VIA) <input type="checkbox"/> Underpass (UNP) <input type="checkbox"/> Culvert / drainage (CUV) <input type="checkbox"/> Other: _____		<input type="checkbox"/> Ecoduct (ECO) <input type="checkbox"/> Wildlife Overpass (WOP) <input type="checkbox"/> Multi-use Overpass (MOP) <input type="checkbox"/> Wildlife Underpass (WUP) <input type="checkbox"/> Multi-use Underpass (MUP) <input type="checkbox"/> Modified culvert (WCU) <input type="checkbox"/> Amphibian tunnel (ATP)	
Road transversal section: <input type="checkbox"/> Flat <input type="checkbox"/> Embankment <input type="checkbox"/> Cutting <input type="checkbox"/> Slopes combination			
Structure section: <input type="checkbox"/> Circular <input type="checkbox"/> Rectangular <input type="checkbox"/> Vault <input type="checkbox"/> Other: _____		Composition of the structure: <input type="checkbox"/> Simple <input type="checkbox"/> Double <input type="checkbox"/> Triple <input type="checkbox"/> Other: _____	
Visibility of opposite entrance: <input type="checkbox"/> 0% <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 100%			
Dimensions (m): Height (H): Width (W): Length (L): Openness Index (Section/L): Multicellular Height (H): Width (W=W1+W2): Length (L): Openness Index (Section/L):			
Construction material: Structure <input type="checkbox"/> Concrete <input type="checkbox"/> Corrugated steel <input type="checkbox"/> Other: _____ Substratum material <input type="checkbox"/> Concrete <input type="checkbox"/> Corrugated steel <input type="checkbox"/> Natural substratum (%): _____ <input type="checkbox"/> Other: _____			
Presence of water: <input type="checkbox"/> No <input type="checkbox"/> Yes, permanent <input type="checkbox"/> Yes, temporal Water layer depth (cm): _____ Surface covered by water (%): _____			
Dry ledges: <input type="checkbox"/> One side Material: _____ Width (m): _____ <input type="checkbox"/> Both sides Material: _____ Width ₁ (m): _____ Width ₂ (m): _____			
Uses of the passages: <input type="checkbox"/> Cattle trail <input type="checkbox"/> Pedestrian trail <input type="checkbox"/> Forestry road (unpaved) <input type="checkbox"/> Paved road <input type="checkbox"/> Water channel <input type="checkbox"/> Stream crossing <input type="checkbox"/> Other: _____			
Other features: _____ _____ _____			
Inspected by:		Date inspection:	

STRUCTURE CODE:	
Entrance 1 (orientation side: _____)	Entrance 2 (orientation side: _____)
Obstacles at the entrances	
Type of obstacle <input type="checkbox"/> Stepped exit; num. of steps _____ height (cm): _____ <input type="checkbox"/> Stone or concrete ramp; slope (°): _____ <input type="checkbox"/> Pit <input type="checkbox"/> Riprap <input type="checkbox"/> Other: _____	<input type="checkbox"/> Stepped exit; num. of steps _____ height (cm): _____ <input type="checkbox"/> Stone or concrete ramp; slope (°): _____ <input type="checkbox"/> Pit <input type="checkbox"/> Riprap <input type="checkbox"/> Other: _____
Vegetation ¹	
Dominant vegetation <input type="checkbox"/> Trees <input type="checkbox"/> Bushes <input type="checkbox"/> Herbaceous	<input type="checkbox"/> Trees <input type="checkbox"/> Bushes <input type="checkbox"/> Herbaceous
Representative species _____	
% vegetation coverage <input type="checkbox"/> 0-4 <input type="checkbox"/> 5-24 <input type="checkbox"/> 25-49 <input type="checkbox"/> 50-74 <input type="checkbox"/> 75-100	
Surroundings ²	
Any activity causing disturbances at the vicinity? <input type="checkbox"/> No <input type="checkbox"/> Yes (which?): _____	
Natural Habitat type/ Land use _____	
Distance to the entrance (m) _____	
Fences	
Typology <input type="checkbox"/> Knotted wire mesh <input type="checkbox"/> Absent <input type="checkbox"/> Welded wire mesh <input type="checkbox"/> Other: _____ Height (cm): Chain-link fence (cm): _____	<input type="checkbox"/> Knotted wire mesh <input type="checkbox"/> Absent <input type="checkbox"/> Welded wire mesh <input type="checkbox"/> Other: _____ Height (cm): Chain-link fence (cm): _____
Safety barrier <input type="checkbox"/> Metal <input type="checkbox"/> Wood <input type="checkbox"/> B-wave <input type="checkbox"/> New Jersey <input type="checkbox"/> Other: _____ Height (cm): _____	<input type="checkbox"/> Metal <input type="checkbox"/> Wood <input type="checkbox"/> B-wave <input type="checkbox"/> New Jersey <input type="checkbox"/> Other: _____ Height (cm): _____
Adjustment to the structure entrances <input type="checkbox"/> Yes <input type="checkbox"/> No: openings or other	<input type="checkbox"/> Yes <input type="checkbox"/> No: openings or other
Presence of specific adaptations <input type="checkbox"/> Base reinforcements <input type="checkbox"/> Outrigger <input type="checkbox"/> Other: _____	<input type="checkbox"/> Base reinforcements <input type="checkbox"/> Outrigger <input type="checkbox"/> Other: _____
Other features: _____ _____ _____	
Field photos: _____ _____ _____	

Figure 2. Field form to characterize the crossing structures elaborated by Minuartia.

For each crossing structures we defined the typology of the structures, we measured the main parameters concerning the size (height, length,...), then we recorded the main use of the structure, and the habitat of the surroundings. Particular attention was devoted to register the presence of obstacles at the entrances of the crossing structures.

During the characterization phase we registered the signs of the animal presence.

Monitor the use of the crossing structures; by the target species

The use of the crossing structures was monitored through the installation of camera traps, and recording the tracks of the animals as well as other signs of their presence.

Selection of the crossing structures to be readapted

The main criteria used to select the crossing structures were the ones indicated in the aforementioned guidelines (i.e. location, size, disturbance).

In the selection process was important to consider the results of the Action A3 (AVC clusters, and crossing point clusters) and the previous knowledge of the bear's movements in the area.

4. RESULTS

In the project area we characterized 127 crossing structures (tab. 2): 20 are located in the Brasov Persani road area, 25 in Brasov Cheia Road, 68 in Padurea Bogatii area and the remaining 14 in Brasov Comarnic Road.

In the figure 3 and 4 we present as an example the distribution of the crossing structures along the Brasov Persani road area, and Brasov Comarnic Road.

All the characterized crossing structures are viaduct except 2 that were culverts.

The mean height of the viaducts was $6,7\text{m} \pm 12,6\text{m}$ (range:1,9m-38m), the mean width $5,8\text{m} \pm 5,3\text{m}$ (range: 2m-18m), while the mean length $44,57\text{m} \pm 28,20$ (range 11m-90m).

Structure code	Road code	Road stretch	Type of crossing structure	Height (m)	Diameter (m)	Width (m)	Length	Uses of the passages
\	E68	Braşov-Perşani	Viaduct	2.10	2.54	2.54	14.50	Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	1.80	2.50	2.50	12.50	Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	1.88	Not applicable	10.05	12.00	Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	9.40	Not applicable	11.50	147.00	Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	2.60	Not applicable	2.03	10.80	Water Channel
E68	E68	Braşov-Perşani			Not applicable			Water Channel
E68	E68	Braşov-Perşani			Not applicable			Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	1.80	Not applicable	2.03	12.00	Water Channel
VIA_E68_	E68	Braşov-Perşani	Viaduct	2.32	Not applicable	5.09	9.13	Water Channel
VIA_E68_	E68	Braşov-	Viaduct	2.50	Not	2.90	10.5	Water

		Perșani			applicable		0	Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.53	Not applicable	2.57	10.37	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.76	Not applicable	12.50	10.50	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.12	2.12	2.12	12.00	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	5.60	Not applicable	4.20	10.90	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.00	2.30	2.30	10.50	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.84	Not applicable	3.55	10.30	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.35	Not applicable	1.92	8.30	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	3.40	Not applicable	6.38	10.60	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	5.37	Not applicable	12.63	10.76	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	3.03	2.78	2.78	18.78	Water Channel
VIA_E68_	E68	Brașov-Perșani	Viaduct	2.46	0.00		15.05	Water Channel
VIA_DN 1 A_144+80	DN 1 A	Brașov-Măneciu	Viaduct	4.30	Not applicable	15.35	10.80	Water Channel
CUV_DN 1 A_43+70	DN 1 A	Brașov-Măneciu	Culvert/drainage	1.48	Not applicable	1.99	14.00	Water Channel
VIA_DN 1 A_43+800	DN 1 A	Brașov-Măneciu	Viaduct	1.50	Not applicable	3.10	9.70	Water Channel
_DN 1 A_42+60	DN 1 A	Brașov-Măneciu		3.70	Not applicable	16.50	10.60	Water Channel
VIA_DN 1 A_41+30	DN 1 A	Brașov-Măneciu	Viaduct	2.53	Not applicable		8.60	Water Channel
VIA_DN 1 A_41+800	DN 1 A	Brașov-Măneciu	Viaduct	3.40	Not applicable	10.50	9.76	Water Channel
VIA_DN 1 A_40+200	DN 1 A	Brașov-Măneciu	Viaduct	2.90	Not applicable	6.46	9.50	Water Channel
VIA_DN 1 A_40+800	DN 1 A	Brașov-Măneciu	Viaduct	3.21	Not applicable	10.45	9.62	Water Channel
VIA_DN 1 A_38+400	DN 1 A	Brașov-Măneciu	Viaduct	2.87	Not applicable	9.74	9.21	Water Channel
VIA_DN 1 A_38+800	DN 1 A	Brașov-Măneciu	Viaduct	2.21	Not applicable	8.23	9.89	Water Channel
VIA_DN 1 A_39+900	DN 1 A	Brașov-Măneciu	Viaduct	1.14	Not applicable	10.10	9.70	Water Channel
VIA_DN 1 A_37+100	DN 1 A	Brașov-Măneciu	Viaduct	2.00	Not applicable	2.20	31.50	Water Channel
VIA_DN 1 A_35+800	DN 1 A	Brașov-Măneciu	Viaduct	1.15	Not applicable	9.20	6.90	Water Channel
VIA_DN 1 A_34+100	DN 1 A	Brașov-Măneciu	Viaduct	1.95	Not applicable	6.30	10.50	Water Channel
VIA_DN 1 A_34+400	DN 1 A	Brașov-Măneciu	Viaduct	1.46	Not applicable	9.90	11.50	Water Channel
VIA_DN 1 A_34+600	DN 1	Brașov-	Viaduct	1.00	Not	2.00	10.0	Water

	A	Măneciu			applicable		0	Channel
VIA_DN 1 A_	DN 1 A	Braşov-Măneciu	Viaduct	3.05	Not applicable	1.90	12.40	Water Channel
VIA_DN 1 A_	DN 1 A	Braşov-Măneciu	Viaduct	3.90	Not applicable	1.90	11.90	Water Channel
VIA_DN 1 A_Valea Babarunca	DN 1 A	Braşov-Măneciu	Viaduct	1.90	Not applicable	3.50	9.00	Water Channel
VIA_DN 1 A_Tesla	DN 1 A	Braşov-Măneciu	Viaduct	2.70	Not applicable	4.50	12.00	Water Channel
VIA_DN 1 A_	DN 1 A	Braşov-Măneciu	Viaduct	3.60	Not applicable	3.00	10.00	Water Channel
VIA_DN 1 A_Tarlungeni	DN 1 A	Braşov-Măneciu	Viaduct	3.00	Not applicable	16.50	10.50	Water Channel
VIA_DN 1 A_Doftana	DN 1 A	Braşov-Măneciu	Viaduct	3.90	Not applicable	7.70	8.50	Water Channel
VIA_DN 1 A_Baraj	DN 1 A	Braşov-Măneciu	Viaduct	5.00	Not applicable	5.35	14.00	Water Channel
VIA_DN 1 A_Subbaraj	DN 1 A	Braşov-Măneciu	Viaduct	4.50	Not applicable	9.00	16.50	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1,973	Not applicable	1,992	10.92	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.50	Not applicable	0.97	10.92	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.43	Not applicable	0.22	10.92	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.38	Not applicable	0.97	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.99	Not applicable	1.4	11.59	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.39	Not applicable	0.92	11.60	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.79	Not applicable	1.93	11.50	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	0.99	Not applicable	0.91	11.20	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.9	Not applicable	1.2	11.10	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	1.5	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.6	Not applicable	1.6	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.3	Not applicable	2.2	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.05	Not applicable	2	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.05	Not applicable	2	11.00	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.3	Not applicable	2	16.80	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.2	Not applicable	2	16.50	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.83	Not applicable	2	18.10	Water Channel
VIA_E 60_	E 60	Padurea	Viaduct	1.8	Not	2	16.0	Water

		Bogatii			applicable		0	Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2	Not applicable	2	16.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	16.0 5	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	16.0 5	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2	Not applicable	3.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.5	Not applicable	5.75	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	1.6	11.0 5	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	1.6	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	1.9	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.2	Not applicable	2.1	16.0 5	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2.5	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	1.9	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea	Viaduct	1.1	Not	2.1	11.0	Water

		Bogatii			applicable		0	Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.44	Not applicable	3.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.1	Not applicable	1.77	11.5 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2	Not applicable	1.7	11.0 5	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2	Not applicable	1.1	11.0 8	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.1	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	1.7	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	1.5	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.7	Not applicable	2.1	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.5	Not applicable	1.5	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.6	Not applicable	9	11.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	2.2	Not applicable	2	18.0 0	Water Channel
VIA_E 60_	E 60	Padurea Bogatii	Viaduct	1.6	Not applicable	9.7	25.0 0	Water Channel
VIA_DN73_	DN7 3	Râșnov-Predeal	Viaduct	1.78	Not applicable	3.6	9.20	Water Channel
VIA_DN73_	DN7 3	Râșnov-Predeal	Viaduct	1.7	Not applicable	3.75	8.00	Water Channel
VIA_DN73_	DN7 3	Râșnov-Predeal	Viaduct	4	Not applicable	18	10.1 0	Water Channel
VIA_DN73_	DN7	Râșnov-	Viaduct	1.85	Not	6.1	12.6	Water

	3	Predeal			applicable		0	Channel
VIA_DN73_	DN7 3	Râşnov- Predeal	Viaduct	1.53	Not applicable	4.5	12.0 0	Water Channel
VIA_DN73_	DN7 3	Râşnov- Predeal	Viaduct	1.3	Not applicable	3.7	20.7 0	Water Channel
VIA_DN1_	DN1	Braşov- Comarnic	Viaduct	4.8	Not applicable	12	90	Stream crossing
VIA_DN1_	DN1	Braşov- Comarnic	Viaduct	3.34	Not applicable	11	25	Forestry road
VIA_DN1_	DN1	Braşov- Comarnic	Viaduct	19.4	26.40	26.4	11	Water Channel
MUP_DN1_	DN1	Braşov- Comarnic	Culvert/dra inage	4.5	Not applicable	88.4	10.8 4	Water Channel
MUP_DN1_696	DN1	Braşov- Comarnic	Viaduct	11.5	12.00	12	52	Water Channel
MUP_DN1_	DN1	Braşov- Comarnic	Viaduct	8.5	Not applicable		12	Water Channel
_DN1_695	DN1	Braşov- Comarnic	Viaduct	38	Not applicable	12	74	
VIA_DN1_697	DN1	Braşov- Comarnic	Viaduct	9.8	12.00	12	48	Stream crossing

Table 2. Crossing structures characterized in the project area.

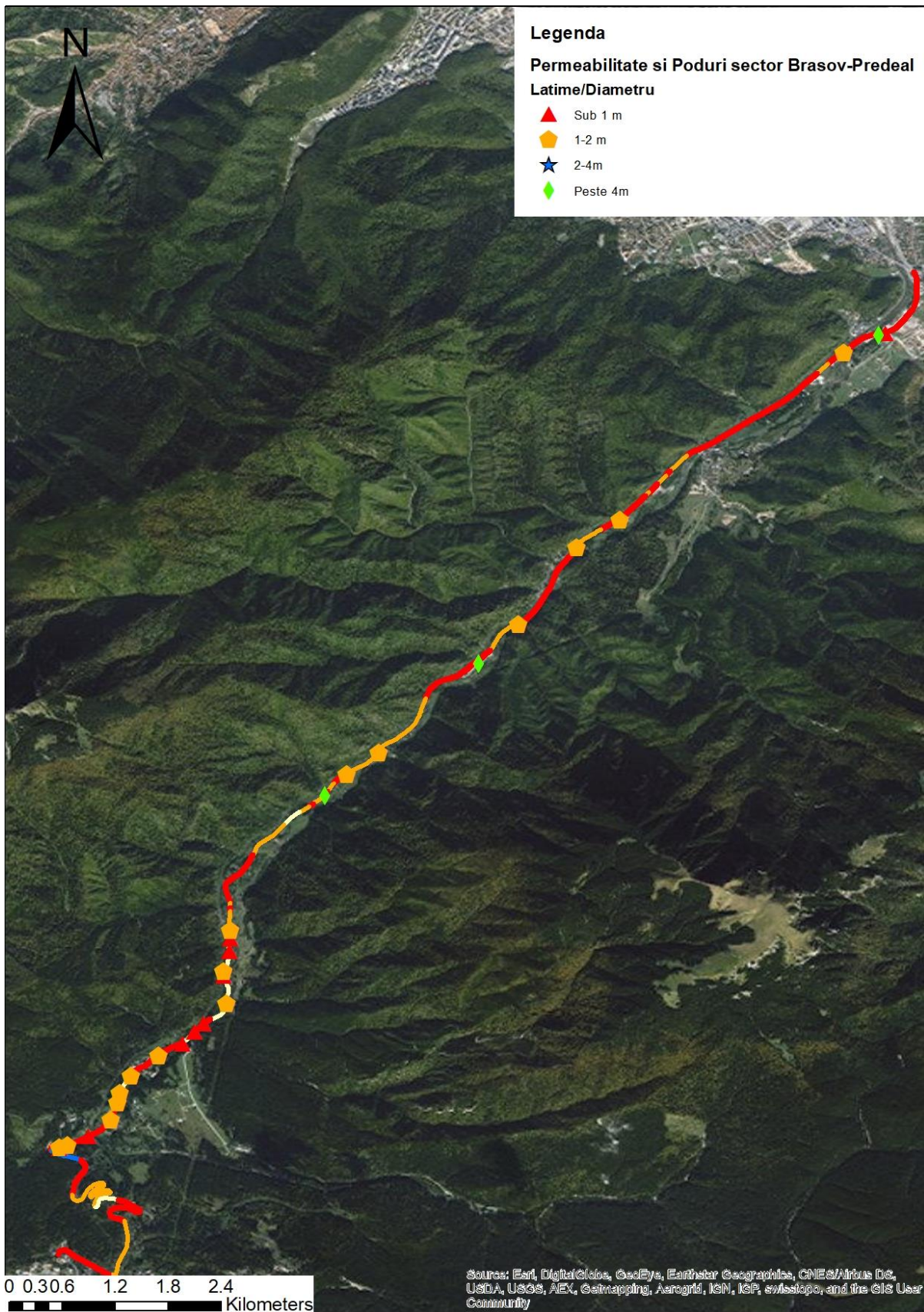


Figure 3. Distribution of the crossing structures along the Brasov Persani road area.

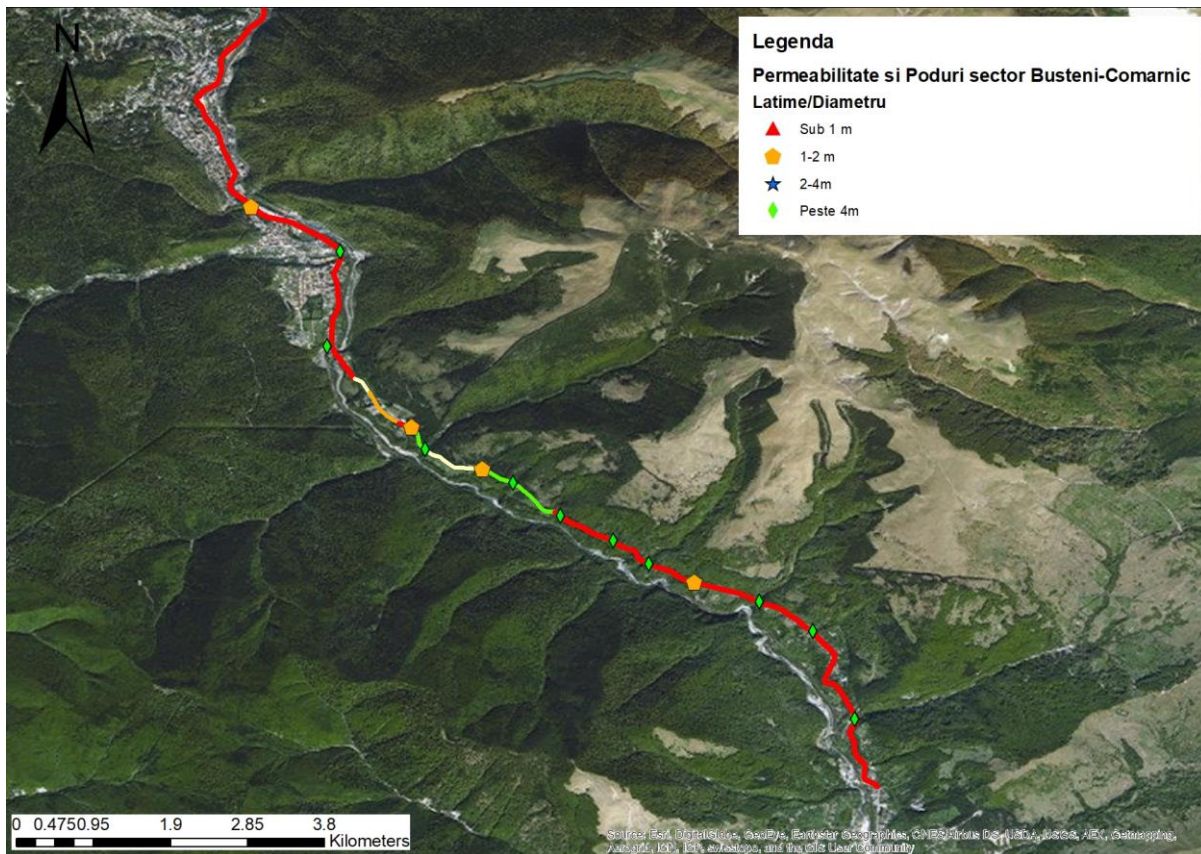


Figure 4. Distribution of the crossing structures along the Brasov-Comarnic road segment.

Over the 127 crossing structures characterized 20 were selected to be monitored with camera traps and to be readapted in the frame of Action C2. The selection of these 20 (15 located in DN1, and 5 in DN13 Padurea Bogatii road segment) was based on the following parameters:

- Localization of the structure
- Characteristics of the structure
- Detection of bear passages

The camera trapping to monitor the use of the selected 20 crossing structure lasted 30-33 days (table 3).

Crossing structure (ID)	Road	Monitoring days	Passages recorded	Species registered
1	Padurea bogatii	30	0	
2	Padurea bogatii	30	2	fox, otter
3	Padurea bogatii	30	0	
4	Padurea bogatii	30	0	
5	Padurea bogatii	30	3	fox, otter, pine marten
1	DN1	33	6	fox, dogs
2	DN1	33	1	Brown bear
3	DN1	33	0	
4	DN1	33	0	
5	DN1	33	0	
6	DN1	33	4	dogs
7	DN1	33	0	
8	DN1	33	5	pine marten, dogs
9	DN1	33	0	
10	DN1	33	0	
11	DN1	33	9	cows
12	DN1	33	0	
13	DN1	33	0	
14	DN1	33	4	fox
15	DN1	33	0	

Table 3. Wildlife species detected in the selected 20 crossing structure trough camera trapping before the concrete interventions.

We recorded animal passages in 8 crossing structures, the wildlife species detected were: brown bear fox, pine marten and otter. The brown bear was detected only once in a crossing structure in DN1 road segment. Unfortunately due to high risk of thefts we had to interrupt the use of camera traps

In Romania after the characterisation of the underpasses, we immediately started the interventions to favour the use of the crossing structures by bears and other wildlife species (Action C2) (fig. 5 and 6). The interventions foreseen consisted mainly in removing the obstacles at both entrance of the crossing structures, specifically the vegetation cutting and the removal of debriefs brought by the water of thrown by the people.

The first intervention was made in May 2019, the details of the interventions carried out will be present in the Action C2 report.

The results of the use of the crossing structures after the first intervention in the 11 crossing structures monitored with camera traps was the following (table 4):

Crossing structure (ID)	Road	Monitoring days	Passages recorded	Species registered
1	Padurea bogatii	100	15	fox, otter, pine marten, roe deer, dog
2	Padurea bogatii	100	10	fox, otter, pine marten, roe deer, wild boar
3	Padurea bogatii	100	20	fox, otter, pine marten, roe deer, wild boar
4	Padurea bogatii	100	8	fox, otter, pine marten, roe deer, dog
5	Padurea bogatii	100	12	fox, otter, pine marten, roe deer, wild boar
2	DN1	103	11	pine marten, dog, red deer, brown bear (3)
4	DN1	103	13	pine marten, dog, red deer, brown bear (5)
7	DN1	103	16	fox, dog
10	DN1	103	27	pine marten, dog, brown bear (2)
13	DN1	103	14	dog, brown bear (1)
15	DN1	103	19	Wild ora, dog, brown bear (4)

Table 4. Wildlife species detected in 11 crossing structure trough camera trapping after the first concrete interventions.

After the first concrete intervention animal passages were recorded in each of the 11 crossing structures monitored, while in the ex ante intervention period animal passages were detected only in 3 crossing structures (table 5). There was a significant increase not only in the total number of passages but also in the number of species detected. In particular after the first intervention brown bear passages were recorded in 5 crossing structures of the 11 monitored, respect to only one in the period before.

Even if the data presented were still preliminary and they were referred to a limited time period, especially the one before the concrete intervention, they seem to show the success of the implemented action. A more detailed analysis of the effectiveness of the concrete conservation action will be obtained during the whole project implementation

Crossing structure (ID)	Road	Number of passages/ monitoring days BEFORE THE INTERVENTION	Number of passages/ monitoring days AFTER THE INTERVENTION
1	Padurea bogatii	0,00	0,15
2	Padurea bogatii	0,07	0,10
3	Padurea bogatii	0,00	0,20
4	Padurea bogatii	0,00	0,08
5	Padurea bogatii	0,10	0,12
2	DN1	0,03	0,11
4	DN1	0,00	0,13
7	DN1	0,00	0,16
10	DN1	0,00	0,26
13	DN1	0,00	0,14
15	DN1	0,00	0,18

Table 5. Comparison of number of wildlife passages detected before and after the intervention on each crossing structure.

5. FINAL CONSIDERATIONS

The action was successfully implemented, and we were able to map and characterize 127 crossing structures in the project area.

We selected the 20 crossing structures to be readapted, in order to favour their use by the target species and thus reducing habitat fragmentation and the probability of the road mortality. All the 20 selected crossing structures were located in the critical area of the brown bear connectivity corridors.

The interventions already carried out showed to represent a benefit not only for the target species, but for the other wildlife species.

We decided to start immediately the concrete interventions because most of the selected structures were inaccessible for the animals, at least in some periods, due to the obstacles found at the entrances.

We think that this action can be replicated in other roads of the country because it will favour ecological connectivity, it will reduce the risk of the animals to be killed on the road and also it will increase the driver's safety.

The major problem encountered in the action implementation was again the risk of theft of camera trapping, that limited the use of this monitoring tool. For the rest of the project we are evaluating different strategies to reduce this problem and we will also continue to monitor the use of the crossing structures through the detection of animal's tracks.



Figure 5. Intervention carried out at the selected crossing structures.



Figure 6. Intervention carried out at the selected crossing structures.