PARTNERSHIP WITH

ENVIRONMENTAL IMPACT REPORT

SUCEAVA - DN2H MOTORWAY and DN2H - SIRET BORDER EXPRESS ROAD

Beneficiary

NATIONAL COMPANY OF THE ROAD INFRASTRUCTURE ADMINISTRATION (CNAIR) SA

ENVIRONMENTAL IMPACT REPORT

"Suceava - DN2H Motorway and DN2H - Siret Border Express Road"

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ABBREVIATIONS AND ACRONYMS

ABA	Water Basin Administration
AMC	Multicriteria Analysis
ANAR	„Apele Romane” National Administration
AND	National Administration of Roads
ANM	National Administration of Meteorology
ANANP	National Agency for Natural Protected Areas
ANPM	National Agency for Environmental Protection
APM	Environmental Protection Agency
Buffer	Term used exclusively with the meaning of the function in ArcGis; with no implications from the perspective of the management of natural protected areas
CE	The European Commission
CF	Railway
ClC	Maintenance and Coordination Center
CLC	Corine Land Cover
CNAIR	National Company of the Road Infrastructure Administration SA
CU	Urbanistic Certificate/Urban Planning Certificate
EIA Directive	Directive 2011/92/EU regarding the assessment of the effects of certain public and private projects on the environment, as amended by the Directive 2014/52/EU
DJ	County Road
DN	National Road
EA	Adequate Assessment
hat	European Environmental Agency
EIA/ EIM	Environmental Impact Assessment
GIS	Geographic Information System
HG	Government Decision
I.E.	Interventions during the construction period
I.O.	Interventions during the operational period
IO	Relative openness index
ITS	Intelligent Transport System
IUCN	International Union for Nature Conservation

MPGT	General Transport Master Plan
MZA	Annual Average Daily Traffic intensity
Natura 2000	The European ecological network of the protected natural areas of community interest
NTLH-001/2008	NTLH-001 "Criteria and principles for the evaluation and selection of the technical solutions for the design and implementation of the hydrotechnical works for the development/redevelopment of watercourses, to achieve environmental objectives in the field of water" approved by the Order no. 1215/2008
OUG	Governmental Emergency Ordinance
PATJ	County Territory Arrangement Plan
PIB	Gross Domestic Product
PMBH/PMSH	Management plan of the Hydrographic Basin/Hydrographic Space
PMM	Environmental Management Plan
RIM	Environmental Impact Report
SCI	Site of community importance
SPA	Area of special avifaunistic protection
TEN-T	Trans European Transport Network
UAT	Territorial-Administrative Unit
UE	European Union
VET	Standard Vehicles Passenger Cars

1 INTRODUCTION

Name of the investment objective:	**Suceava – DN2H Motorway and DN2H – Siret Border Express Road**
Objective location and address:	**Suceava County**
Beneficiary of the works:	**National Company of Road Infrastructure Administration SA** 38 Dinicu Golescu, Sector 1, Bucharest, 010873, Romania Tel.: 021.264.32, fax: 021.312.09.84 E-mail: office@andnet.ro , Web: www.cnadnr.ro Contact person: General Manager: Cristian PISTOL Responsible for environmental protection: Ecaterina Muscalu, Head of the Environment Department
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2 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

The project **"SUCEAVA - DN2H MOTORWAY and DN2H - SIRET BORDER EXPRESS ROAD"** is included in the Annex no. 1 of the Law 292/2018 regarding the assessment of the impact of certain public and private projects on the environment, at point 7, letter b) "Construction of motorways and express roads".

The proposed project falls under the provisions of art. 48 and art. 54 of the Law of Water no. 107/1996, with the subsequent amendments and additions.

The project provides for the construction of a motorway between the municipality of Suceava and DN2H and an express road between the DN2H and Siret. These are provided in the Romanian General Transport Master Plan (MPGT).

Given that transport is the engine of the economy, at the national and European level, it is desired to support a sustainable economic development starting from the provision of an appropriate infrastructure.

The National Company of the Road Infrastructure Administration has submitted to the ANPM the Notice of the Request of Environmental Agreement for the project. As a result of this request, APM Suceava issued the Decision of the initial evaluation stage no. 233 of 29.09.2021 in which it was decided the need to initiate the environmental impact assessment procedure, by submitting the Presentation Report according to the framework content provided in the Annex no. 5E of the Law 292/2018.

In the continuation of the procedure, the Presentation Report was submitted, based on which the Decision of the recruitment stage no. 120 of 07.06.2023, which established that the project is subject to the environmental impact assessment procedure, the adequate assessment and the assessment of the impact on the water bodies. Next, a Guide was prepared by APM Suceava for developing the three requested documents.

The Environmental Impact Report was made in accordance with the framework content of Annex no. 4 of the Law 292/2018 regarding the assessment of the impact of certain public and private projects on the environment, as well as in accordance with the Annex no. 1 of Order no. 269/2020 regarding the approval of the general guide applicable to the stages of the Environmental Impact Assessment procedure, the guide for environmental impact assessment in a cross-border context and other specific guidelines for different fields and categories of projects. The general objective is to improve the economic competitiveness of Romania by developing the transport infrastructure, thus contributing to the development of the internal market with the aim of creating the conditions for increasing the volume of investments, promoting sustainable transport and cohesion in the European road network.

In addition to its national importance, this project will serve in good conditions, the national transit traffic, of goods and people from the territory of Romania and to Ukraine. Depending on the national roads stage of rehabilitation or under rehabilitation, through them the motorway can receive and distribute road traffic through its interchanges, it will ensure the necessary traffic capacity and appropriate traffic conditions related to the TEN-T road network with minimum negative effects at the level environment and land use.

Traffic conditions will be improved at the level of the national transport road network, also in terms of road safety, polluting emissions will be reduced, operating costs will be reduced, thus meeting the requirements of economic development performed by adapting the national road network to the real demand for Transport.

This project will generate important positive social-economic effects, also by "reducing distances" and regional development by increasing the area of "gravitational" economic influence of large cities on their smaller "satellite" localities.

The project provides the construction of a high-speed connection (motorway and express road) between the municipality of Suceava and DN2H and an express road sector between DN2H and Siret Border, this being part of the road project with the generic name "Drumul Siretului", indicative DX5 included in MPGT (Pascani – Suceava – Siret). These sectors are also connected near the Municipality of Suceava with the Motorway A7 (Buzău – Focşani – Bacău – Paşcani – Suceava).

The investment priority Suceava - Siret is confirmed by the MPGT, which refers to the improved mobility for the population and goods within the basic and comprehensive TEN-T network, by building a motorway and a network of express roads, which will reduce travel time, accident risks and implement sustainable economic and environmental projects.

The purpose of the project consists of the construction of a motorway between Suceava and DN2H and an express road between DN2H and Siret Border, part of the Pascani - Suceava - Siret road project. The project will be part of the Bucharest-Ukraine corridor, which will ensure a fast connection between the south of the country via the Motorway A7 to the north in the Moldoveni region and to the neighboring country in the north, Ukraine.

The main objectives of the project are:

- Increasing the technical-economic efficiency of the transport network in Romania and increasing the travel speed between Suceava and Siret, thus improving regional connectivity;
- Ensuring the ability to move and the appropriate related safety conditions;
- The improvement of traffic conditions at the level of the national transport road network, also in terms of road safety, the reduction of polluting emissions, thus meeting the requirements of economic development achieved by adapting the national road network to the real demand for transport.

The following figure shows the general location of the project in relation to the localities in the area.

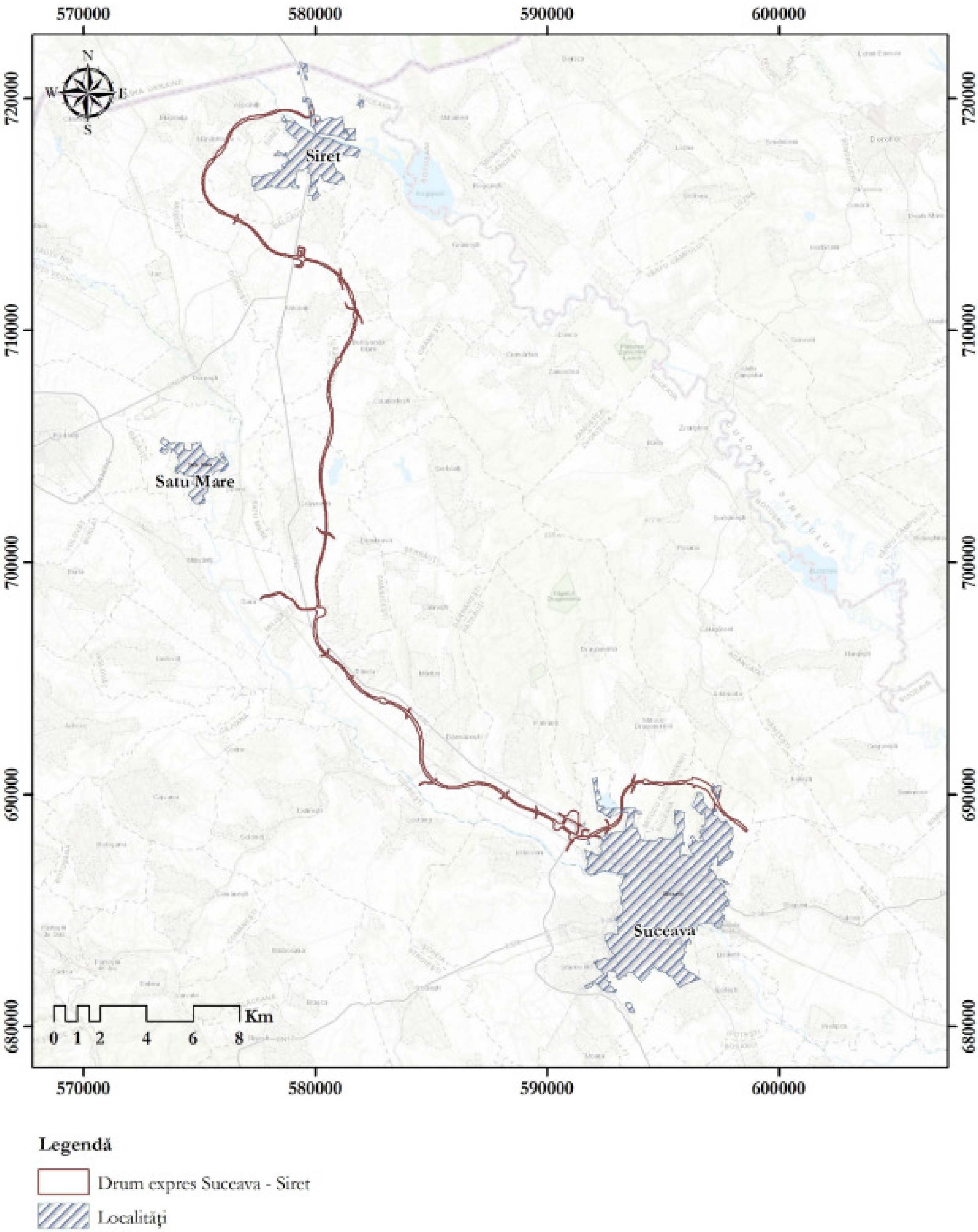


Figure no.2-1 Spatial location of the project Suceava – DN2H motorway and DN2H – Siret Border Express Road

2.2 PROJECT LOCATION

The project of the Suceava - DN2H Motorway and DN2H - Siret Border Express Road will have a total length of approx. 56 km. The permanently occupied land area is of approximately 601.78 ha.

The value of investment is estimated to Eur 594,017,123.

The designed speed is 100 km/h until near km 10+000 (from km 0+000 to km 10+000 the motorway also serves as a bypass of Suceava), and up to km 55+700 the speed of design is 120 km/h.

The Suceava - DN2H Motorway and DN2H - Siret Border Express Road cross the administrative territory of several UATs in Suceava county, respectively: Suceava (km 0+000), Mitocul Dragomirnei (km 3+700), Suceava (km 7+100), Pătrăuţi (km 9+050), Dărmăneşti (km 14+370), Grăniceşti (km 23+554), Milisauti (km 26+357), Calafindeşti (km 33+775), Bălcăuţi (km 39+250), Siret (km 46+100), Muşeniţa (km 48+075), Siret (km 49+350), Museniţa (km 51+000), Siret (km 53+730).

The motorway alignment is crossed by main roads within the national and European network, at the following kilometer positions:

- DN2 (E85) - runs parallel to the project along its entire length, intersecting the project at several points;
- DN2H – intersects the project at km 25+555;
- DN29A – intersects the project at km 1+862;
- DJ178B – intersects the project at km 31+520;
- DJ208D – intersects the project at km 5+810;
- DJ208T – intersects the project at km 1+160;
- DJ209D – intersects the project at km 16+495, km 39+400 respectively at km 41+250.;
- DJ 291A – intersects the project at km 49+813.

At the same time, the expropriation corridor of the project intersects 7 bodies of surface water and 8 registered surface water courses, located in the Siret Hydrographic Basin.

The Suceava - DN2H Motorway and DN2H - Siret Border Express Road does not cross Natura 2000 sites, the closest being located at a distance of approximately 0.5 km from the project site.

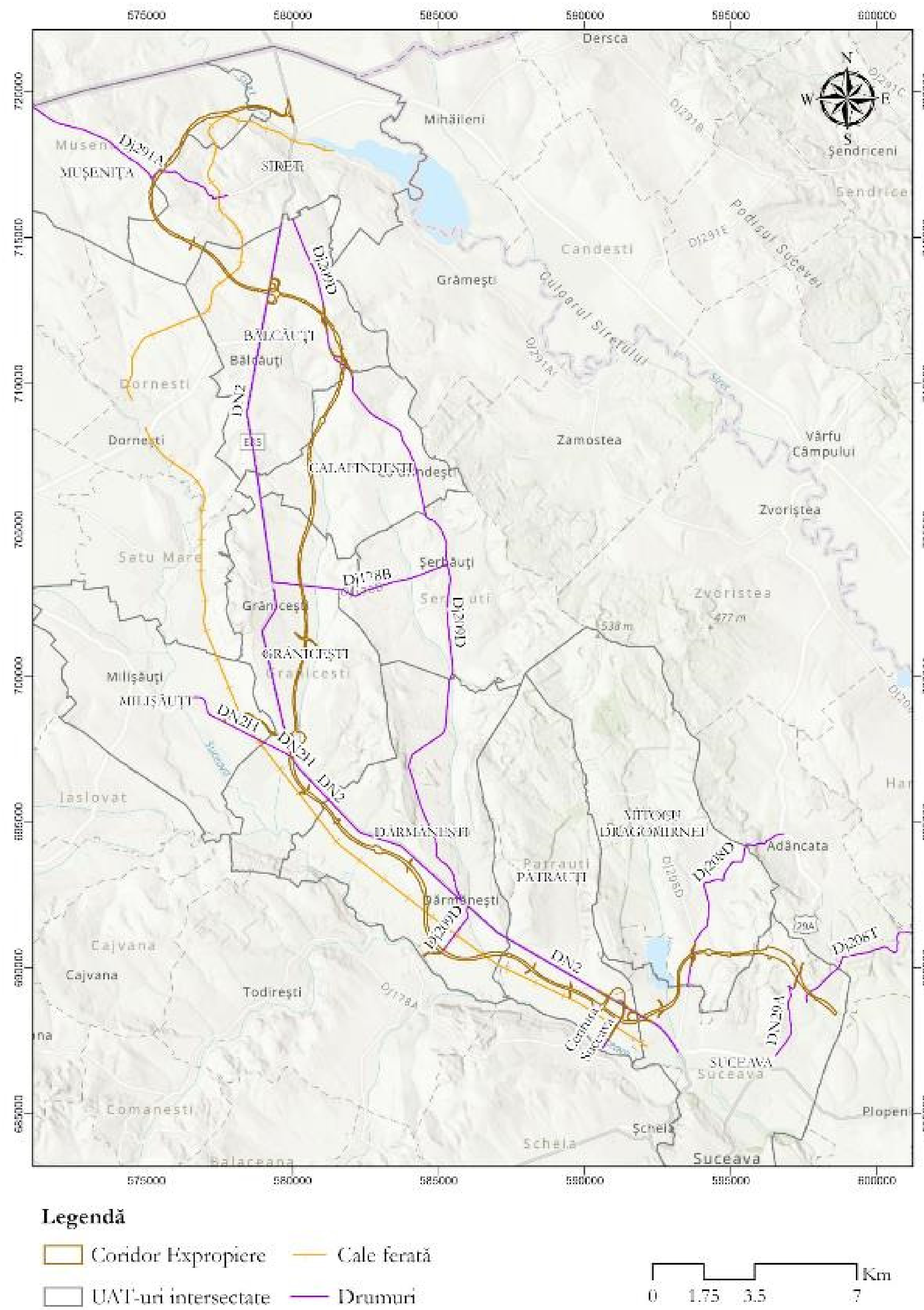


Figure no. 3-2 The territorial administrative units intersected by the project and its connection with the other components of the transport infrastructure in the area

For the Suceava – DN2H motorway and the DN2H – Siret Border Express Road, the characteristics of the Scope of Works were established as follows:

- The proposed typical cross section is in accordance with the TEM norms for motorways with two traffic lanes on each direction, the central area, shoulders and the emergency lane, and in the case of the cross section for the express road there can be found two traffic lanes on each direction, central area, and shoulders;
- The alignment will be surrounded by a protective fence on both sides;
- Parking and service spaces will be provided along the entire alignment according to the regulations in force;
- All the intersections of the project with other public roads will be designed as grade separations;
- The railways will be crossed by underpasses;
- The necessary hydrotechnical works were designed to ensure the optimum water drainage conditions and the safety of the bridge structures.

2.3 Description of the project physical characteristics

2.3.1 Presentation of the land use requirements

During the execution of works, physical changes to the land may occur due to the different categories of works, namely:

- earthworks that lead to soil degradation and induce structural changes in the soil profile;
- removal of the topsoil layer and building an artificial profile through the earthworks performed;
- loss of the natural characteristics of the fertile soil layer through inadequate storage of waste or various substances, materials;
- temporary occupation of land for the location of construction site organizations;
- possible modification of soil quality through accidental discharges of substances/compounds directly on the soil. This type of impact can occur in case of accidental discharges of oil or diesel in the area of work fronts, during the operation of plants in the work fronts or the running of site vehicles;
- qualitative changes of the soil under the influence of pollutants present in the air (qualitative and quantitative changes of the local geochemical circuits);
- changing the function of lands from lands occupied with land crops/pastures, to lands covered with road infrastructure constructions.

According to the Urban Planning Certificate issued for the project, from a legal point of view the lands on which the proposed project is executed are made up of properties belonging to the public domain of national interest, the public domain of territorial administrative units, as well as private properties of natural and legal persons.

From an economic point of view, the main current uses of the land on which the motorway project is proposed are: agricultural land, watercourses, forest, roads, railway, archaeological sites, communal household areas (cemetery) and built-up areas.

The table below shows the legal regime, as well as the current and planned uses of the land according to the Urban Planning Certificate issued by the competent authority.

Table no.2-1 The legal regime, the current economic regime and the proposed economic regime for the land from the motorway area according to the Urban Planning Certificate

County	Legal regime	Current economic regime (current use)	Proposed economic regime (proposed use)
Suceava	The building belongs to the public domain of national interest (national road DN29A, DN2, railway, water, forest), the public domain of Suceava County (DJ 208D), the public domain of the cities of Siret and Milişauţi, the public domain of the localities: Mitocu Dragomirnei, Pătrăuţi, Darmăneşti, Grăniceşti, Calafindeşti, Bălcăuţi, Muşesnita and private properties of the natural and legal persons.	Agricultural lands, watercourses, forests, railways, archaeological sites, cemeteries, built-up areas.	Construction land (motorway).

In order to carry out the proposed project, it is necessary to occupy some areas of land, conventionally divided into two categories:

- definitively occupied lands - those land surfaces that will be occupied by the motorway territory, its safety area, restoration of road connections, relocation of the utility networks and motorway facilities;
- temporarily occupied lands – land surfaces that will be occupied for construction site organizations and bases of production.

2.3.1.1 The temporarily occupied land area

All the lands that will be temporarily occupied will be returned to their original use category and condition after completion of the construction works.

For the execution period, it is estimated that a temporarily occupied area of approx 36ha, for site organizations (4 site organizations are proposed: S1 = approx. 9 ha, S2 = approx. 9 ha, S3 = approx. 8.7 ha, S4 = approx. 9.2 ha).

For the temporary occupation of the land it is not necessary to remove any land surface from the forest fund. The land use category that will be temporarily occupied by the site organizations is arable land.

2.3.1.2 Permanently occupied land surface

The land area definitively occupied by the motorway was estimated to 822.84 ha, based on the construction limit of the motorway (expropriation limit). The definitively occupied lands are those areas of land that will be occupied by the motorway, its safety area and for the restoration of road connections, the motorway facilities and the relocation of utilities.

For performance of the project, it is planned to remove a land area of 37.57 ha from the forest fund.

The estimate of the land areas permanently occupied by the project according to the type of land use are presented in the following table.

Table no.2-2 The areas estimated to be permanently occupied by the motorway/express road, depending on the different uses of the land

Land types of use	Suceava-Siret Motorway and Express Road [ha]
Localities - Discontinuous built-up areas	0.20
Non-irrigated arable areas	738.65
Orchards	21.93
Pastures	8.14
Complex culture patterns	2.08
Areas mostly occupied by agriculture with significant areas of natural vegetation	8.21
Deciduous forests	36.70
Coniferous forests	0.86
Transition areas between forests and shrubs	5.55

2.3.1.3 DEFORESTATION

A category of preparatory works for achieving the investment objective that can lead to a potential significant impact on the environment is the vegetation cutting (trees, shrubs, grasses).

According to the preliminary calculations, the areas estimated to be deforested totalize 37.57 ha. The following table shows the areas proposed to be deforested.

Table no.2-3 The areas proposed to be removed from the forest fund for construction of the project Suceava - DN2H Motorway and the DN2H - Siret Border Express Road

No.	County	UAT	The Forest Division, Forest District	Development unit (UA)	Estimated surface for deforestation (Ha)
1	SUCEAVA	MITOCU DRAGOMIRNEI	Suceava Forest Division, Adâncata Forest District, Adâncata VI	5A	0.1329

No.	County	UAT	The Forest Division, Forest District	Development unit (UA)	Estimated surface for deforestation (Ha)
2	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	5A	3.8251
3	SUCEAVA	MITOCU DRAGOMIRNA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	5C	0.0321
4	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	5C	0.1189
5	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, VI Adancata	8B	0.2133
6	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	11	0.1300
7	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	11B	5.0304
8	SUCEAVA	SUCEAVA	Suceava forestry department Adâncata VI	11C	0.3375
9	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	12	7.1826
10	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	12D	0.0010
11	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	12F	0.0017
12	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	13C	2.1579
13	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	13E	0.6256
14	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	25	0.0559
15	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	25B	6.0480
16	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, VI Adancata	25C	0.2836
17	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	26	0.0082
18	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest	26J	0.4079

No.	County	UAT	The Forest Division, Forest District	Development unit (UA)	Estimated surface for deforestation (Ha)
			District, Adâncata VI		
19	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	81B	0.0002
20	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	81E	0.2071
21	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	12B	4.7489
22	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	26 L	0.1379
2. 3	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, VI Adancata	8A	2.8221
24	SUCEAVA	SUCEAVA	Suceava Forest Division, Adâncata Forest District, Adâncata VI	81AA	0.0767
25	SUCEAVA	MITOCU DRAGOMIRNA	Suceava forestry department Pătrăuţi Forest District, V Dragomirna	31	2.9339
26	SUCEAVA	SUCEAVA	Suceava forestry department Pătrăuţi Forest District, V Dragomirna	31	0.0603
TOTAL					**37.5797**

2.3.2 Construction works

The project assumes performance of the following categories of works:

- Road earthworks;
- Road pavement;
- Road interchanges;
- Bridges;
- Viaducts;
- Overpasses;
- Culverts;
- Box structures;

- Motorway facilities (short-term parking lots, maintenance and coordination center, service areas (S1 type);
- Hydrotechnical works;
- Rainwater collection and evacuation works;
- Consolidation works;
- Works of relocation and protection of utility networks, relocation of transport routes;
- Works for traffic safety;
- Works for environmental protection;
- Works necessary for site organization.

2.3.2.1 Road earthwork

The cross section of the motorway has a platform width of 28.00 m out of which:

- carriageway (2 lanes per direction): 4 x 3.75 m = 15.00 m;
- central area (waterproofed): 3.00 m;
- emergency stationing lane, one for each direction of traffic: 2 x 2.50 m = 5.00 m;
- shoulders: 2 x 0.50 m = 1.00 m;
- guiding lanes: 4 x 0.50 m=2.00 m;
- space for parapets (outside the platform): 2 x 1.00 m.

The cross section of the express road has a platform width of 23.50 m out of which:

- carriageway (2 lanes per direction): 4 x 3.50 m = 14.00 m;
- central area (waterproofed): 3.00 m;
- shoulders: 2 x 1.50 m = 3.00 m;
- guiding lanes: 2 x 0.75 m = 1.50 m;
- space for parapets (outside the platform): 2 x 1.00 m = 2.00 m.

The cross section of the loops and link roads has the following characteristics:

- for loops and unidirectional link roads: the 6.00 m platform, including 4.00 m carriageway and two shoulders of 1.00 m each, out of which 0.25 m is the framing lane. Two areas of 1.00 m each are added to the platform, areas where the protective parapets are located;
- for bidirectional loops and link roads: the 10.50 m platform, including 7.00 m carriageway and two 1.00 m shoulders, out of which 0.25 m is the framing lane. Two areas of 1.00 m each are added to the platform, areas where protective parapets are located.

Taking into account the local characteristics of the project, the edges of the platform were arranged in different solutions to allow the placement of water collection and evacuation devices, safety devices.

2.3.2.2 Road pavement

The road pavement was proposed in accordance with the norms regarding the design of road pavements as well as those regarding the hot asphalt mixtures, and for its performance the raw materials and natural resources provided in the Report in Chapter 2.3.6.1, will be used.

Thus, the semi-rigid road pavement, consisting of the following materials, is provided for the motorway and the interchange link roads:

- wearing asphaltic concrete;
- chipping binder;
- asphalt mixture;
- natural aggregates stabilized with cement;
- ballast;
- soils stabilized with hydraulic binders.

The middle area is waterproofed and made of the following materials:

- wearing asphalt concrete;
- natural aggregates stabilized with cement;
- ballast;
- capping layer of stabilized soil.

The following materials are provided for parking platforms (CIC, PSD):

- road cement concrete;
- ballast stabilized with cement;
- ballast foundation;
- capping layer.

2.3.2.3 Road interchanges

The connection between the existing road network and the project is made through a system of road interchanges. The location and type of interchange was proposed according to the results of the Traffic Study.

5 road interchanges were designed on the road alignment, respectively those in the table below.

Table no. 3-1 Road interchanges designed within the project

No.	Name	Interval provided for the performance of work		Observations	Distance to the nearest protected natural area (km)	Other information
1.	Interchange 1 – DN29A Suceava North	1+150	3+200	It ensures the connection with DN29A and serves as a bypass option for the Municipality of Suceava	ROSCI0075 Pătrăuţi Forest (3.4 km)	It intersects the forest
2.	Interchange 2 – DN2-DN2P Suceava West	8+875	11+250	It provides the connection with DN2 (E85), DN2P and access road to the Municipality of Suceava	ROSCI0075 Pătrăuţi Forest (1.5 km)	-
3.	Interchange 3 – DN2H Rădăuţi	25+500	26+900	It provides the connection with DN2 (E85) and DN2H and access road to the locality of Rădăuţi (Suceava county)	ROSCI0379 Suceava River (2.9 km)	It intersects the Horait River
4.	Interchange 3 – DN2 South Siret	42+275	43+625	It ensures the connection with DN2 (E85) and access road to the locality of Siret (Suceava county)	ROSPA0110 Rogojeşti – Bucecea (4.8 km)	-
5.	Interchange 5 – DN2 Connection DN2 North Siret	55+150	55+700	It ensures the connection with DN2 (E85) between the locality of Siret (Suceava county) and the border with Ukraine	ROSPA0110 Now. Rogojeşti – Bucecea (0.5 km)	-

2.3.2.3.1 Suceava North road interchange (1+862)/ intersection with the DN29A

This road interchange is proposed at the intersection with DN29A at the exit from Suceava municipality to the north. DN29A connects Suceava to Dorohoi and further to Darabani and Rădăuţi-Prut, a locality placed on the border with the Republic of Moldova, near the town of Lipcani, and through the construction of this road interchange, access of the mentioned localities to the new motorway will be ensured.

The Suceava Nord road interchange is of "roundabout" type. It ensures all the connections with the neighboring towns and at the same time allows the return. The longitudinal profile of the motorway in the area of the interchange shows a slope of - 2.4% (towards Siret), at the same time the red line is found in a cutting with H_{max} of approx. 15 m, which leads to the possibility of lowering the red line of the national road (at the moment, the national road is found in a convex connection) and to ensure its access to the roundabout it will be locally relocated. The proposed roundabout will be located at the new level of the national road and will cross the express road by means of two overpasses ensuring the clearance on the express road. Therefore, the DN29A will remain "at level", and the motorway will pass to a lower level.

At the same time, through the location of this road interchange, the project will also fulfill the role of bypassing the municipality of Suceava.

Access will be achieved by means of four unidirectional link roads related to each individual path, according to the information in the table below.

Table no.2-4 One-way link roads provided within the road interchange

Path	Direction	Element	Run inclination		Design speed and geometric elements
			ramp	slope	
1.	exit	link road	X		V=60km/h, R=260m, i=4.5%
	entrance	link road		X	Alignment
2.	exit	link road	X		V=60km/h, R=260m, i=4.5%
	entrance	link road		X	V=60km/h, R=450m, i=2.5%

2.3.2.3.2 Suceava West road interchange (9+690)/ intersection between DN2 – DN2P

This road interchange is proposed at km 9+690 of the motorway, west of the municipality of Suceava, which will ensure the connection with the existing road interchange between the DN2 and DN2P by means of a connecting road.

Similar to the previously presented road interchange, the motorway section up to it, together with the connecting road up to the intersection with DN2P, will also be able to have the role of bypass variant, thus also completed on the east, north-east, north and west of the town of Suceava.

The Suceava West road interchange is a T "trumpet" type with flow entrance loop. It is found between the DN2 and the CFR500 Motorway (the loop is at a distance of approx. 50 m from it). It ensures the connections in all directions with the connecting road and implicitly with the existing road interchange (DN2-DN2P), conditioned by the connection of the connecting road by reconfiguring the existing loop and completing the interchange with a direct link on the Suceava-Motorway connection.

The longitudinal profile of the motorway in the interchange area presents a concave connection (the radius that also ensures optical comfort) composed at the entrance, by a slope of -1.26% and 0.5% at the exit, at the same time the red line is found on embankment with H_{max} of approx. 2.4 m.

The connecting road crosses the motorway by means of an overpass, it has a length of approx. 1.5 km, and the design speed for this sector is 60 km/h (all the geometric elements respecting this speed).

The modernization and completion of the existing road interchange will be minimumly invasive, with the preservation of the existing accesses - DN2-DN2P (municipality of Suceava-DN2P), DN2P-DN2 (DN2P - Rădăuţi), but also the overpass, as well as changing the direction of the existing loop (from two-way traffic to one-way traffic - Suceava municipality-DN2P).

Access will be achieved by means of two unidirectional link roads, a loop, respectively a sequence of loop-link road related to each path, for which the design speed is 60km/h.

Table no.2-5 One-way link roads provided within the road interchange

Path	Direction	Elements	Run inclination		Design speed and geometric elements
			ramp	slope	
1.	exit	Link road		X	V=60km/h, R=155m, i=5% (k=2.66)
	entrance	Link road	X		V=60km/h, R=155m, i=5% (k=2.66)
2.	exit	loop		X	V=60km/h, R=230m, i=5%
	entrance	Link road	X		V=60km/h, R=125m, i=6% (k=2.78)

The design speeds of the existing interchange link roads (trumpet type) are 30-40 km/h.

At the same time, in order to avoid the decrease in the traffic capacity of the entire interchange and to remove certain flows from it, as well as to shorten the access distances to the express road, a number of 4 direct link roads are proposed on some connections, respectively those in the table below.

Table no.2-6 One-way link roads provided within the road interchange

Path	Direction	Elements	Connection		Design speed and geometric elements
			Road	Locality	
1.	exit	Link road	DN2	Suceava	V=60km/h, R=155m, i=5% (k=2.66)
	entrance	Link road	DN2	Radauti	V=60km/h, R=155m, i=5% (k=2.66)
2.	exit	Link road	DN2	Suceava	V=60km/h, R=230m, i=5%
	entrance	loop	DN2P	Suceava	V=50km/h, R=105m, i=5% (k=2.75)

Between the loop of entrance and the exit link road of the path 2 a sorting sector of approx. 770 m is provided.

2.3.2.3.3 Rădăuţi road interchange (km 26+375.65)

This road interchange is proposed near the town of Româneşti to the west of it and approx. 12 km from the town of Rădăuţi, which intersects DN2H through a connection road of approx. 2.3 km in length.

This road interchange, T-type "trumpet" with the flow entry loop, ensures all the connections with the local road network and implicitly with the localities in the area, like the road interchange presented previously.

The proposed connecting road has the geometric elements for the design speed of 80km/h. It crosses both the motorway and DN2, crosses a local stream, then continues parallel to it, going on to cross the CFR500 Motorway. At the end of this connecting road, a turn (Rint=15m) is provided at the level at the intersection with DN2H. To avoid the roundabout, a direct link road is proposed before this (in the direction of Motorway-DN2H Rădăuți) with a design speed of 30 km/h.

By making this connection, the crossing of the CFR500 Motorway for the important traffic flow will be grade separated (in the current phase, DN2H crosses the Motorway at level).

The passage over DN2 is proposed to be built for 4 traffic lanes in order to ensure and connect with the "perspective" connecting road between the Motorway and the Rădăuţi Ring Road.

Access will be achieved by means of two unidirectional link roads, a loop, respectively a sequence of the loop-link road related to each path for which the design speed is 60km/h.

Table no.2-7 One-way link roads provided within the road interchange

Path	Direction	Elements	Run inclination		Design speed and geometric elements
			ramp	slope	
1.	exit	Link road		X	V=60km/h, R=155m, i=5% (k=2.66)
	entrance	loop		X	V=60km/h, R=230m, i=5%
2.	exit	Link road	X		V=60km/h, R=230m, i=5%
	entrance	Link road		X	V=60km/h, R=155m, i=5% (k=2.78)

2.3.2.3.4 South Siret road interchange (km 43+320)

This road interchange is proposed at the intersection of the Express Road (km 43+320) with DN2 at approx. 3 km from the town of Siret, respectively at a distance of approx. 12 km from Rădăuţi municipality (via the national road DN17A and DN2).

The Siret Sud road interchange (DN2) is of the "simple diamond" type. It ensures all the connections with DN2. The longitudinal profile of the motorway in the interchange area is found in a concave connection formed by two slopes of -1.2% and 2% respectively, while the red line is found in a cutting with H_{max} approx. 10 m, which leads to the possibility of lowering the red line of the national road (at the moment the national road DN2 is found in a convex connection). The four link roads of the road interchange, by means of two connecting roads, lead to DN2, at the intersections with it, two roundabouts (Rint=20m) at level are proposed. For right-hand traffic, before the turns (both from the express road and from the DN2), four link roads are proposed (V=40km/h, R=90m, i=5% for k=1.79) connected to the exit and entry points respectively flow in order to increase traffic capacity and avoid roundabouts.

In the space between DN2 and the connecting road to the north of the express road, the location of a maintenance and control center is proposed, with access from the DN2 alignment. This, through the two roundabouts, will be able to provide service to both lanes of the motorway, but also to both directions of the DN2 national road.

Access to and from the motorway will be achieved through four ramps. At the same time, in order to increase the traffic capacity, on the direction Rădăuţi-Motorway lane 2 and Suceava-Motorway lane 1, two direct link roads with R=90 m and R=140 m respectively, are proposed in order to avoid entering the turn in these directions.

Table no.2-8 One-way link roads provided within the road interchange

Path	Direction	Elements	Run inclination		Design speed and geometric elements
			ramp	slope	
1.	exit	Link road		X	V=60km/h, R=155m, i=5% (k=2.66)
	entrance	Link road		X	V=60km/h, R=155m, i=5% (k=2.66)
2.	exit	Link road		X	V=60km/h, R=155m, i=5% (k=2.66)
	entrance	Link road	X		V=60km/h, R=155m, i=5% (k=2.66)

2.3.2.3.5 Siret Nord road interchange – DN2 connection (km 55+203.22)

This link is proposed at the intersection of the Express Road (km 55+300) with DN2 near the city of Siret, north of it and approx. 1.5 km from Siret Customs. At the same time, it also represents the "end interchange" or end of the Suceava-Siret section.

The connection of the express road with DN2 is made at level by means of a curve (C31 left), having a radius of 250m and the speed of 60km/h. For the continuation of DN2 and to avoid intersections of traffic flows, DN2 grade separately crosses the express road by means of a one-way link roads (Vama Siret-loc. Siret), with a sequence of 3 curves and an underpass (over the express road) with the design speed of 60km/h.

At the same time, provision of th econnectivity of the path 1 of the express road with the town of Siret can be done through the roundabout proposed at km 481+540 of DN2.

The roundabout intersection at km 481+540 (inner radius of 20m), has the roles of:

- calming the traffic before the PTF Siret-Porubne;
- the connectivity of the Siret industrial area;
- ensures the connectivity of the express road with the town of Siret (both directions).

DN2, between km 480+340 (km 55+700 DX5 - end of LOT 3 project) and km 481+540 (the roundabout proposed to be built within lot 3 is kept within the existing situation, there is no intervention on this section of the DN with new, additional works. The connection between the express road and DN2 is ensured by means of a roundabout with R_{int}=45 m. All the connections with the DN2 (to the city of Siret and to the border point) are met, as well as with the access to the proposal for the location of a S3 type service space (located on the right side of DN2 with access from the roundabout). The longitudinal profile of the motorway in the interchange area is found in a declivity of -0.65%.The following map shows the road interchanges included in the project.

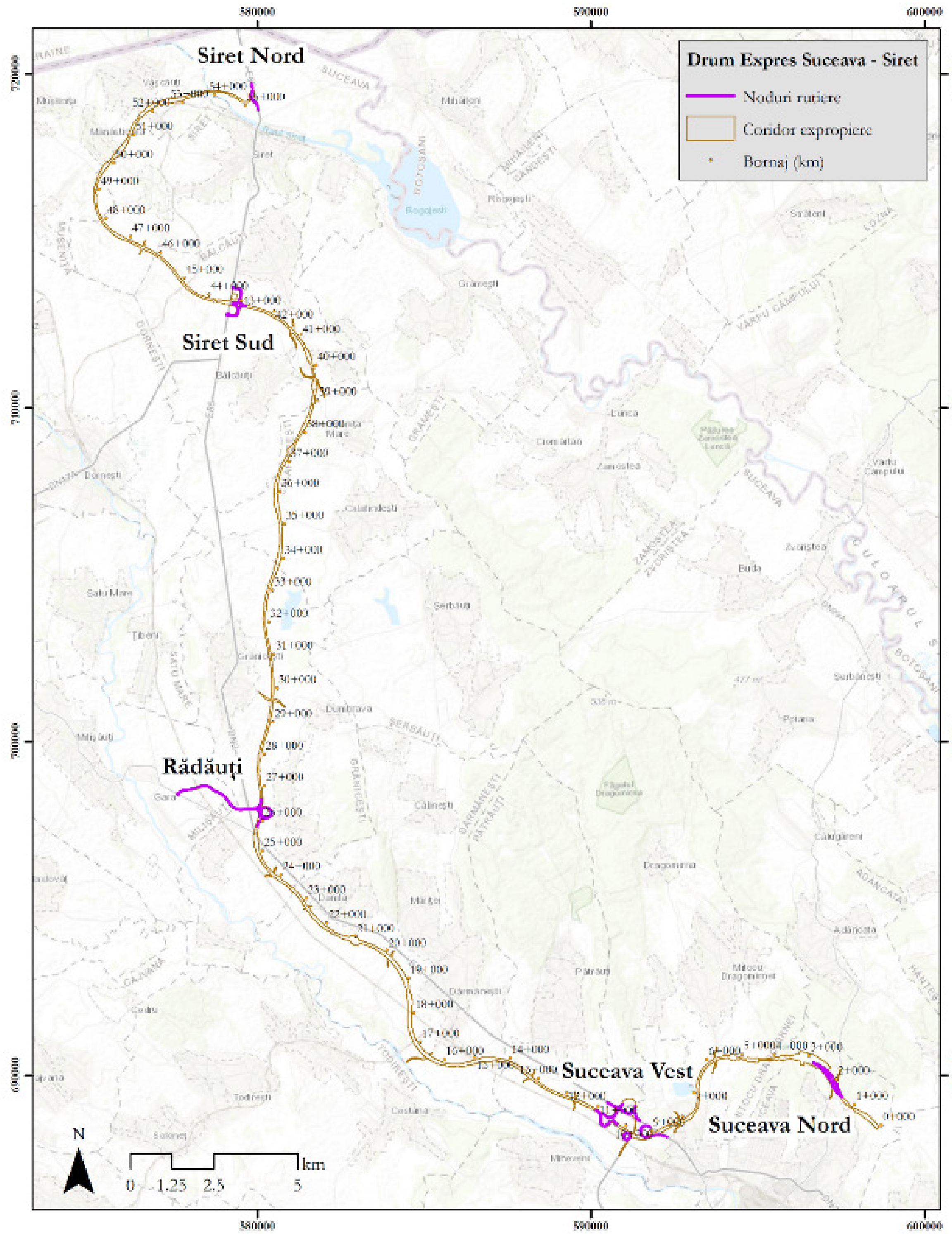


Figure no.2-2 The road interchanges proposed for the Suceava - DN2H Motorway and DN2H - Siret Border Express Road

2.3.2.4 Bridges

On the alignment of the Suceava-DN2H Motorway and the DN2H-Siret Border Express Road, a series of bridges were designed, which are presented in the following table.

Table no. 3-2 Bridges, overpasses and viaducts proposed within the project

No	Name	Interval provided for the completion of work		Obstacle	The distance from the nearest protected natural area		Other observations
		Starting Km	Ending Km		[km]	Name	
1.	Bridge over the Mitocul river Km 4+940	4+740	5+140	Mitocul River	3.2	ROSCI0075 Pătrăuţi Forest	The river has connectivity with the otter corridor
2.	Bridge over the Dragomirna river Km 7+990	7+910	8+070	Dragomirna River	2.5	ROSCI0075 Pătrăuţi Forest	The river has connectivity with ROSCI0075 Pătrăuţi Forest
3.	Bridge over the river Patrăuţeanca Km 11+605	11+530	11+680	Patrăuţeanca River	2	ROSCI0075 Pătrăuţi Forest	The river has connectivity with ROSCI0075 Pătrăuţi Forest
4.	Bridge over the canal Km 12+440	12+360	12+520	Canal and relocated DE	2.1	ROSCI0075 Pătrăuţi Forest	-
5.	Bridge over Hatnuta river tributary Km 14+370	14+300	14+440	Hatnuţa river tributary	2.9	ROSCI0075 Pătrăuţi Forest	-
6.	Bridge over the Hatnuţa river and CF 300 Km 14+961	14+850	15+070	Raul Hatnuţa and CF300	3,4	ROSCI0075 Pătrăuţi Forest	The tributaries of the river reach ROSCI0075 Pătrăuţi Forest
7.	Bridge on DEX over the valley Km 20+315	20+240	20+390	Nameless valley	2.9	ROSCI0075 Pătrăuţi Forest	-
8.	Bridge on DEX over the Sărghiesti river Km 22+193	22+110	22+280	The Sârghiesti River	4.2	ROSCI0075 Pătrăuţi Forest	-
9.	Bridge over the Dănilă stream Km 22+995	22+920	23+070	Dănila Stream	4.6	ROSCI0075 Pătrăuţi Forest	-
10.	Bridge over the river Dănilă Km 23+554	23+480	23+630	Danila River	4.9	ROSCI0075 Pătrăuţi Forest	-
11.	Bridge over Horaiţ River (Grăniceşti) Km 25+212	25+130	25+290	Raul Horait (Granicesti)	5,6	ROSCI0379 Suceava River	-
12.	Bridge over the river Săcari Km 27+920	27+830	28+000	Săcari River	4.3	ROSCI0379 Suceava River	-
13.	Bridge over the valley Km 28+590	28+510	28+670	Nameless valley	4.4	ROSCI0379 Suceava River	-
14.	Bridge over the river Văduvul Km 30+375	30+300	30+450	The Widow River	4.5	ROSCI0379 Suceava River	-
15.	Bridge over the pârâul cel Adânc Km 30+975	30+900	31+050	Deep Stream	4.2	ROSCI0379 Suceava River	-
16.	Bridge over the stream of Fântânilor Km 32+535	32+460	32+610	Fountain Stream	3.7	ROSCI0379 Suceava River	-
17.	Bridge over the Calina stream Km 33+520	33+440	33+600	Călina Stream	3.7	ROSCI0379 Suceava River	-
18.	Bridge over the Horaiţ River Km 35+120	35+040	35+200	Horaiţ River	3.8	ROSCI0379 Suceava River	-
19.	Bridge over Horaiţ river tributary Km 36+020	35+950	36+090	Horaiţ river tributary	3.8	ROSCI0379 Suceava River	-
20.	Bridge over the Horaiţ river Km 36+575	36+500	36+650	Horaiţ River	4.2	ROSCI0379 Suceava River	-
21.	Bridge over the Rudeşti	42+020	42+180	Rudeşti	4.5	ROSPA0110	The river intersects the

No	Name	Interval provided for the completion of work		Obstacle	The distance from the nearest protected natural area		Other observations
		Starting Km	Ending Km		[km]	Name	
	stream Km 42+100			stream		Accumulations Rogojesti - Bucecea	otter habitat corridor and the ROSPA0110 site Rogoje accumulations you - Bucecea
22.	Bridge over the Balcauti stream Km 43+750	43+610	43+890	Bălcăuţi Stream and DL (Negostina village - Dorneşti commune)	4.8	ROSCI0379 Suceava River	-
23.	Bridge over the Siret river Km 54+030	53+490	54+570	DL (Văscăuţi village - Siret); Siret river	1.2	ROSPA0110 Accumulations Rogojesti - Bucecea	The river crosses the site ROSPA0110 Rogojeşti Accumulations - Bucecea
24.	Bridge over the Siret stream Km 55+115	55+040	55+190	Siret stream	0.8	ROSPA0110 Accumulations Rogojesti - Bucecea	The river crosses the site ROSPA0110 Rogojeşti Accumulations - Bucecea
25.	Bridge on Br.2 Km 2+985 over the Horoit river (Nod3-DN2-DN2H)	2+910	3+060	Raul Horoit	5.3	ROSCI0379 Suceava River	-
26.	Bridge on Br.2 Km 3+466 over the Horoit River (Nod3-DN2-DN2H)	3+400	3+540	Raul Horoit	5.3	ROSCI0379 Suceava River	-

2.3.2.5 Overpasses

The overpasses proposed in the project are presented in the following table.

Table no.2-9 The overpasses proposed in the project

No	Name	Extended interval provided for performance of the work		Obstacle	The distance from the nearest protected natural area		Other information
		Starting Km	Ending Km		[km]	Name	
1.	Overpass crossing DC57 Km 8+120	8+050	8+190	Relocation Lipoveni Street (DC 57)	2.4 km	ROSCI0075 Pătrăuţi Forest	-
2.	Overpass crossing DL Km 11+700	11+630	11+770	DL relocation (com Pătrăuţi)	2 km	ROSCI0075 Pătrăuţi Forest	-
3.	Overpass crossing DE km 14+070	14+000	14+140	Relocation OF	2.6 km	ROSCI0075 Pătrăuţi Forest	-
4.	Overpass crossing DJ209D Km 16+495	16+420	16+570	DJ209D	4 km	ROSCI0075 Pătrăuţi Forest	-

No	Name	Extended interval provided for performance of the work		Obstacle	The distance from the nearest protected natural area		Other information
		Starting Km	Ending Km		[km]	Name	
5.	Overpass crossing CF 513 Km 17+130	17+050	17+210	DE and CF 513 Darmănești-Mouth of Humor	5.2 km	ROSCI0075 Pătrăuţi Forest	-
6.	Overpass crossing DE Km 17+550	17+480	17+620	Exploitation road	3 km	ROSCI0075 Pătrăuţi Forest	-
7.	Overpass crossing CF 500 Km 18+030	17+950	18+110	CF500 bus	4 km	ROSCI0075 Pătrăuţi Forest	-
8.	Overpass crossing DL Km 21+950	21+ 880	22+020	DL (Sârghiesti village - Măriţei village)	4 km	ROSCI0075 Pătrăuţi Forest	-
9.	Overpass crossing DC38C Km 22+770	22+700	22+840	DC38C (Dănila village)	4.6 km	ROSCI0075 Pătrăuţi Forest	-
10.	Overpass crossing DC40B Km 24+200	24+130	24+270	DC 40B (Iacobești village)	5.4 km	ROSCI0075 Pătrăuţi Forest	-
11.	Overpass crossing DN2H and DN2 Km 25+555	25+460	25+650	DN 2H and DN2	6 km	ROSCI0075 Pătrăuţi Forest	-
12.	Overpass crossing DC39 Km 35+063	34+990	35+130	DC 39 (Calafindești commune - DN2)	3.8 km	ROSCI0379 Suceava River	-
13.	Crossing over CF 518 Siret - Domnești Km 44+817	44+730	44+900	CF 518 (Dornesti - Siret) - closed	5.8 km	ROSCI0379 Suceava River	-
14.	Passage for wildlife crossing Km 51+000	50+930	51+070	-	3.8 km	ROSPA0110 Accumulations Rogojesti - Bucecea	-
15.	Passage on DE over Motorway Km 0+250	0+190	0+310	Suceava - Siret motorway	4.7 km	ROSCI0380 Suceava Liţeni River	-
16.	Overpass crossing the Motorway Km 3+500	3+450	3+550	To protect the fauna	3.2 km	ROSCI0075 Pătrăuţi Forest	-
17.	Passage on DJ208D over Motorway Km 5+810	5+750	5+870	Suceava - Siret motorway	2.3 km	ROSCI0075 Pătrăuţi Forest	-
18.	Passage on DN2 over DEX Km 8+833.20	8+770	8+900	Suceava - Siret motorway	2.4 km	ROSCI0075 Pătrăuţi Forest	-
19.	Passage on DE over Motorway Km 13+220	13+160	13+280	Suceava - Siret motorway	3 km	ROSCI0075 Pătrăuţi Forest	-
20.	Passage on the DL over the Motorway Km 19+790	19+730	19+850	Suceava - Siret motorway	2.6 km	ROSCI0075 Pătrăuţi Forest	-
21.	Passage on DC 40C over DEX Km 29+650	29+590	29+710	Express Road Suceava - Siret	4.6 km	ROSCI0379 Suceava River	-
22.	Passage on DJ178B over DEX Km 31+520	31+460	31+580	Express Road Suceava - Siret	3.9 km	ROSCI0379 Suceava River	-
23.	Passage on DC35 over DEX Km 40+473.10	40+410	40+540	Express Road Suceava - Siret	4.3 km	ROSCI0075 Pătrăuţi Forest	-
24.	Passage on DJ209D over DEX Km 41+250.35	41+190	41+320	Express Road Suceava - Siret	4 km	ROSPA0110 Accumulations Rogojesti - Bucecea	-
25.	Passage on DE over DEX Km 46+530	46+470	46+590	Express Road Suceava - Siret	3.1	ROSCI0379 Suceava River	-
26.	Passage on DJ 291A over DEX Km 49+813.65	49+750	49+880	Express Road Suceava - Siret	3.1 km	ROSCI0379 Suceava River	-

No	Name	Extended interval provided for performance of the work		Obstacle	The distance from the nearest protected natural area		Other information
		Starting Km	Ending Km		[km]	Name	
27.	Passage on DL over DEX Km 50+325.35	50+260	50+400	Express Road Suceava - Siret	4.2 km	ROSPA0110 Accumulations Rogojesti - Bucecea	-
28.	Passage on DC 52 over DEX Km 51+878.36	51+810	51+940	Express Road Suceava - Siret	3.3 km	ROSPA0110 Accumulations Rogojeşti-Bucecea	-
29.	Passage on DN29A over Motorway km 1+862 (Nod1-DN29A)	1+810	1+920	Interchange1 - DN 29A	4.2	ROSCI0075 Pătrăuţi Forest	-
30.	Motorway passage Km 9+690 over VO 2P (Interchange 2 - DN2 - DN2P)	9+610	9+770	VO 2P (Suceava Ring-road)	2.4	ROSCI0075 Pătrăuţi Forest	-
31.	Passage on Br.10 over the Motorway Km 10+451.36 (Interchange 2 - DN2-DN2P)	10+390	10+520	motorway	1.7	ROSCI0075 Pătrăuţi Forest	-
32.	Passage on Link road 10 Km13+460.37 over DN2 (Interchange 2 - DN2 - DN2P)	13+390	13+540	DN2	2.2	ROSCI0075 Pătrăuţi Forest	-
33.	Passage on link road 2 over the Motorway Km 26+357.65 (Interchange 3-DN2-DN2H)	26+290	26+420	motorway	5	ROSCI0379 Suceava River	-
34.	Passage on link road 2 Km 0+612 over CF 500, (Interchange 3-DN2-DN2H)	0+540	0+710	CF 500 motorway	3.1	ROSCI0379 Suceava River	-
35.	Passage on link road 2 Km 1+960 over the channel and relocated DL (Interchange 3-DN2-DN2H)	1+900	2+020	Canal and DL relocated	2.9	ROSCI0379 Suceava River	-
36.	Passage on link road 2 Km 2+463 over DN2 (Interchange 3-DN2-DN2H)	2+380	2+540	DN 2 (E85)	2.9	ROSCI0379 Suceava River	-
37.	Passage on DN 2 over DEx Km 43+320 (Interchange 4-Siret S)	43+260	43+380	Express Road	5.1	ROSCI0379 Suceava River	-
38.	Passage on DN2 over DEx Km 55+203.22 (Interchange 5-Siret N)	55+140	55+270	Express Road	0.4	ROSPA0110 Accumulations Rogojeşti-Bucecea	-

2.3.2.6 Viaducts

The proposed viaducts within the project, located on the Suceava-DN2H motorway alignment and DN2H-Siret border express road are presented in the following table.

Table no.2-10 Viaducts proposed within the project

No	Name	Interval provided for the completion of the work	Obstacle	Distanceto the nearest protected natural area	Other observations

		Starting Km	Ending Km		[km]	Name	
1.	Viaduct Km 1+035	0+790	1+280	Adâncata Valley - Suceava; DJ208T	4.6 km	ROSCI0380 Suceava Liţeni River	-
2.	Viaduct Km 4+255	3+890	4+620	DE and Mitoc Lake runoff channel 2	3.6 km	ROSCI0075 Pătrăuţi Forest	The river crosses the site ROSCI0075 Pădurea Patrăuţi
3.	Viaduct Km 38+840	38+720	38+960	Nameless valley	3.2 km	ROSCI0075 Pătrăuţi Forest	-
4.	Viaduct Km 39+790	39+570	40+010	Relocation DJ 209D and Nameless Valley	3.6 km	ROSCI0075 Pătrăuţi Forest	-
5.	Viaduct Km 48+910	48+770	49+050	Nameless valley	2.5 km	ROSCI0379 Suceava River	-

2.3.2.7 Culverts

The following table shows the culverts provided for in the project Suceava-DN2H Motorway and DN2H-Siret Border Express Road. The following table also includes the culverts on the CIC, short-term parking lots and service spaces.

Table no. 3-10 Box culverts provided on the motorway/express road

No.	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
			starting km	ending km		
1.	5	2.6	3+585	3+595	ROSCI0075 Pătrăuţi Forest (3.2 km)	The Podul Vatafului River
2.	2	1.2	5+435	5+445	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
3.	2	1.2	6+100	6+110	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
4.	2	1.2	6+605	6+615	ROSCI0075 Pătrăuţi Forest (2 km)	-
5.	2	1.2	7+055	7+065	ROSCI0075 Pătrăuţi Forest (2.2 km)	-
6.	5	2.6	7+822	7+832	ROSCI0075 Pătrăuţi Forest (2.5 km)	-
7.	3	2.6	9+405	9+415	ROSCI0075 Pătrăuţi Forest (2.5 km)	-
8.	2	1.2	9+770	9+780	ROSCI0075 Pătrăuţi Forest (2.3 km)	-
9.	3	2.6	10+185	10+195	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
10.	2	1.2	10+410	10+420	ROSCI0075 Pătrăuţi Forest (2 km)	-
11.	4	1.4	10+522	10+532	ROSCI0075 Pătrăuţi Forest (2 km)	-
12.	5	2.6	12+920	12+930	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
13.	2	1.2	14+020	14+030	ROSCI0075 Pătrăuţi Forest (2.6 km)	-
14.	2	1.2	14+770	14+780	ROSCI0075 Pătrăuţi Forest (2.9 km)	-
15.	5	2.6	15+245	15+255	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
16.	3	2.6	15+809	15+819	ROSCI0075 Pătrăuţi Forest (3.6 km)	-
17.	2	1.2	16+020	16+030	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
18.	3	2.6	16+285	16+295	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
19.	2	1.2	16+395	16+405	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
20.	2	1.2	16+645	16+655	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
21.	5	2.6	16+915	16+925	ROSCI0075 Pătrăuţi Forest (3.6 km)	-
22.	2	1.2	17+370	17+380	ROSCI0075 Pătrăuţi Forest (3.5 km)	-
23.	2	1.2	17+745	17+755	ROSCI0075 Pătrăuţi Forest (3.2 km)	-
24.	4	2.6	18+195	18+205	ROSCI0075 Pătrăuţi Forest (2.8 km)	-
25.	3	2.6	21+445	21+455	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
26.	5	2.6	21+795	21+805	ROSCI0075 Pătrăuţi Forest (4 km)	-

No.	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
			starting km	ending km		
27.	2	1.2	24+045	24+055	ROSCI0075 Pătrăuţi Forest (5.3 km)	-
28.	2	1.2	25+645	25+655	ROSCI0379 Suceava River (5.3 km)	-
29.	2	1.2	27+095	27+105	ROSCI0379 Suceava River (4.7 km)	-
30.	5	2.6	27+495	27+505	ROSCI0379 Suceava River (4.4 km)	-
31.	2	1.2	28+945	28+955	ROSCI0379 Suceava River (4.4 km)	-
32.	3	2.6	29+175	29+185	ROSCI0379 Suceava River (4.5 km)	-
33.	3	2.6	29+555	29+565	ROSCI0379 Suceava River (4.5 km)	-
34.	5	2.6	29+920	29+930	ROSCI0379 Suceava River (4.7 km)	-
35.	4	2.6	31+320	31+330	ROSCI0379 Suceava River (4 km)	-
36.	3	2.2	31+655	31+665	ROSCI0379 Suceava River (3.9 km)	-
37.	5	1.4	32+235	32+245	ROSCI0379 Suceava River (3.7 km)	-
38.	2	1.2	32+955	32+965	ROSCI0379 Suceava River (3.8 km)	-
39.	2	1.2	35+015	35+025	ROSCI0379 Suceava River (3.7 km)	-
40.	5	4.5	35+970	35+980	ROSCI0075 Pătrăuţi Forest (3.8 km)	Domestic animal crossing
41.	5	5	36+055	36+065	ROSCI0075 Pătrăuţi Forest (3.7 km)	Domestic animal crossing
42.	5	2.2	37+520	37+530	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
43.	5	2.2	37+732	37+742	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
44.	5	2.6	38+570	38+580	ROSCI0075 Pătrăuţi Forest (3.1 km)	-
45.	3	2.6	40+745	40+755	ROSPA0110 Rogojești – Bucecea accumulations (4.2 km)	-
46.	3	2.6	41+702	41+712	ROSPA0110 Rogojești – Bucecea accumulations (4.2 km)	-
47.	3	2.6	42+715	42+725	ROSPA0110 Rogojești – Bucecea accumulations (4.3 km)	-
48.	3	2.6	44+117	44+127	ROSCI0379 Suceava River (4.1 km)	-
49.	2	1.2	44+970	44+980	ROSCI0379 Suceava River (3.9 km)	-
50.	3	2.6	45+785	45+795	ROSCI0379 Suceava River (4 km)	-
51.	3	2.6	47+045	47+055	ROSCI0379 Suceava River (3 km)	-
52.	3	2.6	47+385	47+395	ROSCI0379 Suceava River (2.5 km)	-
53.	5	2.6	47+936	47+946	ROSCI0379 Suceava River (2.3 km)	-
54.	5	2.6	50+070	50+080	ROSCI0379 Suceava River (3.3 km)	-
55.	5	2.6	51+270	51+280	ROSPA0110 Rogojești – Bucecea accumulations (3.7 km)	-
56.	5	2.6	51+470	51+480	ROSPA0110 Rogojești – Bucecea accumulations (3.6 km)	-

Table no. 3-11 Culverts provided on the road interchanges

No.	Section	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
				starting km	ending km		
Road interchange Suceava West							
1.	Link road 4	2	1.2	0+220	0+230	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
2.	Link road 5	2	1.2	0+250	0+260	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
3.	Link road 6	2	1.2	0+315	0+325	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
4.	Link road 6	2	1.2	0+465	0+475	ROSCI0075 Pătrăuţi Forest (1.3 km)	-

No.	Section	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
				starting km	ending km		
5.	Link road 8	2	1.2	0+195	0+205	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
6.	Link road 9	2	1.2	0+265	0+275	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
7.	Link road 10 and DN2P	2	1.2	13+630	13+640	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
8.	Link road 10 and DN2P	2	1.2	14+030	14+040	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
9.	Link road 10 and DN2P	2	1.2	14+460	14+470	ROSCI0075 Pătrăuţi Forest (1.3 km)	-
Road interchange Radauti							
10.	Link road 1	2	1.2	0+245	0+255	ROSCI0379 Suceava River (2.9 km)	-
11.	connection road	2	1.2	0+145	0+155	ROSCI0379 Suceava River (3.9 km)	-
12.	connection road	2	1.2	0+845	0+855	ROSCI0379 Suceava River (3.9 km)	-
13.	connection road	2	1.2	1+445	1+455	ROSCI0379 Suceava River (3.9 km)	-
14.	Link road 3	2	1.2	0+120	0+130	ROSCI0379 Suceava River (3.9 km)	-
15.	Link road 4	2	1.2	0+260	0+270	ROSCI0379 Suceava River (3.9 km)	-
16.	Link road 1	2	1.2	0+235	0+245	ROSCI0379 Suceava River (5.1 km)	-
17.	Link road 1	2	1.2	0+295	0+305	ROSCI0379 Suceava River (5.1 km)	-
18.	Link road 1	2	1.2	0+585	0+595	ROSCI0379 Suceava River (5.1 km)	-
19.	Link road 3	2	1.2	0+015	0+025	ROSCI0379 Suceava River (5.1 km)	-
Siret Nord road interchange							
20.	Ring-road DN2 Km 55+203.22	2	1.2	0+555	0+565	ROSPA0110 Rogojești – Bucecea accumulations (0.5 km)	-

Table no. 3-12 Box culverts provided for the relocation of local roads

No.	Name	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
				starting km	ending km		
1	Relocation - DJ 209D km 39+790	2	1.2	0+625	0+635	ROSCI0379 Suceava River (4.1 km)	-
2	Relocation -DJ 209D km 41+250.35	2	1.2	0+480	0+490	ROSPA0110 Rogojești – Bucecea accumulations (4.1 km)	-
3	Relocation -DJ 209D km 41+250.35	2	1.2	0+754	0+764	ROSPA0110 Rogojești – Bucecea accumulations (4.1 km)	-
4	Relocation DN2 km 43+320	2	1.2	473+809	473+819	ROSPA0110 Rogojești – Bucecea accumulations (5 km)	-

108 culverts were provided on the maintenance roads, 54 bridges on each side of the motorway and express road.

Table no. 3-13 Culverts provided on the maintenance roads

No.	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
			starting km	ending km		
1	5	2.6	3+585	3+595	ROSCI0075 Pătrăuţi Forest (5 km)	-
2	2	1.2	5+435	5+445	ROSCI0075 Pătrăuţi Forest (2.7 km)	-
3	2	1.2	6+100	6+110	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
4	2	1.2	6+605	6+615	ROSCI0075 Pătrăuţi Forest (2 km)	-
5	2	1.2	7+055	7+065	ROSCI0075 Pătrăuţi Forest (2.2 km)	-
6	5	2.6	7+822	7+832	ROSCI0075 Pătrăuţi Forest (2.2 km)	-
7	3	2.6	9+405	9+415	ROSCI0075 Pătrăuţi Forest (2.5 km)	-
8	2	1.2	9+770	9+780	ROSCI0075 Pătrăuţi Forest (2.3 km)	-
9	3	2.6	10+185	10+195	ROSCI0075 Pătrăuţi Forest (2.3 km)	-
10	2	1.2	10+410	10+420	ROSCI0075 Pătrăuţi Forest (1.9 km)	-
11	4	1.4	10+522	10+532	ROSCI0075 Pătrăuţi Forest (1.9 km)	-
12	5	2.6	12+920	12+930	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
13	2	1.2	14+020	14+030	ROSCI0075 Pătrăuţi Forest (2.5 km)	-
14	2	1.2	14+770	14+780	ROSCI0075 Pătrăuţi Forest (3 km)	-
15	5	2.6	15+245	15+255	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
16	3	2.6	15+809	15+819	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
17	2	1.2	16+020	16+030	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
18	3	2.6	16+285	16+295	ROSCI0075 Pătrăuţi Forest (3.8 km)	-
19	2	1.2	16+395	16+405	ROSCI0075 Pătrăuţi Forest (3.8 km)	-
20	2	1.2	16+645	16+655	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
21	5	2.6	16+915	16+925	ROSCI0075 Pătrăuţi Forest (3.6 km)	-
22	2	1.2	17+370	17+380	ROSCI0075 Pătrăuţi Forest (3.5 km)	-
2. 3	2	1.2	17+745	17+755	ROSCI0075 Pătrăuţi Forest (3.5 km)	-
24	4	2.6	18+195	18+205	ROSCI0075 Pătrăuţi Forest (2.9 km)	-
25	3	2.6	21+445	21+455	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
26	5	2.6	21+795	21+805	ROSCI0075 Pătrăuţi Forest (4 km)	-
27	2	1.2	24+045	24+055	ROSCI0075 Pătrăuţi Forest (5.3 km)	-
28	2	1.2	25+645	25+655	ROSCI0379 Suceava River (4.3 km)	-
29	2	1.2	27+095	27+105	ROSCI0379 Suceava River (4.7 km)	-
30	5	2.6	27+495	27+505	ROSCI0379 Suceava River (4.4 km)	-
31	2	1.2	28+945	28+955	ROSCI0379 Suceava River (4.5 km)	-
32	3	2.6	29+175	29+185	ROSCI0379 Suceava River (4.5 km)	-
33	3	2.6	29+555	29+565	ROSCI0379 Suceava River (4.5 km)	-
34	5	2.6	29+920	29+930	ROSCI0379 Suceava River (4.7 km)	-
35	4	2.6	31+320	31+330	ROSCI0379 Suceava River (4 km)	-
36	3	2.2	31+655	31+665	ROSCI0379 Suceava River (3.8 km)	-
37	5	1.4	32+235	32+245	ROSCI0379 Suceava River (3.7 km)	-
38	2	1.2	32+955	32+965	ROSCI0379 Suceava River (3.6 km)	-
39	2	1.2	35+015	35+025	ROSCI0379 Suceava River (3.8 km)	-
40	5	2.2	37+520	37+530	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
41	5	2.2	37+732	37+742	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
42	5	2.6	38+570	38+580	ROSCI0075 Pătrăuţi Forest (3.1 km)	-
43	3	2.6	40+745	40+755	ROSPA0110 Rogojești – Bucecea accumulations (4.3 km)	-
44	3	2.6	41+702	41+712	ROSPA0110 Rogojești – Bucecea accumulations (4.3 km)	-
45	3	2.6	42+715	42+725	ROSPA0110 Rogojești – Bucecea accumulations (4.8 km)	-
46	3	2.6	44+117	44+127	ROSCI0379 Suceava River (4.5 km)	-
47	2	1.2	44+970	44+980	ROSCI0379 Suceava River (3.9 km)	-
48	3	2.6	45+785	45+795	ROSCI0379 Suceava River (3.6 km)	-
49	3	2.6	47+045	47+055	ROSCI0379 Suceava River (2.9 km)	-
50	3	2.6	47+385	47+395	ROSCI0379 Suceava River (2.6 km)	-
51	5	2.6	47+936	47+946	ROSCI0379 Suceava River (2.3 km)	-
52	5	2.6	50+070	50+080	ROSCI0379 Suceava River (3.3 km)	-

No.	Width (m)	Height (m)	Interval provided for the completion of the work		Distance to the nearest protected natural area (km)	Other information
			starting km	ending km		
53	5	2.6	51+270	51+280	ROSPA0110 Rogojești – Bucecea accumulations (3.8 km)	-
54	5	2.6	51+470	51+480	ROSPA0110 Rogojeşti – Bucecea accumulations (3.5 km)	-

2.3.2.8 Motorway facilities

For the Suceava - DN2H Motorway and DN2H - Siret Border Express Road, the following facilities were proposed:

- Maintenance and Coordination Center (CIC);
- Short-term parking (PSD);
- S1 type Service spaces.

These facilities will be carried out in accordance with the provisions of the Norm regarding the Design of Extraurban Motorways - PD 162-2002, correlated with the document TEM 2001 - TEM Standards and Recommended Practices, Third Edition, December 4-6, 2001.

The optimum location with respect to the existing networks (water supply and sewerage networks, electricity networks, telephone networks, common road networks, etc.) was followed.

The table below shows the positions of these facilities.

Table no.2-11 Locations of the proposed facilities

No.	Section	Name	Location	Distance km	Distance to the nearest protected natural area (km)	Other information
1.	Suceava Siret border	Short-term parking	Left Right	5+100-5+450	ROSCI0075 Pătrăuţi Forest (approx. 2.7 km)	-
2.		S1 type Service Space	Left	20+730-21+170	ROSCI0075 Pătrăuţi Forest (approx. 3.2 km)	-
3.		S1 type Service Space	right	21+800-21+250	ROSCI0075 Pătrăuţi Forest (approx. 3.2 km)	-
4.		Short term parking	Left Right	37+150-37+500	ROSCI0075 Pătrăuţi Forest (approx. 3.3 km)	-
5.		Maintenance and coordination center	right	43+050-43+310	ROSPA0110 Rogojești-Bucecea accumulations (approx. 5 km)	-

The following map shows the location of the CIC and the short-term car parkings of the motorway/express road.

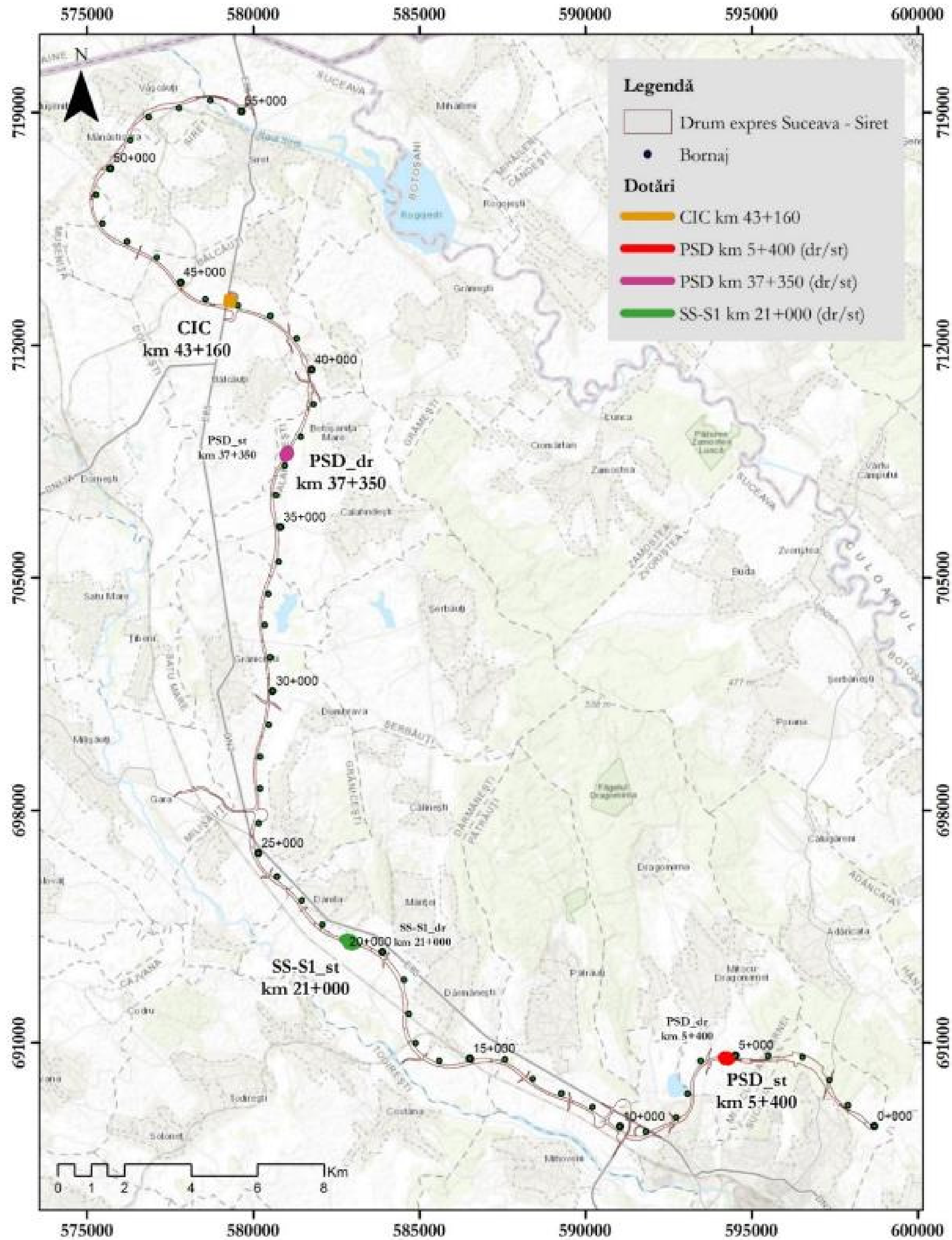


Figure no.2-3 CIC and short-term parking locations (PSD) Maintenance and Coordination Centers (CIC)

2.3.2.8.1 Maintenance and Coordination Centers

The Maintenance and Coordination Center is a service unit for a motorway sector with the role of maintaining the motorway in proper operating condition and ensuring the safety of road traffic in the area, supporting the repair of equipment. It also has functions of coordination of the activity of support points and permanent supervision of the inclusion of the motorway in the performance criteria according to "Regulations for the maintenance of motorways based on performance criteria" ind. AND 596/2009 equipped with specific measurement and control equipment.

The Maintenance and Coordination Center is a technical complex that also has a series of tasks grouped as follows:

- traffic supervision, influence of meteorological factors on the traffic;
- providing first aid in case of accidents;
- maintenance of the motorway on the relevant section, of the service spaces, markings, lighting installations and telecommunications installations;
- restorations and repairs after accidents or natural calamities;
- collection of taxes and fines;
- fuel supply of maintenance equipment;
- maintenance of equipment, etc.

To achieve the tasks described above, constructions with different functions were designed. These constructions are:

- Operational building P+1E;
- Car garage;
- Above ground fuel tanks;
- Fencing sanitary protection area;
- Water tank with pumping group;
- Drilled well;
- Washing ramp;
- Cabin gate;
- Drainable sealed basin;
- Treated water collection tank;
- Sludge and hydrocarbon interceptors;
- Rainwater pumping station;
- CaCl preparation plant (silo, tank, mixing basin);
- Outdoor platforms for material storage;
- Fuel tank for fire engines;

- Metallic gates;
- Wire mesh fences;
- Substation and electrical connection;
- Waste storage platform;
- Generator set;
- Covered parking for cars with a capacity of 12 places;
- Covered electric car parking for 4 electric car charging positions with 2 pcs. charging equipment to which 2 pcs of electric cars can be simultaneously connected.

2.3.2.8.2 Short-term parking

Short-term parking is a space physically separated from the motorway, which allows users to stop when they need rest and relaxation. It is recommended that these areas offer a change from the monotony of the motorway, in belview points.

The actual parking platform has a protection zone of min. 10 m width from the edge of the motorway carriageway. Each parking platform will be arranged for both heavy vehicles and cars.

Access to and from the parking platform will be made only on special entrance and exit ramps, so that vehicles can re-enter traffic in complete safety.

These short-term parking lots are located along the motorway, in principle both on the right and on the left side, symmetrical to the axis of the road, according to the motorway layout plans.

Rainwater coming from the premises of the objective will be collected through drains with siphon and deposit. The water thus collected will be gravity channeled through simple concrete pipes to the two sludge and mineral oil separators (one on the left side and one on the right side of the motorway). Also, the rainwater from the parking areas will be treated in the hydrocarbon interceptor and will be sent to the caissons of the wastewater pumping stations.

The thermal source is the thermal plant located in the WC building and will be equipped with a boiler operating with electricity, a closed expansion tank and a line pump for the circulation of the thermal agent.

The compensation of the exhausted air is done by means of the transit grids mounted on the lower part of the access doors.

Each left or right location contains:

- Public sanitary group;
- Drilled well;
- Drainable sealed basin;
- Rainwater pumping station and buffer tank;
- Weighing platform;
- External fencing of wire mesh panels;

- Covered tables;
- Protection spaces;
- Substation transformer;
- Fencing drilled well;
- Water tank with pumping group;
- Waste storage platform;
- Car parking - 29 places;
- Covered electric car parking for 6 electric car charging positions with 3 pcs. charging equipment to which 2 pcs of electric cars can be simultaneously connected.
- Bus parking - 2 places;
- Heavy vehicle parking - 15 places;
- Parking for people with disabilities - 4 places.

2.3.2.8.3 Service spaces (S1 type)

The S1 type Service Space is intended for longer-term parking and standing, having as additional equipment than short-term parking a fuel filling station and a commercial space with public food. The space will be concessioned in order to place the mentioned facilities.

Each S1 type service space will be equipped with the following:

- Public sanitary group;
- Water connection pipe to the network in the area/drilled well;
- Drainable sealed basin;
- Rainwater pumping station and buffer tank;
- External fencing;
- Covered tables;
- Protection spaces;
- Substation;
- Drilled well fencing;
- Water tank with pumping group;
- Ecological container platform;
- Car parking - 87 spaces + 7 spaces in the gas station;
- Covered electric car parking for 6 electric car charging positions with 3 pcs. of charging equipment to which 2 pcs of electric car can be simultaneously connected;
- Bus parking - 6 places;
- Heavy vehicle parking - 33 places;
- Parking for people with disabilities - 6 places;
- Gas station reserved space;
- Space reserved for trade + public food;
- Equipment maintenance cell.

2.3.2.9 Hydrotechnical works

In order to ensure an optimum hydraulic flow of water under the bridges, but also to protect the road embankment, when it is in contact with running water or standing water, the construction of hydrotechnical works is required.

The designed hydrotechnical works ensure:

- protecting riverbeds in the area of bridges;
- optimum hydraulic routing and water flowing by the bridges spans;
- protection of the road slope, the areas on which it is subject to the action of water;
- ensuring the stability of the thalweg in the area of water crossings.

The hydrotechnical works were designed to ensure calculation according to the STAS in force.

According to STAS 4273-83 "Classification of importance" - point 2.11 the category of hydrotechnical constructions related to public roads (crossings in the area of water courses) is for the national roads 3. According to point 5.1 of STAS 4273-83, according to the duration of operation - definitive and according to the functional role - main, hydrotechnical construction 3 is appropriate to the importance class III.

In accordance with STAS 4068/2-87 "Annual probabilities of maximum flows and volumes under normal and special operating conditions" - point 2.1 under normal operating conditions at importance class III is appropriate to the annual probability of exceeding 2%.

The hydraulic design of bridges and culverts is done respecting the conditions of free passage in accordance with PD 95-2002, table 6.III. and table 7.I.

For the intersected watercourses (with flows below 1000m^3/s with floats) the minimum height of free passage under bridges is 1.00m.

The main hydrotechnical works are:

- Slope protection
- earth channel recalibration
- Relocation of earth channels
- Construction of concrete channels

2.3.2.9.1 Slope protection with a concrete slab wall

Hydrotechnical Work Type – 1 cast-in-place concrete slab wall: To protect the road embankment at the level with the calculation insurance of 2%, when the road is located in the main river bed, a cast-in-place concrete slab wall reinforced with 15 cm thick Buzău nets was provided. It is supported by a base of concrete beams.

Hydrotechnical work Type - 2- wall made of cast-in-place concrete slabs and gabions: The work is applied to the areas where the alignment approaches the minor river bed. This is a defense solution composed of a gabion wall to protect the bank of the minor river bed and a wall to protect the motorway embankment, located in the major river bed. The gabion wall has a variable height between 1.5-3.0 m and is placed on a 5.0 m long gabion mattress. The protection of the embankment was planned to be executed with a wall of cast-in-place concrete slabs, supported on a concrete beam. The wall is 15 cm thick and reinforced with a Buzău net.

The recalibration of the bed is necessary in the areas where bank defense works were planned for the river bed as well as in the area of the bridges, where by carrying out the works, the drainage section would be reduced.

Under these conditions, a recalibration of the bed is necessary in these areas, which consists in making the section necessary for the flow of the calculation flow.

Also, in the areas where the water course bed is meandering and have deposits, to increase the area of the drainage section, the bed will be recalibrated on a portion and most often in the area of bridges, where the bed shows deformations of the bottom and especially deposits.

Table no.2-12 Hydrotechnical works to protect the motorway slopes

PROTECTION OF ROAD SLOPE WITH CONCRETE WALL										
No.	**Left side**			**Distance to the nearest protected natural area**	**Name of protected natural area**	**Right Side**			**Distance from the nearest protected natural area**	**Name of protected natural area**
	pK	**Pkf**	**L (m)**	**km**		**pK**	**Pkf**	**L (m)**	**km**	
1	7+850	7+975	125	2.54	ROSCI0075 Patrauti Forest	7+845	7+975	130	2.42	ROSCI0075 Patrauti Forest
2	8+000	8+150	150	2.44	ROSCI0075 Patrauti Forest	8+000	8+150	150	2.45	ROSCI0075 Patrauti Forest
3	9+225	9+275	50	2.60	ROSCI0075 Patrauti Forest	-	-	-	-	-
4	-	-	-	-	ROSCI0075 Patrauti Forest	9+400	9+500	100	2.10	ROSCI0075 Patrauti Forest
5	9+690	10+350	660	2.50	ROSCI0075 Patrauti Forest	-	-	-	-	-
6	11+400	11+590	190	1.96	ROSCI0075 Patrauti Forest	11+400	11+590	190	1.86	ROSCI0075 Patrauti Forest
7	11+610	11+685	75	2.06	ROSCI0075 Patrauti Forest	11+610	11+685	75	1.98	ROSCI0075 Patrauti Forest
8	11+710	11+900	190	2.11	ROSCI0075 Patrauti Forest	11+710	11+900	190	2.05	ROSCI0075 Patrauti Forest
9	14+380	14+515	135	2.66	ROSCI0075 Patrauti Forest	14+285	14+360	75	2.61	ROSCI0075 Patrauti Forest
10	14+715	14+910	195	3.00	ROSCI0075 Patrauti Forest	14+380	14+525	145	2.84	ROSCI0075 Patrauti Forest
11	15+000	15+200	two hun dred	3.19	ROSCI0075 Patrauti Forest	14+740	14+920	180	3.12	ROSCI0075 Patrauti Forest
12	17+150	17+550	400	3.63	ROSCI0075 Patrauti Forest	17+150	17+550	400	3.54	ROSCI0075 Patrauti Forest
13	17+725	17+875	150	3.19	ROSCI0075 Patrauti Forest	17+725	17+875	150	3.11	ROSCI0075 Patrauti Forest
14	22+090	22+175	85	4.16	ROSCI0075 Patrauti Forest	15+000	15+190	190	4.08	ROSCI0075 Patrauti Forest
15	22+210	22+290	80	4.31	ROSCI0075 Patrauti Forest	22+100	22+175	75	4.24	ROSCI0075 Patrauti Forest

PROTECTION OF ROAD SLOPE WITH CONCRETE WALL										
No.	Left side			Distance to the nearest protected natural area	Name of protected natural area	Right Side			Distance from the nearest protected natural area	Name of protected natural area
	pK	Pkf	L (m)	km		pK	Pkf	L (m)	km	
16	25+025	25+200	175	5.50	ROSCI0379 Suceava River	22+215	22+280	65	4.25	ROSCI0075 Patrauti Forest
17	25+250	25+500	250	5.53	ROSCI0379 Suceava River	25+025	25+200	175	5.65	ROSCI0379 Suceava River
18	30+930	30+970	40	4.83	ROSCI0379 Suceava River	25+250	25+500	250	5.39	ROSCI0379 Suceava River
19	30+950	30+970	20	4.84	ROSCI0379 Suceava River	30+930	30+970	40	4.91	ROSCI0379 Suceava River
20	32+545	32+590	45	3.65	ROSCI0379 Suceava River	30+985	31+030	45	4.92	ROSCI0379 Suceava River
21	35+160	35+200	40	3.73	ROSCI0379 Suceava River	55+128	55+283	155		ROSCI0379 Suceava River
22	36+030	36+050	20	3.85	ROSCI0379 Suceava River	-	-	-	-	
2. 3	36+425	36+560	135	3.84	ROSCI0379 Suceava River	36+425	36+560	135	3.75	ROSCI0075 Patrauti Forest
24	36+590	36+850	260	3.77	ROSCI0075 Patrauti Forest	36+590	36+850	260	3.71	ROSCI0075 Patrauti Forest
25	54+960	55+105	145	0.82	(ROSPA0110) Rogojeşti-Bucecea accumulations	-	-	-	-	ROSPA0110) Rogojeşti-Bucecea accumulations
26	55+128	55+283	155	0.80	ROSPA0110) Rogojeşti-Bucecea accumulations	-	-	-	-	ROSPA0110) Rogojeşti-Bucecea accumulations

2.3.2.9.2 Deviation and bed protection with gabion mattress

The works to deviate the bed of the Horoiţ and Negostina water bodies are designed in the crossing areas with bridges, thus avoiding the creation of abutement in the minor bed.

The protection of the bed with the gabion mattress is applied because it is necessary to stabilize the bank and the talveg, thus ensuring its protection against erosion induced by water bodies.

The gabion mattresses are placed on a geosynthetic material that acts as a filter. The gabions are overlapped, behind which a geotextile filter will be placed.

The advantages of works made of gabions are elasticity, quick execution and the possibility of immediate exploitation.

Table no.2-13 Riverbed deviation in the area of bridges and protection with gabion mattress

No.	Type of work	Interval provided for the completion of the work				Length	Distance to the nearest protected natural area (km)	Name of the protected natural area
		Left		Right				
		starting km	ending km	starting km	ending km	(m)		
1.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Mitocul tributary 4+940	4+850	4+950	4+900	5+000	189.32	3.7 km	ROSCI0075 Pătrăuţi Forest
2.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Dragomirna River km 7+990	7+950	8+050	7+950	8+050	235.73	2.39 km	ROSCI0075 Pătrăuţi Forest
3.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Raul Patrăuţeanca km 11+605	11+550	11+650	11+550	11+650	206.53	1.98 km	ROSCI0075 Pătrăuţi Forest
4.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Hantuta tributary km 14+370	14+350	14+450	14+250	14+400	193.33	2.74 km	ROSCI0075 Pătrăuţi Forest
5.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Paraul Danila km 22+995	22+900	23+025	22+950	23+100	260.44	4.65 km	ROSCI0075 Pătrăuţi Forest
6.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Danilă River km 23+554	23+450	23+550	23+450	23+550	220.43	4.87 km	ROSCI0075 Pătrăuţi Forest
7.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Horait River km 25+212	25+100	25+250	22+150	25+300	323.52	5.8 km	ROSCI0075 Pătrăuţi Forest
8.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Sacari river km 27+910	27+850	27+950	27+875	27+925	160.06	6 km	ROSCI0075 Pătrăuţi Forest
9.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Rau Vadutul km 30+375	30+375	30+400	30+325	30+375	185.4	5.75 km	ROSCI0075 Pătrăuţi Forest
10.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Paraul cel Adanc km 30+975	30+950	31+000	30+950	31+000	134.82	5.48 km	ROSCI0075 Pătrăuţi Forest

No.	Type of work	Interval provided for the completion of the work				Length	Distance to the nearest protected natural area (km)	Name of the protected natural area
		Left		Right				
		starting km	ending km	starting km	ending km	(m)		
11.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Paraul Calina km 33+520	33+450	33+600	33+400	33+550	230.62	1.7 km	ROSCI0075 Pătrăuţi Forest
12.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Horait tributary km 35+120	35+100	35+250	33+050	35+150	215.37	4.01 km	ROSCI0075 Pătrăuţi Forest
13.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Rau Horait km 36+575	36+575	36+700	36+500	36+575	240.46	3.72 km	ROSCI0075 Pătrăuţi Forest
14.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Paraul Rudesti (Negostina) km 42+100	41+975	42+150	42+050	42+250	283.5	4.38 km	ROSPA0010 Rogojesti - Bucecea Accumulations
15.	Recalibration of the riverbed in the area of the bridges - the gabion mattress Paraul Siret km 55+115	55+050	55+150	55+050	55+150	368.54	0.56 km	ROSPA0010 Rogojesti - Bucecea Accumulations

2.3.2.9.3 Rainwater collection and evacuation works

The water drainage devices provided in the project are divided into two categories:

- works that ensure the flow of meteoric waters to the watercourse:
  - ditches with a walled section at the edge of the embankment;
  - culverts (with the span of 2 m and 5 m);
  - shoulder gutters from precast elements;
  - water discharge boxes from the motorway surface in the case of high embankments, ramps; bridges and passages;
  - walled gutters in the median area of the motorway in the case of arranged curves.
- works for the depollution of water before discharge into the watercourse or on natural valleys:
  - settlement tank/separator chambers for hydrocarbons 282 pcs., these devices are placed before the discharge of ditches to culverts or in natural water courses;
  - settlement tank/separator chambers for hydrocarbons associated with water dispersion tanks in the number of 15 pcs., are provided in the areas where the water collected in the ditches will be discharged on the natural ground, in depressed areas and has the purpose of the laminar drainage of the water to avoid soil erosion;
  - retention basins 16 pcs.

In total, 297 pieces of hydrocarbon interceptors are provided and 16 pcs of retention basins.

In order to drain and evacuate the water from the road pavement, it was planned to extend the granular layer to the edge of the platform to allow the water infiltrated into the foundation to be discharged on the slopes or in the drainage devices along the motorway.

At the base of the embankment slopes, concrete trapezoidal ditches will be constructed to collect rainwater from the motorway area, along the entire length of the motorway (left and right).

Water from the motorway platform will be collected through concrete side ditches and discharged on the slope, in ditches, through boxes located according to the hydraulic capacity calculation of the ditch.

Table no.2-14 Hydrocarbon interceptors provided on the main alignment

No.	KM	Position	Description
1	0+849	right	hydrocarbon interceptor
2	0+850	Left	hydrocarbon interceptor
3	1+213	right	hydrocarbon interceptor
4	1+215	Left	hydrocarbon interceptor
5	3+571	right	hydrocarbon interceptor
6	3+574	Left	hydrocarbon interceptor
7	3+606	right	hydrocarbon interceptor
8	3+602	Left	hydrocarbon interceptor
9	3+951	right	hydrocarbon interceptor
10	3+949	Left	hydrocarbon interceptor

No.	KM	Position	Description
11	4+553	right	hydrocarbon interceptor
12	4+554	Left	hydrocarbon interceptor
13	4+802	right	hydrocarbon interceptor
14	4+799	Left	hydrocarbon interceptor
15	5+035	Left	hydrocarbon interceptor
16	5+428	Left	hydrocarbon interceptor
17	5+430	right	hydrocarbon interceptor
18	6+085	right	hydrocarbon interceptor
19	6+088	Left	hydrocarbon interceptor
20	6+105	Left	retention basin + hydrocarbon interceptor
21	6+117	right	hydrocarbon interceptor
22	6+117	Left	hydrocarbon interceptor
2. 3	6+594	Left	hydrocarbon interceptor
24	6+595	right	hydrocarbon interceptor
25	7+044	right	hydrocarbon interceptor
26	7+044	Left	hydrocarbon interceptor
27	7+809	right	hydrocarbon interceptor
28	7+819	Left	hydrocarbon interceptor
29	7+829	right	hydrocarbon interceptor
30	7+960	right	hydrocarbon interceptor
31	7+963	Left	hydrocarbon interceptor
32	8+013	right	hydrocarbon interceptor
33	8+009	Left	hydrocarbon interceptor
34	9+399	Left	hydrocarbon interceptor
35	9+413	Left	hydrocarbon interceptor
36	9+418	right	hydrocarbon interceptor
37	10+069	Left	hydrocarbon interceptor
38	10+081	Left	hydrocarbon interceptor
39	10+182	right	hydrocarbon interceptor
40	10+192	right	hydrocarbon interceptor
41	10+193	Left	hydrocarbon interceptor
42	10+519	Left	hydrocarbon interceptor
43	10+530	Left	hydrocarbon interceptor
44	10+539	right	hydrocarbon interceptor
45	11+576	right	hydrocarbon interceptor
46	11+576	Left	hydrocarbon interceptor
47	11+616	right	hydrocarbon interceptor
48	11+616	Left	hydrocarbon interceptor
49	12+414	right	hydrocarbon interceptor
50	12+415	Left	hydrocarbon interceptor
51	12+453	Left	hydrocarbon interceptor
52	12+486	right	hydrocarbon interceptor
53	12+916	Left	hydrocarbon interceptor
54	12+916	right	hydrocarbon interceptor
55	12+936	right	hydrocarbon interceptor
56	12+937	Left	hydrocarbon interceptor
57	14+024	Left	retention basin + hydrocarbon interceptor
58	14+342	Left	hydrocarbon interceptor
59	14+345	right	hydrocarbon interceptor
60	14+774	Left	retention basin + hydrocarbon interceptor
61	14+989	Left	hydrocarbon interceptor
62	15+231	Left	hydrocarbon interceptor
63	15+240	right	hydrocarbon interceptor
64	15+251	right	hydrocarbon interceptor

No.	KM	Position	Description
65	15+252	Left	hydrocarbon interceptor
66	15+796	Left	hydrocarbon interceptor
67	15+804	right	hydrocarbon interceptor
68	15+815	Left	hydrocarbon interceptor
69	16+024	Left	retention basin + hydrocarbon interceptor
70	16+292	right	hydrocarbon interceptor
71	16+393	right	retention basin + hydrocarbon interceptor
72	16+643	right	retention basin + hydrocarbon interceptor
73	16+917	Left	hydrocarbon interceptor
74	16+917	right	hydrocarbon interceptor
75	16+927	Left	hydrocarbon interceptor
76	16+928	right	hydrocarbon interceptor
77	17+369	right	retention basin + hydrocarbon interceptor
78	17+746	right	retention basin + hydrocarbon interceptor
79	18+194	Left	hydrocarbon interceptor
80	18+195	right	hydrocarbon interceptor
81	18+204	right	hydrocarbon interceptor
82	18+205	Left	hydrocarbon interceptor
83	20+288	Left	hydrocarbon interceptor
84	20+294	right	hydrocarbon interceptor
85	20+967	Left	hydrocarbon interceptor
86	21+119	Left	hydrocarbon interceptor
87	21+441	Left	hydrocarbon interceptor
88	21+441	right	hydrocarbon interceptor
89	21+452	Left	hydrocarbon interceptor
90	21+453	right	hydrocarbon interceptor
91	22+154	Left	hydrocarbon interceptor
92	22+159	right	hydrocarbon interceptor
93	22+211	right	hydrocarbon interceptor
94	22+221	Left	hydrocarbon interceptor
95	22+999	right	hydrocarbon interceptor
96	22+999	Left	hydrocarbon interceptor
97	23+530	right	hydrocarbon interceptor
98	23+530	Left	hydrocarbon interceptor
99	24+053	Left	retention basin + hydrocarbon interceptor
100	25+161	Left	hydrocarbon interceptor
101	25+185	right	hydrocarbon interceptor
102	25+235	Left	hydrocarbon interceptor
103	25+266	right	hydrocarbon interceptor
104	25+664	Left	hydrocarbon interceptor
105	25+664	right	hydrocarbon interceptor
106	27+083	Left	hydrocarbon interceptor
107	27+084	right	hydrocarbon interceptor
108	27+113	right	hydrocarbon interceptor
109	27+115	Left	hydrocarbon interceptor
110	27+483	right	hydrocarbon interceptor
111	27+486	Left	hydrocarbon interceptor
112	27+515	right	hydrocarbon interceptor
113	27+515	Left	hydrocarbon interceptor
114	27+894	right	hydrocarbon interceptor
115	27+895	Left	hydrocarbon interceptor
116	27+946	Left	hydrocarbon interceptor
117	27+948	right	hydrocarbon interceptor
118	28+565	right	hydrocarbon interceptor

No.	KM	Position	Description
119	28+566	Left	hydrocarbon interceptor
120	28+617	right	hydrocarbon interceptor
121	28+617	Left	hydrocarbon interceptor
122	28+945	right	retention basin + hydrocarbon interceptor
123	29+165	Left	hydrocarbon interceptor
124	29+166	right	hydrocarbon interceptor
125	29+192	Left	hydrocarbon interceptor
126	29+193	right	hydrocarbon interceptor
127	29+544	Left	hydrocarbon interceptor
128	29+572	Left	hydrocarbon interceptor
129	29+574	right	hydrocarbon interceptor
130	29+908	right	hydrocarbon interceptor
131	29+909	Left	hydrocarbon interceptor
132	29+939	right	hydrocarbon interceptor
133	29+940	Left	hydrocarbon interceptor
134	30+393	Left	hydrocarbon interceptor
135	30+394	right	hydrocarbon interceptor
136	30+954	Left	hydrocarbon interceptor
137	30+954	right	hydrocarbon interceptor
138	30+993	Left	hydrocarbon interceptor
139	30+994	right	hydrocarbon interceptor
140	31+320	right	hydrocarbon interceptor
141	31+328	Left	hydrocarbon interceptor
142	31+328	right	hydrocarbon interceptor
143	31+642	right	hydrocarbon interceptor
144	31+643	Left	hydrocarbon interceptor
145	31+664	Left	hydrocarbon interceptor
146	31+665	right	hydrocarbon interceptor
147	32+236	Left	hydrocarbon interceptor
148	32+236	right	hydrocarbon interceptor
149	32+245	Left	hydrocarbon interceptor
150	32+245	right	hydrocarbon interceptor
151	32+512	right	hydrocarbon interceptor
152	32+515	Left	hydrocarbon interceptor
153	32+555	Left	hydrocarbon interceptor
154	32+558	right	hydrocarbon interceptor
155	32+948	right	hydrocarbon interceptor
156	32+973	Left	hydrocarbon interceptor
157	32+973	right	hydrocarbon interceptor
158	33+487	right	hydrocarbon interceptor
159	33+489	Left	hydrocarbon interceptor
160	33+551	right	hydrocarbon interceptor
161	33+552	Left	hydrocarbon interceptor
162	35+014	Left	hydrocarbon interceptor
163	35+016	right	hydrocarbon interceptor
164	35+032	right	hydrocarbon interceptor
165	35+093	Left	hydrocarbon interceptor
166	35+143	right	hydrocarbon interceptor
167	35+144	Left	hydrocarbon interceptor
168	35+997	right	hydrocarbon interceptor
169	36+000	Left	hydrocarbon interceptor
170	36+045	Left	hydrocarbon interceptor
171	36+046	right	hydrocarbon interceptor
172	36+522	right	hydrocarbon interceptor

No.	KM	Position	Description
173	36+552	Left	hydrocarbon interceptor
174	36+602	right	hydrocarbon interceptor
175	36+600	Left	hydrocarbon interceptor
176	37+229	Left	hydrocarbon interceptor
177	37+511	Left	hydrocarbon interceptor
178	37+541	Left	hydrocarbon interceptor
179	37+542	right	hydrocarbon interceptor
180	37+751	Left	hydrocarbon interceptor
181	37+753	right	hydrocarbon interceptor
182	38+571	right	hydrocarbon interceptor
183	38+572	Left	hydrocarbon interceptor
184	38+589	right	hydrocarbon interceptor
185	38+589	right	hydrocarbon interceptor
186	38+767	right	hydrocarbon interceptor
187	38+771	Left	hydrocarbon interceptor
188	38+912	right	hydrocarbon interceptor
189	38+912	Left	hydrocarbon interceptor
190	39+618	Left	hydrocarbon interceptor
191	39+613	right	hydrocarbon interceptor
192	39+949	Left	hydrocarbon interceptor
193	39+958	right	hydrocarbon interceptor
194	40+733	Left	hydrocarbon interceptor
195	40+736	right	hydrocarbon interceptor
196	40+761	right	hydrocarbon interceptor
197	40+762	Left	hydrocarbon interceptor
198	41+690	Left	hydrocarbon interceptor
199	41+690	right	hydrocarbon interceptor
two hundred	42+068	right	hydrocarbon interceptor
201	42+070	Left	hydrocarbon interceptor
202	42+111	right	hydrocarbon interceptor
203	42+123	Left	hydrocarbon interceptor
204	42+702	Left	hydrocarbon interceptor
205	42+704	right	hydrocarbon interceptor
206	42+729	Left	hydrocarbon interceptor
207	42+731	right	hydrocarbon interceptor
208	43+040	Left	retention basin + hydrocarbon interceptor
209	43+650	Left	hydrocarbon interceptor
210	43+650	right	hydrocarbon interceptor
211	43+836	Left	hydrocarbon interceptor
212	43+838	right	hydrocarbon interceptor
213	44+133	Left	hydrocarbon interceptor
214	44+133	right	hydrocarbon interceptor
215	44+958	Left	hydrocarbon interceptor
216	44+958	right	hydrocarbon interceptor
217	44+987	Left	hydrocarbon interceptor
218	44+987	right	hydrocarbon interceptor
219	45+801	right	hydrocarbon interceptor
220	45+802	Left	hydrocarbon interceptor
221	47+032	Left	hydrocarbon interceptor
222	47+032	right	hydrocarbon interceptor
223	47+373	right	hydrocarbon interceptor
224	47+373	Left	hydrocarbon interceptor
225	47+401	right	hydrocarbon interceptor

No.	KM	Position	Description
226	47+401	Left	hydrocarbon interceptor
227	47+924	right	hydrocarbon interceptor
228	47+925	Left	hydrocarbon interceptor
229	47+953	right	hydrocarbon interceptor
230	47+953	Left	hydrocarbon interceptor
231	48+819	right	hydrocarbon interceptor
232	48+820	Left	hydrocarbon interceptor
233	49+000	Left	hydrocarbon interceptor
234	49+001	right	hydrocarbon interceptor
235	50+060	Left	hydrocarbon interceptor
236	50+064	right	hydrocarbon interceptor
237	50+093	Left	hydrocarbon interceptor
238	50+093	right	hydrocarbon interceptor
239	50+979	Left	hydrocarbon interceptor
240	50+981	right	hydrocarbon interceptor
241	51+262	right	hydrocarbon interceptor
242	51+264	Left	hydrocarbon interceptor
243	51+292	Left	hydrocarbon interceptor
244	51+293	right	hydrocarbon interceptor
245	51+462	Left	hydrocarbon interceptor
246	51+466	right	hydrocarbon interceptor
247	51+490	Left	hydrocarbon interceptor
248	51+493	right	hydrocarbon interceptor
249	53+528	Left	hydrocarbon interceptor
250	53+542	right	hydrocarbon interceptor
251	54+513	Left	hydrocarbon interceptor
252	54+550	right	hydrocarbon interceptor
253	55+098	Left	hydrocarbon interceptor
254	55+098	right	hydrocarbon interceptor
255	55+132	right	hydrocarbon interceptor
256	55+138	Left	hydrocarbon interceptor

Hydrocarbon interceptors and retention basins provided at road interchanges are presented in the following table.

Table no.2-15 Hydrocarbon interceptors provided at road interchanges

No.	Object	KM	Position	Description
Interchange 1-DN29A				
1	Link road 3	0+243	Left	hydrocarbon interceptor
2		0+243	right	hydrocarbon interceptor
Interchange 2-DN2P				
3	Link road 4	0+216	right	hydrocarbon interceptor
4		0+233	right	hydrocarbon interceptor
5	Link road 11	0+102	right	retention basin
6	Link road 10	13+252	Left	retention basin + hydrocarbon interceptor
7		13+612	right	hydrocarbon interceptor
8		13+612	Left	hydrocarbon interceptor
9		14+030	right	hydrocarbon interceptor
10		14+029	Left	hydrocarbon interceptor
11		14+040	right	hydrocarbon interceptor
12		14+039	Left	hydrocarbon interceptor

No.	Object	KM	Position	Description
13		14+247	Left	hydrocarbon interceptor
14		14+460	Left	hydrocarbon interceptor
15		14+460	right	hydrocarbon interceptor
16		14+470	Left	hydrocarbon interceptor
17		14+472	right	hydrocarbon interceptor
18	Link road 9	0+265	Left	hydrocarbon interceptor
19		0+265	right	hydrocarbon interceptor
20		0+274	Left	hydrocarbon interceptor
21		0+275	right	hydrocarbon interceptor
22	Link road 7	0+220	Left	hydrocarbon interceptor
Interchange 3-DN2-DN2H				
2. 3	Link road 1	0+333	right	hydrocarbon interceptor
24		0+384	right	hydrocarbon interceptor
25	Connection road DN2H-A7	0+154	Left	retention basin + hydrocarbon interceptor
26		0+844	right	retention basin + hydrocarbon interceptor
27		1+470	right	retention basin + hydrocarbon interceptor
28		1+935	Left	hydrocarbon interceptor
29		1+938	right	hydrocarbon interceptor
30		1+977	right	hydrocarbon interceptor
31		1+978	Left	hydrocarbon interceptor
32	Link road 2	2+965	right	hydrocarbon interceptor
33		2+968	Left	hydrocarbon interceptor
34		3+001	Left	hydrocarbon interceptor
35		3+005	right	hydrocarbon interceptor
36		3+439	right	hydrocarbon interceptor
37		3+484	right	hydrocarbon interceptor
Interchange 4 - DN2 (South Siret)				
38	Link road 3	0+497	Left	hydrocarbon interceptor
39	Link road4	0+175	Left	hydrocarbon interceptor
Interchange 5 – DN2 (Siret Nord)				
40	Link road DN2	0+344	right	hydrocarbon interceptor
41		0+545	right	hydrocarbon interceptor
42		0+566	right	hydrocarbon interceptor

2.3.2.10 Consolidation works

2.3.2.10.1 Earthworks

Taking into account the ground morphology, the earthworks will be carried out on embankment (fillings) with heights of max. 12 m and cut (excavations) with a depth of max. 30 m, measured in the designed axis.

The materials that will be used to make the embankment must comply with the STAS 2914-84 specifications, thus materials that fall into the "very good", "good" and "mediocre" categories can be used.

The embankment fillings that will be executed on land with a slope greater than 10% will be executed in twin steps after removing the topsoil.

The twinning steps will be executed with a width of min. 3 m and height min. 50 cm. The base of each twinning step will be executed with a slope of 2%-4% in the direction of the inclination of the natural terrain.

The slopes of the embankment slopes were adopted 1:2 and banks of 5 m width at intervals of 6 m vertically. The intermediate benches were provided with concrete gutters for collecting and directing rainwater. The slopes of the slopes were established following general stability calculations, considering cohesive material from the filling in the embankment body with the following characteristic values for the physical-mechanical parameters:

- angle of internal friction of the material $\phi = 15°$;
- cohesion c=25 Kpa;
- volumetric weight $\gamma = 19$ KN/m^3.

The characteristics of the foundation soil were adopted according to the recommendations of the Geotechnical Study for each horizon identified in the geotechnical drilling correlated with the geological load appropriate to the depth at which each horizon is located.

For the embankment areas, provided with slopes of the slopes of 1:2 and intermediate banks of 5 m wide, at intervals of 6 m vertically, where the general stability is not satisfied, the following individual consolidation solutions or combinations between these have been provided solutions;

- reinforcement of the embankment base with reinforcing geogrids and/or unidirectional high-resistance woven geotextiles;
- improvement of the foundation soil with embankment piles made of granular material or wick drains;
- reinforced concrete supporting structures with indirect foundation on large diameter drilled piles.

In accordance with the specifications of AND 515/93, the fillings adjacent to the reinforced concrete bridges, passages and culverts will be made of granular material of type 1a, 1b, 2a (very good) or 2b (good) according to STAS 2914/84. The length of the embankment that will be made of granular material will be min. 30 m for bridges and passages and min. 5 m for reinforced concrete culverts. The transition from granular filling to cohesive material filling will be done with steps of 1 m width and 1 m height.

The slopes of the slopes adjacent to the bridges and passages were established following general stability calculations, considering the non-cohesive filling material in the embankment body with the following characteristic values for the physical-mechanical parameters:

- angle of internal friction of the material $\phi = 33°$;
- cohesion c=2 Kpa;
- volumetric weight $\gamma = 19$ KN/m^3.

The slopes of the cut slopes were adopted according to the stratification identified by the geotechnical investigations, so as to ensure their local and general stability. The slopes of the cut slopes were adopted as follows:

- slopes of 1:2 – 1:4 and banks of 5 m width at intervals of 6 m vertically;

- Slopes of 1:5 – 1:10 without intermediate benches on the areas where the stratification of the land indicates appropriate material for the execution of embankment fillings and the configuration of the land allows the execution of excavations with reduced slopes.

The characteristics of the stratification were adopted according to the recommendations of the Geotechnical Study for each horizon identified in the geotechnical drilling correlated with the geological load appropriate to the depth at which each horizon is located.

For the cut areas where the reduction of the slopes to ensure the general stability was not allowed, due to the local constraints of the site (inclinations of the natural land in cross section accentuated, limitations of the expropriation corridor, etc.), supporting structures made of columns were provided large diameter holes.

The benches at the level of the crowns of the embankment and embankment support walls were provided with a width of 3 m and concrete gutters for collecting and directing surface water along the supporting structures. The discharge of the gutters will be done through boxes made of precast elements provided at their minimum point from one of the ends of the retaining walls.

2.3.2.10.2 Works for embankment slopes protection

Protection of embankment slopes

The protection of the embankment slopes was adopted depending on the nature of the land out of which the embankment filling was made and the slope of the embankment slopes as follows:

For non-cohesive filling material and slopes falls of 1:1 or 2:3, the protection of the slopes will be carried out with grassy topsoil, spatial geosynthetics to ensure the stability of the topsoil on the slope and biodegradable geonets to maintain humidity after sprinkling the slopes with water in the vegetation development period (approx. 30 – 60 days) after sowing.

For non-cohesive filling material with slope slopes of 1:2 or 1:3, the protection of the slopes will be done with grassy topsoil and biodegradable geonets to maintain humidity after sprinkling the slopes with water during the vegetation development period (approx. 30 – 60 days) after sowing.

For cohesive filling material (clay dust, dusty clay, sandy clay) and slopes of the slopes 1:1 or 2:3, the protection of the slopes will be done with grassy vegetable soil and biodegradable geonets to maintain humidity after sprinkling the slopes with water in the vegetation development period (approx. 30 – 60 days) after sowing.

For cohesive filling material (clay dust, dusty clay, sandy clay) with slopes of 1:2 or 1:3, the protection of the slopes will be done with grassy topsoil.

2.3.2.10.3 Protection works for the cut slopes

Protection of the cut slopes

The protection of the cut slopes was adopted depending on the stratification and fall of the cut slopes as follows:

For non-cohesive stratification and slopes fall of 1:1 or 2:3, the protection of the slopes will be done with a 50 cm thick rough stone drainage mask.

For non-cohesive stratification and slopes of slopes 1:2, 1:3 or 1:4, the protection of the slopes will be done with a 30 cm thick rough stone drainage mask.

For cohesive type stratification (clay dust, dusty clays, sandy clays) and slopes falls of 1:1 or 2:3, the protection of the slopes will be done with grassy topsoil, spatial geosynthetics to ensure the stability of the topsoil on the slope and biodegradable geonets to maintain humidity following the sprinkling of the slopes with water during the vegetation development period (approx. 30 – 60 days) after sowing.

For cohesive stratification (clay dusts, dusty clays, sandy clays) and slopes of the slopes 1:2, 1:3 or 1:4, the protection of the slopes will be done with grassy vegetable soil and biodegradable geocells to maintain humidity after sprinkling the slopes with water during the vegetation development period (approx. 30 – 60 days) after sowing.

For cohesive stratification (clay dusts, dusty clays, sandy clays) or non-cohesive and slopes of slopes smoother than 1:4, the protection of the slopes will be done with grassy topsoil.

2.3.2.10.4 Drainage works

Drains in the open cut For the interception, collection and directed evacuation of the underground water, drains are provided in the open excavation to reduce the humidity of the natural land and improve its physical-mechanical characteristics.

The drains in the open excavation are provided in the following situations:

- longitudinally at the base of the cut slopes
- across the road on the surface of the cut slopes
- longitudinally on the upstream side in the case of mixed cross-sections (embankment / filling)
- transverse to the road in its vicinity when the slope of the natural terrain is accentuated and shows exfiltration of water.

The drains in the open excavation have a height between 1.0m ÷ 3.00 m and a width of 0.60m ÷ 1.20 m.

The drainage filling can be made of ballast grade 0÷63 mm or crushed stone grade 0÷71. Regardless of the type of draining material used, it will be protected with non-woven geotextile with an anti-pollution role, and on the upper part, the drain cover is made by the impermeable surface water drainage system (gutter, ditches, side ditch) or clay plug of 30 cm thick.

At the base of the drain for capturing and directing water to the watercourses or collection points, there is a perforated corrugated tube, SN8, with a diameter between 110 mm - 160 mm.

For the inspection and maintenance of the drains in the open excavation, inspection manholes are provided at intervals of approx. 50 m along the entire length of the drain and at the required points (intersections of drains).

Excavations for the execution of drains with a depth greater than 1.50 m will be carried out with supports from vertical wooden boards, horizontal rulers and sprits.

Horizontally drilled drains

Horizontally drilled drains are provided for the deep drainage of the cut slopes. The procedure consists in making horizontal boreholes that have a slope of 5-10% towards the outlet, over a length of 10.00-20.00m by means of special installations. These boreholes are lined with corrugated pipes / perforated plates with a diameter of 90 – 120 mm (no perforations are provided on the lower third of the pipes to ensure the evacuation of the collected water). The tubes are protected with geotextile with the role of a reverse filter on the entire surface of the tube.

Depending on the situation, the outlet end of the drain is arranged with a wall made of concrete and precast side ditch to direct the water to the collecting elements of the surface water at the base of the slope.

2.3.2.10.5 Surface improvement of the foundation soil

Compaction of the foundation soil with the compactor cylinder

By compaction, we mean filling by mechanical means, resulting in the reduction of the volume of soil voids. In non-cohesive soils, this compaction is achieved by reorienting the particles, process which is produced by overcoming the friction between them and to a lesser extent by local crushing at the contact points.

In cohesive soils, compaction occurs by breaking the bonds between the particles, followed by reorientation as well as bending and distortion of the particles and the bound water layers that surround them.

The void volume is reduced due to the pores not occupied by water. If the soil is saturated and works as a closed system, without the possibility of water removal, compaction is not possible. The state of saturation represents the theoretical limit for the compaction of a soil, regardless of its natural humidity.

Cushion made of cohesive material compacted and stabilized with hydraulic binders

This type of work aims to remove the very compressible layer or difficult soils (sensitive to wetting, with large swellings and contractions, cohesive soils with reduced bearing capacity (Ic<0.5) on a limited thickness of no more than 1-2 m of loose non-cohesive (ID < 0.33) and replacing them with a suitable earth cushion (3a-4b, according to STAS 2914-84) compacted or stabilized with hydraulic binders.

The percentage of hydraulic binder and the type of hydraulic binder is established on the basis of a sample sector depending on the humidity of the foundation soil and the nature of the cohesive material used in the execution of the pillow.

Mattress made of granular material reinforced and protected with geotextile

The mattress made of granular material reinforced with geosynthetics and protected with geotextile (if applicable) has a double role of preventing capillary ascent and ensuring the general stability of the embankment fillings.

The thickness of the mattress is between 50 cm - 1.20 m depending on the characteristics of the ground and the number of embankment elements.

The reinforcement is made with unidirectional geosynthetics having a long-term calculated resistance between 100 KN/m - 400 KN/m.

If below the level of the mattress made of granular material, the ground is very compressible and with increased humidity, before the execution of the reinforced mattress at the base of the excavation, a block of crushed stone is made, sort 90-200 mm, by embedding in the natural ground until reaching the refuse over which it rests in layer of max. 20 cm of ballast that is compacted with the compactor cylinder.

Verification of the improved foundation soil

After the improvement of the surface of the foundation soil, deformability checks are made with the Benkelman lever and load-bearing capacity checks with the Lucas plate and the dynamic plate according to the specifications of AND 530/2012.

2.3.2.10.6 The deep improvement of the foundation soil

It is applied in high embankment areas, bridge ramps and passages, areas adjacent to culverts.

The improvement in depth of the weak soils is achieved by the execution of draining piles made of stone or wick drains made of geosynthetic material.

Depth improvement with stone piles

The improvement of the depth of the foundation soil with 8-32 mm sorted stone piles is applied to the connection areas of the embankments with the works of art and has a double role: a role of eliminating excess water pressure from the pores of the compressible layer and speeding up the process of consolidating the foundation soil and the second role of improving the physical and mechanical parameters of the compressible layer through lateral compaction.

The length of the piles varies between 4.00 m - 12.00 m, the distance between the piles is between 1.50 m - 3.00 m, the diameter of the piles is 0.60 m

Piles are driven from the bottom to the top at intervals of 50 cm, the pushing force is min. 150 KN. The check of the pilings is carried out by dynamic penetrations on the piles and through them (if applicable).

The depth improvement solution with stone piles is recommended in areas where the ground is compressible and the general stability of the embankment is not ensured.

Depth improvement with wick drains

The depth improvement of the foundation soil with wick drains (vertical drains made of geosynthetic material) is applied to the connection areas of the embankments with the works of art and has the role of eliminating the excess water pressure from the pores of the compressible layer and speeding up the consolidation process of foundation soil.

The length of the wick drains varies between 4.00 m - 12.00 m, the distance between the drains is between 1.50 m - 3.00 m.

The improvement solution with wick drains is recommended in areas where the foundation ground is compressible and there are no risks of general instability of the embankment filling.

2.3.2.10.7 Supporting structures

Reinforced concrete supporting structures

Reinforced concrete supporting structures are used to ensure the local stability of embankments or embankment slopes. The height of these structures is between 1.00m - 6.00m.

The constructive system is:

- Reinforced concrete foundation and elevation;
- Drain trough and barbicans for draining water from behind the supporting structure;
- Draining geocomposite drain at the soffit of the supporting work;
- Waterproofing with bitumen emulsion of the concrete that comes into contact with the ground;
- The supporting structure is executed in 4.00 - 20.00 m sections, the joints between the sections being made of bituminous cardboard in a thickness of 5 - 10 mm.

The visible face of the supporting walls will be protected with anti-corrosion protection for concrete.

Reinforced earth supporting structures

Geogrid-reinforced earth supporting structures are provided at embankments to ensure their local stability, the maximum height of the structures is 12 m.

The constructive system is made of successive layers of compacted granular material, reinforced with unidirectional geogrids at a vertical distance of 40 cm - 80 cm.

The visible face of the reinforced earth retaining walls will be made of precast concrete elements of the panel or block type. The reinforcement elements interconnect with the precast elements of the visible face.

Supporting structures with indirect foundation

The supporting structures with indirect foundations on drilled piles of large diameter (600 mm – 1200 m) are provided to ensure the general stability of the embankment fillings, the height of the elevation is between 2 – 8 m. Depending on the height of the supporting walls, the characteristics of the land foundation and the inclination in the cross section of the natural terrain, the supporting structures with indirect foundations are provided on one row of piles or two rows of piles. The distance, diameter and length of the piles was established following calculations of local and general stability.

The constructive system is:

- Drilled piles, d = 600 – 1200 mm;
- Leveling and elevation of reinforced concrete;
- Drain trough and barbicans for draining water from behind the supporting structure;
- Draining geocomposite drain at the soffit of the supporting work;

- Waterproofing with bitumen emulsion of the concrete that comes into contact with the ground;
- The supporting structure is executed in 4.00 - 20.00 m sections, the joints between the sections being made of bituminous cardboard in a thickness of 5 - 10 mm.

The visible face of the supporting walls will be protected with anti-corrosion protection for concrete.

Supporting structures made of drilled piles (bars)

The supporting structures made of drilled piles of large diameter (600 mm - 1500 mm) or bars are provided in the cut to ensure the general stability of the slopes resulting from the excavations, the height of the elevation is between 2 - 8 m.

The supporting solution made of drilled piles leads to minimum excavation volume and reduced changes in the stress state in the excavated slope.

The piles drilled at the top will be anchored (if applicable) with bar anchors or anchors made of T15.7 strands.

The constructive system is made up of:

- The platform for drilling the piles at the elevation of the crown of the retaining wall;
- Drilled piles (bars);
- The solidarity beam of the piles at their upper part;
- Anchors at the top of the retaining wall (if applicable);
- Excavation in front of the supporting work and execution of intermediate anchorages on the depth of the excavation (if applicable);
- Exposed front execution retaining wall made of lining concrete, shotcrete or precast elements made of reinforced concrete.
- Monitoring the movements by topographic measurements at each stage of the earth excavation in front of the retaining wall.

The visible face of the supporting walls will be protected with anti-corrosion protection for concrete.

For the elimination of infiltration water, if necessary, horizontally drilled drains are provided between the drilled piles.

2.3.2.10.8 Monitoring the consolidation works

In order to monitor the behavior of the supporting works over time, they will be instrumented with devices that allow the subsequent measurement of deformations and / or efforts in accordance with SR EN 1997-2004 during the execution period as well as in the post-execution period.

2.3.2.11 Works of relocation and protection of utility networks, relocation of transport paths and demolitions

2.3.2.11.1 Relocation of utility networks

In order to carry out the project, it is also necessary to relocate some utility networks (water supply and sewerage, transport or gas supply, telephone installations and electrical networks). The placement (kilometer positions) of the utilities relocations that will be carried out on the motorway alignment are presented in the following tables.

Table no.2-16 Relocation/protection works of water and sewage networks intersected by the project

No.	Utility networks to be relocated/protected	Kilometer interval	The distance from the nearest protected natural area	Other information
1.	Public water supply - sewerage service – locality of Pătrăuți	11+700, 11+800	ROSCI0075 Pătrăuți Forest (2 km)	-
2.	Approval from the City Hall of the locality of Dărmănești	16+650, 17+800, 19+980	ROSCI0075 Pătrăuți Forest (10.2 km)	-
3.	ACET Suceava	54+300-55+600, 5+900-5+800	ROSPA0110 Accumulations Rogojești – Bucecea (1.2 km)	-

Table no.2-17 Relocation/diversion/protection works of gas/oil transport networks

No.	Utility networks to be relocated/protected	Kilometer interval	The distance from the nearest protected natural area	Other information
1.	Gas transport network	11+800 – 11+900	ROSCI0075 Pătrăuți Forest (7.8 km)	-
2.	Gas transport network	15+600 – 15+700	ROSCI0075 Pătrăuți Forest (10.4 km)	-
3.	Gas transport network	16+450 – 16+550	ROSCI0075 Pătrăuți Forest (11.2 km)	-
4.	Development of an intelligent natural gas distribution network in the commune of Dărmanesti	16+650-17+800	ROSCI0075 Pătrăuți Forest (10.2 km)	-
5.	Gas transport network	16+900 – 17+000	ROSCI0075 Pătrăuți Forest (11.4 km)	-
6.	Gas transport network	17+375 – 17+475	ROSCI0075 Pătrăuți Forest (11.5 km)	-
7.	Low pressure natural gas distribution pipeline PEHD Dn 63 mm in execution	49+900 – 50+000	ROSCI0379 Suceava River (2.1 km)	-
8.	Medium pressure natural gas distribution pipe PEHD Dn 110mm	55+500 – 55+600	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.7 km)	-

The following table shows the telephone networks that will be relocated or protected and the related kilometer positions.

Table no.2-18 Relocation works of telephone networks

No.	Utility networks to be relocated/protected	Kilometer interval	The distance from the nearest protected natural area	Other information
1.	RCS-RDS network	1+150, 29+400, 40+600, 42+400, 50+000, 51+100, 52+050	ROSPA0110 Accumulations Rogojeşti – Bucecea (5 km)	-
2.	Aerial and underground network	1+800 - 2+100	ROSCI0075 Pătrăuţi Forest (4 km)	-
3.	Air network	5+600 - 5+700	ROSCI0075 Patrăuti Forest (2.3 km)	-
4.	Underground network	8+800	ROSCI0075 Pătrăuţi Forest (2.4 km)	-
5.	Underground network	9+000 - 9+100	ROSCI0075 Pătrăuţi Forest (2.4 km)	-
6.	Underground network	9+800	ROSCI0075 Patrăuti Forest (2.3 km)	-
7.	Underground network	10+400 - 11+400	ROSCI0075 Pătrăuţi Forest (1.9 km)	-
8.	Aerial and underground network	25+500 - 25+700	ROSCI0075 Patrăuţi Forest (5.9 km)	-
9.	Aerial and underground network	26+400 (link road)	ROSCI0379 Suceava River (5.1 km)	-
10.	Underground network	39+300 - 40+000	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
11.	Aerial and underground network	40+300 - 40+700	ROSCI0075 Pătrăuţi Forest (4.1 km)	-
12.	Underground network	41+100	ROSPA0110 Accumulations Rogojesti – Bucecea (4.2 km)	-
13.	Underground network	43+300	ROSCI0379 Suceava River (5.2 km)	-
14.	Air network	49+800	ROSCI0379 Suceava River (3.2 km)	-
15.	Aerial and underground network	55+200 (link road), 55+700	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.4 km)	-
16.	DC FIBER HOME SRL			

The following table shows the relocation or protection works of the electrical networks and their related kilometer positions.

Table no.2-19 Electrical network relocation/deviation works

No.	Utility networks to be relocated/protected	Kilometer interval	The distance from the nearest protected natural area	Other information
1.	LEA 110 KV DOROHOI CONNECTIONS	0+500 approx	ROSCI0380 Suceava Liteni River (4.4 km)	-
2.	LES 20KV, LES 0.4, LEA 0.4 KV	1+900 - 2+200	ROSCI0075 Pătrăuţi Forest (4.1 km)	-
3.	LEA 20KV DERIVATION PT 2	7+000 - 7+900	ROSCI0075 Pătrăuţi Forest (2.4 km)	-
4.	LEA 20 KV LEA 20 KV AVICOLA LEA 20 KV ITCANI - DEEP DERIVE PTZ1	8+100 - 9+300	ROSCI0075 Pătrăuţi Forest (2.1 km)	-
5.	LEA 20 KV ITCANI	PARALLELISM - 9+800 - 11+300	ROSCI0075 Pătrăuţi Forest (1.9 km)	-
6.	LEA 20 ITCANI - DARMANESTI	11+600 - 11+700	ROSCI0075 Pătrăuţi Forest (1.9 km)	Pătrăuţeanca River
7.	LEA 20 KV ITCANI - DARMANESTI, LEA 20 KV	16+400 - 17+600	ROSCI0075 Pătrăuţi Forest (3.7 km)	-
8.	LEA 20 KV	26+200, 28+400,	ROSCI0075 Pătrăuţi Forest (5.5 km)	-
9.	LEA 20 KV	28+500 - 28+60029+400 - 29+80030+900 - 31+500	ROSCI0075 Patrăuti Forest (5.6 km)	-

No.	Utility networks to be relocated/protected	Kilometer interval	The distance from the nearest protected natural area	Other information
10.	LEA 20 KV	39+200 - 39+300	ROSCI0075 Pătrăuţi Forest (3.3 km)	-
11.	LEA 20 KV DERIV PT A1 RUDESTI LEA 20 KV SIRET - BALCAUTI	40+000 - 40+10039+500 - 40+600	ROSCI0075 Pătrăuţi Forest (3.9 km)	-
12.	LEA 110 KV RADAUTI - SIRET	43+300 - 43+400	ROSCI0379 Suceava River (5.2 km)	-
13.	LEA JT	50+300	ROSCI0379 Suceava River (3.6 km)	-
14.	LEA JT	51+900	ROSPA0110 Accumulations Rogojesti – Bucecea (3.2 km)	-
15.	LEA 20KV - SIRET - TATARCINA	51+700 - 52+100	ROSPA0110 Accumulations Rogojesti – Bucecea (3.2 km)	-
16.	LEA 20 KV	53+600 - 53+700	ROSPA0110 Accumulations Rogojesti – Bucecea (1.9 km)	-
17.	LEA 20 KV SIRET - MIHAILENI	55+100 - 55+200	ROSPA0110 Accumulations Rogojesti – Bucecea (0.8 km)	-
18.	LEA 0.4 KV	55+100 - 55+200	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.4 km)	-

The following table shows the sewer relocation works and their related kilometer positions.

Table no.2-20 Relocation of sewage networks

No.	Name	The distance from the nearest protected natural area		Other information
		[km]	name	
1.	Interchange Km 0+000 Bretea 1 Km 0+375	1.8	ROSCI0075 Pătrăuţi Forest	-
2.	Interchange Km 0+000 Ring-road 1 Km 1+050	2.1	ROSCI0075 Pătrăuţi Forest	-
3.	Express Road Km 1+650	4.5	ROSCI0075 Pătrăuţi Forest	-
4.	Express Road Km 3+200	3	ROSCI0075 Pătrăuţi Forest	-
5.	Express Road Km 4+000	3.2	ROSCI0075 Pătrăuţi Forest	-
6.	Express Road Km 4+331.82	3.3	ROSCI0075 Pătrăuţi Forest	-
7.	Express Road Km 4+972	3.2	ROSCI0075 Pătrăuţi Forest	-
8.	Express Road Km 5+214	3	ROSCI0075 Pătrăuţi Forest	-
9.	Express Road Km 5+700	2.5	ROSCI0075 Pătrăuţi Forest	-
10.	Express Road Km 5+900	2,3	ROSCI0075 Pătrăuţi Forest	-
11.	Express Road Km 6+020	2.2	ROSCI0075 Pătrăuţi Forest	-
12.	Express Road Km 6+080	2	ROSCI0075 Pătrăuţi Forest	-
13.	Express Road Km 7+183	2,3	ROSCI0075 Pătrăuţi Forest	-
14.	Express Road Km 8+150	2	ROSCI0075 Pătrăuţi Forest	-
15.	Express Road Km 8+950	2.4	ROSCI0075 Pătrăuţi Forest	-
16.	Express Road Km 9+014	2.4	ROSCI0075 Pătrăuţi Forest	-
17.	Express Road Km 9+750	2.4	ROSCI0075 Pătrăuţi Forest	-
18.	Express Road Km 9+980	2.2	ROSCI0075 Pătrăuţi Forest	-

The following table shows the relocation works of the ANIF canals, proposed in the areas with bridges.

Table no.2-21Relocations of ANIF channels, proposed in areas with bridges

No.	Kilometer position of ANIF canal intersection	Type of work	Interval provided for the completion of the work		Length (m)	The distance to the nearest protected area	
			starting km	ending km		[km]	name
1	10+190	recalibration, unclogging channel 100m downstream and 100m upstream	10+185	10+195	125	2	ROSCI0075 Pătrăuţi Forest
2	27+475	recalibration, unclogging channel 100m downstream and 100m upstream	27+495	27+505	160	5.8	ROSCI0075 Pătrăuţi Forest
3	29+180	recalibration, unclogging channel 100m downstream and 100m upstream	29+175	29+185	100	5,6	ROSCI0075 Pătrăuţi Forest
4	29+502	recalibration, unclogging channel 100m downstream and 100m upstream	29+555	29+565	185	5.5	ROSCI0075 Pătrăuţi Forest
5	31+325	recalibration, unclogging channel 100m downstream and 100m upstream	31+320	31+330	155	6.4	ROSCI0075 Pătrăuţi Forest
6	32+240	recalibration, unclogging channel 100m downstream and 100m upstream	32+235	32+245	140	5	ROSCI0075 Pătrăuţi Forest
7	37+737	recalibration, unclogging channel 100m downstream and 100m upstream	37+732	37+742	430	2.9	ROSCI0075 Pătrăuţi Forest

2.3.2.11.2 Relocation and restoration of road connections

The alignment of the Suceava-DN2H Motorway and DN2H - Siret Border Express Road intersects a series of exploitation roads, interrupting their continuity.

Depending on their importance, grade separated intersections without access to the motorway (of the type of passage over/under the motorway) or their deviation along the motorway and their grouping in order to create a common passage over the motorway were foreseen. In the case of roads of communal or county importance, passages were provided in the intersection area. These are shown in the following table.

Table no.2-22 County roads that require relocation

No.	Name	Km position	The distance from the nearest protected natural area		Other information
			[km]	name	
1.	DJ208D	5+790 - 5+830	1 km	ROSCI0075 Pătrăuţi Forest	-
2.	DJ209D	16+475-16+515	1 km	ROSCI0075 Pătrăuţi Forest	-
3.	DJ178B	31+500-31+540	1 km	ROSCI0075 Pătrăuţi Forest	-
4.	DJ209D (relocation at km 39+650) through a viaduct span	39+630-39+670	1 km	ROSCI0075 Pătrăuţi Forest	-
5.	DJ209D	41+230-41+270	2 km	ROSCI0075 Pătrăuţi Forest	-
6.	DJ291A	49+793-49+833	961 m	ROSPA0110 Accumulations Rogojesti - Bucecea	-

Table no.2-23 Communal and local exploitation roads that require relocation

No.	Name	Position km	The distance from the nearest protected natural area		Other information
			[km]	name	
1	Local road (Fetesti-Suceava) over the motorway	0+240 - 0+260	4.5	ROSCI0380 Suceava River - Liteni	-
2	DE local underpass	8+110-8+130	1.8	ROSCI0075 Pătrăuţi Forest	-
3	DE local (relocation at km 11+750) underpass	11+540 - 11+560	1.9	ROSCI0075 Pătrăuţi Forest	-
4	Local road (Patrauti-Mihoveni) bridge over the motorway	11+690 - 11+710	2	ROSCI0075 Pătrăuţi Forest	-
5	DE local (relocation at km 12+450) underpass	12+190 - 12+210	1.9	ROSCI0075 Pătrăuţi Forest	-
6	Local road (Patrauti-Mihoveni) passage over the motorway	13+367 - 13+387	2.1	ROSCI0075 Pătrăuţi Forest	-
7	OF relocation parallel to the motorway and crossing through the passage on the motorway at km 15+080	14+807 - 14+827	3.3	ROSCI0075 Pătrăuţi Forest	-
8	DL relocation parallel to the motorway and crossing through the passage on the motorway at km 15+080	15+390 - 15+410	3.4	ROSCI0075 Pătrăuţi Forest	-
9	OF relocation parallel to the motorway and crossing through the passage on the motorway at km 17+295	17+490 - 17+510	3.4	ROSCI0075 Pătrăuţi Forest	-
10	OF relocation parallel to the motorway and crossing through the passage on the motorway at km 18+170	17+685 - 17+705	3.2	ROSCI0075 Pătrăuţi Forest	-
11	Local road over the motorway	19+967 - 19+987	2.5	ROSCI0075 Pătrăuţi Forest	-
12	Local relocation road parallel to the motorway and crossing through the passage on the motorway at km 22+335	21+847 - 21+867	3.9	ROSCI0075 Pătrăuţi Forest	-
13	Local road (Danila- Danila Railway Station) - passage on the motorway	22+923 - 22+943	4.5	ROSCI0075 Pătrăuţi Forest	-
14	OF relocation parallel to the motorway and crossing through the passage on the motorway at km 23+700	23+365 - 23+385	4.7	ROSCI0075 Pătrăuţi Forest	-
15	Local road - overpass	24+435 - 24+455	5.5	ROSCI0075 Pătrăuţi Forest	-
16	OF relocation parallel to the motorway and crossing through the overpass at km 29+804	28+740 - 28+760	4.6	ROSCI0379 Suceava River	-
17	DC40C (Granicesti-Dumbrava) passage over the express road	29+794 - 29+814	4.8	ROSCI0379 Suceava River	-
18	OF relocation parallel to the express road and crossing through the passage on the express road at km 30+508	30+257 - 30+277	4.8	ROSCI0379 Suceava River	-
19	OF relocation parallel to the express road and crossing through the passage on the express road at km 32+700	33+085 - 33+105	3.8	ROSCI0379 Suceava River	-

No.	Name	Position km	The distance from the nearest protected natural area		Other information
			[km]	name	
20	OF relocation parallel to the express road and crossing through the passage on the express road at km 33+675	33+455 - 33+475	3.9	ROSCI0379 Suceava River	-
21	OF relocation parallel to the express road and crossing through the passage on the express road at km 33+675	33+905 - 33+925	3.9	ROSCI0379 Suceava River	-
22	DC35 (DN2-Calafindeşti) express road passage	35+203 - 35+223	3.9	ROSCI0379 Suceava River	-
2. 3	OF relocation parallel to the express road and crossing through the passage on the express road at km 35+213	35+685 - 35+705	3.8	ROSCI0075 Pătrăuţi Forest	-
24	DC35 (BalăuÞi-Gropeni) express road passage	40+614 - 40+634	4.1	ROSPA0110 Accumulations Rogojesti - Bucecea	-
25	OF relocation parallel to the express road and crossing through the passage on the express road at km 42+230	42+380 - 42+400	4.6	ROSPA0110 Accumulations Rogojesti - Bucecea	-
26	OF relocation parallel to the express road and crossing through the passage on the express road at km 43+880	44+010 - 44+030	4.5	ROSCI0379 Suceava River	-
27	OF relocation parallel to the express road and crossing through the viaduct opening at km 48+940	48+045 - 48+065	2.5	ROSCI0379 Suceava River	-
28	OF relocation parallel to the express road and crossing through the passage over the express road at km 49+945	49+465 - 49+485	2.9	ROSCI0379 Suceava River	-
29	Strada Dragos Voda (locality Bancesti) passage over the express road	50+443 - 50+463	3.8	ROSCI0379 Suceava River	-
30	DC52 (Siret- Văşcăuţi) passage over express road	51+996 - 52+016	3.2	ROSPA0110 Accumulations Rogojesti - Bucecea	-
31	OF relocation parallel to the express road and crossing through the passage over the express road at km 53+340	53+330 - 53+350	2	ROSPA0110 Accumulations Rogojesti - Bucecea	-
32	DC52 (Siret- Văşcăuţi) crossing by opening the bridge over Siret	53+665 - 53+685	1.2	ROSPA0110 Accumulations Rogojesti - Bucecea	-

2.3.2.11.3 Demolition

No demolition works are necessary for performance of the project.

2.3.2.11.4 Maintenance roads

The maintenance roads will be located on the entire motorway/express road inside the permanent safety fence. In the following figure, the characteristics of the maintenance roads are represented, namely the width is 3.5 m with road pavement made of ballast.

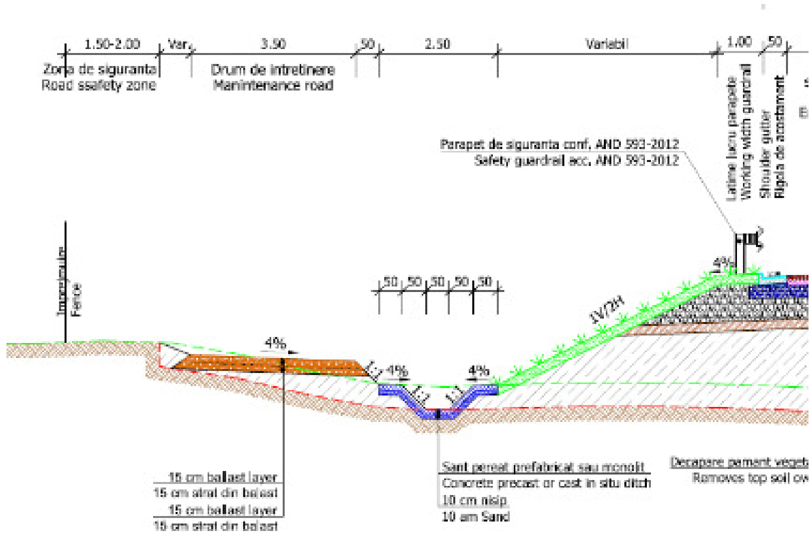


Figure no.2-4 Location of the maintenance roads

2.3.2.12 Works for traffic safety

2.3.2.12.1 Elements for traffic safety

The signaling and marking system was designed both on the motorway and on the lower-category roads that will intersect the motorway, as well as on the road network in the motorway corridor, where the road signs were designed for orientation towards the motorway.

The materialization of the system for organizing and developing traffic through signs and markings aimed to increase the degree of safety and fluency on the entire network of roads that enter the system and to allow all those who drive on these roads to orientate themselves in order to sign up in time for the direction desired, thus eliminating confusion, wrong maneuvers, additional trips and even traffic jams.

In order to direct traffic in each interchange, two complete portals were provided (one on each side of the interchange).

The consoles were designed for pre-signaling the road interchanges and service areas.

Considering the way how traffic is carried out on the motorway (travel speed, traffic intensity), it is necessary that the drivers are provided with a series of information related to road the conditions, events produced on the motorway, warnings, etc.

This will be done through variable messages, transmitted from the motorway coordination center and displayed on variable message boards.

The motorway being made up of two distinct one-way lanes, the installation of kilometer markers on the edge of the carriageway was foreseen.

Reflectors will be mounted on the safety slides of the parapet.

On the motorway alignment, as well as on the roads intended for international traffic, very large signs have been provided, very large format for the interchange link roads, large format for the national roads, current size signs have been provided for the other roads.

On the safety parapets retro-reflective elements will be installed (reflectors, reflective flyers or other reflective elements).

To protect the pedestrian traffic (including personnel for maintenance, in case of road accidents), the pedestrian parapet will be placed on both sides of the works of art, the edge of the sidewalk.

Very large format signs will be provided on the link roads of the road interchanges.

The consoles on the national roads will be protected with galvanized metal parapets. Portals and consoles will have a closed outline and will be protected by galvanizing.

Vertical signaliazation - signs

The vertical road markings on the Suceava-DN2H Motorway and the DN2H - Siret Border Express Road contain the following elements:

- warning signs;
- regulatory signs;
- guidance and information signs;
- prohibition signs;
- additional signs.

Horizontal signlization – markings

Depending on the location where they are placed and the role of the marking in guiding traffic, several types of marking will be provided:

- longitudinal markings;
- markings for delimitation of the carriageway;
- cross markings;
- various markings;
- side markings.

For traffic safety, the project will include safety barriers as well as pedestrian barriers.

The materialization of the system for organizing and conducting traffic through signs and markings aimed to increasing the degree of safety and fluency on the entire network of roads that enter the system and allows all those who drive on these roads to orientate themselves in order to sign up in time for the desired direction , thus eliminating confusion, wrong maneuvers, additional trips and even traffic jams.

The signaling and marking system was designed both on the motorway and on the lower category roads that will intersect the motorway, as well as the road network in the corridor where the road signaling was designed for orientation towards the motorway. This was done in accordance with AND 604-2012- Guide for the planning and design of road signalization and information to ensure its continuity, uniformity and cognizability.

Traffic signs are supported by metal poles, portals or consoles.

2.3.2.12.2 The motorway communication system and the intelligent traffic control system

System for monitoring the traffic, traffic conditions and the condition of the infrastructure.

System description

The system will be a tool for collecting data on the state of road infrastructure and road traffic in order to increase the efficiency of the administration and operation of CNAIR SA, for all the motorway sectors on the Trans-European Road Transport Network.

A separate volume for the ITS System will be presented as a report and drawings.

ITS system

As part of the construction program of new motorways/express roads and the rehabilitation of the existing ones, the National Company of the Road Infrastructure Administration implements Intelligent Transport Systems (ITS) as a major option for increasing efficiency, fluency, safety and for limiting the impact on the environment regarding the road transport process.

The intelligent transport systems are applications of communications and information technology that ensure both monitoring and management of the road network and informing traffic users.

Component subsystems

The monitoring system is composed of the following subsystems:

- Traffic monitoring subsystem - VEH - Vehicle detectors - using video technology;
- The subsystem for monitoring weather conditions - METEO - Weather stations and frost sensors at the level of the running surface;
- Video monitoring subsystem – CCTV - There will be two types of video cameras for monitoring:
    - CCTV PTZ cameras (with movement and zooming system - Pan Tilt and Zoom) - located at the entrances to the motorway segment, in the parking area, in road interchanges and in accident risk areas;
    - Fixed CCTV cameras, fixed zoom, usually placed every 2 km. On the motorway sector, fixed CCTV cameras will fulfill the function of AID cameras, except for fixed cameras in parking lots and security cameras.
- Subsystem for automatic recognition of registration numbers and monitoring/criminal penalties - ANPR;
- Automatic number plate recognition subsystem (ANPR - Automatic Number Plate Recognition);
- Concentration points – CONC.

The concentration points are the locations that will host the equipment needed for the different subsystems. Concentration points will be made approximately every 2 km. Supply of the concentration points, for all the ITS equipment, will be done both from the national electricity network and from solar panels. For those locations that will contain ITS equipment, small energy consumers (e.g.: AID, CCTV cameras, etc.) the supply will be made from systems with solar panels and buffer batteries and the backup will be made by connecting them to the national network of electricity.

Monitoring

The traffic monitoring subsystem allows remote data collection, their evaluation and transmission in am unified format to the command center.

The speed, category and number of vehicles is recorded by the tool in real time for each vehicle and by statistical methods. The road usage rate is calculated and displayed based on the measured data. The classification parameters will be able to be modified through the software. The monitoring system will allow static and dynamic weight measurement.

2.3.2.12.3 Motorway lighting system

Lighting is done fundamentally for all the works of art with lengths over 100 m and equipment. According to the design norm NP-062-02 and the applicable standards SR-EN 40-1-1994 and SR-EN 40-2-2006, interchanges, intersections, and structures with a length of more than 100 m, the parking lots of short duration, but also the Maintenance Centers. The lighting fixtures have also been fitted to an appropriate standard.

The Guide regarding lighting conditions on the national roads and motorways from 2012 was followed with the necessary subsequent additions and corroborated with the compliance with the EU Norms regarding lighting.

For the public lighting of intersections and proposed structures, the following were considered:

A. the lighting was made with intelligent systems that lend themselves to telemanagement, energy saving. The supply of the lighting system provided from the national/regional/local electricity grid will be made mandatory with LED technology and the presentation of the energy efficiency calculation regarding energy consumption.

B. the design of carriageway lighting was done in accordance with SR-EN 13201 and CIE 115-2010, special importance being given to the selection of lighting classes to avoid oversizing the lighting system, reducing electricity consumption and increasing the efficiency of the proposed lighting system ;

C. the criteria and parameters underlying the selection of lighting classes according to SR-EN 13201 are:

   - Criteria - user speed, types of users in the same area and types of excluded users;
   - Parameters - area (geometry), traffic use and external environmental influences;

D. the selection of lighting classes according to CIE 115-2010 is made according to the following parameters: speed, traffic flow, traffic component, separation of directions, intersection density, ambient luminance level and visual guidance;

E. the correct selection of lighting classes is in close correlation with the fulfillment of performance criteria such as: luminance of the road surface and physiological blindness;

F. the solution proposed by the specialized designer must have a maintenance factor as high as possible and with explicit specifications regarding the depreciation of the luminous flux over time;

G. it is mandatory to specify the corrective maintenance operations;

H. the solutions agreed by the beneficiary are with remote management, namely, intelligent and adaptive, respectively with day and night twilight sensors and traffic sensors with the possibility of managing the light intensity by the beneficiary, depending on the traffic or time interval and energy efficiency of the system lighting.

All the interchanges, intersections and structures with a length greater than 100m will be illuminated. It is mandatory to present the brief calculations for the lighting calculation and to determine the distance between the poles with the presentation of the inventory of coordinates (x, y) for each pole. The lighting of buildings (interior and exterior) is done with intelligent systems.

The lighting poles are protected by a parapet, and when they are placed on site, it will be taken into account that they do not block the visibility of road signs;

The electric public street lighting network designed in accordance with the beneficiary's requirements, in accordance with the legislation, with the norms and regulations in force, will be located in the following areas:

The lighting systems will be located in the following areas:

- In the areas of road interchanges provided in the project;
- In CIC areas, service spaces and short-term parking lots;
- In the areas of bridges, viaducts and passages.

2.3.2.13 Works for environmental protection

2.3.2.13.1 Sound-absorbing panels

To reduce the level of noise generated by the construction works and road traffic on the motorway, the project provides for the installation of sound-absorbing panels. These will be provided mainly in the locality areas, but also in sensitive areas for fauna. The height of the sound-absorbing panels is 3 meters. The locations where sound-absorbing panels are proposed as well as their lengths are presented in the following tables.

Table no.2-24 The locations of the sound-absorbing panels proposed for the protection of biodiversity

No.	starting km	ending km	The side on which it is installed	Length (m)	The distance from the nearest protected natural area
1.	0+975	1+600	Right	629	ROSCI0075 Pătrăuţi Forest (4.5 km)
2.	3+475	3+650	Left	175	ROSCI0075 Pătrăuţi Forest (3.2 km)
3.	3+475	3+650	Right	170	ROSCI0075 Pătrăuţi Forest (3.2 km)
4.	3+850	4+750	Left	896	ROSCI0075 Pătrăuţi Forest (3.4 km)
5.	3+850	3+950	Right	101	ROSCI0075 Pătrăuţi Forest (3.3 km)
6.	7+325	7+550	Left	231	ROSCI0075 Pătrăuţi Forest (2.4 km)
7.	7+050	8+025	Right	957	ROSCI0075 Pătrăuţi Forest (2.5 km)

No.	starting km	ending km	The side on which it is installed	Length (m)	The distance from the nearest protected natural area
8.	14+075	15+000	Right	912	ROSCI0075 Pătrăuţi Forest (2.6 km)
9.	38+625	39+075	Left	434	ROSCI0075 Pătrăuţi Forest (3.2 km)
10.	38+625	39+075	Right	445	ROSCI0075 Pătrăuţi Forest (3.2 km)
11.	39+575	40+075	Left	503	ROSCI0075 Pătrăuţi Forest (4 km)
12.	39+575	40+075	Right	512	ROSCI0075 Pătrăuţi Forest (4 km)
13.	43+550	44+075	Left	516	ROSCI0379 Suceava River (4.5 km)
14.	43+550	44+075	Right	521	ROSCI0379 Suceava River (4.5 km)
15.	48+725	49+125	Left	398	ROSCI0379 Suceava River (2.4 km)
16.	48+725	49+125	Right	393	ROSCI0379 Suceava River (2.4 km)
17.	53+100	54+950	Right	1854	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.8 km)
18.	53+025	54+950	Left	1953	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.8 km)
19.	54+950	55+475	Left	500	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.8 km)

Table no.2-25 The locations of the sound-absorbing panels proposed in the localities area

No.	starting km	ending km	The side on which it is installed	Length (m)	The city served	The distance from the nearest protected natural area
1.	0+675	1+400	Left	720	Municipality of Suceava (0.2 km)	ROSCI0075 Pătrăuţi Forest (4.5 km)
2.	3+950	4+575	Right	639	Mitocu Dragomirnei (1.5 km)	ROSCI0075 Pătrăuţi Forest (3.3 km)
3.	5+450	6+075	Right	639	Mitocu Dragomirnei (0.9 km)	ROSCI0075 Pătrăuţi Forest (2.2 km)
4.	5+425	7+325	Left	1875	Municipality of Suceava (intersected)	ROSCI0075 Pătrăuţi Forest (2 km)
5.	7+550	8+250	Left	718	Municipality of Suceava (0.1 km)	ROSCI0075 Pătrăuţi Forest (2.5 km)
6.	9+025	9+825	Left	805	Mun Suceava (0.3 km)	ROSCI0075 Patrăuti Forest (2.3 km)
7.	11+725	12+375	Right	659	Pătrăuți (0.5 km)	ROSCI0075 Pătrăuţi Forest (2.1 km)
8.	12+850	13+875	Right	1017	Pătrăuți (0.5 km)	ROSCI0075 Pătrăuţi Forest (2.1 km)
9.	15+000	17+175	Right	2163	Darmanesti (0.1 km)	ROSCI0075 Pătrăuţi Forest (3.1 km)
10.	17+800	18+700	Right	884	Darmanesti (0.3 km)	ROSCI0075 Pătrăuţi Forest (2.6 km)
11.	21+450	23+600	Right	2151	Măriţea Mică Danila (0.3 km)	ROSCI0075 Pătrăuţi Forest (3.7 km)
12.	20+850	21+200	Right (SS type S1)	391	Măriţea Mică (0.3 km)	ROSCI0075 Pătrăuţi Forest (3.2 km)
13.	24+175	24+975	Right	807	Iacobesti (0.2 km)	ROSCI0075 Pătrăuţi Forest (5.4 km)
14.	24+975	26+350	Left	1496	Slobozia Sucevei	ROSCI0379 Suceava River (5.1 km)

No.	starting km	ending km	The side on which it is installed	Length (m)	The city served	The distance from the nearest protected natural area
					(crossed)	
15.	26+425	27+900	Right	1460	Romanesti (0.3 km)	ROSCI0379 Suceava River (4.4 km)
16.	26+350	27+450	Left	1185	Slobozia Suceva (0.2 km)	ROSCI0379 Suceava River (4.5 km)
17.	30+800	31+350	Left	550	Granicesti (0.3 km)	ROSCI0379 Suceava River (4 km)
18.	40+625	40+975	Left	330	Pits (0.03 km)	ROSPA0110 Rogojeşti - Bucecea reservoirs (4.2 km)
19.	43+050	43+275	Right	295	Negostina (0.3 km)	ROSPA0110 Rogojeşti - Bucecea reservoirs (4.8 km)
20.	49+900	50+125	Right	220	Mănăstioara (0.04 km)	ROSPA0110 Rogojeşti - Bucecea reservoirs (4.4 km)
21.	49+900	50+125	Left	232	Bancesti (0.03 km)	ROSCI0379 Suceava River (3.2 km)
22.	54+975	55+425	Right	471	Siret (intersected)	ROSPA0110 Accumulations Rogojeşti – Bucecea (0.8 km)
23.	55+450	55+700	Right	264	Siret (intersected)	ROSPA0110 Accumulations Rogojeşti – Bucecea (1 km)

During the construction stage, mobile panels will be used that will be installed at the level of the work fronts, especially in areas with high sensitivity (natural protected areas, connectivity/permeability areas for fauna protected species, inhabited areas). The sound-absorbing panels will have heights of up to 3 m in all the areas where it is necessary to maintain low values of the equivalent noise level (inhabited areas and sensitive areas for biodiversity).

2.3.2.13.2 Anti-collision panels

In order to avoid the collision of fauna with the car traffic during the operating period, the project will provide anti-collision panels in sensitive locations from the biodiversity point of view. The main targeted locations are those at the intersection or adjacent to Special Bird Protection Areas or Sites of Community Importance.

The most important features of anti-collision mesh panels that need to be considered for this project are:

- height: 3 m, to ensure the optimum deviation of the flight of animals over the collision risk area;
- anchoring in a solid foundation with the application of a constructive solution to deter theft;
- made of a sufficiently thick net to ensure its visibility for the widest possible spectrum of flying species (mesh < 5 cm).

It is necessary that the proposed panels be made of materials and colors that ensure the highest degree of their landscape integration.

Figure no.2-5 Example of anti-collision panels

(attention, the panels in the example are not 3m high)

Their location is shown in the following table.

Table no.2-26 The locations of the proposed anti-collision panels

No.	starting km	ending km	The side on which it is installed	Length (m)	The distance from the nearest protected natural area
1.	1+400	1+550	Left	163	ROSCI0075 Pătrăuţi Forest (4.6 km)
2.	6+075	7+050	Right	985	ROSCI0075 Pătrăuţi Forest (2 km)
3.	11+100	11+700	Left	588	ROSCI0075 Pătrăuţi Forest (1.9 km)
4.	14+075	17+550	Left	3493	ROSCI0075 Pătrăuţi Forest (2.6 km)
5.	22+125	23+625	Left	1495	ROSCI0075 Pătrăuţi Forest (4.3 km)
6.	24+075	24+975	Left	909	ROSCI0075 Pătrăuţi Forest (5.5 km)
7.	25+000	25+900	Right	893	ROSCI0379 Suceava River (5.2 km)
8.	28+500	28+700	Left	199	ROSCI0379 Suceava River (4.4 km)
9.	28+500	28+700	Right	204	ROSCI0379 Suceava River (4.4 km)
10.	29+000	29+875	Right	881	ROSCI0379 Suceava River (4.5 km)
11.	29+000	29+875	Left	873	ROSCI0379 Suceava River (4.5 km)
12.	30+900	31+050	Right	152	ROSCI0379 Suceava River (4.6 km)
13.	32+450	32+700	Left	237	ROSCI0379 Suceava River (3.7 km)
14.	32+450	32+700	Right	240	ROSCI0379 Suceava River (3.7 km)
15.	33+425	33+625	Left	207	ROSCI0379 Suceava River (3.7 km)
16.	33+425	33+625	Right	205	ROSCI0379 Suceava River (3.7 km)
17.	34+950	35+300	Left	349	ROSCI0379 Suceava River (3.8 km)
18.	34+900	35+300	Right	409	ROSCI0379 Suceava River (3.8 km)
19.	35+875	36+175	Left	290	ROSCI0379 Suceava River (3.8 km)
20.	35+875	36+175	Right	297	ROSCI0379 Suceava River (3.8 km)
21.	42+000	42+225	Left	209	ROSPA0110 Rogojeşti - Bucecea accumulations (4.4 km)
22.	42+000	42+225	Right	211	ROSPA0110 Rogojeşti - Bucecea accumulations (4.4 km)

2.3.2.13.3 Landscaping works

The landscaping project will include the following operations:

- removal and storage of the topsoil layer;

- covering all the unexposed slopes of all the cuts and earthworks with earth and planting grasses and shrubs;
- restoration of the areas affected by the works (service roads, storage and stacking areas, etc.), by covering with earth and planting appropriate grasses and shrubs;
- planting shrubs. The type of shrubs used will be chosen so as to comply with the height of the earthwork of the adjacent road;
- in the upper part of all cuttings, suitable shrubs must be planted to prevent the penetration of snow;
- all the plant species used for landscaping will be characteristic to the area;
- the soil removed will be stored in order to be reused in covering the cuts and earthworks and for the rearrangement of the areas affected by works.

The basic fund of the landscape design is the vegetation and forest protection curtains. Covering the green spaces near the carriageway, the grassy surfaces, in addition to the role of soil stabilizer, also constitute the background on which the shrub vegetation is created.

In order to protect roads against snow, forest protection curtains have proven to be the most effective solution, they act as biological snow guards. The forest species used must meet the following criteria:

- from a stationary point of view - to grow as fast as possible, so that the curtain becomes functional in the shortest period of time;
- to be long-lived and ensure a good natural regeneration;
- not to harbor pests of agricultural crops from the surfaces they protect;
- to offer other adjacent advantages from an economic point of view.

For the same stationary conditions, under equal conditions of growth and development, long-lived species will be preferred, so that the effect of the curtain is ensured for as long as possible.

For lands with chemical soils and other categories, the following will be planted:

- Trees: brumarian oak, sky, silver linden, sedge, jugastre.
- Shrubs: elder, Tatar maple, hawthorn.

For the border rows, we recommend: wax cherry, red buckthorn, cherry, scurvy, lilac, etc.

2.3.2.13.4 Constructions for water pretreatment

In the case of the project, in order to protect the quality of the soil and water, the following constructions were designed for water treatment, the number of these constructions being determined according to the hydrographic basins of the area.

The project provides for the construction of the following constructions for water pretreatment:

- hydrocarbon settlement tank/separator chambers 256 pcs. - provided on the main alignment of the motorway sector and the express road sector;

- hydrocarbon settlement tank/separator chambers 41 pcs. - provided on the link roads of road interchanges;
- retention basins 16 pcs.

Details regarding the positioning of the structures for water pre-treatment are presented in the section 2.3.2.9.3.

2.3.2.13.5 Animal crossings

In order to ensure permeability for fauna species, undercrossing structures (undercrossings for fauna) and overcrossing will be included in the project. The provided structures are presented in the following table.

Table no.2-27 The proposed undercrossing and overcrossing structures within the project

No.	Structure type	starting km	ending km	Width (m)	Height (m)	The distance from the nearest protected natural area
1.	Overpass	3+450	3+550	100	-	3 km - ROSCI0075 Pătrăuţi Forest
2.	Underpass	11+145	11+155	2	2	1.7 km - ROSCI0075 Pătrăuţi Forest
3.	Underpass	50+930	51+070	17	5	3.8 km - ROSPA0110 Accumulations Rogojesti - Bucecea

2.3.2.13.6 Fencing

The motorway, respectively the express road, will be fenced off. In the forest areas, the fence height will be H = 2.6m, km 1+215 – km 3+955 area. H = 1.5m fencing is provided on the rest of the alignment. Fencing will play a role in preventing wildlife from entering the carriageway area.

2.3.3 Works necessary for site organization

Within the project Suceava-DN2H Motorway and DN2H - Siret Border Express Road, four locations were provided for placing the construction sites, one for the motorway sector and three for the express road sector, the total length of the alignment being approximately 56 km.

The locations of the site organizations will comply with all the conditions and restrictions that will be required by the environmental agreement.

For the execution period, the Contractor has the obligation to carry out all the environmental protection measures regarding the polluting or potentially polluting objectives (production bases, material warehouses, site organizations, earth quarries). The Contractor also has the obligation related to the ecological reconstruction of the occupied or affected lands.

Table no.2-21 Location of the proposed site organizations

No.	Kilometer interval provided for performance of the work	Side	The distance from the nearest protected natural area	The distance from the inner city of the nearest locality	The distance to the nearest water course
1.	9+700-10+250	right	1.9 km – ROSCI0075 Pătrăuţi Forest	0.8 km – Municipality of Suceava	1.3 km - Pătrăuţeanca

No.	Kilometer interval provided for performance of the work	Side	The distance from the nearest protected natural area	The distance from the inner city of the nearest locality	The distance to the nearest water course
2.	27+800-28+000	Left	6.1 km – ROSCI0075 Pătrăuţi Forest	0.55 km – Slobozia Suceva	0.7 km - Horaiţ
3.	43+050-43+300	right	5 km - ROSPA0110 Accumulations Rogojesti - Bucecea	0.4 km – Negostina	0.3 km - Negostina
4.	54+800-55+100	Left	0.8 km - ROSPA0110 Accumulations Rogojesti - Bucecea	0.01 km - Siret	0.4 km - Siret

The location of site organizations in relation to the inhabited areas, water bodies and protected natural areas is presented in the following figures.

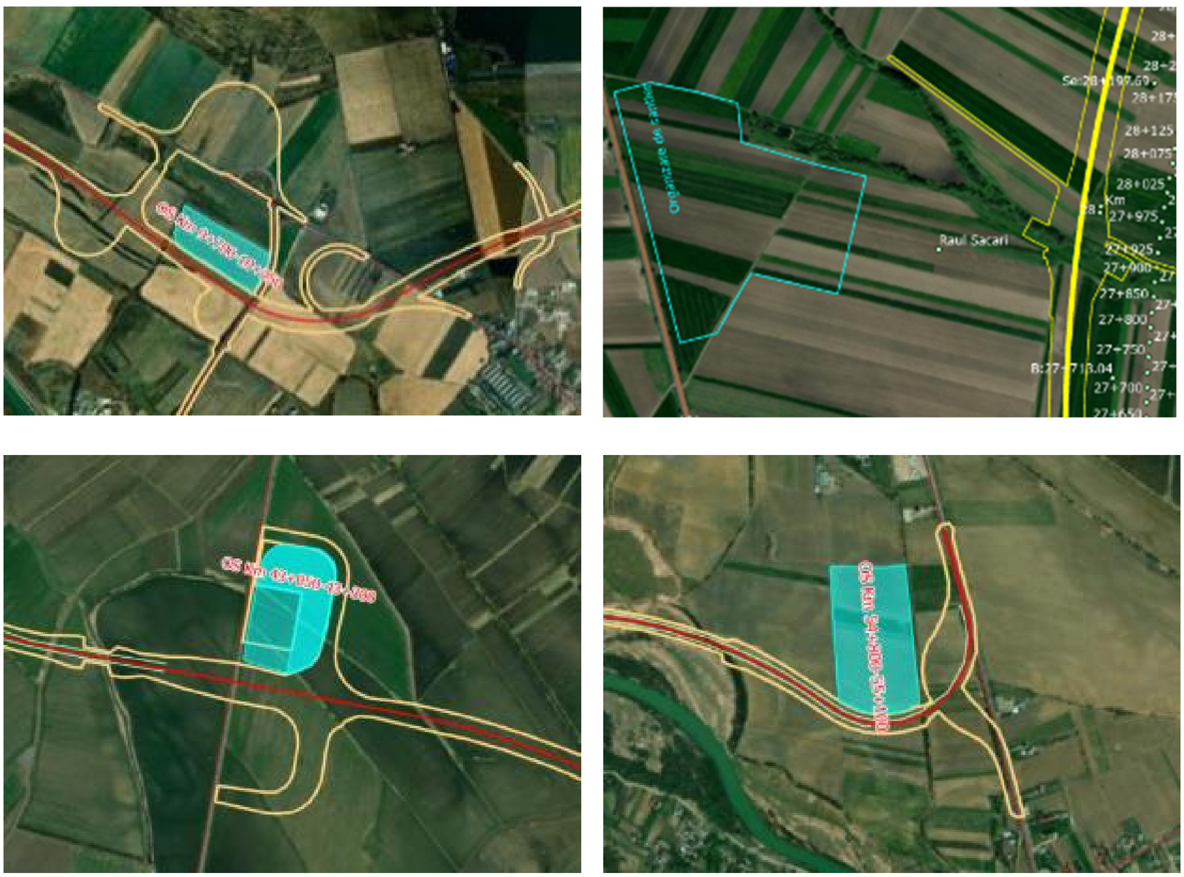


Figure no.2-6 Location of site organizations

The main location conditions that must be taken into account when choosing the locations of construction site organizations are:

- Site organizations will not be installed within the boundaries of protected natural areas, with the exclusive exception of office spaces that can be located in the countryside of the localities. The site organizations will be located at distances greater than 500 m from the limits of the protected natural areas;

- Site organizations will not be located near residential areas, with the exclusive exception of office spaces that can be located in the suburbs of localities. In the case of sites where asphalt and/or concrete preparation stations will be installed, the provisions of Order no. 119/2014, with subsequent amendments and additions, will be observed. Also, in the case of these sites, other areas included in the definition of "protected territories" will be considered, according to Order no. 119/2014, with the subsequent amendments and additions, respectively: parks, natural reserves, areas of balneoclimatic interest, rest and recreation, social-cultural, educational and medical institutions;
- The site organizations will not be located in the vicinity of surface water bodies, being necessary to be located at distances greater than 50 m from their banks;
- Site organizations will not be located in the vicinity of water supply sources intended for drinking water (surface or underground) and their protection areas;
- Site organizations will not be located in flood areas, wetlands or swamps, areas at risk of landslides;
- Forest areas will not be deforested for the organization of the construction site;
- Site organizations will not be located in the vicinity of archaeological sites and historical monuments. The minimum distance to these objectives will be established depending on the type of site/monument so that they are not affected by the activities carried out within the site organizations (traffic, vibrations, emissions of atmospheric pollutants);
- Site organizations will not be located in the safety areas of the transport networks and infrastructure, nor in the vicinity of SEVESO industrial objectives.

When choosing locations, the following will also be taken into account:

- access roads to the works site;
- CF ramps and lines;
- electrical network in the vicinity of the location;
- water supply sources;
- access roads to the borrow pits;
- low costs for transporting materials, without requiring long distances;
- maintaining the quality of materials during transport (concrete);
- possibility of placing fixed stations for the preparation of concrete and asphalt mixture;
- rational use of plants and/or installations;
- rational use of water resources;
- provision of hygienic-sanitary facilities for workers.

The conditions for choosing locations for construction site organizations are also valid in case of a possible future stage of decommissioning.

Several specific plants and equipment, necessary for the construction of the structures provided for in the project, will be stored, maintained and used within the site organizations. The main plants present in the site organizations will be: bulldozers, excavators, cranes, drilling rigs, graders and compactor cylinders. Dump trucks, concrete mixers and front loaders will be used for the transport of construction materials in the construction sites.

The facilities related to the construction site organizations consist of:

- Cabin gate;
- Infirmary;
- Laboratory;
- Offices;
- Canteen;
- Covered working platform
- Mechanical workshop;
- Washing ramp;
- Warehouse;
- Concrete station;
- Aggregates for concrete plant;
- Asphalt station;
- Aggregates for asphalt station;
- Hydrocarbon interceptor;
- Water management;
- Fuel station;
- Electricity supply generator;
- Scale;
- Car parking;
- Equipment parking;
- Material warehouses;
- PSI

The main measures provided for reducing the impact related to site organizations during the execution period are:

- site organizations and production bases will be provided with sewerage, treatment and drainage systems for domestic and rainwater. If necessary, a system with drainable basins can be adopted, the connection to the sewage networks in the neighborhood or the installation of pre-treatment/treatment and discharge into the watercourses;

- the plans to prevent and combat accidental pollution developed by each Contractor will include clear provisions regarding the risks, prevention measures and intervention measures related to site organizations in the event of accidental pollution of the soil, underground water and surface water;
- the technological waste water resulting from the processes of preparation of construction materials and the water resulting from the washing of construction means and equipment will be collected and pre-treated in settlement tanks and oil product separators before unloading;
- the material warehouses will be provided with perimeter ditches and jompers to retain the material carried away by precipitation;
- liquid fuel storage tanks will be placed in a protective box, which can support at least 110% of the total volume of the tank with an appropriate guard height. Fill/discharge pipes shall be located to ensure containment of the dischargeed substance in the tank and all the valves shall be lockable. Tanks will be checked and cleaned at regular intervals, including hatches and oil and fuel filters;
- the used oils will be collected in specially built tanks and will later be handed over to specialized units;
- all the mobile generators and other static equipment shall be of the type provided with integrated support or shall be placed in a welded steel tray of adequate volume;
- limitation of atmospheric pollutant emissions at concrete and asphalt preparation plants by equipping them with pollutant and dust retention systems (capture-treatment);
- avoiding the direct placement of construction materials and waste resulting from the works on the ground;
- the temporary on-site storage of waste resulting from the works, as well as household waste, until it is taken over by specialized companies for final disposal or recovery, will be carried out separately, in appropriate containers, in specially designed spaces;
- the storage of dangerous substances and the setting up of asphalt/concrete stations will be done on specially arranged platforms, in order to protect the soil and underground water from accidental leaks and infiltrations;
- site organizations will be properly equipped with specific absorbent materials for each type of material/substance that can cause pollution as a result of improper management;
- the protection and adequate signaling of construction site organizations and the prohibition of access to their premises for unauthorized persons;
- carrying out the restoration works of the surfaces affected by the location of the site organizations after their decommissioning, so that they can structurally and functionally be reintegrated into the previous category of land use. For any restoration and landscaping of the temporarily affected areas, after their decommissioning, only species from the local

phytocenotic composition will be used (appropriate to the affected habitats or located near the site organization areas). The use of any foreign (non-native) plant species will be prohibited.

2.3.4 Construction techniques and methods adopted

For the implementation of the project, a series of construction works will be necessary, which will include:

- Location of site organizations;
- Landscaping;
- Carrying out the earthworks;
- Carrying out the relocation or protection works of the intersected utilities;
- Construction of the works of art (bridges, culverts, passages);
- Construction of the hydrotechnical works;
- Construction of the rainwater drainage system;
- Construction of the consolidation works;
- Carrying out the necessary works for traffic protection;
- Construction of the works for environmental protection;
- Landscaping works.

For performance of the project, demolition works of some existing objectives located on the motorway alignment will not be necessary.

Earthworks

For the actual execution of the motorway, earthworks are initially required. The earthworks support the carriageway and ensure its connection to the natural terrain. Through the road pavement, they take over the stresses arising from the demands of the vehicles.

The following categories of works are distinguished during the execution of earthworks:

- Preparatory work;
- Basic works;
- Finishing work.

Preparatory work

These works are carried out before the basic works and aim to bring the natural terrain (on the width of the motorway and express road area) to the state of being able to be dug or to be able to receive the earth filling.

The preparatory works are the following:

- Obtaining the land;
- Drawing the work platform;
- Removal and storage of the topsoil;
- Landscaping;
- Protection and relocation of utilities;
- Arrangements for environmental protection and restoration;
- Ammunition removal (demining the project implementation area) - carried out along the entire alignment of the motorway, more specifically on its edge.

Basic works

After the preparatory works are finished, the basic works are carried out, i.e. the actual earthworks, which consist of:

- loading, transporting and leveling the earth in the embankment;
- soil compaction.

Fillings that are usually compacted will be made with the following types of equipment:

- compactor cylinders;
- tankers for the transport of water needed to correct the humidity of embankments put into operation;
- bulldozers, graders.

Finishing works

The group of finishing works includes the operations necessary to bring the platform, slopes and surface water drainage devices to a good working condition and a suitable aesthetic presentation.

Foundations and road pavements

The foundation is the part between the motorway bed and express road and pavement and has the role of receiving, distributing and transmitting to the earthworks or the natural terrain the loads of vehicles acting on the road pavement.

The road surface represents the part of the motorway placed above the foundation and which supports the traffic and can be made up of one or more layers. The set of layers of the covering and the foundation is called road pavement.

From a constructive point of view, the road pavement of the motorway is made up of:

- capping layer;
- foundation layer;
- base course;
- binding layer;

- wearing course.

The execution technology of the road system requires the use of numerous materials and raw materials for the technological processes of manufacturing concrete, asphalt mixtures, etc.

Regarding the road pavement, the road pavement adopted for the road will be the semi-rigid one.

Works on the superstructure of the express road

Laying the ballast layer in the foundation involves unloading it from dump trucks, mechanized leveling and compaction with the vibratory cylinder. The layer of natural aggregates stabilized with cement involves preparing the mixture in the concrete plant, bringing it to the site and then using the above technology.

The priming of the surfaces with cationic emulsion with quick breaking is done with a special tanker truck. The base course is made of asphalt mixture with hot bitumen and crushed aggregates. The mixture will be brought to the construction site with dump trucks equipped with tarpaulins, unloaded into distributors and then compacted with specific cylinders for asphalt. The hot run chipping binder bond layer will follow the above technology. The wearing course of the stabilized asphalt mixture will be executed using the same technology.

The transport of the mixture is done with isothermal dump trucks to maintain the temperature until it is laid. The pavement laying is done with the spreader-finisher, a complex plant consisting of: leveling plate, thickness adjustment device, vibrating beam, spreading auger, hopper, conveyor belt.

Works of art

The works of art fall into the following categories: bridges, passages, viaducts, boxed structures and culverts.

1. Bridges

The superstructure of the motorway bridges and express road consists of two culverts (one for each direction of traffic), made of precast pre-stressed concrete beams for spans up to 40.00 m, metal beams for spans between 50.00 - 90.00 m and monolithic beams with variable height pre-stressed concrete, cast on cantilever, for spans between 90.00 – 150.00 mm.

The adoption of the continuity system at the level of the over-concreting plate at the culverts of the motorway structures will lead to performance of a reduced number of watertight devices to cover the expansion joints, and therefore to lower post-execution maintenance costs.

The main advantages of this solution are:

- A reduced number of beams in the cross section;
- The use of precast elements allows a higher construction speed;
- Greater control over the element performance.

For an efficient response of the superstructure to seismic actions, monolithic reinforced concrete struts are provided at both ends of the deck, and anti-seismic devices are installed on the infrastructure benches.

The abutments of motorway/express road bridges are massive reinforced concrete abutments, with turned walls and retaining wall. They are founded indirectly, by means of drilled piles of large diameter. The drilled piles are made of monolithic reinforced concrete, with a different length depending on the loads from the superstructure and the lithological structure of the soil in which they are made.

Horizontally, the connection of the structure with the motorway earthwork is done by means of connection plates, to avoid different settlements between the road pavement on the road and the road pavement on the superstructure of the works of art. The vertical connections with the motorway/express road earthwork of the works of art are made, depending on the existing situation on site of each structure with quarter cones, retaining walls made of gabions, etc.

The piles of the structures have lamellar elevations, provided at the top with a reinforced concrete ruler. They are indirectly founded by means of drilled piles of large diameter, monolithically made of reinforced concrete. The drilled piles are solidarized at the top with monolithic reinforced concrete screeds.

At each end of the structures, water drains and access stairs will be constructed.

2. Overpasses

The overpasses have the width of the carriageway of about 7.80 m with sidewalks of about 2.35 m on each side of the superstructure. The minimum span of the overpasses crossing the motorway/express road is 28.00 m.

The deck of the overpass is composed, in cross-section, of precast beams, solidarized between them with monolithic reinforced concrete struts and in their upper part by means of a monolithic cast reinforced concrete surfacing plate. The static scheme of the structure is of the "continuous beam" type.

The abutments of the overpasses crossing the motorway/express road are of the drowned type, with two pillars, made of monolithic reinforced concrete, with turned walls. The piles will be founded indirectly by means of drilled piles of large diameter.

Horizontally, the connection of the structure with the motorway earthwork will be done by means of connection plates, to avoid different settlements between the soil filling behind the piles and the motorway earthwork.

3. Boxed structures and culverts

These structures are intended for the crossing of both watercourses and various other communication paths (national road, county roads, communal roads). They are located both on the motorway alignment and on other adjacent alignments (road interchanges). The location possibilities, along with the obliquity required by the situation on the ground and the clearance values that must be ensured, lead to a significant variety of lengths of these types of structures.

In cross-section, the structures are of frame type, monolithic, made of reinforced concrete, of minimum class C30/37. It is based on a layer of concrete with the role of protection against the action of the freezing-thaw phenomenon. All the concrete areas in contact with the ground will be protected by applying appropriate insulating solutions. Behind the walls, the draining filling, covered with geotextile, will be executed. The evacuation of infiltrated water will be done longitudinally of the structure (respectively transverse to the motorway), through PVC barbicans. The exterior of the slab will be protected with a waterproofing membrane, adequately protected with a special mortar.

The connections with the earthworks will be made through C30/37 reinforced concrete wings (founded similar to the frame structure) and reinforced concrete connection plates.

Water collection and evacuation works

The drainage of rainwater was achieved by designing ditches, gutters that are discharged into the watercourses, after appropriate pre-treatment. The collected rainwater, before being discharged into the watercourses, passes through settlement tanks and hydrocarbon interceptors in order not to negatively influence the quality of the existing waters in the watercourse.

The separators will be mounted on a layer of compacted aggregates. Another layer of sand will be placed over this layer.

The compaction of the fillings around the hydrocarbon interceptors will be done with light plants. The fill will be laid and compacted at the same level around the separators.

The installation of the hydrocarbon interceptors and the execution of the settlement tanks assumes the setting up of the work platform and the actual layout of the works.

Consolidation works

Several types of consolidation works were planned for performance of the project. Details regarding these works are presented in section 2.3.2.10.

Hydrotechnical works

The motorway project crosses a series of watercourses, located in the Siret hydrographic space. Their list is presented in section 2.3.2.9.

Parapets

The installation of the parapets provided for in the project will be done as follows:

- The pillars supporting the parapets on site (foundations) will be fixed according to the technical sheet resulting from the shock test;
- The overlap of the metal parapet slats will be done respecting the principle of the direction of attack of the traffic;
- On bridges with devices of covering the expansion joints, the safety parapet and the pedestrian parapet will be provided with elements to compensate for the length in the area of the joints and end elements;
- Red and white or yellow (approved) reflective devices and signaling elements at the end of the parapet will be mounted on the parapet.

Signs and markings

The execution technology for horizontal signaling works – longitudinal, transverse and various road markings consists of:

- cleaning the surfaces;
- pre-marking;
- the execution of longitudinal and transversal markings, through arrows and various inscriptions, executed with piles for directing traffic;

- surface cleaning;
- pre-marking;
- execution of markings.

The surface of the pavement, where the marking material is to be placed, will be clean and dry.

Pre-marking is performed before the actual marking operation. Pre-marking is performed with surveying devices for all markings. The pre-marking is done by drawing landmarks on the road surface.

During the execution of the works, the following aspects will be taken into account:

- ensuring free spaces on the motorway/road, to ensure the working speed of the marking plant, according to its parameters;
- execution of marking and installation of protective cones;
- protecting the applied marking, with a cone recovery vehicle;
- the method of covering the paint layer with microbeads is constantly monitored. If a non-uniform spreading of them is noticed, the works are stopped immediately and the appropriate measures are taken.

The side markings delimiting the traffic lanes from the emergency lane, as well as the one in the median zone, will be of the resonator type.

On the deceleration lanes of the road interchanges, to warn about the reduction of speed, transverse resonator markings will be used in sequences of 6 lanes, located at a distance of 1 m from each other.

On the interchange link roads, the side delimitation marking of the carriageway will be profiled executed to ensure the resonator effect.

The technology for asphalt mixture

Asphalt mixtures are prepared in installations equipped with devices for predosing, drying, springing and gravimetric dosing of natural aggregates, gravimetric or volumetric dosing of bitumen and filler, as well as a device for forced mixing of aggregates with the bituminous binder. The verification of operation of the asphalt mixture production installations is done periodically by specialized personnel according to a maintenance program specified by the equipment manufacturer and the metrological verification program of the measuring and control devices.

The stages of the technology for the asphalt mixture are as follows:

- Taking over the aggregates from the warehouse by means of self-loaders, loading them into the compartments of the predosing bunker of the station, from where, by means of the conveyors, they are directed into the drum for drying and heating;
- Introducing the hot aggregates into the mixer for preparing the mixture;
- Pneumatic transport of the filler from the warehouse to the working silo of the installation, then to the filler dispenser by means of an elevator. From the dispenser, the filler is put into the mixture mixer by means of a conveyor;

- The fluidized bitumen is transported by pumping from car tankers to the stock tanks, and from here by pumping to the day storage;
- The fluidization of the bitumen is carried out by means of the boiler that uses hot oil as a heating agent;
- Mixing the hot aggregates with filler and bitumen in the station mixer, thus resulting in the actual asphalt mixture. From the mixer the mixture is sent to the storage hopper for dispatching to the working points. To maintain the constant temperature of the asphalt mixture, until its delivery, the storage bunker is equipped with a heating installation, which uses hot oil as a heating agent;
- The transport of the mixture to the work points is done with a dump truck (covered with a tarpaulin) that goes under the storage hopper and takes the mixture by gravity.

Concrete production technology

The raw materials and materials used for the preparation of concrete are: sorted river aggregates, cement and water.

The technological flow of concrete preparation is as follows:

- Bringing the sorted aggregates from the ballast by means of vehicles, unloading and storing them on the sorters;
- Bringing cement in specialized wagons, unloading it in silos;
- Taking the aggregates from the warehouse by means of self-loaders, loading them into the compartments of the station's dosing hopper, from where, by means of conveyors, they are directed to the loading ship of the concrete station's mixer;
- The cement from the stock warehouse is loaded by gravity into an impeller, from where it is sent to the service silos by means of compressed air. From the silos, by means of conveyors, the dosing scale is fed. After dosing, the cement is discharged by gravity into the mixer of the concrete station;
- Mixing aggregates with cement and water in the station's mixer. After mixing, the concrete is unloaded by gravity into concrete trucks and taken to the work sites.

Transport activities

For achieving the project, a large and different volume of materials, semi-finished and precast, is used so that it is necessary to use a various range of means of transport:

- dump trucks of various capacities (generally over 16 tons), dumpers, tankers, autoisotherms;
- concrete mixers and concrete pumps;
- trailers.

2.3.5 Site restoration works

2.3.5.1 Site restoration works upon completion of the investment

Upon completion of the construction works, the Contractor will ensure the restoration of the natural framework of the temporarily occupied areas and those included in the construction limit, but which are not occupied by the interventions related to the motorway, including in the areas related to the relocation of utilities (e.g. the rehabilitation of the land surface in the case of underground networks). The areas affected by the construction works will be brought to a state that represents as faithfully as possible the natural state of the affected areas and ensure the landscape integration of the elements subject to the restoration works. These works will be carried out by sanitizing the area (total removal of the waste resulting from the specific activities of the work fronts, including household waste), filling with topsoil and ensuring its stability, planting species from the vegetation specific to the area. The restoration works have both the aim of ensuring the landscape restoration of the affected areas, as well as that of reducing the risk of penetration and installation of invasive non-native plant species on the affected surfaces, which would endanger the natural areas in the vicinity of the proposed project, leading to the increase of surfaces of altered habitats. Restoration works may have different degrees of complementarity with other measures to reduce the impact on the environment, such as mitigating the impact on the air quality or measures to restore the ecological connectivity of the affected areas. Site restoration works can be classified into the following main categories:

- Works for the restoration of the areas occupied by the site organizations - following their decommissioning, the evacuation of materials and equipment, the site will be arranged according to the category of use prior to its occupation;
- Works to restore the borrow pits and the adjacent areas affected by the execution works - the works involve the sloping and reprofiling of the slope to reduce the risk of erosion, leveling and grassing or planting trees and shrubs, using plant species specific to the vegetation in the area;
- Works for the restoration of the areas included in the construction limit, but which are not occupied by the interventions related to the motorway (e.g. embankment slopes), including in the areas related to the relocation of utilities;
- Works for the development of the CIC, parking lots, road interchanges - these will be landscaped, by planting trees, shrubs and grassy species.

For any restoration work and landscaping of the areas affected by the project, only the species from the local phytocenotic composition (appropriate to the affected areas or located near the affected areas) will be used. The use of any foreign (non-native) plant species will be prohibited.

2.3.5.2 Site restoration works carried out during the closure/demolition stage of the project

In accordance with HG Annex no. 2139/2004, amended by HG no. 1496/2008 (Catalogue regarding the classification and normal durations of operation of fixed means, chapter III, point 4, "Maintenance in operation of fixed means that can affect the protection of life, health and the environment - road, rail, air and naval, construction and communal household plants, lifting plants, etc.), after the expiration of the normal operating period, the maintenance of the express road in operation will be possible only "on the basis of a technical report prepared by certification bodies or inspection bodies technically qualified in the field of activity of the fixed asset".

The specific closing activities of the proposed project will include the following stages:

- Demolition/dismantling and sorting works in order to reuse the superstructure and infrastructure elements (asphalt and the components of the eathworks, bridges, culverts and rainwater management elements);
- Land clearing (which involves the collection, sorting, classification and management of unusable materials classified as waste);
- Environmental restoration works by rehabilitating the lands occupied by the project (return to agricultural/natural circuit) - if no alternative solutions for use are found.

The waste estimated to be produced by decommissioning the project is mainly: concrete, soil and stones, iron and steel, asphalt and household waste. Depending on the life of the project, there are chances that some of it will belong to the category of contaminated waste.

In the event that the need to decommission the express road is determined, it will be necessary to obtain an Environmental Agreement. The Environmental Impact Report (RIM) or other studies that will be required by the legislation in force at the time of decommissioning of the project will establish the impact on the environment generated by the decommissioning activities, the measures necessary to avoid the impact and those intended to restore the ecological integrity of the project area .

2.3.6 Information about raw materials, substances or chemical preparations

2.3.6.1 Raw materials and natural resources

The raw materials required for performance of the project and the estimated quantities required are presented in the following table.

Table no.2-28 The raw materials and construction materials necessary for the realization of the project and the estimated quantities

No.	Raw materials and construction materials	UM	Estimated quantity
1.	Asphalt mixtures	tons	409749.7
2.	Natural aggregates stabilized with cement	mc	46316.6
3.	Ballast	mc	74.4878
4.	Asphalt concrete	MP	201189.2
5.	Capping layer of stabilized soil	mc	36276.6
6.	Topsoil	mc	48045.15
7.	Concrete	mc	35839.25
8.	Cement	tons	20904.7
9.	Water	mc	24491.8
10.	Reinforcement	tons	10054.1

No.	Raw materials and construction materials	UM	Estimated quantity
11.	Diesel fuel	tons	2764877.85
12.	Lubricant	tons	36572.5
13.	Steel parapets	tons	5205.648

The concrete and asphalt mixtures will be prepared in the asphalt and concrete stations located in the construction sites.

The project will require fuel (diesel) for transportation and the operation of the equipment necessary to fulfill the objectives proposed in the execution phase. Fuel supply will be provided from outside the construction site, their transport being carried out by means of car tanks to the fueling points within the construction site organization.

Electricity will be provided in the site organizations, through connection to the existing network and through generating sets. The provision of electricity in the work fronts will be done by means of generating sets.

During the period of operation, within the CIC, the service areas and the short-term parking lots will need to be supplied with water and electricity. The CIC site will store various materials used in current maintenance work, such as anti-slip materials, paints and thinners.

When repair work is required, the operations and raw materials used will be similar to those in the operation stage, but the extent of the work and the quantities used will be smaller.

2.3.6.2 Borrow pits

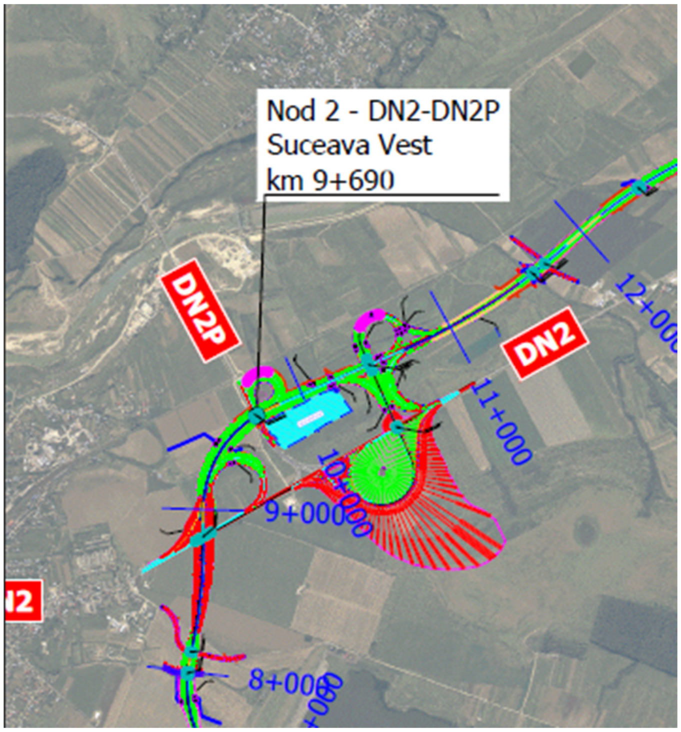
At this stage, the amount of material required for the execution of earthworks in the embankment/filling was identified, the volumes required for the filling works to be taken mainly from the cutting areas within the project where a large amount of material in excess will result (approx. 14 .8 million m^3) or from authorized sources, if applicable.

For the execution of works, division into 3 sections was proposed as follows:

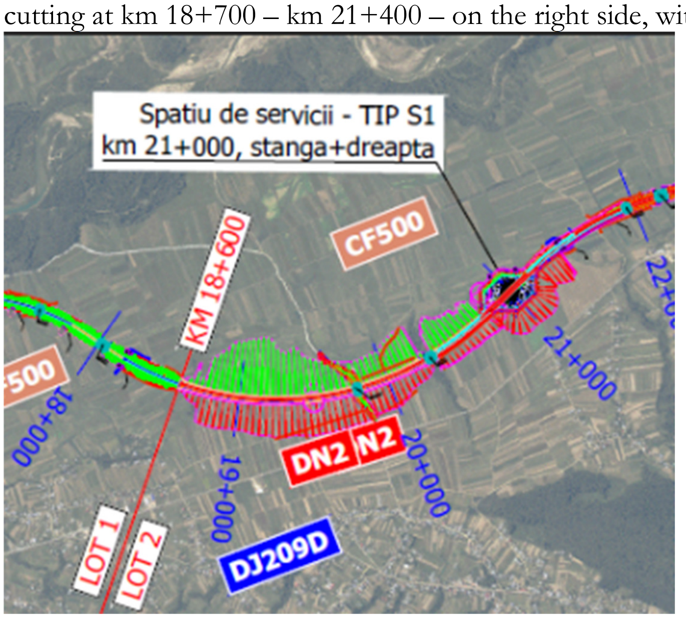
- Lot 1 km 0+000 – km 18+600,
- Lot 2 km 18+600 – km 43+050,
- Lot 3 km 43+050 – km 55+700.

The necessary volumes for fillings will be provided from the cutting areas as follows:

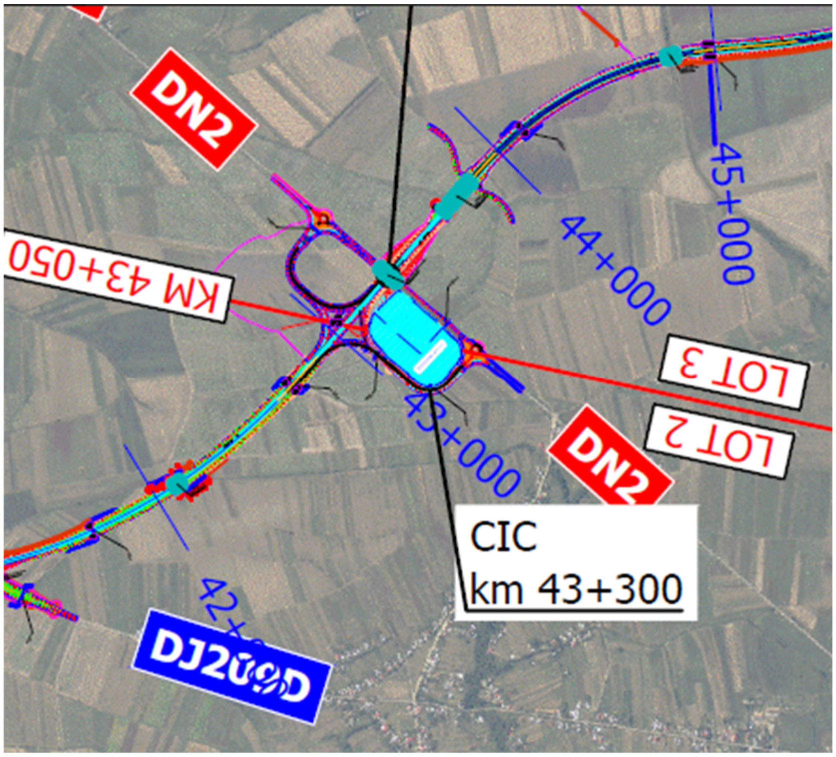
- cutting at nterchange 2P Link road 10 – on the right side, with red



- cutting at km 18+700 – km 21+400 – on the right side, with red



- cutting at interchange Siret Sud Link Road 3-4 – is the outline in magenta where the Km position 43+050 is mentioned



<u>Thus, the project does not provide creation of borrow pits.</u>

Borrow pits are not required, the need for earthworks being offset by the volume of excavations.

<u>Thus, the project does not provide for the construction of additional borrow pits.</u>Borrow pits are not required, the need for earthworks being offset by the volume of excavations.

2.3.6.3 Chemical substances and preparations

The execution of works for the construction of the Suceava - DN2H Motorway and DN2H - Siret Border Express Road will require the use of materials that, by their composition or by their potential effects on the health of employees, fall into the category of dangerous chemical substances and preparations. These substances and materials are represented by:

- Fuels (diesel, gasoline) used for the operation of equipment and means of transport;
- Lubricants (oil, petroleum jelly);
- Paints, adhesives, resins, solvents, etc.;
- Solvents used for diluting paints;
- Additives for asphalt mixtures and bitumen used in asphalting works.

The main substances used, together with the nature of the risk generated by the use of these substances, are presented in the following table.

Table no. 6-4 The main dangerous chemical substances and preparations used

No.	Name of the chemical substance/preparation	Classification and labeling of chemical substances or preparations	
		Hazardous/Non-Hazardous Category (P/N)	Degree of danger
1.	diesel fuel	p	High degree of flammability
2.	Lubricants (engine oils)	p	Irritant, hardly flammable
3.	Paints	p	Flammable, irritant
4.	Cleaners	p	Highly flammable
5.	Bitumen	p	Flammable, toxic
6.	Asphalt mixture additives	p	Flammable, toxic
7.	Cement	N	-

The management of these substances will be done in compliance with the legislation in force and the instructions on the packaging of these products, as well as from the safety data sheets that accompany the products.

2.4 THE MAIN CHARACTERISTICS OF THE OPERATION STAGE

2.4.1 Operating time

The execution period of the works is estimated at 30 months. The period of operation is unlimited, provided maintenance and repair work is carried out according to the regulations in force.

The motorway administrator can approve, with the consent of the traffic police, the closure or establishment of traffic restrictions, on specific road sectors and for a limited time, in order to carry out works authorized according to the legal provisions in the motorway area or to protect the roads and traffic users.

Closure of traffic, regardless of duration, or the establishment of traffic restrictions for motorways and express roads, is done only by CNAIR and with the consent of the Traffic Police Directorate.

During blizzards, heavy snow or other meteorological phenomena that may cause traffic problems, the following measures will be taken:

- The road administrator will install the appropriate road signaling means to restrict traffic and will inform the traffic users about the measures taken;
- Users will be informed about the possibility of access on the restricted road sector.

2.4.2 The expected level of traffic

As part of the Feasibility Study development activities for the project Suceava – DN2H Motorway and DN2H – Siret Border Express Road, a Traffic Study was developed. It aimed to estimate the effect of the implementation of new infrastructure (motorways, express roads, national roads, bypasses, bridges, etc.), transport policy measures and any interventions that change the structure and traffic capacity of the road network. The traffic study was carried out at a certain level of detail, to allow the design of the planned intersections, which will ensure connection with the existing road network, and the estimate of the effect on mobility demand and related traffic flows, differentiated by vehicle types and their combinations, for a period of 30 years from the implementation of the project. The traffic study was used to substantiate the following aspects:

- the preliminary evaluation of the attractiveness of the studied alignment variants, from the point of view of the traffic attracted;
- establishing the cross section of new or existing road sectors, based on the evaluation of traffic demand (design of traffic capacity) - similar to the recommendation of the type of infrastructure;
- establishing the calculation traffic for design of the bearing capacity of the roads; providing input data for the Cost-Benefit Analysis.

The following table shows the estimated traffic attracted by the Suceava-Siret Motorway:

Table no.2-29 The estimated traffic attracted by the motorway for the forecast year 2050 (MZA, vehicles per 24 hours) –

Section	Cars	LGV	HGV	BUSES	Total vehicles
Airport – DN29A	9913	1525	2080	416	13882
Interchange DN29A	6848	1027	1805	299	9979
DN29A – DN/DN2P	8530	1258	2170	370	12328
DN2/DN2P interchange	11516	1525	2491	480	16012
DN2/DN2P interchange	11373	1506	2473	475	15827
DN2/DN2P interchange	11126	1476	2379	463	15444
DN2/DN2P interchange	9656	1243	1913	396	13208
DN2/DN2P interchange	8592	1066	1628	349	11635
DN2/DN2P interchange	12769	1455	1912	499	16635
DN2/DN2P – DN2H	13921	1579	2089	544	18133
Interchange DN2H	6669	937	1671	355	11832
Interchange DN2H	3621	259	1023	152	5055
Interchange DN2H	3794	382	1023	161	5360
DN2H – DN2 Siret S	4155	534	1027	177	5893
Siret Sud interchange	718	71	94	27	910
DN2 Siret S – DN2 Siret N	890	93	94	33	1110
DN2 Siret S – DN2 Siret N	890	93	94	33	1110

LGV – Light Goods Vehicles; HGV – Heavy Goods Vehicles; VET - standard vehicles passenger cars

2.4.3 Maintenance work

The works and services regarding the maintenance of the road infrastructure network consist of all the intervention activities that are carried out throughout the year, determined by wear or degradation under normal operating conditions, which aim to ensure the technical conditions necessary for safe road traffic, in compliance with the rules in force, as well as to maintain a permanent state of cleanliness and appearance.

Maintenance work can be:

- current maintenance works, which are carried out permanently to maintain cleanliness, aesthetics, ensure the drainage of water or to eliminate small-scale damage to the road, works of art, road safety and related buildings;
- periodic maintenance works, which are carried out periodically and planned for the purpose of partial or total compensation of the wear and tear produced on the road pavement, works of art, road safety and related buildings.

As a strategy for the execution of maintenance works, they can be:

- curative type strategy - specific works are carried out depending on the degradations that occur;
- preventive type strategy, whose main objectives are the preservation and adaptation of the road system or the element of the work of art (bridge, culvert, overpass, etc.) or road safety for the level of aggression to which it is subjected.

Accidental works due to natural calamities are carried out in the first emergency to restore traffic

Depending on the technical condition investigated in the field, the type of maintenance and repair work to be adopted is recommended, and the AND Normative 596-2010 includes the performance level for motorways and the types of interventions to maintain acceptable indices of technical condition.

Thus, the technical condition class of the road pavement on motorways is determined according to the load-bearing capacity, the state of degradation, flatness and roughness, and the maintenance works are determined according to the technical condition class. The measurement period of the technical condition evaluation characteristics of the motorways is established according to the measurement conditions according to the technical instructions in force.

Defects in the carriageway that could cause accidents to the road users must be repaired within a maximum of 24 hours or warning signs must be installed immediately after they are detected.

Degradations produced on the surface of the carriageway due to frost will be repaired to the required level in maximum 1 week.

The Norm AND 596-2010 establishes the periodicity of carrying out the main maintenance and current repair works on motorways. The periodicity of performing maintenance and current repair work on motorways is defined as the time interval at which the respective work is repeated for the same road sector, within the cycle of capital repairs or during a calendar year.

The main elements that determine the periodicity of the works are:

- the size of the traffic intensity and its structure in relation to which the wear or degradation of the works occurs;
- the type of work on which maintenance work or current repairs are carried out;
- the quality of the materials used;
- the effects of winter, the stability of some sectors in the road area, the effects of heavy transport, the optimum periods for the execution of some works;
- the frequency of occurrence of degradation due to traffic and natural factors, etc.

The range of maintenance works depends on the standards related to the treatments or activities to be carried out and the length of time it is desired to maintain the road to the desired standards. These activities are divided into the following categories:

- daily maintenance;
- major maintenance;
- emergencies;
- other maintenance activities regarding project-specific utilities.

Daily maintenance includes short-term activities or periodic activities that are necessary to maintain the road in good conditions and safe in operation. This can involve both current and periodic maintenance activities.

Major maintenance, also known as structural maintenance, refers to road maintenance and rehabilitation of the road pavement. It usually involves major rehabilitation of road equipment after initial identification of defects during daily inspections and investigations. Following specific surveys and feasibility studies that are usually prepared, details of the works to be carried out result.

Occasionally, incidents due to the road accidents or adverse weather conditions affect road conditions. In the event of a traffic incident requiring emergency action, it is essential to maintain staff to respond as quickly as possible. The aim is to reduce any danger or deformations (distortions) or traffic delays.

Other maintenance activities regarding specific project facilities include daily, periodic maintenance and rehabilitation works that will be carried out in the case of works regarding the environment, maintenance and road facilities.

Placing the maintenance spaces and maintenance strategy

The distribution of the maintenance spaces along the motorway is done respecting the recommended distance between two maintenance spaces.

This distribution is also made in accordance with the development of the road network in the area and the location of road interchanges, as well as with the provisions of AND Norms no. 554-2002 and AND no. 525-2013 regarding maintenance and repair works and winter works, after putting the motorway into operation.

The main functions of the maintenance and coordination center will be as follows:

- supervision of the motorway, traffic, evolution of the meteorological factors and traffic;
- first aid in case of accident;
- maintenance of the motorway on the relevant section, of the works of art, parking and service spaces, road markings, lighting, telecommunications and signaling installations;
- repairs and restorations after accidents or natural calamities;
- maintenance, repair of equipment, as well as their parking spaces;
- repair and replacement of accessories following accidents;
- all the motorway cleaning operations, including periodic cleaning of ditches, drains and building structures, rest and service areas;

- all operations for cleaning and maintenance of markings, safety devices (fences, parapets), lighting system, telecommunications system;
- local repair of damage from clothing, care of plantations;
- winter activity for removing snow and ice, installing, maintaining and storing snow guards.

After the execution of the motorway/express road, the Operation and Maintenance Manual of the motorway will be developed, which will be based on the following components:

- monitoring and evaluating the operation of the motorway, in order to identify the problems that occur or may occur;
- formulating the problems identified through the monitoring and evaluation process;
- the design of the appropriate remedies as well as the possibility of carrying out these remedies;
- implementation of maintenance and improvement works resulting from daily incidents identified through the operating process;
- substantiation of financial needs;
- tracking/ measuring/ evaluating the effectiveness of previously implemented maintenance and improvement works.

The manuals will be constantly updated with legislative changes and advances in maintenance and operation technologies.

2.4.4 Information about raw materials, natural resources, chemical substances or preparations during the period of operation

During the period of operation, within the CIC, the service areas and the short-term parking lots will need to be supplied with water and electricity. The CIC site will store various materials used in current maintenance work, such as anti-slip materials, paints and thinners.

In the operation stage when repair works will be necessary, the operations and raw materials used will be similar to those in the construction stage, but the extent of the work and the quantities used will be smaller. A series of materials and natural resources will be used both for the maintenance works and for the operation of short-term parking lots, service areas and CIC. The following table shows the estimated quantities of raw materials and natural resources used in this stage.

Table no.2-30 The raw materials needed in the operation stage

No.	Raw materials	UM	Estimated quantity	Observations
1.	Wear layer	m^3	185916.0	Required once every 5 years, after year 7
2.	Chipping binder	tons	413715.2	Required once every 10 years, after year 7
3.	Asphalt mixtures	tons	419158.8	Required once every 15 years, after year 7
4.	Non-slip material	tons /	3275	-

No.	Raw materials	UM	Estimated quantity	Observations
		year		
5.	Paint markings	tons / year	431.7	-
6.	Water	m^3/year	5675	-
7.	Electricity for the motorway facilities and for lighting, including the charging stations for electric cars	kWh/year	2631796	-

2.4.5 Evacuation of waste water during operation

2.4.5.1 Works of rainwater collection and evacuation from the motorway platform

Ditches and gutters. Precast cement concrete elements will be used for the collection and drainage of rainwater. In situations where rainwater discharges into a natural outlet (watercourse, valley, canal) they will be treated in hydrocarbon interceptors. In situations where it is not possible to discharge into a natural watercourse, rainwater will be discharged into retention basins after a prior treatment.

Culverts are provided in situations where rainwater from the platform can be evacuated through such works.

2.4.5.2 Collection of water from CIC and service spaces

Rainwater collected on CIC sites, short-term parking lots and service areas will be pre-treated by means of settlement tanks and hydrocarbon interceptors. The rainwater collected from the road platform will be directed through the designed collection system into settlement tanks and hydrocarbon interceptors before discharging into the watercourse. In areas where it is not possible to discharge into natural watercourses, retention basins are provided.

The wastewater resulting from the operation stage will be represented by the wastewater resulting from the sanitary groups within the premises of the service spaces and the maintenance and coordination center (CIC). They will be discharged into emptying basins.

2.5 Decommissioning activities

In accordance with the Annex of GD no. 2139/2004, amended by GD no. 1496/2008 (Catalogue regarding the classification and normal durations of operation of fixed means, chapter III, point 4, "Maintenance in operation of fixed means that can affect the protection of life, health and the environment - road, rail, air and naval, construction and communal household plants, lifting plants, etc.), after the expiration of the normal operation period, the maintenance of the motorway will be possible only "on the basis of a technical report drawn up by certification bodies or technical inspection bodies certified in the field of activity of the fixed asset".

The specific closing activities of the proposed project will include the following stages:

- Demolition/dismantling and sorting works in order to reuse the superstructure and infrastructure elements (asphalt and the components of the earthworks, bridges, culverts and rainwater management elements);
- Land clearing (which involves the collection, sorting, classification and management of unusable materials classified as waste);
- Environmental restoration works by rehabilitating the lands occupied by the project (return to agricultural/natural circuit) - if no alternative solutions for use are found.

The waste estimated to be produced by decommissioning the project is mainly: concrete, soil and stones, iron and steel, asphalt and household waste. Depending on the life of the project, there are chances that some of it will belong to the category of contaminated waste.

In the event that the need to decommission the motorway is established, it will be necessary to obtain an Environmental Agreement. The studies that will be required by the legislation in force at the time of the decommissioning of the project will establish the impact on the environment generated by the decommissioning activities, the measures necessary to avoid the impact and those intended to restore the ecological integrity of the project area.

2.6 Territorial planning/arrangement

The alignment proposed for the construction of the Suceava - DN2H Motorway and DN2H - Siret Border Express road crosses a number of 10 administrative-territorial units Suceava (km 0+000), Mitocul Dragomirnei (km 3+700), Suceava (km 7+200), Pătrăuţi (km 9+230), Dărmăneşti (km 14+520), Grăniceşti (km 23+715), Calafindeşti (km 33+925), Bălcăuţi (km 39+400), Siret (km 46+240), Muşeniţa (km 48+210), Siret (km 49+475), Musenita (km 51+150), Siret (km 53+860).

In order to obtain the Construction Authorization for the analyzed objective, the following were issued:

- Urban Planning Certificate No. 192 of 12.15.2022 issued by the Suceava County Council

According to the Urban Planning Certificate, performance of the project involves the occupation of land with the following types of current use categories: agricultural land, watercourses, forest, roads, railway, archaeological sites, communal household areas (cemetery), built-up areas.

The lands affected by the alignment of the express road are located in the extra-urban and intra-urban areas of the localities, part of the public and private domain that will be expropriated as a result of one/some expropriation decisions, respectively Government Decisions.

The project provides for the construction of a high-speed link (motorway and express road) between the municipality of Suceava and DN2H and an express road sector between DN2H and Siret Border, this being part of the road project with the generic name "Drumul Siretului", indicative DX5 included in GTMP (Pascani – Suceava – Siret).

In addition to its national importance, this project will serve in good conditions, the national transit traffic, of goods and people from the territory of Romania and to Ukraine. Depending on the stage of rehabilitation of the national roads or national roads under rehabilitation, through them the motorway can receive and distribute road traffic through its interchanges, it will ensure the necessary traffic capacity and appropriate traffic conditions related to the TEN-T road network with minimum negative effects at the level environment and land use.

2.7 Modalities proposed for connection to the existing infrastructure

2.7.1 Construction period

The provision of the necessary utilities during the construction period will be carried out as follows:

- Water supply: the necessary technological water and that used for domestic purposes will be provided by connecting to the network in the area, where it exists, or it will be provided by purchase from third parties and will be brought to the site by means of car tankers. The drinking water needed by the staff will be purchased from the trade;
- Evacuation of waste water: domestic waste water will be directed through the internal sewerage network to the existing networks or into emptying basins, from where it will be taken over and transported to the existing treatment plants in the project area by companies authorized on the basis of the concluded contracts. In the case of working fronts, ecological toilets will be provided in certain areas;
- The electricity supply of all the objectives related to the maintenance center will be made from a substation, which will be provided by Electrica SA. The new substation will be connected to the supplier's network with a cable protected with copper conductors and XLPE insulation;
- Provision of the thermal agent is necessary exclusively for the site organizations and will be carried out through the thermal power plants.

2.7.2 Period of Operation

During the operating period, the following utilities will be required:

- The water supply will be provided in the CIC and the short term parking lots, service spaces through the construction of authorized drilled wells or through connection to the water supply network in the area (if it will be available);
- Evacuation of waste water: domestic waste water produced in CIC, short-term parking lots and service spaces will be directed through the internal sewerage network to the emptying basins proposed within the objectives. If the local conditions will allow it, the connection to the sewage networks of the neighboring localities will be ensured;
- Rainwater collected on the CIC locations, service spaces and ashort-term parking lots will be pre-treated by means of settlement tanks and hydrocarbon interceptors. The rainwater

collected from the road platform will be directed through the designed collection system into settlement tanks and hydrocarbon interceptors before discharging into the watercourse. In areas where it is not possible to discharge into natural watercourses, retention basins are provided;

- The electricity supply will be ensured by connection to the existing networks in the area of the locations;
- The thermal agent is needed in the CIC and in the short-term parking lots it will be provided by means of thermal plants and electric radiators.

2.8 Estimate of the type and quantities of emissions and wastes

2.8.1 Emissions in surface water and underground water

2.8.1.1 Sources and pollutants generated

During the execution period, the main sources of water pollutants are represented by:

- Soil manipulation works, generating soil particles that can reach surface waters. In the case of large quantities of powders, they can accumulate in watercourses, generating changes in water turbidity and affecting aquatic flora and fauna;
- Site traffic to and from the work fronts or the areas out of which construction materials are brought (quarries, ballast);
- Accidental discharges of chemicals, fuels and oils from the operation of plants involved in construction works or due to faulty handling of transport vehicles;
- Improper handling and putting into operation or storage of the materials used in the execution of the works (bitumen, concrete, aggregates, etc.), which can reach the surface waters by entrainment by rainwater;
- Improper extraction of mineral aggregates (sand, ballast, gravel);
- Inadequate storage and management of domestic waste water resulting in the sanitary groups within the construction site organizations, the management being properly ensured by means of authorized operators;
- Washing plants and means of transport at the site organization level.

The wastewater generated during the execution stage of the project will be at the level of the site organizations. They will be collected and discharged periodically by emptying, based on contracts concluded with authorized companies, and where possible by discharge into the local sewerage networks or discharge into the watercourse following appropriate pre-treatment/treatment.

During the operating period, the main source of water pollutants is represented by the washing and entrainment by precipitation of solid particles and other soluble compounds deposited on the surface of the road as a result of road traffic, such as heavy metals, hydrocarbons, snow removal substances. Potential sources of pollutants can be represented by:

- Deposition of atmospheric emissions from vehicle thermal engines – heavy metals (Fe, Cr, Zn, Ni, Cd, Cu, Pb), hydrocarbons (PAH, PCB);
- Residues from the wear of vehicle tires and braking elements - suspended particles (PM10, PM2.5);
- Maintenance works - sodium (derived from the substances applied in winter for snow removal); heavy metals and hydrocarbons (from repair works at the level of road surface - asphalting);
- Metallic residues from vehicle corrosion - Fe, Cr, Ni, Cd, Cu and from galvanized parapets - Zn, oils and mineral fats;
- Residues from the wear of the road surface - solid materials.
- The risks of surface water or groundwater contamination are greater in the following situations:
- Direct deposition in surface waters of pollutants generated by vehicles involved in the car traffic;
- Improper operation of settlement tanks and hydrocarbon interceptors;
- Accidental discharge of liquid or solid pollutants into surface waters (mainly due to massive discharges of substances as a result of a traffic accident in the area of a water course).

Domestic wastewater from CIC, SS and PSD can be a source of water pollutants, but these waters will be collected in tight emptying basins and periodically evacuated by authorized operators.

Rainwater potentially contaminated with hydrocarbons, collected from the road surface and from the CIC premises, service spaces and short-term parking lots will be pre-treated by means of settlement tanks and hydrocarbon interceptors provided in the project before being discharged into the watercourses.

2.8.1.2 Emissions during the operating phase

As stated previously, the main pollutant emissions associated with the operating stage of the express road are represented by specific pollutants driven by the surface runoff of stormwater that washes all the built (waterproof) elements of the express road (road platform, service spaces, CIC, service spaces, etc.).

However, the concentrations of pollutants in the volume of meteoric water collected from the express road depend on the technical condition of the vehicles participating in the traffic, the speed of travel, the quality of fuels, etc. At the same time, the current qualitative and hydrological conditions (flow, speed) of the watercourses are an important factor in determining the magnitude of the impact due to the evacuation of meteoric waters, they significantly influence the natural self-treatment capacity of the rivers (diffusion and dilution processes).

The methodology developed by SETRA was used to estimate pollutant emissions in surface waters[1](Department of Road and Motorway Technical Studies - French Ministry of Transport). This methodology presents a simple method for calculating the loads of meteoric water collected from the road pavement that takes into account the average annual load, the impermeable surfaces out of which the rainwater is collected and the rain flows. The methodology establishes loading factors for the indicators: suspended matter (MS), chemical oxygen consumption (CCO), Zinc, Copper, Cadmium, total hydrocarbons and polycyclic aromatic hydrocarbons (PAH). Annual loads (kg/year or g/year) are presented in the methodology according to:

- traffic volume:
  - ≤ 10,000 vehicles/day;
  - > 10,000 vehicles/day.
- road type:
  - open roads - which do not present obstacles for dispersion (eg: plain areas, areas with small vegetation, embankment areas);
  - closed roads – roads that have elements that can affect the dispersion phenomenon (eg: areas with very large debris, tunnels, large vegetation adjacent to the road, etc.).

The SETRA methodology establishes a formula for calculating the pollutant emissions in rainwater that takes into account: the average annual pollutant loads deposited on the road pavement (kg/year), waterproof surfaces (ha), average annual precipitation (m) and reduction factors (appropriate to the solutions provided for the rainwater pre-treatment).

The following table presents the results of the calculations of the average annual pollutant loads, divided by the sections considered in the Traffic Study.

Table no.2-31 Average annual pollutant concentrations on the express road calculated according to the traffic volume

Section	Total of veh/day (2050)	Area (ha)	Ca - Annual loads (kg/year)						
			MS	CCO	Zn	Cu	CD	Total hydrocarbons	HAP
Airport - DN29A	13882	3.30	2109.38	2032.47	6.76	0.80	0.037	34.85	0.0056
Interchange DN29A	9979	1.50	900.89	900.89	3.00	0.30	0.015	13.51	0.0023
DN29A - DN2/DN2P	12328	16.89	10530.19	10294.20	34.28	3.81	0.181	167.79	0.0273
DN2/DN2P interchange	16012	0.19	123.38	116.63	0.39	0.05	0.002	2.13	0.0003
DN2/DN2P interchange	15827	0.59	387.06	366.51	1.22	0.16	0.007	6.66	0.0011
DN2/DN2P interchange	15444	0.47	310.60	295.09	0.98	0.12	0.006	5.30	0.0008

1 SETRA (2007) Guide Technique. Pollution d'origine routiere. Concept des ouvrages de treatment des eaux. Service d'Ètudes Techniques des Routes et Autoroutes (SETRA)

Section	Total of veh/day (2050)	Area (ha)	Ca - Annual loads (kg/year)						
			MS	CCO	Zn	Cu	CD	Total hydrocarbons	HAP
DN2/DN2P interchange	13208	0.27	170.57	165.37	0.55	0.06	0.003	2.77	0.0004
DN2/DN2P interchange	11635	0.17	107.43	105.72	0.35	0.04	0.002	1.68	0.0003
DN2/DN2P interchange	16635	0.28	184.71	173.68	0.58	0.08	0.003	3.23	0.0005
DN2/DN2P - DN2H	18133	38.86	26477.98	24581.59	81.68	11.25	0.483	476.19	0.0741
Interchange DN2H	11832	0.28	171.40	168.35	0.56	0.06	0.003	2.70	0.0004
Interchange DN2H	5055	0.11	31.85	31.85	0.11	0.01	0.001	0.48	0.0001
Interchange DN2H	5360	0.35	112.79	112.79	0.38	0.04	0.002	1.69	0.0003
DN2H - DN2 Siret S	5893	42.36	14976.45	14976.45	49.92	4.99	0.250	224.65	0.0374
Siret S interchange	910	0.37	20.41	20.41	0.07	0.01	0.0003	0.31	0.0001
DN2 Siret S - DN2 Siret N	1110	29.85	1987.70	1987.70	6.63	0.66	0.033	29.82	0.0050
DN2 Siret S - DN2 Siret N	1110	2.04	135.58	135.58	0.45	0.05	0.002	2.03	0.0003

The determination of pollutant concentrations in rainwater was made by applying the formula:

$$, \text{ where } Cm = \frac{C_a \, x \, (1-\tau)}{9 \, x \, S \, x \, H}$$

Cm = average annual concentration (mg/l);

Ca = annual load (kg) – calculated inTable no.2-26

τ = reduction rate (depends on the rainwater pre-treatment solution);

S = waterproof surface (ha);

H = water height for peak rainfall (m).

The average concentrations of pollutants in rainwater were calculated considering a reduction rate (τ) appropriate to the designed pre-treatment solutions, respectively retention basins (with reduction efficiency of 85% for MS, 75% for CCO, 80% for Cu, Cd , Zn and 65% for total hydrocarbons and PAHs - according to table no. 10 of the SETRA Methodology).

The results of the calculations are presented for each section in the table below.

Table no.2-32 Average annual pollutant concentrations in rainwater collected from the express road

Section	Cm - Rainwater concentrations (mg/l)						
	MS	CCO	Zn	Cu	Cd	Total hydrocarbons	HAP
Airport - DN29A	21.29	34.20	0.091	0.011	0.00050	0.821	0.00013
Interchange DN29A	19.96	33.26	0.089	0.009	0.00044	0.699	0.00012
DN29A - DN2/DN2P	20.78	33.85	0.090	0.010	0.00048	0.772	0.00013

Section	Cm - Rainwater concentrations (mg/l)						
	MS	CCO	Zn	Cu	Cd	Total hydrocarbons	HAP
DN2/DN2P interchange	22.00	34.67	0.092	0.012	0.00052	0.887	0.00014
DN2/DN2P interchange	21.94	34.63	0.092	0.012	0.00052	0.881	0.00014
DN2/DN2P interchange	21.81	34.54	0.092	0.012	0.00052	0.869	0.00014
DN2/DN2P interchange	21.07	34.05	0.091	0.010	0.00049	0.800	0.00013
DN2/DN2P interchange	20.55	33.70	0.090	0.010	0.00047	0.751	0.00012
DN2/DN2P interchange	22,21	34.81	0.093	0.012	0.00053	0.906	0.00014
DN2/DN2P - DN2H	22.71	35.14	0.093	0.013	0.00055	0.953	0.00015
Interchange DN2H	20.61	33.74	0.090	0.010	0.00047	0.757	0.00012
Interchange DN2H	10,11	16.85	0.045	0.004	0.00022	0.354	0.00006
Interchange DN2H	10.72	17.87	0.048	0.005	0.00024	0.375	0.00006
DN2H - DN2 Siret S	11.79	19.64	0.052	0.005	0.00026	0.413	0.00007
Siret S interchange	1.82	3.03	0.008	0.001	0.00004	0.064	0.00001
DN2 Seret S - DN2 Siret N	2.22	3.70	0.010	0.001	0.00005	0.078	0.00001
DN2 Seret S - DN2 Siret N	2.22	3.70	0.010	0.001	0.00005	0.078	0.00001
Limits NTPA001-2005 (mg/l)	**35**	**70**	**0.5**	**0.1**	**0.2**	**5**	**-**

From the analysis of the results, it is found that the efficiency of the rainwater pre-treatment facilities provided in the project before their discharge into the watercourses is appropriate, the estimates indicating concentrations below the maximum admissible limits according to the *Norm NTPA001-2005 regarding the establishment of pollutant loading limits of industrial and urban wastewater upon discharge into natural receptors.*

2.8.2 Atmospheric emissions

2.8.2.1 Sources and pollutants generated

During the execution period of the works necessary for the realization of the project, the main sources of atmospheric emissions will be represented by:

- The activities of handling earth masses (excavation of fertile soil, excavations, fillings, leveling, loading, unloading, transport), some construction materials (sand, gravel, ballast) and waste – uncontrolled stationary sources. Pollutants: suspended dust and sedimentable dust;
- Temporary storage of powdery materials (sand, earth) that can be carried away by the wind. Pollutants: suspended dust and sedimentable dust;
- Wind erosion on disturbed or unvegetated land surfaces – uncontrolled stationary sources. Pollutants: suspended dust and sedimentable dust;
- Generator sets to ensure energy supply in site organizations and work fronts - directed stationary source. Pollutants: NO_2, SO_2, CO, dust;
- Diesel storage. Pollutants: volatile organic compounds;

- The operation of asphalt and concrete stations - stationary point sources, located at the site organizations level;
- Welding/cutting activities of metal elements – uncontrolled stationary sources. Pollutants: metal particles, combustion gases appropriate to the use of welding/cutting devices;

  Mobile emission sources (vehicles and plants that participate in land development and the transport of materials and equipment, as well as in the supply of substances and materials during the execution of construction works. Pollutants: NOx, SOx, CO, dust in suspension, particles with heavy metals.

Atmospheric pollutant emissions will be generated by works necessary to carry out the entire construction process, starting with digging and excavations and continuing with filling works, the construction of the earthwork of the express road and the construction of works of art. The area of the working fronts will constitute the most important source of emissions as it accumulates the activity of several polluting factors.

The construction works also include numerous mobile sources represented by the plants necessary for the development of the land and the construction of the objectives, by the vehicles that will ensure the supply of construction materials, but also by the vehicles necessary to evacuate the wastes from the site. Their operation will be intermittent, depending on the work schedule and the work schedule.

The works related to the project will be carried out with modern equipment (excavator, bulldozer, loader, mobile crane, pile drilling installations, etc.).

For the most part, the emission sources of atmospheric pollutants are ground sources (except for the works of art located at significant heights from the ground level), free, open and mobile or stationary diffuse/directed.

During the operation period of the objective, the sources of atmospheric pollutants will be mobile, represented mainly by the vehicles that will transit the express road. According to the *EMEP/EEA air pollutant emission inventory guidebook 2019*, the main pollutants emitted by road traffic are:

- ozone precursors (CO, NOx, NMVOC);
- greenhouse gases (CO2, CH_4, N_2O);
- acidifying substances (NH_3, SO_2);
- suspended particles (PM);
- carcinogenic substances (PAHs and POPs);
- toxic substances (dioxins and furans);
- heavy metals.

2.8.2.2 Emissions during the execution period

2.8.2.2.1 Emissions from controlled stationary sources

In the execution stage, the controlled stationary sources are represented by generator sets to ensure the energy supply.

2.8.2.2.2 Emissions from uncontrolled stationary sources

Uncontrolled stationary sources of atmospheric pollution will appear during the execution period of the works proposed to achieve the objective and will be represented by the activities of handling the earth masses (excavation work, uncovering the soil, loading - unloading, transport), of some materials construction. The dust generated by material handling and wind erosion is mainly of natural origin (soil particles, mineral dust).

The estimate of pollutant emissions generated as a result of construction activities was carried out according to the *EMEP/EEA 2019 – 2.A.5.b Construction and demolition methodology*, using the following equation:

$$EM_{PM10} = EF_{PM10}\ x\ A_{affected}\ x\ d\ x\ (1-CE)x\ \left(\frac{24}{PE}\right)\ x\ \left(\frac{S}{9\%}\right)$$, where:

EF - the emission factor appropriate to the types of constructions carried out within the site, respectively road construction → according to 2.A.5.b Construction and demolition, Table 3.4;

$A_{affected}$ – the total surface arranged in the project → 6045320. m^2;

d - duration of execution works → 2.5 years;

CE - efficiency of emission control measures → 0.5 according to 2.A.5.b Construction and demolition, page 9;

PE – evaporation index → 41.5 (calculated according to the formula from 2.A.5.b Construction and demolition, page 9);

s – soil sediment content → 35% (determined according to the type of soil in the site area).

The results of emission calculations for the PTS, PM10 and PM2.5 indicators are presented in the following table.

Table no.2-33 Uncontrolled emissions associated with the express road construction operations

Road sign	emissions (t/ execution period)
TSP	130,819
PM10	39,075
PM2.5	3,907

The emissions estimated in the table above reflect all the activities of handling the earth masses (excavation, compaction) and pouring concrete over the entire surface of the project.

Also, in the execution stage, other important uncontrolled stationary sources will be represented by the asphalt and concrete stations. According to *EMEP/EEA 2019 - 2.D.3.b Road paving with asphalt*, emissions from asphalt and concrete plants are suspended particles, volatile organic compounds, liquid aerosols and organic vapors. The main sources of emissions from an asphalt station are the dryer, areas with high temperatures, storage areas, but also the loading and unloading of the material and the associated vehicle traffic.

The estimate of total emissions from asphalting activities (from production to asphalting itself) was carried out based on the emission factors provided for in the *EMEP/EEA 2019 methodology - 2.D.3.b Road paving with asphalt (Table 3.1 Tier1 emission factors for source category 2.D.3.b Road paving with asphalt)* and the total amount of asphalt mixtures necessary for performance of the project (presented in Section 2.3.4.1).

Table no.2-34 Air pollutant emissions generated in asphalt stations

Road sign	Emission factor*	Amount of asphalt required for the entire project	Emissions
	(g/t)	(t)	(t/ per, of execution)
VOC	16	2,211,042	35.4
MTS	14,000		30954.6
PM10	3,000		6633.1
PM2.5	400		884.4

It is specified that the total emissions estimated in the table above will occur only in a certain stage of the project, appropriate to the road superstructure construction operations (especially the asphalting operations), estimated to be carried out in approx. 22 months.

Of the total emissions, a part will be generated directed within the asphalt stations and a part will be generated uncontrolled on the road surface, at the time of asphalting works. The emissions generated within the asphalt stations are limited by means of the filtration systems provided in the stations, which have the role of filtering both the burnt gases resulting from the drying process of the aggregates in the dryer drum and the dust resulting from the sifting - dosing and weighing of the aggregates. The retained dust is transported for storage in a dust silo and can be reintroduced into the technological flow, depending on the recipe used. Venturi emission reduction installations were taken into account in the emission estimate. The calculations were based on their minimum filtering capacity of 97%, according to the methodology *EMEP*.

2.8.2.2.3 Emissions from mobile sources

The estimate of pollutant emissions generated by non-road mobile sources (equipment) was made using the EMEP/EEA calculation methodology - 1.A.4. Non-road mobile plant 2019, Tier 1, which takes into account the type of fuel, the fuel consumption used and the emission factors appropriate to the characteristic pollutants. The results are presented in the table below and represent the total emissions from all the plants that will be involved in the execution works, divided by each type of plant.

Table no.2-35 Mobile sources during the execution period

Name of the source	Pollutants and mass flows									
	NO_2*		CO_2		CO		SO_2		PM_{10}	
	g/h	g/s	g/h	g/s	g/h	g/s	g/h	g/s	g/h	g/s
Dump	251.4	0.070	84,131.8	23,370	286.8	0.080	26.6	0.007	56.0	0.016
Bulldozer	353.6	0.098	118,310.4	32,864	403.4	0.112	37.4	0.010	78.8	0.022
Self grader	125.7	0.035	42,065.9	11,685	143.4	0.040	13.3	0.004	28.0	0.008
Compactor	330.0	0.092	110,423.0	30,673	376.5	0.105	34.9	0.010	73.5	0.020
Excavator	157.1	0.044	52,582.4	14,606	179.3	0.050	16.6	0.005	35.0	0.010
Excavators with long	149.3	0.041	49,953.3	13,876	170.3	0.047	15.8	0.004	33.3	0.009

Name of the source	Pollutants and mass flows									
	NO_2*		CO_2		CO		SO_2		PM_{10}	
	g/h	g/s	g/h	g/s	g/h	g/s	g/h	g/s	g/h	g/s
arm (20 m)										
Backhoe	117.9	0.033	39,436.8	10,955	134.5	0.037	12.5	0.003	26.3	0.007
Front loader	94.3	0.026	31,549.4	8,764	107.6	0.030	10.0	0.003	21.0	0.006
Water tank	117.9	0.033	39,436.8	10,955	134.5	0.037	12.5	0.003	26.3	0.007
Generator 330 kW	502.9	0.140	168,263.7	46,740	573.7	0.159	53.2	0.015	112.0	0.031
20T truck crane	62.9	0.017	21,033.0	5,842	71.7	0.020	6,7	0.002	14.0	0.004

**NO_2 calculated as a percentage of 29% of NO_X*

The Order 462/1993 does not provide limits for mobile sources. The order indicates that the polluting emissions of road vehicles are limited as a preventive measure by the technical conditions stipulated in the technical inspections carried out periodically throughout the use of road vehicles registered in the country.

2.8.2.3 Emissions during operation

Emissions during the operating period are mainly represented by mobile sources related to car traffic on the express road. A detailed analysis of emissions from mobile sources is not necessary considering the absence of limit values in the legislation for these types of sources. The modeling of emissions from mobile sources, as well as the analysis of their impact on air quality, is presented in detail in section 7.3.2.

Secondary, at the level of service spaces and CIC, directed fixed sources (such as thermal power plants or generating sets) may appear, as well as uncontrolled surface sources (fueling at fuel stations). Occasionally, maintenance operations may take place on the express road, which may include asphalting activities or other interventions at the road infrastructure level. These operations are generators of atmospheric pollutant emissions, but their contribution is insignificant.

2.8.2.4 Greenhouse gas emissions

Greenhouse gas (GHG) emissions associated with the project are represented by CH_4 and N_2O (expressed as $CO_{2\ eq}$) resulting from road traffic. According to the data available on the website of the European Environment Agency (2020), road transport is the main contributor to greenhouse gas emissions, covering approx. 21% of their total (CO_2 equivalent) at European level. To estimate the GHG emissions resulting from road traffic, the equivalent CO_2 emissions were calculated using the methodology of the European Investment Bank – EIB Project Carbon Footprint Methodologies, 2023.

GHG emissions were estimated for the entire project of the Suceava - Siret express road, both for the "without project" scenario (reference emissions) and for the "with project" scenario (absolute emissions). The relative emissions were calculated by the difference between the absolute emissions and the reference emissions.

Table no.2-36 Estimate of GHG emissions

Forecast year	Reference emissions	Absolute emissions	Relative emissions	
	(tCO_2e/year)	(tCO_2e/year)	(tCO_2e/year)	(% CO_2)
2025	43,629	56,581	12,952	+30
2030	49,103	62,759	13,656	+28
2035	51,417	66,302	14,885	+29
2040	53,260	70,491	17,231	+32
2045	55,181	73,935	18,754	+34
2050	56,522	77,632	21,110	+37

Through the implementation of the project, an increase in relative GHG emissions of 28% to 37% is estimated in the period 2025-2050, representing the difference between the emissions generated by road traffic with the presence of the project (absolute emissions) and those generated only with the existing infrastructure (reference emissions).

2.8.3 Emissions in the soil

In the construction stage, the potential sources of contamination/degradation for soil, subsoil and groundwater will be represented by:

- Improper storage of plants and construction materials;
- Improper management and storage of the waste resulting from the works, as well as household waste resulting from the personnel involved in the execution of the works;
- The traffic of vehicles and plants involved in achieving the objective. Along with the air impurity, there is the possibility that a certain amount of atmospheric pollutants (SO_2, NOx, heavy metals) reach the soil, which can lead to the modification of its characteristics;
- Accidental leaks of fuels, lubricants and other chemical substances from the vehicles and plants involved in the construction works or from their improper storage;
- Degradation of soil quality through improper handling/storage of uncovered/excavated material, implicitly the occurrence of erosion and/or spreading phenomena;
- Contamination of the soil with germinal material belonging to ruderal and/or non-native invasive and potentially invasive species, as a result of soil manipulation activities, as well as the traffic of plants and working personnel;
- Deposition of the dust resulting from excavation, loading, transport and unloading of construction materials;
- Inadequate management of domestic and technological waste water resulting from the site of the construction site organizations and in the working fronts.

In the operating stage, the potential sources of pollution will consist of the following:

- Road traffic, which represents a continuous source of pollutants from the exhaust gases resulting from the burning of fuels. This represents a continuous source of pollution through which elements such as NOx, SO_2, PM_{10} and heavy metals generated by exhaust gases, road wear, tire wear, etc. they can deposit and accumulate on the soil level, affecting both its quality and the abiotic and biotic elements that depend on it;

- Accidental leaks of fuels, lubricants from waste transport vehicles and personnel involved in maintenance activities;
- Accidental leaks of toxic substances or hydrocarbons as a result of road accidents in which vehicles transporting dangerous substances are involved;
- Substances used in the cold season for snow removal (basic solutions of Calcium/Sodium chloride) as a result of road maintenance activities, which causes an input of chlorides in the soil and surface waters by entrainment of particles by rainwater, as well as affecting the vegetation on the side of the road.
- The project may generate a potential impact on the geology during the construction period, as a result of the construction of piles and bridges. In the case of the other elements of the project, the works will be carried out with the superficial damage to the soil layers so that they will not have an impact on the geological environment.

2.8.4 Light pollution

The Suceava – Siret Motorway and express road will contribute to increasing the level of light pollution in the area where it will be built. The project proposes the lighting of several areas of the express road, including road interchanges and other structures.

For the analysis of the current level of light pollution in the project area, publicly available resources were used. Light pollution map[2] was an important resource. This shows the level of artificial brightness of the sky, according to the methodology proposed by Falchi et al. in 2016[3]and is based on the quantification of the light pollution level of the sky based on satellite images and brightness measurements (Falchi et al., 2016).

According to this map, the most light-polluted area in the motorway area is located in the municipality of Suceava, approximately 0.3 km from its axis. Among the UATs crossed by it, most localities are characterized by a moderate level of light pollution. Only the localities of Bălcăuţi and Calafindeşti predominantly present a low level of light pollution, oriented on the right side of the motorway axis. The following map shows the motorway and the Suceava - Siret express road and the level of light pollution in the territorial administrative units intersected by it (based on the data set associated with the work of Falchi et al. from 2016).

[2]The map is available at the following address https://www.lightpollutionmap.info/#zoom=8.67&lat=46.4735&lon=25.6189&layers=B0FFFFFFFTFFFFFFFFFF
[3]Falchi, F., Cinzano, P., Duriscoe, D., Kyba, CCM, Elvidge, CD, Baugh, K., Portnov, BA, Rybnikova, NA, & Furgoni, R. (2016). The new world atlas of artificial night sky brightness. *Science Advances*, *2*(6), e1600377.

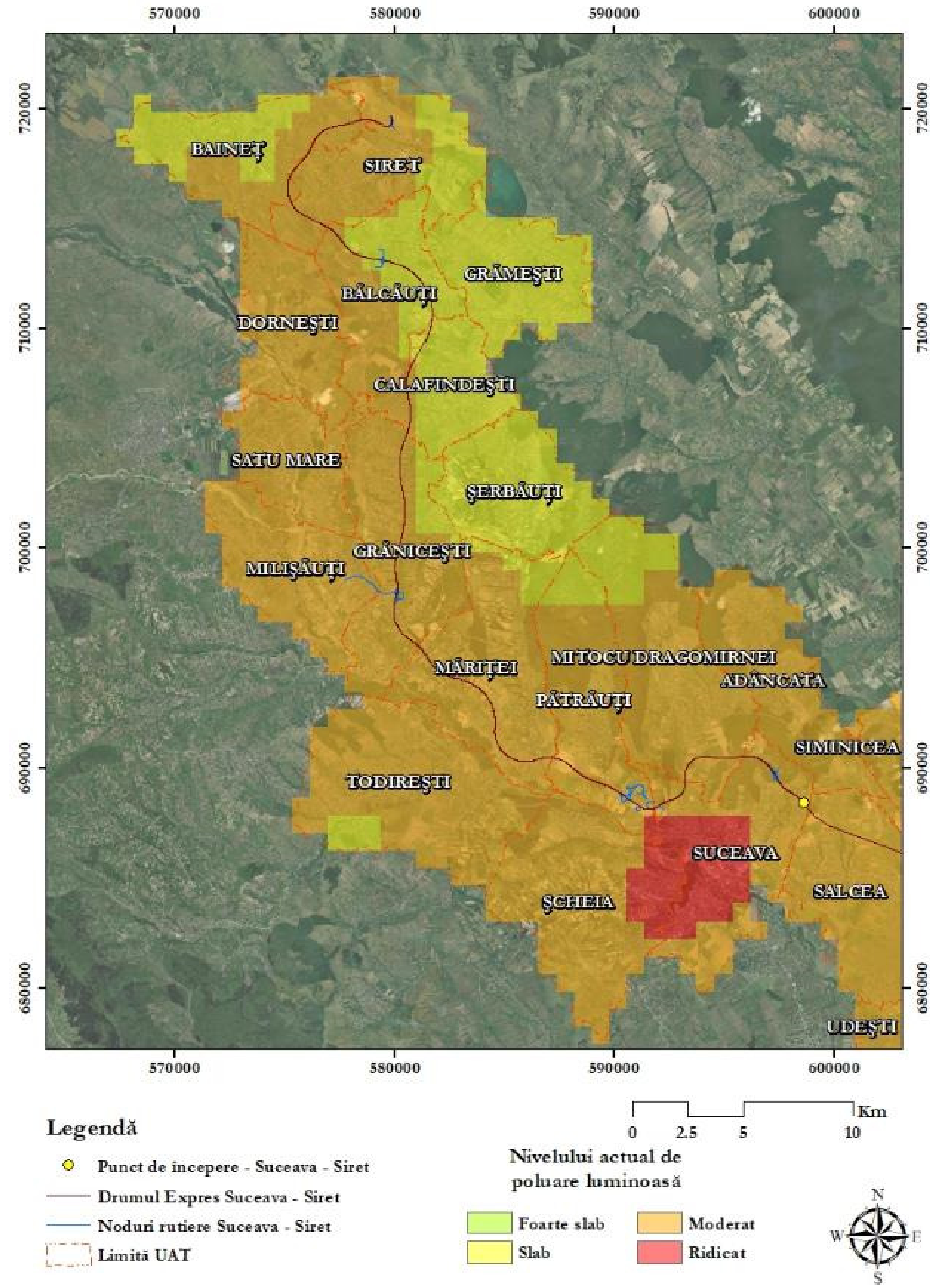


Figure no.2-7 The existing level of light pollution in the area of the Suceava - Siret Motorway and express road

The project proposes lighting in several areas: in the areas of overpasses / bridges / viaducts larger than 100 m, in the area of road interchanges, short-term parking lots and in CIC and service spaces. These illuminated sectors are also located inside sensitive areas from the point of view of biodiversity, in areas where the current level of lighting is low.

Based on the available data and information regarding the artificial lighting proposed on the express road, the areas where there is a high risk of disturbing the activity of wildlife species are the following:

- In the town of Suceava, where the motorway/express road provides a viaduct (km 4+255) near some forest areas;
- In the locality of Calafindești, where the motorway/express road provides two short-term parking lots near an area with a low level of light pollution;
- In the locality of Bălcăuți, where the express road provides a CIC space near an area with a low level of light pollution.

2.8.5 Noise and vibrations

2.8.5.1 Current background noise level

In the study area there is a dense network of roads that represent an important source of noise pollution for the receivers in the area, especially in the localities intersected by national and county roads, as follows:

- DJ178A – Costâna, Mihoveni, Scheia, Parhăuţi;
- DJ178B – Grănicesti;
- DJ208D – Mitocași, Mitocu Dragomirnei, Suceava;
- DJ208T – Suceava;
- DJ208U – Mitocu Dragomirnei;
- DJ208V – Pătrăuţi;
- DJ209D – Calafindeşti, Costâna, Darmăneşti, Botoşaniţa Mare;
- DJ291A – Băncesti, Mănăstioara, Musenita, Siret;
- DN17A – Balcauti;
- DN2H – Railway Station, Milişauţi, Slobozia Sucevei;
- DN29A – Suceava;
- DN29C – Siret

Among these roads, strategic noise maps were made in 2017 only for DN2, available on the CNAIR website. In order to establish the current background noise level, the strategic noise map was analyzed on the DN2 road section of interest for the study area, between km 441+500 – km 457+100. The relevant localities for the project, analyzed on this section of DN2, are: Balcăuţi, Dănila, Dărmăneşti, Grăniceşti, Iacobesti, Măriţeia Mică, Siret, Slobozia Sucevei, Pătrăuţi, Româneşti and Suceava.

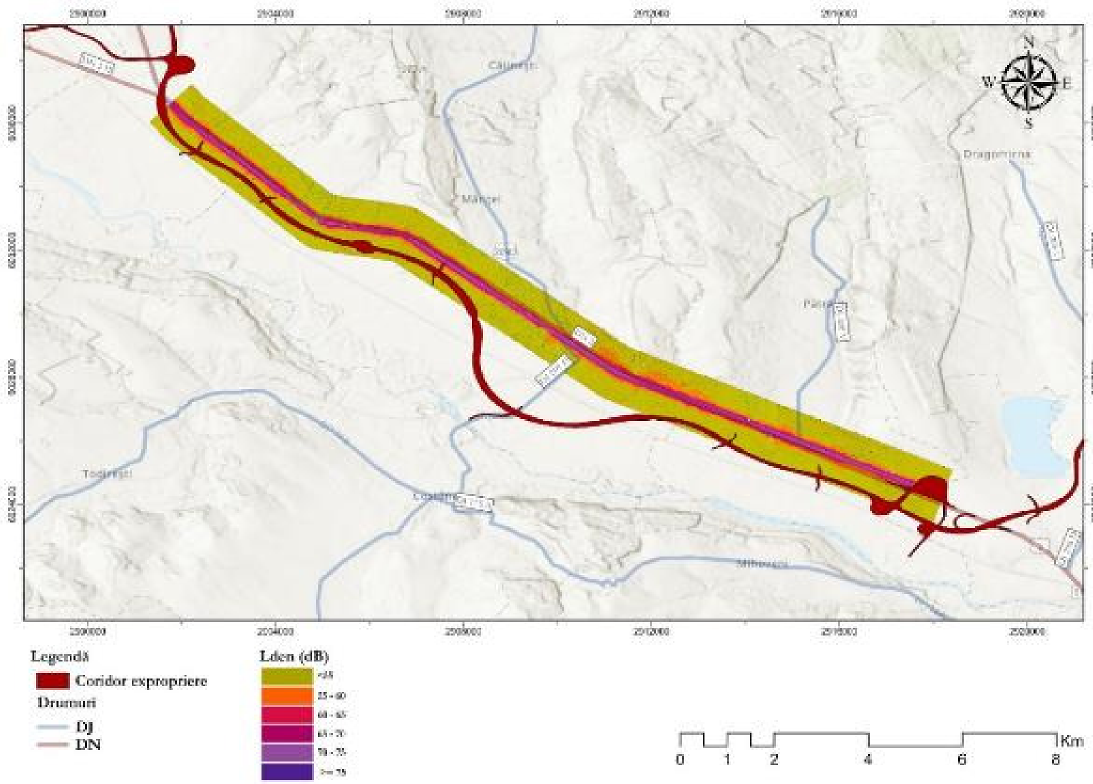


Figure no.2-8 Strategic noise map of the DN2 national road, section 441+500 457+100 in relation to the project location

Using the strategic noise map associated with the studied section of the DN2 national road, the localities with data on noise pollution were identified, as follows:

Table no.2-37 Localities affected by noise pollution caused by the DN2 national road, according to the CNAIR strategic noise map

Locality	Lzsn(dB)	Total exposed area [km²]	Estimated number of people exposed	Estimated number of exposed houses	Estimate number		
					Schools/kindergartens exposed	Exposed hospitals	Exposed administrative buildings
You're screwing up	> 55	1.86	442	190	0	0	5
	> 65	0.66	86	37	0	0	0
	> 75	0.10	0	0	0	0	0
Granicesti	> 55	0.53	14	5	0	0	0
	> 65	0.18	11	3	0	0	0
	> 75	0.04	0	0	0	0	0
The municipality of Suceava	> 55	0.39	12	5	0	0	0
	> 65	0.14	3	1	0	0	0
	> 75	0.02	0	0	0	0	0
Pătrăuţi	> 55	1.16	65	18	0	0	0
	> 65	0.39	0	0	0	0	0
	> 75	0.07	0	0	0	0	0

Exceedings of the Lzsn threshold value of 55 dB were identified in all the studied localities. The axis of the DN2 national road passes through the center of Grăniceşti and Dărmăneşti localities and thus affects a high percentage of the inhabitants through noise pollution. Most of the houses in the town of Grănicesti are located in the alignment of the DN2 road, being thus subject to a very high noise level, which exceeds values of 65 dB during the day.

The values of Lzsn > 65 dB and Ln > 50 dB are typical for almost all the roads with a traffic of more than 3 million vehicles per year.

Also, the project intersects railway lines 500, 513 and 518. CF500, which connects the cities of Liteni, Suceava and Cernăuţi, crosses the localities of Dărmăneşti, Gara, Musenita, Slobozia Sucevei, Vişcani and the city of Suceava and is located in the vicinity of the town of Milişauţi. CF513, which connects the towns of Dărmăneşti and Cacica, is located in the vicinity of the towns of Costâna, Dărmăneşti and Sârghiesti and crosses the town of Părhăui. CF518, which connects the cities of Suceava and Siret, is located in the vicinity of the town of Mănăstioara. The National Railway Company has created a series of strategic noise maps for the major network interchanges in the country, but the municipality of Suceava or any of the railway segments of interest are not found in these maps.

Due to the dense transport networks in the study area, all the localities of interest for the project are considered in the evaluation as having a low sensitivity in terms of current background noise (with noise values higher than the limit values).

2.8.5.2 Project execution stage

During the construction stage, the noise sources will have a temporary character and duration, they will manifest themselves locally and intermittently. The main sources of noise will be represented by:

- traffic in the area organizations of construction site, working front, from access roads,traffic to and from areas where construction materials are obtained (quarries, ballasts, storage areas, etc.);
- the activities of excavation, handling of ballast materials, respectively their loading and unloading;
- operation of asphalt and concrete stations, asphalt/concrete pouring;
- operation of plants (transporters, heavy-duty trucks, concrete mixers, excavators, cranes, bulldozers, compressors) - operation of engines, handling and transport of loads.

2.8.5.3 The operation stage of the project

During **the operation stage**, the sources of noise and vibrations will be generated by the movement of vehicles at the level of the express road (traffic and maintenance activity), which will be permanent, carried out during the entire operation period.

2.8.5.4 Vibration level

During the operation of the motorway, vibrations of different intensities will be generated depending on the volume of traffic, the average driving speed, the type of vehicles that transit a certain sector, the structure of the basement. Also, the effect of these vibrations is based on the type of materials out of which the buildings are constructed, the footprint of these buildings, their height and age. Based on these factors, at certain values of the vibration intensity, they can have a direct negative effect both on people and on the constructions in the vicinity of the motorway.

Ground vibration (GBV) is the oscillatory motion of the ground around an equilibrium position that can be described in terms of displacement, velocity or acceleration. Vibrational displacement represents the distance a body moves away from its static position. Velocity is the instantaneous movement of this body in a certain period of time, and acceleration is the rate of change of speed.

The frequency range of greatest concern for GBV is approximately 1 Hz to 100 Hz. Typical vibrations from transport activities usually fall within the range of 10 – 30 Hz and with a median around 15 Hz.

Peak Particle Velocity (PPV – mm/s) is generally accepted as the most suitable indicator for assessing the building damage potential. It represents the highest value recorded at the level of the three mutually perpendicular displacement directions of the vibratory movement.

At the European level, there are the following standards that establish limits for vibrations in the context of affecting buildings: the Dutch standard SBR-A (2017), the German standard DIN 4150-3 (2016), the British standard BS 7385-2 (1993) and the Swiss SN 640 312: (1989). These are shown in the following table.

Table no.2-38 Vibration limit values for constructions

The type of building	SBR-A limits depending on the type of vibration manifestation (mm/s^2)			DIN 4140-3 limits depending on the type of vibration manifestation (mm/s^2)		BS 7385-2 limits depending on the type of vibration manifestation (mm/s^2)		Limits SN 640 312: 1989 depending on the type of vibration manifestation (mm/s^2)
	Short term	Repetitive – short duration	Continuously	Repetitive – short duration	Continuously	Repetitive – short duration	Continuously	Generally valid
Fragile buildings - monuments	2.9	3.0	2.5	8	2.5	-	-	3
Residential buildings - masonry	5.0	5.0	5.0	15	5.0	15	7.5	5
Concrete buildings	20	20	10	40	10	50	25	12

In the operating stage, the vibrations associated with road traffic will manifest continuously and repetitively, for an indefinite period of time and at different intensities depending on several parameters and situations.

According to a study carried out in Canada (Osama Hunaidi - Traffic vibrations in buildings), car traffic can generate vibrations between 5 and 25 Hz (oscillations per minute). The amplitude of the vibrations at the level of the driving zone of the motorway varies between 0.005 and 2 m/s^2 (0.0005 and 0.2 g) measured as acceleration or 0.05 and 25 mm/s measured as speed. Predominantly, the frequencies and amplitude of the vibration depend on many factors, including the condition of the road; vehicle weight, speed and system suspension; soil type and stratification; the season of the year distance from the road and the type of building. The amplitude and frequency of the vibrations are influenced by the type and stratification of the soil. In the project area, the predominant soil class is that of mollisols (50%), followed by clay loams (22%) and undeveloped truncated or uncovered soils (22%). Considering the given conditions, the vibration values in the operating stage are estimated to register a maximum of 2 m/s^2 at the level of the road earthwork, this value being located below the most unfavorable limit value presented in the previous table, respectively 2.5 m/s^2 for fragile buildings (Standard SBR-A).

2.8.6 Waste

The waste estimated to be generated both in the execution stage and in the operation stage, as well as the manner of their management, are presented in the following table.

Table no. 6-2 Waste estimated to be generated in the execution stage and in the operation stage

Waste name	Estimated amount to be generated	Place of generation	Unit of Measure	Physical condition*	Waste Code**	Management method
Execution stage						
Mixed municipal waste	36	The social activity of construction personnel	t/year	S	20 03 01	Specially arranged spaces will be created, equipped with bin-type containers. Periodically they will be picked up by authorized operators and transported to the waste depots or to the transfer stations of the localities.
Paper and cardboard	3			S	20 01 01	They will be collected separately in specially arranged temporary storage areas within the site organizations and in the work fronts. Periodically they will be picked up by authorized operators and transported for recovery.
Plastic	2			S	20 01 39	
Metals	1			S	20 01 40	
Metallic mixtures	22	Remains of fittings or other metal elements used in construction	t/ execution period	S	17 04 07	
Plastic waste	9	Material scraps used in construction (PVC pipes, profiles, etc.)		S	17 02 03	
Paper and cardboard packaging	4	Building materials supplied		S	15 01 01	
Packaging of plastic materials	7			S	15 01 02	
Wooden packaging	9			S	15 01 03	
Packaging containing dangerous substances	4			S	15 02 10*	They will be collected and stored selectively, in order to be transported to disposal facilities by authorized operators. The exception is the packaging that is returned to the manufacturer (eg: IBCs).
Absorbents, filter materials (including oil filters not otherwise specified), polishing materials, protective clothing contaminated with	1	Equipment maintenance		S	15 02 02*	They will be collected in sealed bags and stored in specially arranged spaces and will be handed over to authorized operators for disposal.

Waste name	Estimated amount to be generated	Place of generation	Unit of Measure	Physical condition*	Waste Code**	Management method
hazardous substances						
Other engine, transmission and lubricating oils	34			S	13 02 08*	They will be collected in closed, labeled containers, stored in a closed enclosure equipped with a concrete platform. They will be handed over to authorized units for collection and recovery.
Used tires	10			S	16 01 03	They will be collected on concrete platforms from the site organizations and handed over to authorized units for collection and recovery.
Welding waste	0.9	From welding works		S	12 01 13	They will be collected in covered bins located in specially designed spaces and will be handed over to authorized operators for disposal.
Earth and stones other than those specified in 17 05 03*	9	Removals, excavations		S	17 05 04	Stored in the area of the work fronts and later reused as a filling material.
Sludge from emptying basins	9	From the emptying watertight basins in the construction sites		SS	20 03 04	The sludge collected in the drainable basins that serve the sanitary groups will be mandatorily emptied and transported by authorized operators to nearby treatment plants.
Operation stage						
Mixed municipal waste	225	Social activity of CIC employees and traffic users (in short-term parking lots)	t/year	S	20 03 01	Within the CIC and in the short-term parking lots, there will be specially arranged spaces equipped with bin-type containers. Periodically they will be picked up by authorized operators and transported to the waste depots or to the transfer stations of the localities.
Paper and cardboard	44			S	20 01 01	They will be collected selectively in the bins provided in the CIC and short-term parking lots. Periodically they will be picked up by authorized operators and transported for recovery.
Metallic mixtures	56			S	17 04 07	
Plastic materials	9			S	17 02 03	
Paper and cardboard packaging	2	Materials supplied in CIC and used for motorway maintenance		S	15 01 01	They will be selectively collected in temporary storage spaces specially arranged within the CIC. Periodically they will be picked up by authorized operators and transported for recovery.
Packaging of plastic materials	3			S	15 01 02	
Wooden packaging	4			S	15 01 03	
Packaging containing dangerous substances	2			S	15 02 10*	They will be collected and stored selectively, in order to be transported to the recovery facilities by authorized operators. The exception is the packaging that is returned to the manufacturer (eg: IBCs).
Used tires	4	Coming from the plants used for motorway		S	16 01 03	They will be collected on concrete platforms within the CIC and handed over to authorized units for collection and recovery.

Waste name	Estimated amount to be generated	Place of generation	Unit of Measure	Physical condition*	Waste Code**	Management method
Absorbents, filter materials (including oil filters not otherwise specified), polishing materials, protective clothing contaminated with hazardous substances	0.9	maintenance		S	15 02 02*	They will be collected in sealed bags and stored in specially arranged spaces and will be handed over to authorized operators for disposal.
Other engine, transmission and lubricating oils	4			S	13 02 08*	They will be collected in closed, labeled containers, stored in a closed enclosure equipped with a concrete platform. They will be handed over to authorized units for collection and recovery.
Mixtures of fats and oils from the separation of water/oil mixtures from sectors other than those specified in 19 08 09	180	Hydrocarbon interceptors	m^3/year	SS	19 08 10*	They will be collected from the settling chambers of the hydrocarbon interceptors and transported by authorized operators for disposal.
Sludge from drainable basins	45	From the drainable cisterns in the CIC, service spaces and short-term parking lots	m^3/year	SS	20 03 04	The sludge collected in the drainable basins that serve the sanitary groups will be mandatorily emptied and transported by authorized operators to nearby treatment plants.

** Physical state: Solid-S, Liquid-L, Semisolid-SS.*

*** In accordance with the List containing the waste, provided in the Decision of the European Commission 2014/955/EU and in Annex no. 2 of HG no. 856/2002 regarding the record of waste management and for the approval of the list including waste, including hazardous waste, with subsequent amendments and additions.*

In all the stages of the project, contracts will be concluded with authorized companies that will ensure the elimination/utilization of all types of generated waste. All the waste generated as a result of the project, in all its stages, will be temporarily stored only on surfaces specially arranged for this purpose.

In the case of hazardous waste, special measures will be taken to manage it (by separate storage only on impermeable surfaces), so as not to contaminate the rest of the waste or the soil. Within the site organization, the Contractor will set up a platform specially intended for the collection and management of all types of waste that will result from the execution of the works, provided with bins, containers and containers specially intended for the temporary storage of waste. The platform will be set up in such a way as to allow the handling of waste by the contracted authorized companies, in safe conditions. The temporary storage of waste will be done separately, for each type of waste, each container or recipient intended for storage being labeled with the appropriate waste code, according to HG 856/2002 with the subsequent amendments and additions.

3 CONCEPTUAL FRAMEWORK AND IMPACT ASSESSMENT METHOD

3.1 THE CONCEPTUAL FRAMEWORK

The choice of evaluation methodology was based taking into account the requirements of the Milieu/COWI Guide - 2017. The conceptual framework used, which includes the methodological steps followed, is schematically presented in the following figure. In the following the main methodological elements that were considerating for impact assesment process are presented.

In RIM the terms "environmental component" and "sensitive receptor" have been used alternatively to describe environmental factors.

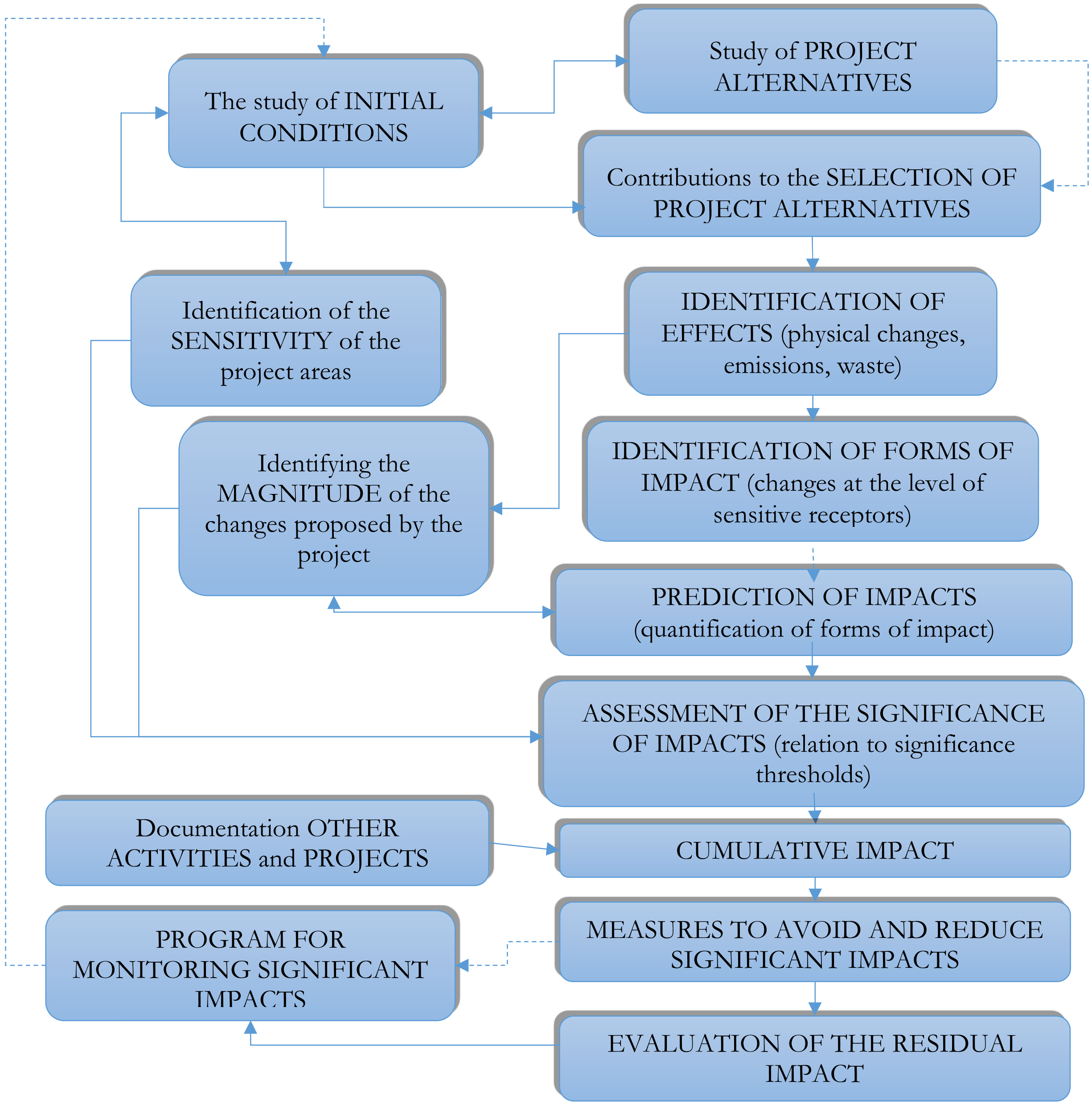


Figure no.3-1 The conceptual framework for environmental impact assessment

3.2 Project alternatives

The evaluation of project alternatives was carried out by means of a multicriteria analysis (see chapter 4).

The evaluation of the project alternatives was carried out by identifying the forms of impact and presenting the advantages and disadvantages that differentiate the alternatives. Advantage represents the absence of a form of impact or a reduced impact, disadvantage represents an additional form of impact or a more extensive impact.

3.3 IDENTIFICATION AND QUANTIFICATION OF EFFECTS

The methodology proposed within this RIM proposes a differentiation between the concept of "effect" and that of "impact". The effects refer to the changes caused to the physical environment as a direct consequence of the causes (changes) generated by the project (both in the construction and operation stages). The effects mainly include: topography modification, pollutant emissions, waste. Impacts include changes at the level of sensitive receptors, such as affecting the population and human health, loss, alteration or fragmentation of habitats, reducing the population of wild flora and fauna species, changing the landscape, etc.

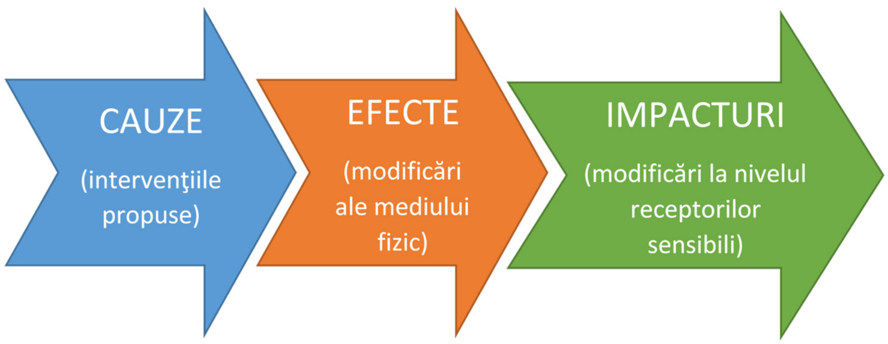


Figure no.3-2Conceptual model applied for the identification of effects and forms of impact

The identification of the effects involved the following steps:

- Analysis of all interventions proposed within the project;
- Identification of all activities resulting from the construction and operation of investments;
- Identification of all the changes (effects) that occur in the physical and socio-economic environment as a result of the implementation and operation of the interventions.

The evaluation includes the effects that can be quantified and that lead with certainty to the emergence of a form of impact. The identification of the effects was achieved with the help of a matrix that allowed the analysis of the stages and activities corresponding to each of the investment objectives proposed within the project.

The effects were quantified based on:

The information provided by the designer (affected surfaces, spatial location, quantities, volumes of works, etc.);

- Calculations based on agreed methodologies (eg: atmospheric emissions calculations made according to EMEP/EEA or AP42, rainwater loading calculations collected from the highway according to the SETRA methodology);
- Estimates based on the experience of similar projects or provided within specific guidelines (eg: Guide on the management of construction and demolition waste, ARPM Sibiu, 2011).

All the quantitative results of this evaluation are presented in the chapters 2 and 7.

3.4 IDENTIFICATION OF FORMS OF IMPACT

The identification of the forms of impact was made based on the list of effects (see previously), as well as an analysis based on a matrix. The principle of analysis is relatively simple and is based on the identification of changes that may occur at the level of sensitive receptors as a result of any effect generated by the project. For example: air pollutant emissions can generate an impact both on air quality and on the comfort of citizens, the state of health of the population, biodiversity components, cultural objectives/historical monuments, or climate change.

In the impact identification stage, all the causal links between the identified effects and the potential impacts are listed without analyzing the probability of occurrence of the impacts or their size

3.5 IMPACTS PREDICTION

It represents a qualitative and quantitative assessment of the forms of impact. The parameters considered for the assessment of the impacts are:

- Project phase (construction, operation, decommissioning);
- Type of impact (positive, negative);
- The nature of the impact (direct, secondary, indirect);
- Spatial extension (local, zonal, regional, national, cross-border);
- Duration (short, medium, long term);
- Frequency (accidental, intermittent, periodic, continuous, one time/temporary);
- Probability (uncertain, improbable, likely, very likely);
- Reversibility (reversible, irreversible).

Figure no.3-3The parameters taken into account for the evaluation of the impacts

Evaluation parameter	The variables of the evaluation parameters	Description of the characteristics of the evaluation parameters variables
Impact type	Positive	The changes contribute to improving the condition/achieving the objectives of the analyzed component.
	Negative	The changes contribute to the deterioration of the condition/failure to achieve the objectives of the analyzed component.
Impact nature	Direct	Main impact form produced by the occurrence of an effect.
	Secondary	Impact form generated by a direct impact.
	Indirect	The form of impact that appears not due to an effect generated by the project, but to some activities that are encouraged to occur as a consequence of the project.
Cumulative potential	Yes	The impact has the potential to generate, combined with other effects/impacts from the same project or from different projects, greater changes at the level of the analyzed environmental component.
	No	There is no risk that this impact will produce, combained with other impacts, larger changes in the environmental component.
Spatial extension	Local	The impact is manifested on surfaces smaller than the limit of a UAT, in one or more locations of the project.

Evaluation parameter	The variables of the evaluation parameters	Description of the characteristics of the evaluation parameters variables
	Zonal	The impact is manifested on surfaces larger than the limit of a UAT, in one or more locations of the project.
	Regional	The impact is manifested at the region level (several counties), meaning the entire length of the project and the adjacent areas.
	National	The impact produces changes felt throughout the country.
	Border	The impact is manifested on the territory of some neighboring countries.
Term	Short term	The impact is manifested only during the intervention.
	Medium term	The impact manifests itself during construction works and for a short post-construction period (or during decommissioning and a short post-decommissioning period).
	Long term	The impact manifests itself during the entire construction and operation period (or during the entire period of decommissioning and many years after decommissioning).
Frequency	Accidentally	The impact manifests itself only as a result of an accident (accidental pollution).
	One time/temporary	The impact is manifested only once in one of the project phases. Most often associated with a short duration.
	Intermittent	The impact occurs repeatedly/discontinuously, with an unknown frequency.
	Periodic	The impact manifests itself repeatedly, with a known frequency.
	Without interruptions	The impact manifests continuously after the moment of occurrence (Attention! It must be correlated with the "Duration" parameter: "without interruption" on "medium term" means that the impact is continuous during the construction period).
Probability	Uncertain	The probability of the impact is unknown, most likely it will not occur.
	Unlikely	The probability of the impact occurring is low – it may occur.
	Probable	The probability of the impact occurring is high – it is very likely to occur.
	Very likely	Impact production is certain.
Reversibility	Reversible	After the impact disappears, the affected component can return to its initial conditions.
	Irreversible	The impact does not allow the return to the initial conditions of the affected environmental component.

Where possible, the prediction of impacts is carried out quantitatively and can be expressed in surface units (hectares) or time (number of years), as well as regarding the changes occurring at the level of the studied component/sensitive receptor (decrease/increase in population numbers, number of affected residents, etc.). Quantitative assessments are mainly based on numerical modeling of the behavior of pollutants or processes and the use of spatial analysis (GIS). In situations where a precise quantification is not possible (information is missing, there is no quantification method, the degree of uncertainty is high, etc.) the qualitative assessment classes of each parameter are used (see the information specified in the brackets of the previous enumeration).

In the evaluation process, to the extent possible, redundancies were eliminated. More precisely, when two effects lead to the same form of impact on the same surface and in the same time interval, the effect was maintained which may also include the other redundant effects (e.g. Vegetation removal, Soil compaction and Soil structural changes leading to habitat alteration on the same surface).

3.6 Evaluation of the significance of impacts

The evaluation of the significance of the impact was carried out based on the following two criteria:

The Sensitivity of the area and the components located in the study area;

The magnitude of the changes proposed through the implementation of the project.

Sensitivity and magnitude have been established for each environmental factor potentially affected by the project, mentioned in the EIA Directive: water (surface and underground), air, soil, geology, biodiversity, climate, population, human health, material assets, heritage cultural, landscape.

The sensitivity and magnitude classes are presented in the sections dedicated to each environmental factor (sensitive receptor) in Chapter 7.

The sensitivity classes and the magnitude classes do not allow the ad literam framing of all the situations encountered in the project evaluation, but they certainly provide a framework for guiding how to use the "expert opinion" for all the identified forms of impact.

The impact classes used in RIM are:

- Significant impact (negative/positive);
- Insignificant impact (negative/positive);
- No impact (where it is estimated that no changes will occur at the level of the environmental factor or their level is undetectable).

The assessment of the level of significance is initially carried out with the help of the matrix presented in the following table, but the final framing of the impact is based on arguments based on the "expert's opinion".

For a better understanding of the evaluation results, the prediction and evaluation of the significance of the impacts are presented in the same chapter (Chapter 7).

Figure no.3-4 Impact significance assessment matrix

The meaning of impact		Magnitude of changes										
		Very high negative	High negative	Moderate negative	Low negative	Very low negative	No change	Very low positive	Low positive	Moderately positive	High positive	Very high positive
Receptor sensitivity	Very high	Significantly negative	Significantly negative	Significantly negative	Significantly negative	Insignificantly negative	No impact	Insignificantly positive	Significantly positive	Significantly positive	Significantly positive	Significantly positive
	High	Significantly negative	Significantly negative	Significantly negative	Insignificantly negative	Insignificantly negative	No impact	Insignificantly positive	Insignificantly positive	Significantly positive	Significantly positive	Significantly positive
	Moderate	Significantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	No impact	Insignificantly positive	Insignificantly positive	Insignificantly positive	Insignificantly positive	Significantly positive
	Low	Insignificantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	No impact	Insignificantly positive	Insignificantly positive	Insignificantly positive	Insignificantly positive	Insignificantly positive
	Very low	Insignificantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	Insignificantly negative	No impact	Insignificantly positive	Insignificantly positive	Insignificantly positive	Insignificantly positive	Insignificantly positive

Color code	The meaning of impact	Necessary measures
	Significant negative impact	If effective reduction measures cannot be formulated (residual impact should not be significant), measures must be adopted to avoid the impact (changing the proposed location, changing the proposed technical/technological solution, etc.) or, as the case may be, compensation measures.
	Insignificant negative impact	Avoidance/reduction measures are not necessary, but some measures can be formulated to ensure that the negative impact is kept to a minimum.
	No impact	It is not the case
	Significant positive impact	Any measure that can lead to the extension/multiplication of effects
	Insignificant positive impact	

3.7 The cumulative impact

The evaluation of the cumulative impact was based on the following steps:

- Identification of important existing and/or proposed projects in the project implementation areas;
- Analyzing the probability that these projects generate forms of cumulative impact (contribute with additional effects and/or synergistic effects with the analyzed project);
- Evaluation of the significance of the cumulative impact.

The cumulative impact assessment process involves addressing a number of uncertainties related to the characteristics of the other projects (certainty of implementation, spatio-temporal dynamics, quantification of impacts, etc.). These uncertainties make it difficult to quantitatively estimate the cumulative impact. Consequently, within the RIM, the evaluation of the cumulative impact was carried out on the basis of the assessment matrix of the significance of the impact, taking into account the most unfavorable scenarios regarding the occurrence of the impact.

3.8 Measures to avoid and reduce the impact

Measures for reducing or avoiding the impact were proposed for all forms of impact, where the possibility of appearance of a significant impact, was identified. The measures that can eliminate or drastically reduce the probability of the occurrence of a significant impact were considered avoidance measures and the measures that can ensure a reduction in the significance of the impact (from significant to insignificant) by reducing the magnitude of the changes, were considered reduction measures.

Avoidance and mitigation measures that meet the above requirements have been included in Chapter 9.1, residual impact assessment.

Other measures to reduce the impact can be found formulated within each section of Chapter 7, corresponding to the impact assessment for each environmental factor. These are rather good practice requirements and/or generally applicable conditions and were not taken into account in the residual impact assessment.

3.9 Residual impact

The residual impact represents a prediction of the significance of the impact under the conditions of the implementation of the avoidance and reduction measures. Conventionally, within the RIM, a high level of efficiency of each proposed measure was considered (efficiency to be tested through the monitoring program).

The residual impact assessment was carried out based on the impact significance assessment matrix using the same sensitivity and magnitude classes presented in each section of Chapter 7 for each environmental factor.

3.10 Monitoring

The proposed monitoring program took into account two main requirements:

- The need to evaluate the effectiveness of measures to avoid and reduce the impact;
- The need to ensure that the predicted level of impacts (from RIM) will not be exceeded through the construction and operation of the project.

Systematic ex-post monitoring of the effects and/or impacts resulting from the construction and operation of the project provides the opportunity to identify if the forecasted impact does not develop as predicted, so that remedial measures can be taken.

Also, monitoring allows the consideration of additional or unforeseen relevant information (e.g. climate change or cumulative impact), which also allows the implementation of remedial measures.

4 ANALYSIS OF REASONABLE ALTERNATIVES

4.1 ALTERNATIVE "0"

Alternative "0" corresponds to the option of not realizing the project, respectively of maintaining the current road transport solutions on the route Suceava - Siret.

The advantages of not implementing the project are:

- **Biodiversity**- maintaining unchanged the use of the land on the entire area proposed for the construction of the highway and the expressway. The proposed route crosses pastures, pastures, agricultural lands, wooded areas, riparian vegetation and surface water bodies that constitute favorable habitats for several species of wild animals such as those of community interest *Spermophilus citellus* and *Lutra lutra*. Likewise, there will not be a barrier in the forest area north of Suceava, an area that represents a favorable habitat for mammal species, such as *Capreolus capreolus*, *Cervus elaphus* or *Sus scrofa*;
- **Water -**maintaining water quality (there will no longer be potential risks of contamination of water bodies crossed by the proposed route);
- **Soil –**maintenance of soil surfaces with vegetation;
- **The landscape -**maintaining the existing semi-natural and anthropogenic elements;
- **Cultural heritage –** maintaining heritage elements;
- **The social and economic environment –**maintaining the existing situation (no other emissions will be generated in the area of the localities and no other sources of noise will appear).

However, these disadvantages can be reduced, or even excluded, by implementing a set of measures for each component potentially affected by the project (social-economic component, biodiversity, surface water bodies, soil, air).

A solution proposed in the MGPT for long travel times that lead to non-competitive services on key national connectivity corridors consists in improving traffic speeds on the main national connectivity corridors identified through investments in new routes (highways and expressways). From a socio-economic point of view, **the non-implementation of the project represents the worst alternative**, the main arguments that allow us to make this statement are the following:

1. From the point of view of the impact on the economic environment, the lack of an adequate transport infrastructure can hinder development, and the national/regional economy stagnates or even registers a regression. Difficult access (measured in time and cost) to areas with economic, residential or leisure functions of a region makes that region less attractive both for the business environment and for the population. The high transport costs (whether we are talking about raw materials, semi-finished products or finished products) and the difficult movement of people in a certain area are factors that discourage economic investment and lead

to the gradual decline of that area[4]. It is estimated that the lack of highways leads to losses of billions of euros from the national economy[5].

2. The Suceava - DN2H highway and the DN2H - Frontiera Siret expressway will generate important positive socio-economic effects, including by "reducing distances" and regional development by increasing the area of "gravitational" economic influence of large cities on their smaller "satellite" localities, such as and by facilitating economic exchanges with Ukraine. The project aims to build a highway sector between the municipalities of Suceava and the connection node with DN2H and an express road sector between this connection node and the border with Ukraine. The highway and the expressway also connect in Suceava with the A7 Highway (Ploiesti - Buzău - Focşani - Bacău - Paşcani - Suceava). **The lack of an infrastructure suitable** for traffic conditions that would attract different economic operators for the economic development of the region, leads to a significant negative impact on the economic environment.
3. From the social impact point of view, there are many aspects that can be taken into account.

Considering the above, Alternative "0" does not represent a viable option from the point of view of environmental impact. Highway constructionand the express road is a necessary option under the conditions in which it can meet the following two major objectives:

- Reduction of the current significant negative impact due to road transport carried out on existing roads in the area;
- Avoiding the generation of significant additional impacts by choosing the route and constructive solutions of the highway.

4.2 Alternatives identified and studied

At the time of the Feasibility Study in 2020, an analysis of the alternatives was carried out for the Suceava - Siret section. 7 route variants were analyzed (within AMC1). The analysis was carried out jointly with the analysis of alternatives for the Paşcani - Suceava highway. In the case of Suceava – Siret, 7 route variants were analyzed, shown in the following figure (SVS V1, SVS V2, SVS V3, SVS V3.1, SVS V4, SVS V5, SVS V8)

4The Competition Council, 2013, Sectoral Investigation on the road and highway construction market

5https://www.wall-street.ro/articol/Auto/181033/lipsa-autostrazilor-cea-mai-acuta-problema-a-romaniei-cum-pierde-economia-tarii-miliarde-si-ce-proiecte- should-urgent.html

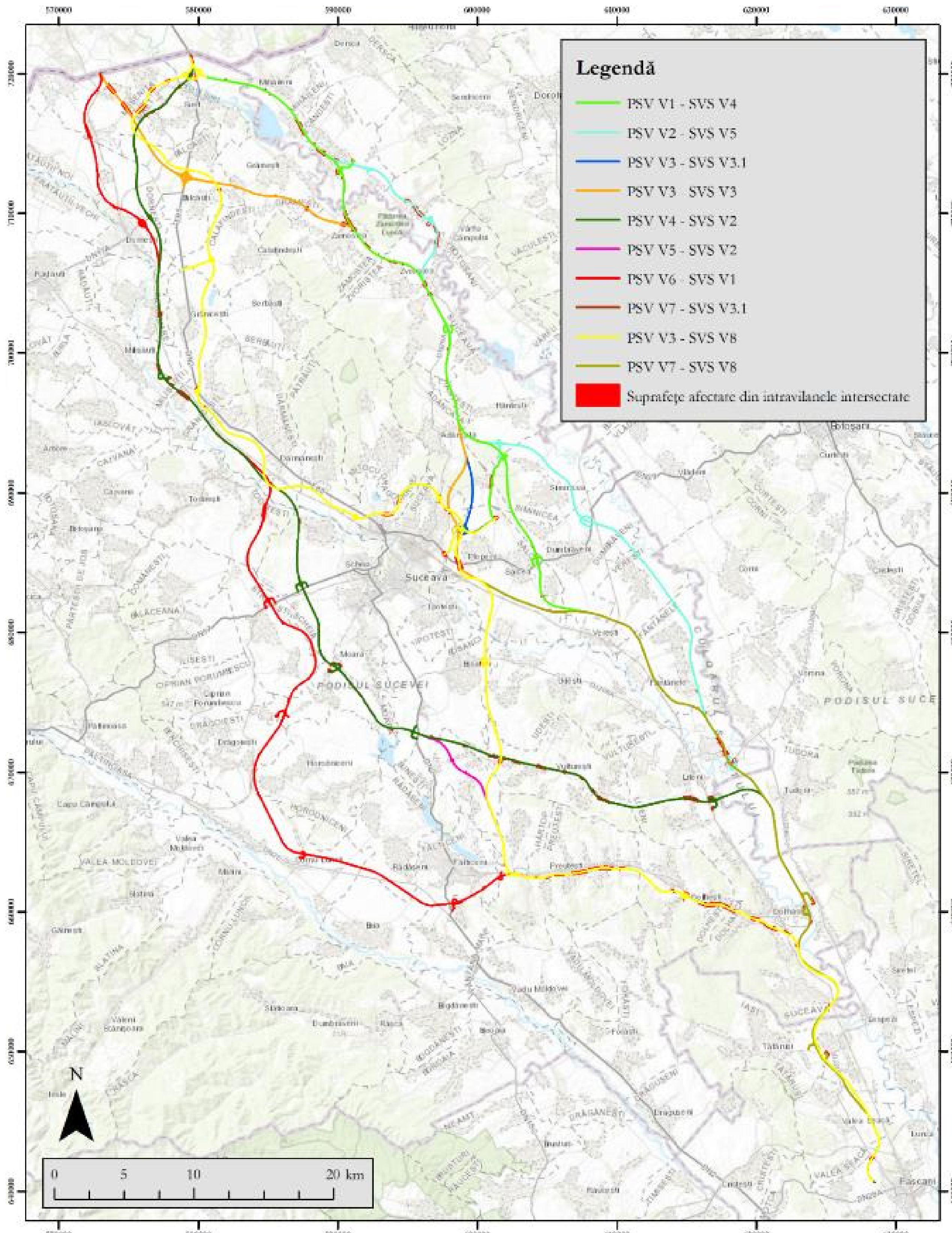


Figure no.4-1 The analyzed alternatives and the areas inside the urban areas potentially affected by the change in air quality

For the Suceava – Siret project, the AMC1 results indicated the SVS V8 and SVS V2 alternatives as the most advantageous alternatives.

Following the analysis carried out in AMC 2, Alternative 8 was chosen as the optimal alternative for the Suceava - Siret sector. This alternative avoids the intersection with Natura 2000 sites, although it borders several sites. The alternative also presents advantages in terms of noise, land use, permeability, the risk of fauna collision with road traffic. The following figure shows the intersection areas of the alternatives analyzed in AMC 2 with the Natura 2000 sites.

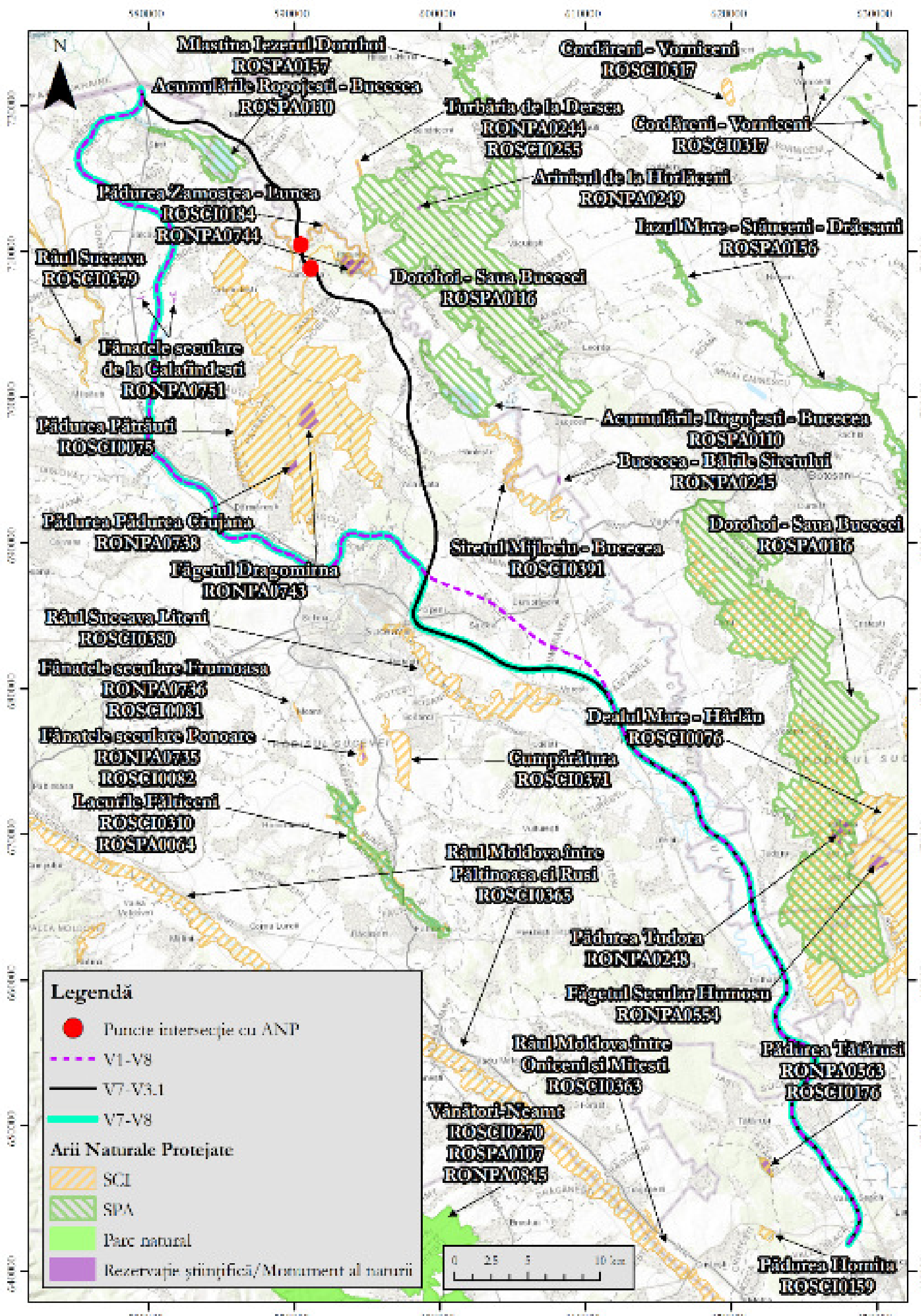


Figure no.4-2 Natura 2000 sites intersected or adjacent to the routes analyzed in AMC 2

CONSULTANȚĂ DE MEDIU

5 DESCRIPTION OF THE RELEVANT ASPECTS OF THE CURRENT STATE OF THE ENVIRONMENT

5.1 WATER/BODIES OF WATER

5.1.1 Surface water

The project is located in the Siret River Basin. The Siret hydrographic basin is located in the eastern part of Romania and is bordered to the east by the Prut hydrographic area, to the west by the Olt, Mureş, Someş and Tisa hydrographic areas, to the south by the Ialomiţa and Dobrogea Litoral hydrographic basins, and to the north by the border with Ukraine. The basin is mostly located upstream from the Adjud city, in the Moldavian Plateau, and the southern extremity is part of the Romanian Plain until it flows into the Danube near the Municipality of Galați.

The registered watercourses intersected by the project are presented in the following table.

Table no.4-1Registered surface water courses intersected by the project

Hydrographic basin	Cadastral code	Watercourse name	Confluence with:
lace	XII_1.....	Siret	Negostina
	XII_1.3....	Negostina	Siret
	XII_1.17.24a...	Horaiț	Soloneț
	XII_1.17.27...	Hătnuta	Suceava
	XII_1.17.28...	Pătrăuţeanca	Scheia
	XII_1.17.30...	Dragomirna	Mitoc
	XII_1.17.30.1..	Mitoc	Podul Vătafului
	XII_1.17.30b...	Podul Vătafului	Plopeni

The project intersects 7 bodies of surface water. Details regarding the works to be carried out in the area of water bodies (eg: bridges, decks, consolidations, etc.) are presented in chapter 2 of this Report. The following table shows the intersected water bodies.

Table no.4-2Surface water bodies intersected by the project

No. crt.	Hydrographic space code	The hydrographic basin	Water body name	Water body code
1.	RO10	Siret	Horait	RORW12.1.17.24a_B1
2.			Hatnuţa + Bocancea	RORW12-1-17-27-1
3.			Pătrăuțeanca	RORW12-1-17-28-1
4.			Dragomira (Lacul Dragomirna – CF Suceava)	RORW12-1-17-30-B3
5.			Mitoc	RORW12-1-17-30A-1
6.			Podul Vătafului	RORW12-1-17-30B-1
7.			Negostina	RORW12-1-3-1

The following figure shows the surface water bodies intersected by the project's catchment area. It is necessary to mention the fact that the intersections of the catchment area with water bodies are represented in the figure with a corresponding color for each water body. The analysis of the intersections was carried out using the data provided by the beneficiary (catchment area of the project) and the spatial data for the water bodies available on the website of the European Environment Agency https://www.eea.europa.eu/).

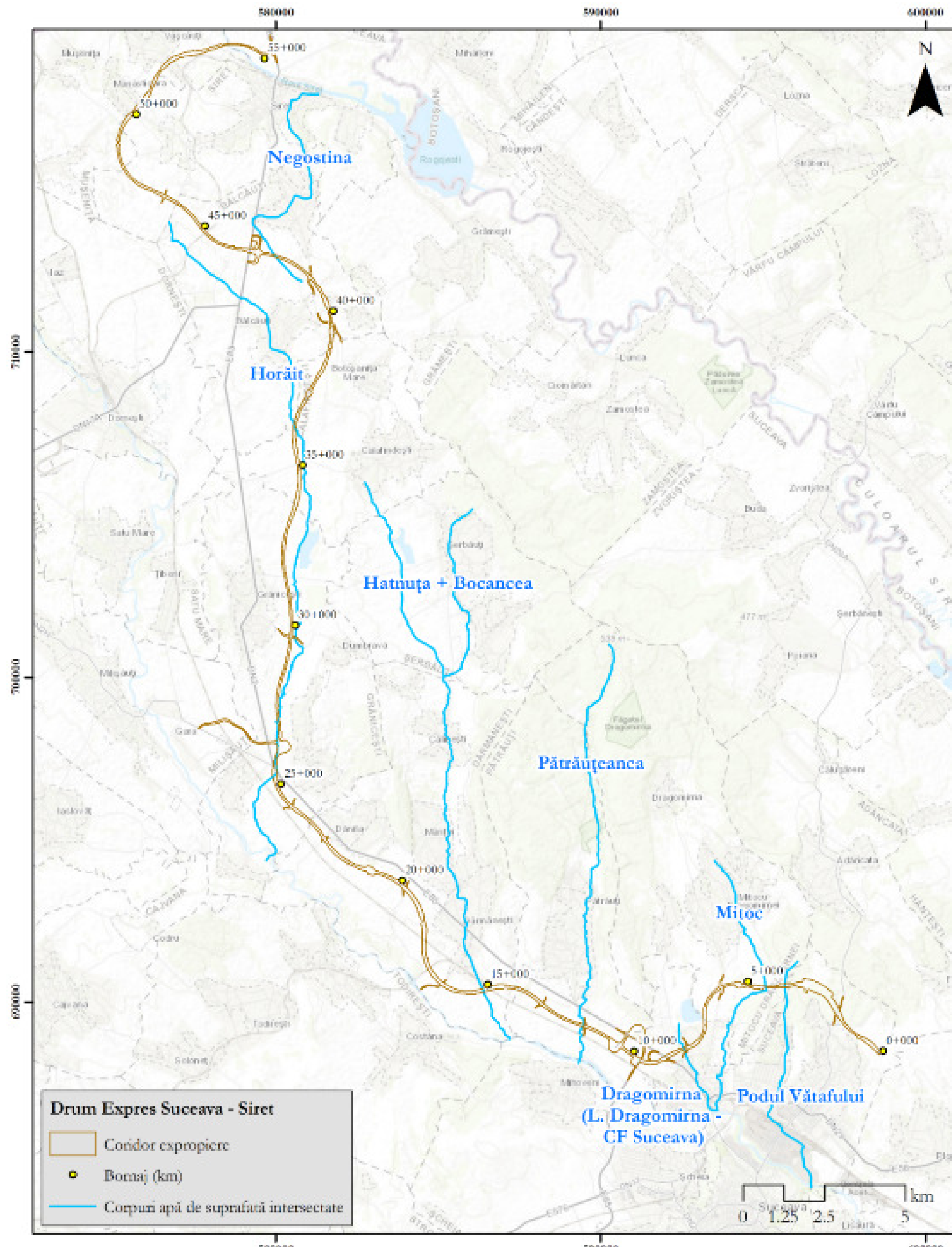


Figure no.4-3Water bodies that intersect with the Suceava - Siret project

The environmental objectives established within the Basin Management Plans, cycle III, for the water bodies influenced or potentially influenced by the project are shown in the following table.

Table no.4-3Presenting the current status and environmental objectives for the surface water bodies intersected by the project and the deadlines for achieving them

No. crt.	Code and name of the water body	Protected areas	Assessed status of the water body		Environmental objective		The deadline for achieving the objective	
			Ecological status	Chemical state	Ecological status	Chemical state	Ecological status	Chemical state
1.	RORW12.1.17.24a_B1	SCI/SPA	Good	Good	Good	Good	2016	2016
2.	RORW12.1.17.27_B1	SCI/SPA	Good	Good	Good	Good	2016	2016
3.	RORW12.1.17.28_B1	SCI/SPA	Good	Good	Good	Good	2016	2016
4.	RORW12-1-17-30-B3	SCI/SPA	Good	Good	Good	Good	2021	2021
5.	RORW12.1.17.30a_B1	SCI/SPA	Good	Good	Good	Good	2016	2016
6.	RORW12.1.17.30b_B1	SCI/SPA	Moderate	Good	Good	Good	2027	2016
7.	RORW12.1.3_B1	SCI/SPA	Good	Good	Good	Good	2016	2016

5.1.2 Ground water

In the project area, 2 underground water bodies were identified: ROSI03 Lunca Siretului and its tributaries and ROSI06 Suceava.

According to the Management Plan of the Siret Hydrographic Area, the ROSI03 and ROSI06 groundwater bodies reach good chemical status and the quantitative status is classified as good.

The following figure shows the location of the Suceava-DN2H highway and the DN2H-Frontiera Siret expressway in relation to underground water bodies.

Table no.4-4The underground bodies overlapping the proposed route of the Suceava-DN2H highway and the DN2H-Frontiera Siret expressway

Water body code	Body of water	Type of water body	Quantitative status	Chemical state
ROSI03	Lunca Siretului și afluenții săi	ground	Good	Good
ROSI06	Suceava	Of depth	Good	Good

Phreatic groundwater body ROSI03 Lunca Siretului și afluenții săiand its tributaries

The phreatic groundwater body is porous-permeable, of Quaternary age, it develops in the deposits in the meadow and terraces of the Siret River and its tributaries. The phreatic aquifer is confined in sands and gravels with boulders, covered by deposits of clays, silty clays or sandy clays. The permeable layers are about 5-10 m thick. The type of water is bicarbonatato - calcium or bicarbonatato - calcium - magnesian. The hydrostatic level generally has a free character, in the presence of the roof of the phreatic layer of clay-silty deposits, an ascending character is observed. According to the Management Plan of the Siret Hydrographic Area, the chemical and quantitative status of the underground water body is good.

Deep underground water body ROSI06 Suceava

The body of water is porous and permeable, develops in formations of Sarmatian age and has a transboundary character. The Sarmatian deposits have a wide development in the Moldavian Platform and are constituted by an alternation of clays, marls, sands and centimeter intercalations of calcareous sandstones and oolitic limestones. Lithologically, the basal part of the Sarmatian (Volhynian) is represented by an alternation of: clays, sands, sandstones and oolitic sandstones, in which thin intercalations of bentonite and andesitic tuff are also found. The upper horizon consists of sands, clays and sandstones. The number of permeable porous horizons varies from one well to another and is between 2 and 8 horizons. The stack of Volhynian deposits has a thickness of over 250 m, and the Fălticeni borehole intercepted 4 horizons consisting of medium and coarse sands. The flow obtained from this well is 0.4 l/s. In the drilling from Truşeşti, the thickness of the Volhynian deposits is 100 m, at the base on approximately 13 m a stack of eggplant clays belonging to the Buglovian develops. The Volhynian deposits are predominantly made up of aubergine clays, the only intercalation of sands occurring at about 50 m (the thickness of the sands is about 40 cm). The flow rate obtained is 0.3 l/s, and the water is of good quality. In the Roma well, 4 porous-permeable horizons were identified, the flow obtained being 1.3 l/s, and the water falls within the potability limits.

Figure no.4-4Groundwater bodies crossed by the Suceava-DN2H highway project and the DN2H-Frontiera Siret expressway

In the case of underground water bodies in the project area, the qualitative and quantitative status was determined to be good according to the Management Plan of the Siret Hydrographic Area. The following table shows the bodies of underground water, their condition and environmental objectives.

Table no.4-5The status and environmental objectives for the underground water bodies intersected by the project and the deadlines for achieving them

Name of underground water body	Code	condition		Environmental Objective - Status		The deadline for achieving the objective	
		Quantitative	Chemical	Quantitative	Qualitative	Quantitative	Qualitative
Lunca Siretului și afluenții săi	ROSI03	Good	Good	Good	Good	2020	2020
Suceava	ROSI06	Good	Good	Good	Good	2020	2020

5.1.1 Protected areas

The protected areas provided for the surface water bodies within the Management Plans of the Siret Hydrographic Space are presented in the following table for each water body intersected by the project catchment.

Table no.4-6The protected areas identified for each surface water body intersected by the project

Water body name	Water body code	Protected areas
Horait	RORW12.1.17.24a_B1	-
Hatnuța + Bocancea	RORW12-1-17-27-1	Protection areas for habitats and species
Pătrăuțeanca	RORW12-1-17-28-1	Protection areas for habitats and species
Dragomira (Lac Dragomirna – CF Suceava	RORW12-1-17-30-3	-
Mitoc	RORW12-1-17-30A-1	-
Podul Vătafului	RORW12-1-17-30B-1	Protection areas for habitats and species
Negostina	RORW12-1-3-1	Protection areas for habitats and species

Regarding the designated protected areas on the groundwater bodies, protected areas have been identified.

Table no.4-7Protected areas associated with groundwater bodies of interest

Code	Body of water	Type of water body	Protected area
ROSI03	Lunca Siretului și afluenții săi	ground	-
ROSI06	Suceava	Of depth	-

5.2 The Air

5.2.1 Brief characterization of existing pollution sources in the project area

The main sources of ambient air pollution existing in the project area are represented by:

- Car traffic on area roads, mainly DN2 (E85), DN2H, DN29A, DJ178B, DJ208D, DJ208T, DJ290A, DJ290D, DJ 291A. Characteristic pollutants: nitrogen oxides, sulfur oxides, carbon oxides, particles containing heavy metals, volatile organic compounds;
- Car traffic on the dirt roads related to the lands in the project area – undirected surface sources. Characteristic pollutants: powders in suspension. A characteristic of the traffic on earth operation roads is that it generates significant amounts of dust in the atmospheric air, by entraining it from the wheels of the vehicles;
- Agricultural activities in the area – non-directed stationary sources generating dust particles;
- Space heating in the neighboring towns, which is mainly carried out in stoves operating on solid fuel (wood) - directed stationary sources. Characteristic pollutants: nitrogen oxides, sulfur oxides, carbon oxides, particles containing heavy metals, volatile organic compounds;

In the vicinity of the project, no economic agents have been identified that carry out activities with the potential for atmospheric pollution, which fall under the scope of the Industrial Emissions Directive, or other industrial sites with a significant potential for pollution (mining operations, quarries, concrete plants, etc.).

5.2.2 Current state of air quality

To determine the current state of air quality in the project area, official public sources were analyzed, as follows:

- Air quality maintenance plans (PMCA) related to Suceava county;
- The values of PM10, NO_2, NOx and SO_2 concentrations measured in the fixed air quality monitoring stations of the National Air Quality Monitoring Network (RNMCA) in the relevant stations for the project area;

- European air quality maps for PM10, NO_2 and NOx, published in 2020 on the website of the European Environmental Protection Agency.

According to the dispersion maps presented within the PMCA Suceava, at the level of 2025 (the modeled base scenario), no exceedances of the analyzed relevant pollutants (PM10, PM2.5, NO_2, SO_2, CO) were estimated.

At the level of the Suceava - Siret project area, relevant automatic air quality monitoring stations within the RNMCA have been identified, respectively:

- SV-1 (located in the northwestern part of the city of Suceava, in the vicinity of the Mihai Eminescu College) – station of the urban type. Pollutants measured: PM10, SO_2, O_3, NO_2. Radius of the representative area: industrial/ 100m - 1km;
- SV-2 (located in the north-eastern part of the city of Suceava, relatively close to the Suceava-Burdujeni railway station) – urban industrial type station. Pollutants measured: PM10, SO_2, NO_2.Radius of the representative area: urban background / 1 - 5 km.
- SV-3 (located in the central part of the Siret town near an industrial area in the east of the town) – urban traffic type station. Pollutants measured: PM10, NO_2.

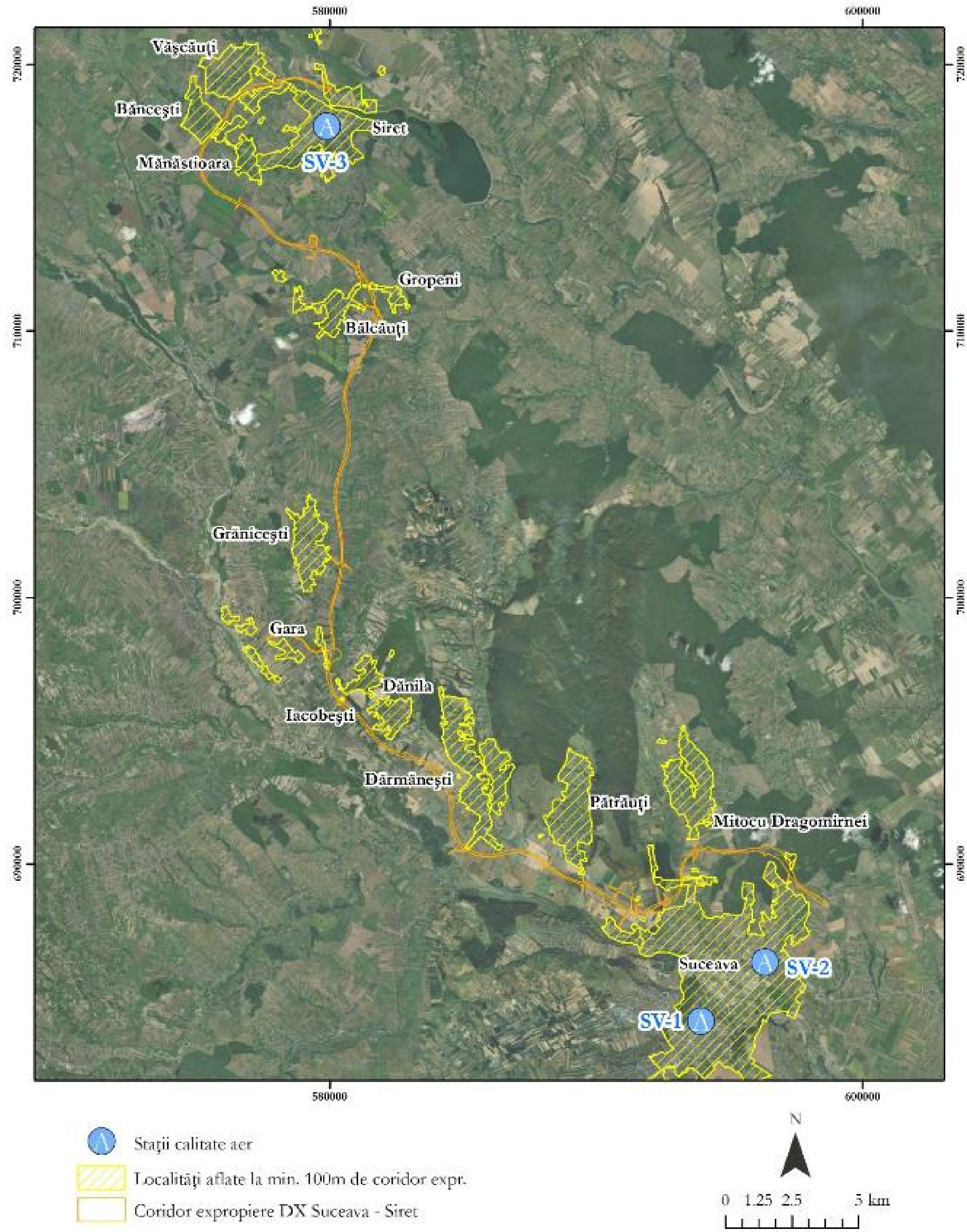


Figure no.4-5Location of air quality monitoring stations in the vicinity of the Suceava – Siret highway route and expressway

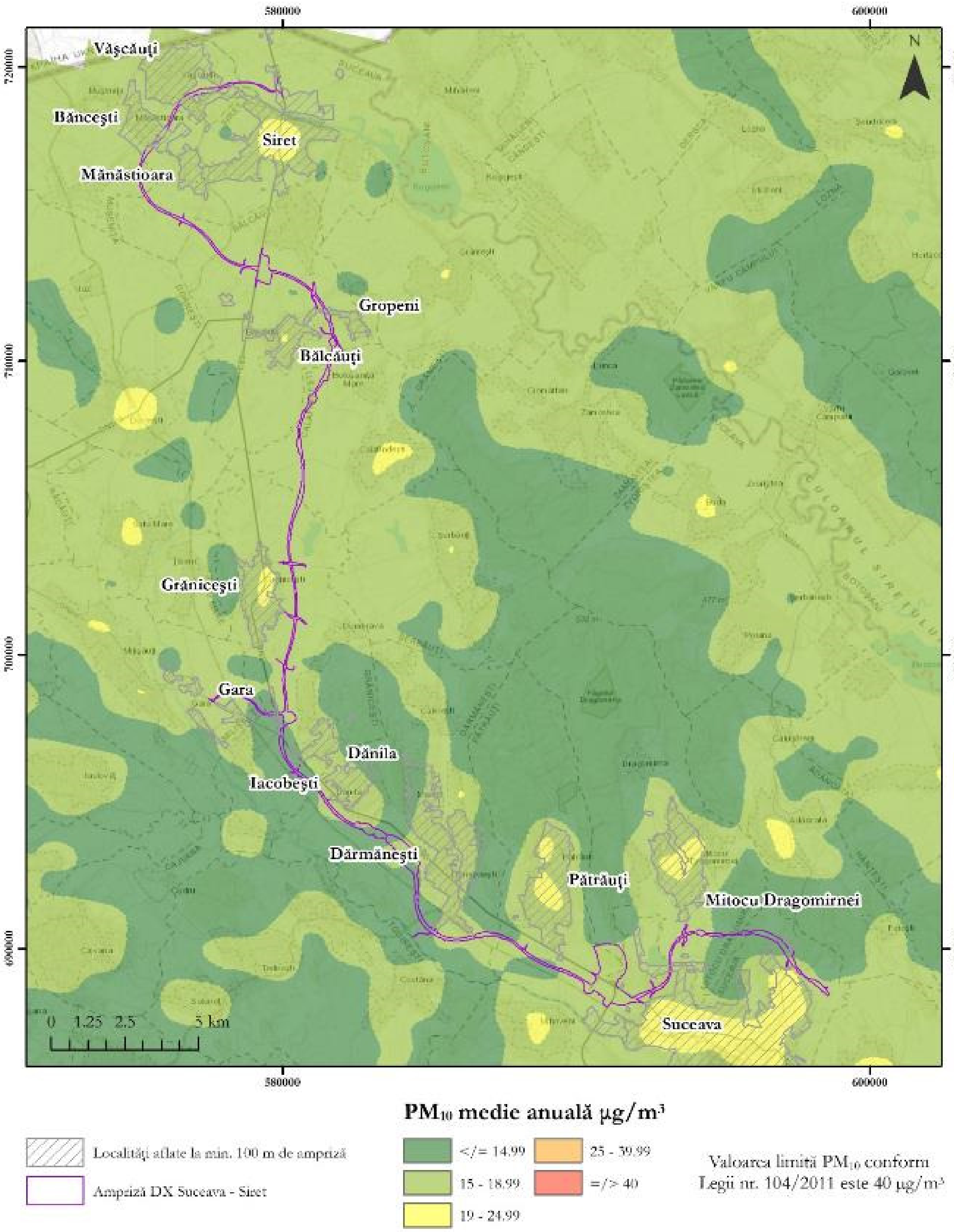


Figure no.4-6The annual average in 2020 for the PM10 indicator in the vicinity of the Suceava – Siret highway and expresway route

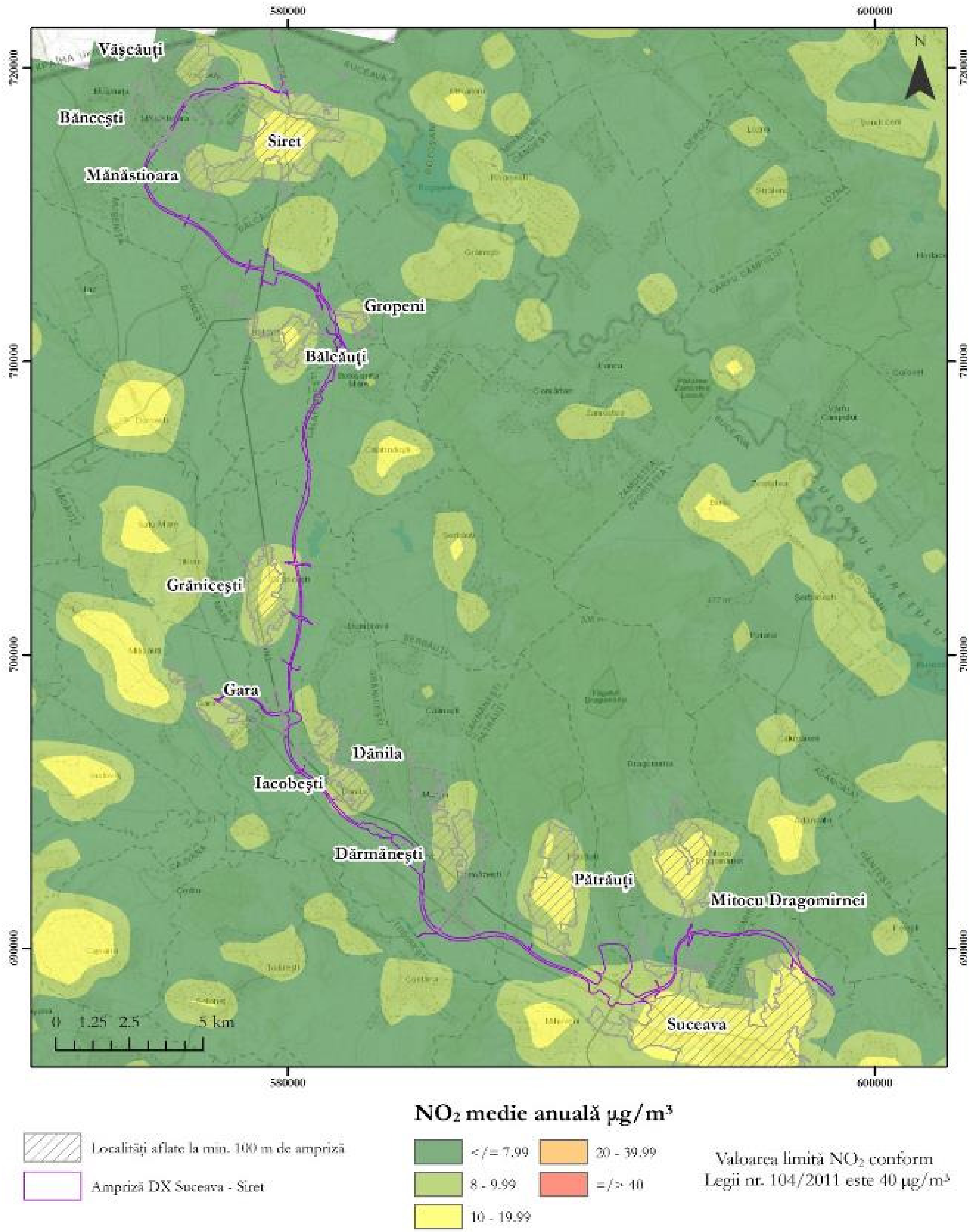


Figure no.4-7The annual average in 2020 for the NO_2 indicator in the vicinity of the Suceava – Siret highway and expressway route

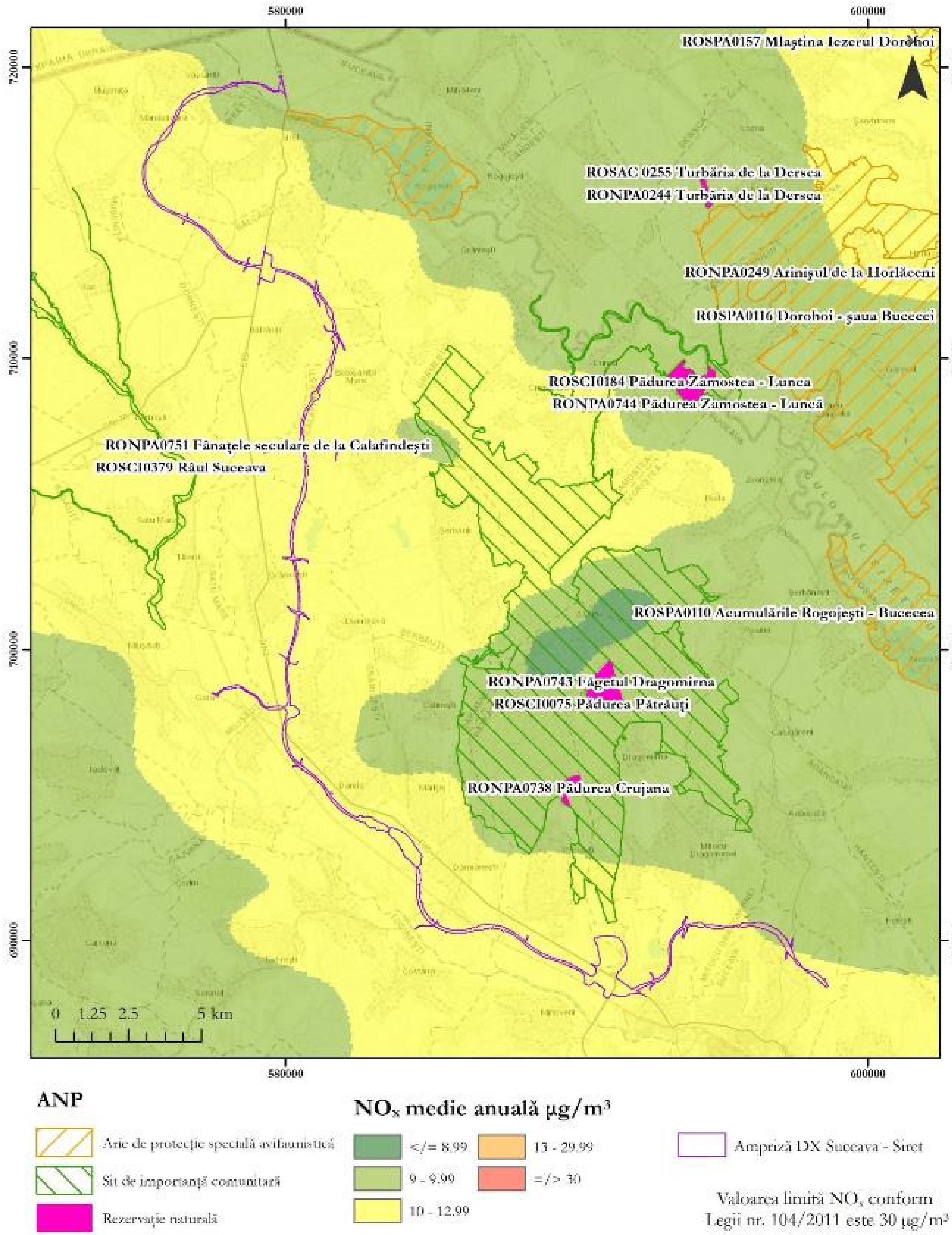


Figure no.4-8The annual average in 2020 for the NOx indicator in the vicinity of the Suceava – Siret highway and expressway route

From the images presented above, it can be observed that in the project area, no exceedances of the concentrations of the analyzed indicators were forecast.

In the case of the PM10 indicator, in the inhabited areas with higher density, respectively in the municipality of Suceava and in the localities of Mitocu Dragomireşti, Pătrăuţi, Grăniceşti and Siret, higher values are observed (with average annual concentrations in the range of 19-25 µg/m^3), the main sources of air pollution that can influence the concentrations of this indicator in these areas, being the road traffic carried out on the roads passing through these localities as well as agricultural activities.

For NO_2, the air quality maps indicate higher values in the municipality of Suceava and in the localities of Mitocu Dragomireşti, Pătrăuţi, Grăniceşti, Bălcăuţi and Siret, but located below the limit value, the range being between 10-20 µg/m3.

The highest values of the NOx indicator in the analyzed area are between 10-13 µg/m^3 as values, but from a legislative point of view, limit values are not established for human health, but for vegetation, the interpretation of the air quality map for this indicator being made in relation to the sensitive areas from the point of view of natural vegetation, respectively to the Natura 2000 sites in the project area.

According to the map below, the Natura 2000 sites are not affected, the areas with higher values are outside the project area.

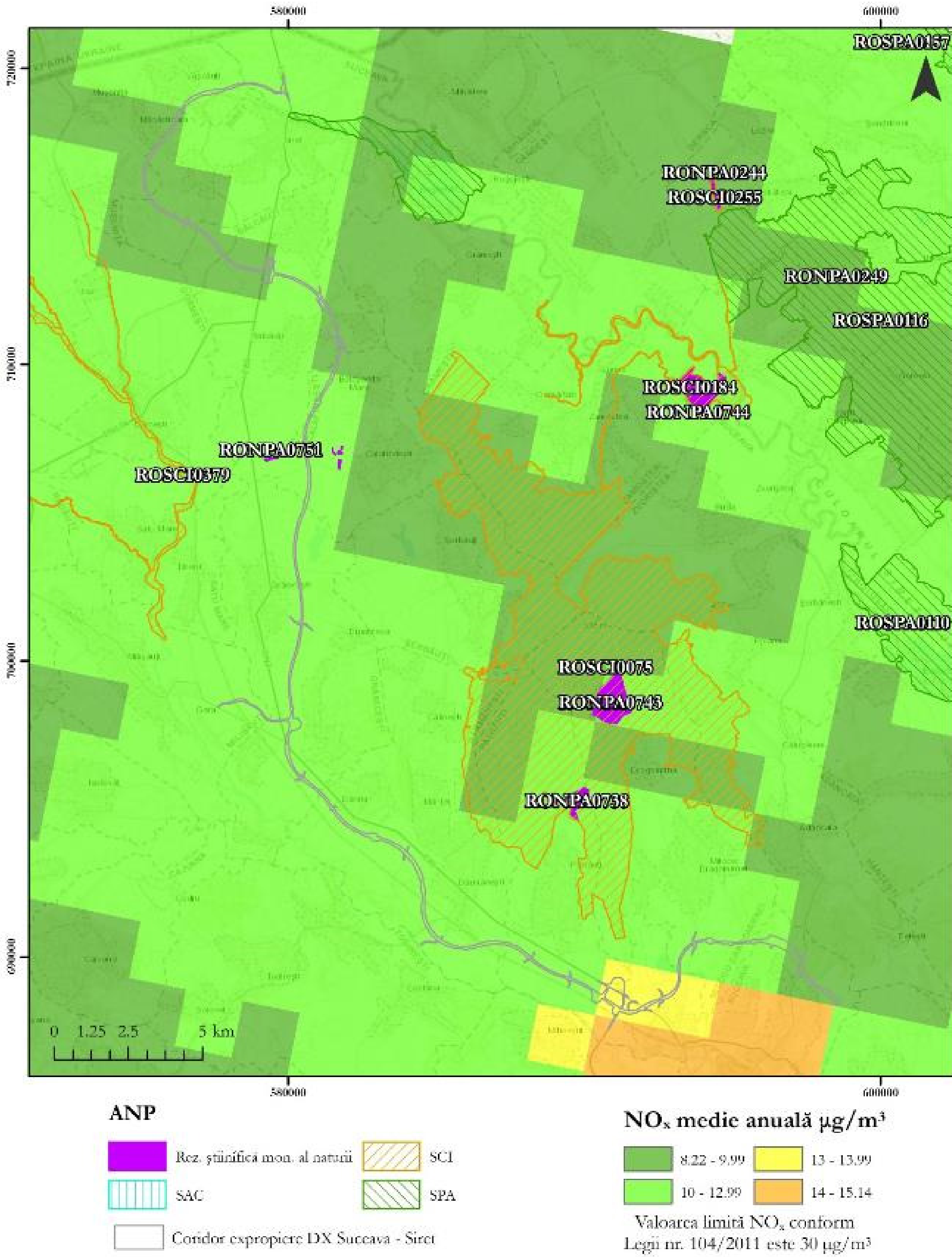


Figure no.4-9The annual average in 2020 for the NOx indicator in the vicinity of the Suceava – Siret highway and expressway route reported to the ANP from the vicinity

5.3 THE SOIL

5.3.1 General information

From a pedological point of view, the analyzed land surface, according to the Pedological Map of Romania at a scale of 1:200,000, is represented by 5 types of soils from the classes of molisols, argiluvisols, hydromorphic soils and undeveloped truncated or exposed soils, the largest areas being occupied by molisols (48.9% of the total surface of the area occupied by the project) and undeveloped truncated or exposed soils (25.49%). Additional classes (waters) occupy the smallest area compared to the total area of the project catchment area (1.35%).

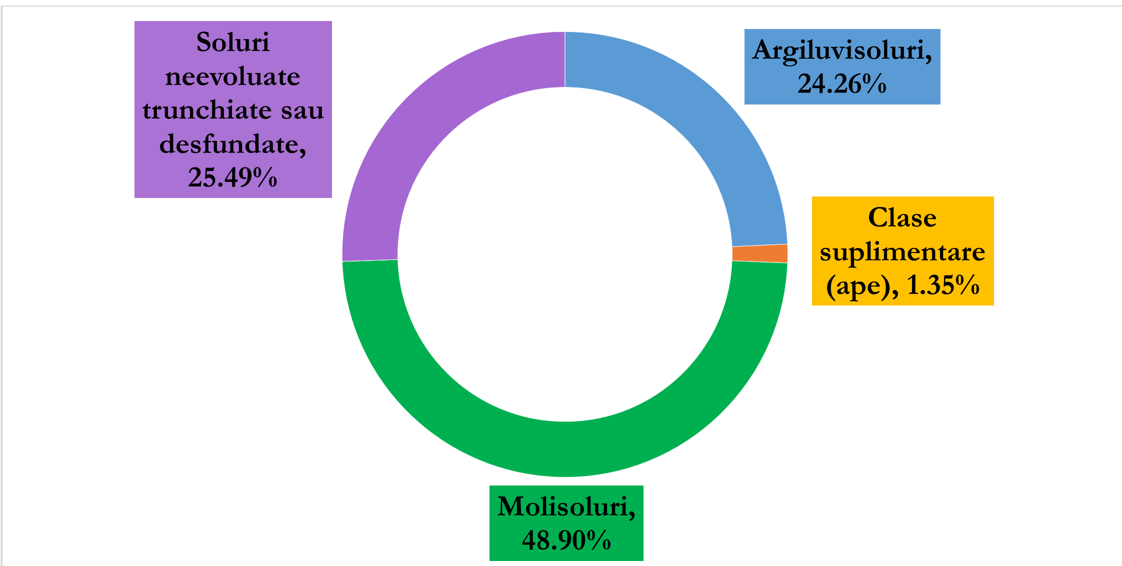


Figure no.4-10Soil classes in the project implementation area

The following table shows the distribution by soil classes at the level of the analyzed area.

Table no.4-8The current way of land occupation in the project implementation area in relation to the soil classes

Land use (according to CLC 2018)	Soil classes	Occupied area (%)
Water courses	Undeveloped truncated or uncovered soils	0.07
orchards	clay-alluvial	0.02
Coniferous forests	clay-alluvial	4.33
	Undeveloped truncated or uncovered soils	0.70
	moli	0.50
Discontinuous urban space and rural space	clay-alluvial	0.00
	molisoils	0.10
	Undeveloped truncated or uncovered soils	0.03
Non-irrigated arable land	clay-alluvial	15,16
	Additional classes (waters)	1.31
	molisoils	46.76

Land use (according to CLC 2018)	Soil classes	Occupied area (%)
	Hydromorphic soils	0.00
	Undeveloped truncated or uncovered soils	23.95
Predominantly agricultural lands mixed with natural vegetation	clay-alluvial	1.04
	molisoils	1.00
	Undeveloped truncated or uncovered soils	0.03
Areas of complex cultures	Additional classes (waters)	0.05
	molisoils	0.53
	Undeveloped truncated or uncovered soils	0.10
Transition areas with shrubs (generally deforested)	clay-alluvial	3.70
	Undeveloped truncated or uncovered soils	0.61

The most fertile soil types in the project implementation area are those from the Mollisol class, being representative of approx. 48.9% of the total area of the project area. The soils of the clay loam class in the project area are currently occupied by the agricultural and forestry use categories (according to CORINE Land Cover 2018), they represent 24.2% of the land use categories within the project catchment.

In conclusion, the project takes place on an area with lands with fertile soils, this aspect being confirmed by the categories of current mainly agricultural activities in the project area.

No pedologically protected areas were identified in the study area.

5.3.2 The current condition of the soils in the project area

In the area of implementation of the project, no objectives or sites have been identified on which potentially soil-contaminating activities are carried out or have been carried out in the past. According to the national inventory of contaminated or potentially contaminated sites in Romania, the nearest location potentially contaminated, represented by the exploitation and preparation of rock salt, SNS SA - Cacica Saltworks branch, located in Pârteşti de Jos UAT (Suceava county). This location is at a distance of approx. 15 km west of the project.

Given the fact that the proposed project will cross mainly agricultural/arable areas and natural areas, it was considered that the soil is not degraded on the entire project implementation area.

5.3.3 The degree of soil erosion in the project area

According to the data on the land susceptibility index regarding wind erosion of the soil, along the length of the project, a very low and low level is mainly observed in the Southern half, and in the North, this parameter is very low or even non-existent. It can be seen how this indicator manifests itself more intensely, especially in certain areas with a higher degree of anthropization. This factor correlated with a low degree of vegetation cover, especially the high type of trees, accentuates the degree of wind erosion.

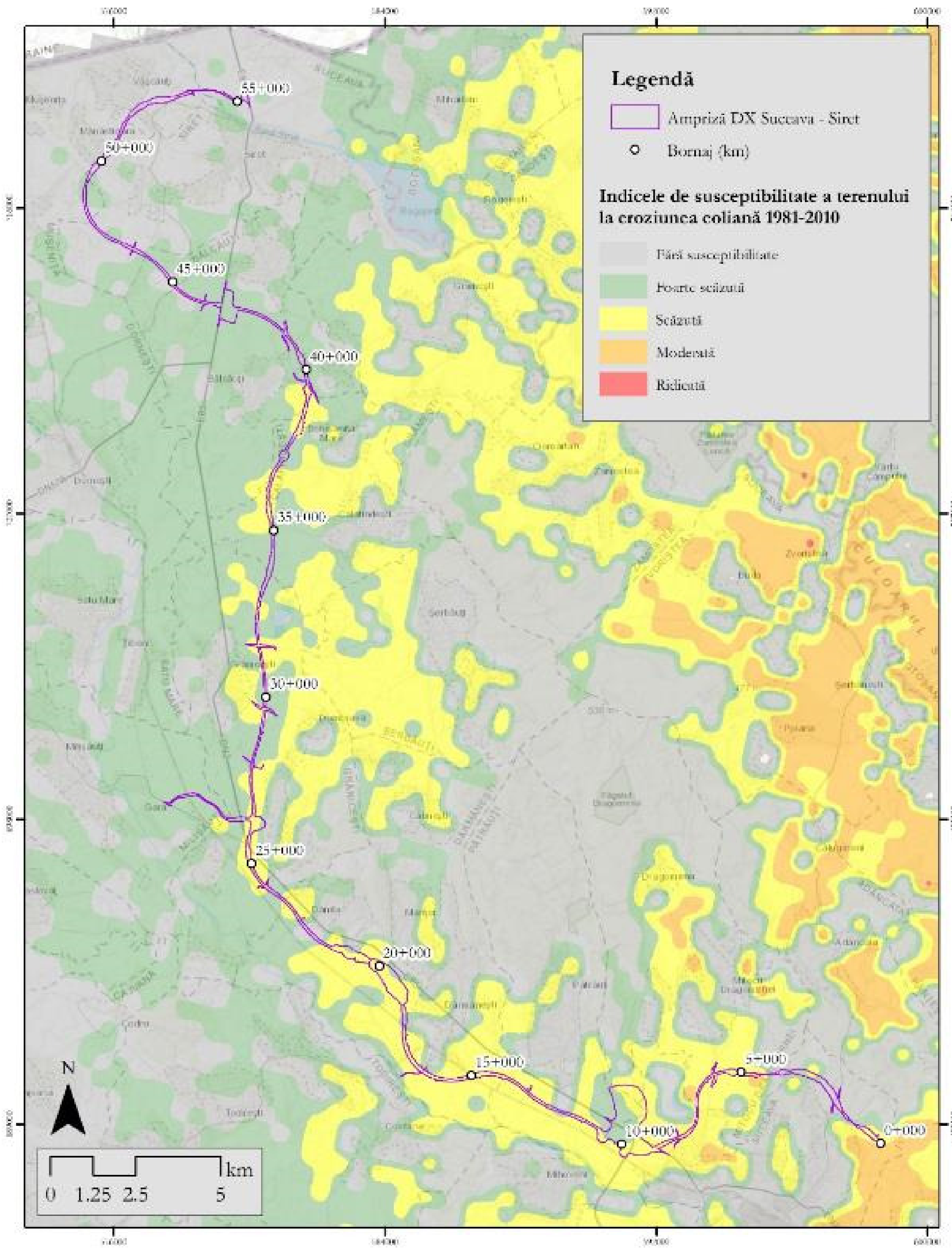


Figure no.4-11Wind Erosion Susceptibility Index Map

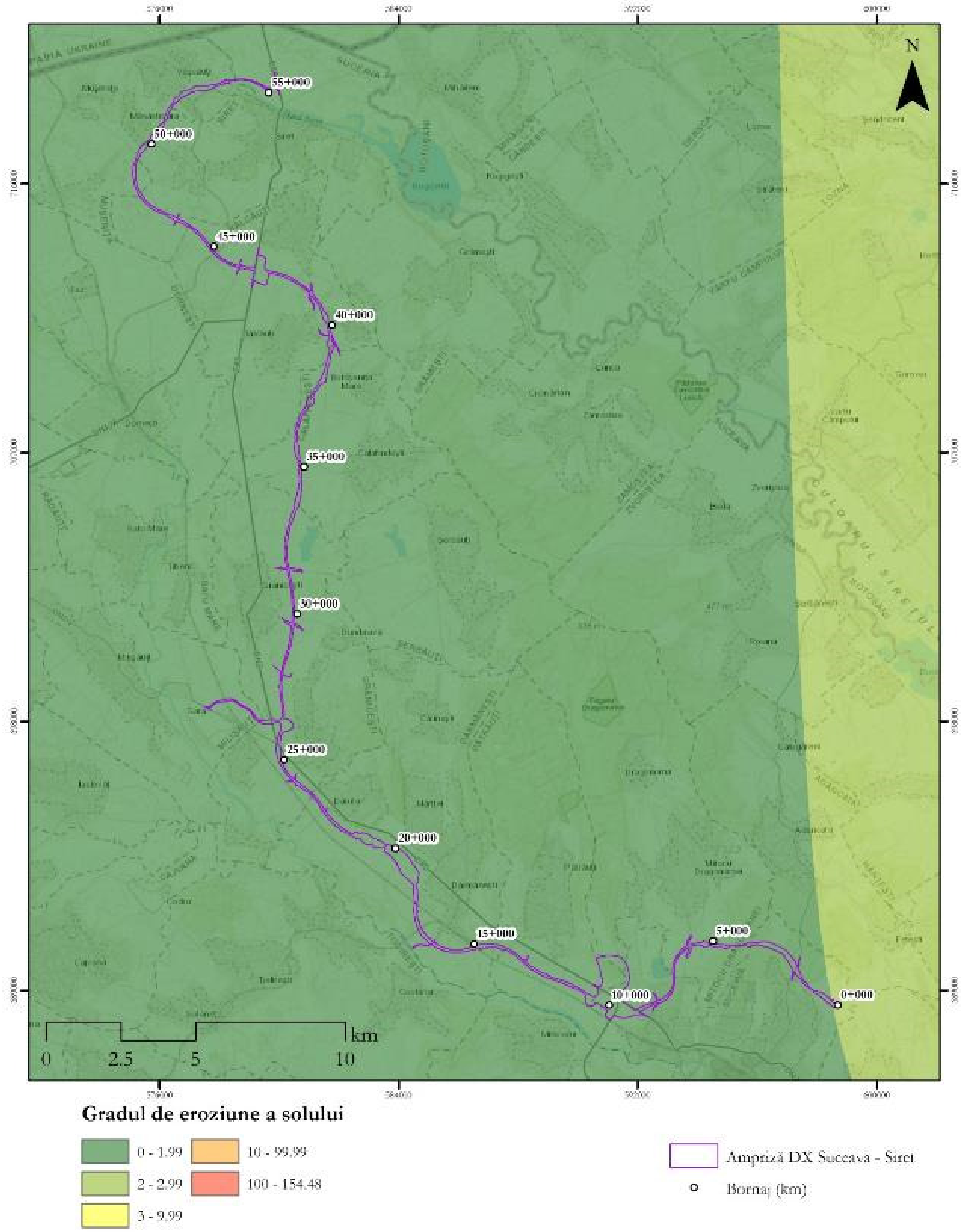


Figure no.4-12Degree of soil erosion

5.4 Subsoil geology

5.4.1 General geological characteristics of the project area

From a geomorphological point of view, the studied project crosses a major relief unit, namely the Moldavian Plateau. Looking in more detail, the proposed project will cross: the Siminica Plateau, the Mitocului Plateau, the Sucevei Corridor, the Bălcăuți Plateau and the Siretului Corridor .

From the point of view of the geological structure, along the entire project catchment, clayey marl alternates with intercalations of sand and gravel-sand, with one exception, near the Siret locality, where the project catchment intersects a strip of compact marl with intercalations of sands.

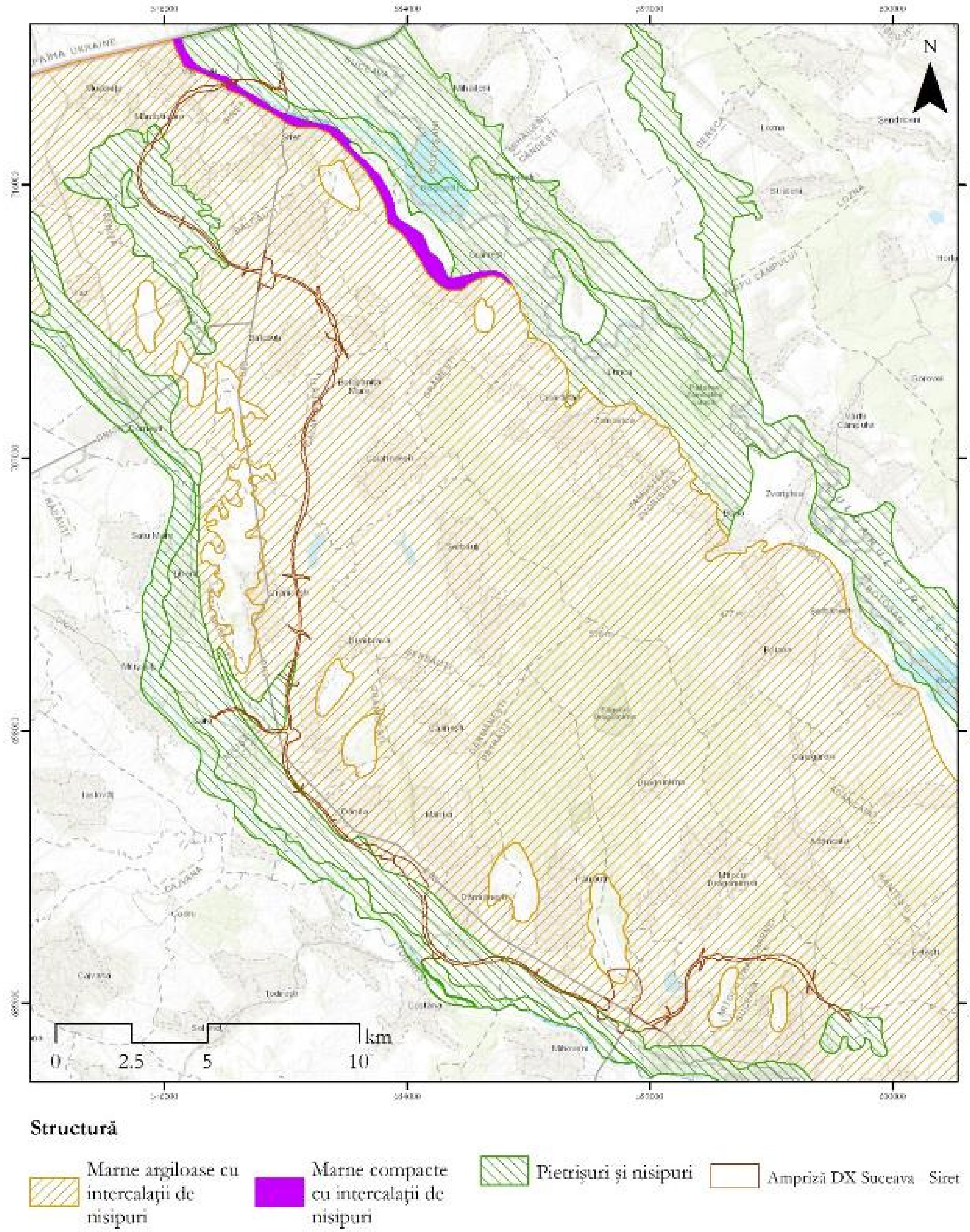


Figure no.4-12'Location of the project from a geological point of view

5.4.2 Landslides

According to the European Landslide Susceptibility Map with a resolution of 1 km x 1 km (represented in the following figure), the analyzed project mostly crosses areas where the degree of susceptibility to landslides is between very low and moderate.

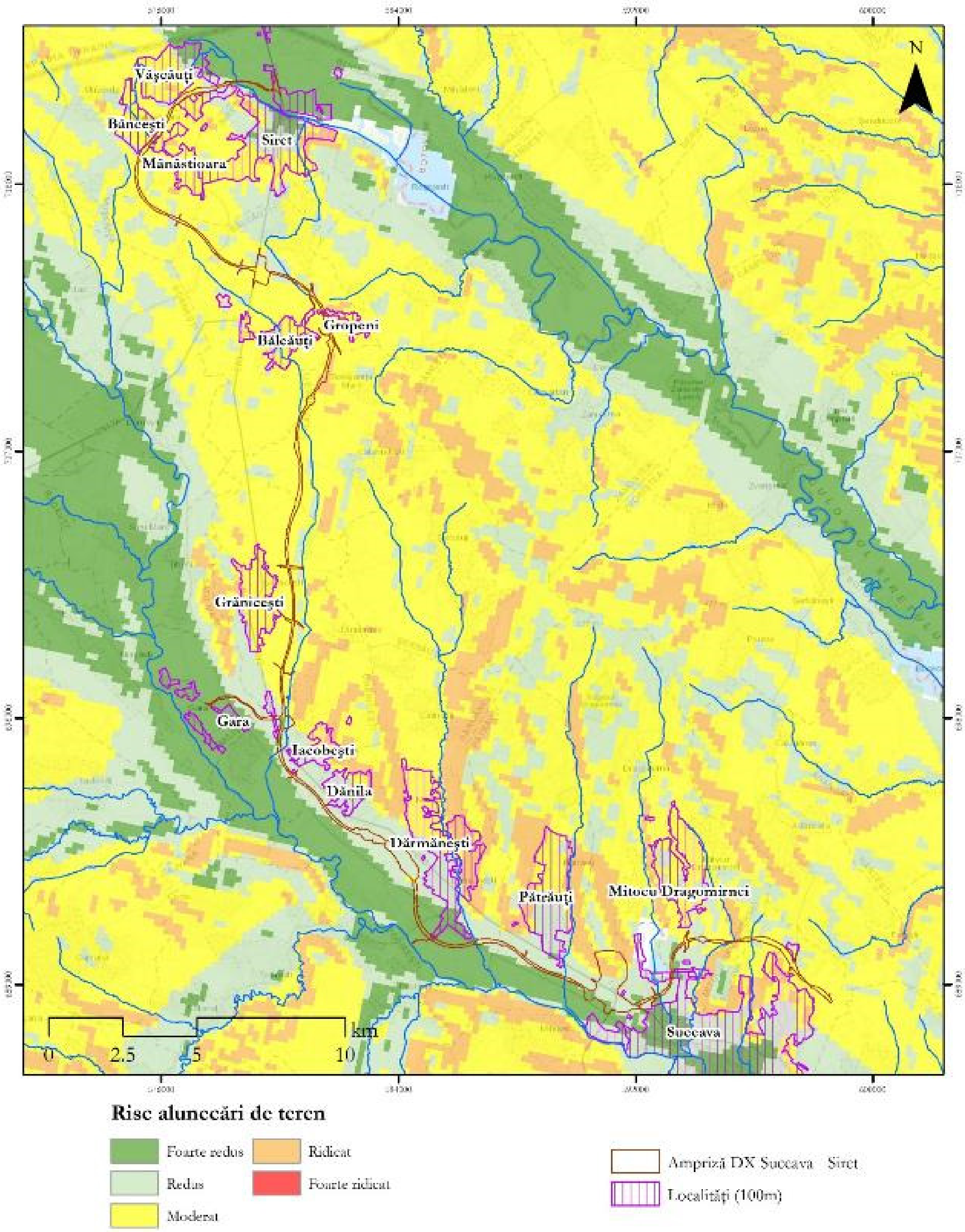


Figure no.4-13Representation of areas susceptible to landslides at the level of the study area

5.4.3 Important areas for the preservation of geological, paleontological and speleological values

The project does not cross natural reservations/natural monuments of geological/paleontological interest, but their presence in the vicinity of the project is noted. The distances of the project from the nearest reservations are as follows:

- approx. 26 km from RONPA0748 Piatra Pinului şi Piatra Şoimului - nature monument with natural reservation of geological-paleontological type status;
- approx. 46 km from RONPA0731 Piatra Buhei – natural reservation of geological-paleontological type;
- approx. 51 km from RONPA0847 Peştera Liliecilor – natural reservation of faunistic and speleological type.

5.4.4 Important areas from the point of view of the presence of underground resources

There are no mining exploration perimeters in the immediate vicinity of the project. The nearest mining operations are at Botoşana (14 km) and Crucea (55 km), both in Suceava county, used for uranium extraction. Also, although there are active gravel and sand mining perimeters in the major beds of the Suceava and Horaiţ rivers, the project does not cross any of them.

5.5 Biodiversity

5.5.1 Presentation of the intersection areas of the project with the protected natural areas

The Suceava – DN2H highway and the DN2H - Siret expressway do not cross any Natura 2000 site or protected area.

5.5.2 Presentation of the project's neighboring areas with protected natural areas

5.5.2.1 Natura 2000 sites

5.5.2.1.1 ROSCI0075 Pădurea Pătrăuţi

Regarding the Natura 2000 site ROSCI0075 Pădurea Pătrăuţi, the information used was taken from the site's Standard Form. It is located at a distance of 1.2 km from the project catchment.

From a geographical point of view, the Natura 2000 site ROSCI0075 Pădurea Pătrăuţi falls within the Moldavian Plateau. It has a typical relief of hills and platform plateaus, structurally erosive, with a monoclinal or weakly folded horizontal structure.

From a geological point of view, the lithological substrate is made up of an alternation of clays, marls, sands and sandstones. The accumulative relief is characteristic of the more important valleys of the site, areas where Quaternary deposits of gravel, sand and fine alluvium appear.

The soils mainly belong to the class luvisols (preluvosol, luvosol) and cambisols (eutricambosol).

Regarding the hydrographic system, the site presents a series of streams that flow into the Suceava River or directly into the Siret River, and among the most important streams are: Hatnuta, Patraceanca, Dragomirna, Mitoc, Vătafului Bridge.

The Pădurea Pătrăuţi site is of particular importance for the habitats 9130 Beech forests of the *Asperulo – Fagetum* type, 91Y0 – Dacian oak and hornbeam forests and 91E0* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, but also for some fauna species of community interest.

Among the general characteristics of the site are several classes of habitats, such as crops (0.29%), pastures (0.27%), other arable land (0.38%), deciduous forests (91.20%), coniferous forests (3.52%), mixed forests (1.48%), forest habitats (2.78%). The habitat classes have a total coverage of 99.92%.

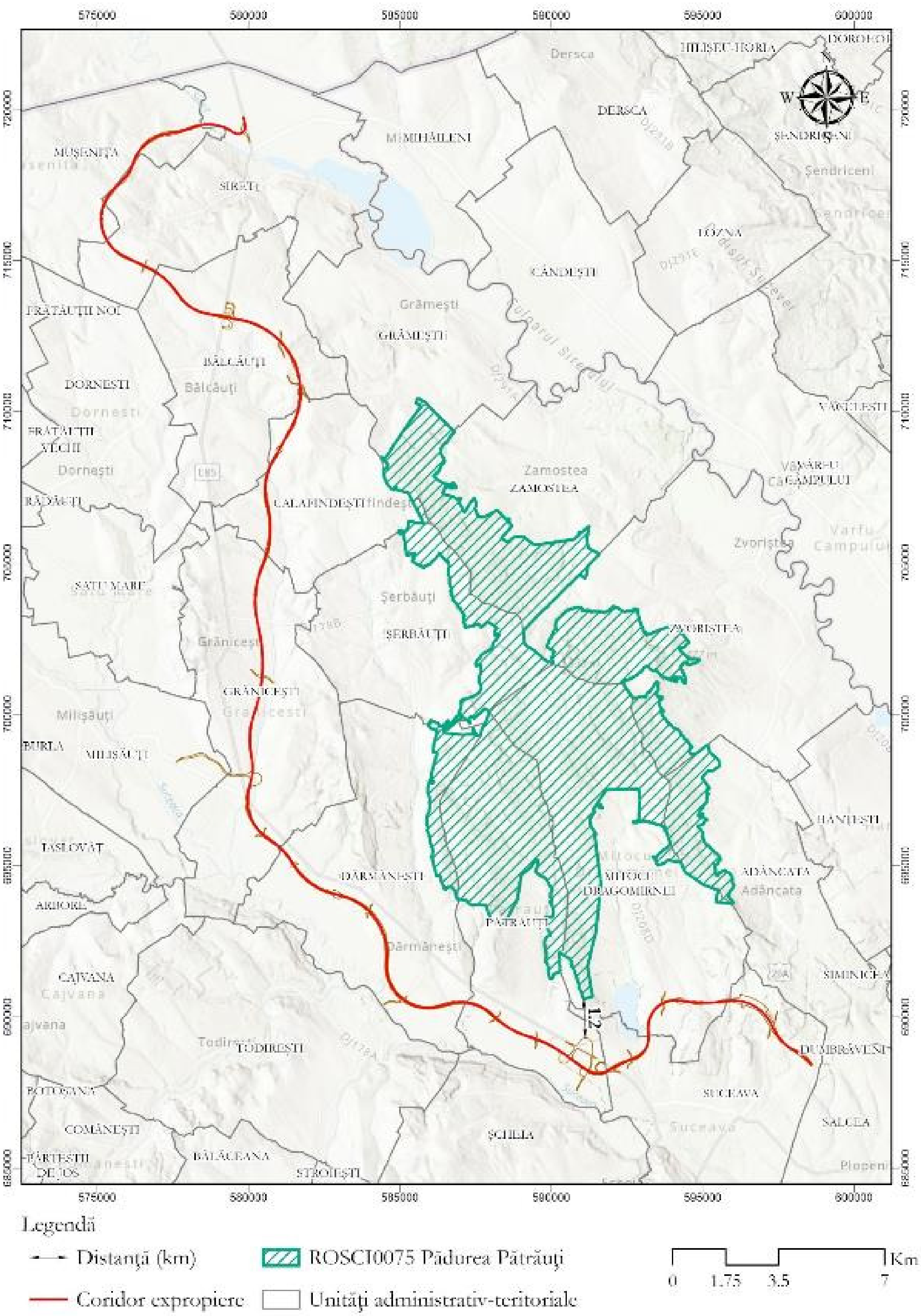


Figure no.4-14Location of the project in relation to the ROSCI0075 Pădurea Pătrăuţi site

5.5.2.1.2 ROSAC0391 Siretul Mijlociu – Bucecea

Regarding the Natura 2000 site ROSAC0391 Siretul Mijlociu – Bucecea, the information used was taken from the site's Standard Forms. It is located at 8.2 km from the project site.

The location of the site is in the southeastern area of the Suceva Plateau, in the Bucecea-Vorona saddle sector, with altitudes between 250 - 150 m. The characteristic relief is that of low hills, wide plains with plateau-like interfluves and low relief energy, on average 30-40 years.

The climate is temperate - continental, strongly influenced by the air masses from the east of the continent, and the proximity to the great Euro-Asian plain strongly influences the air and precipitation regime. Winters are poor in snow, summers are devoid of moisture, prevailing winds are north-west and south-west.

This site is of importance and quality for the presence of *Unio crassus* and *Rhodeus sericeus amarus* species.

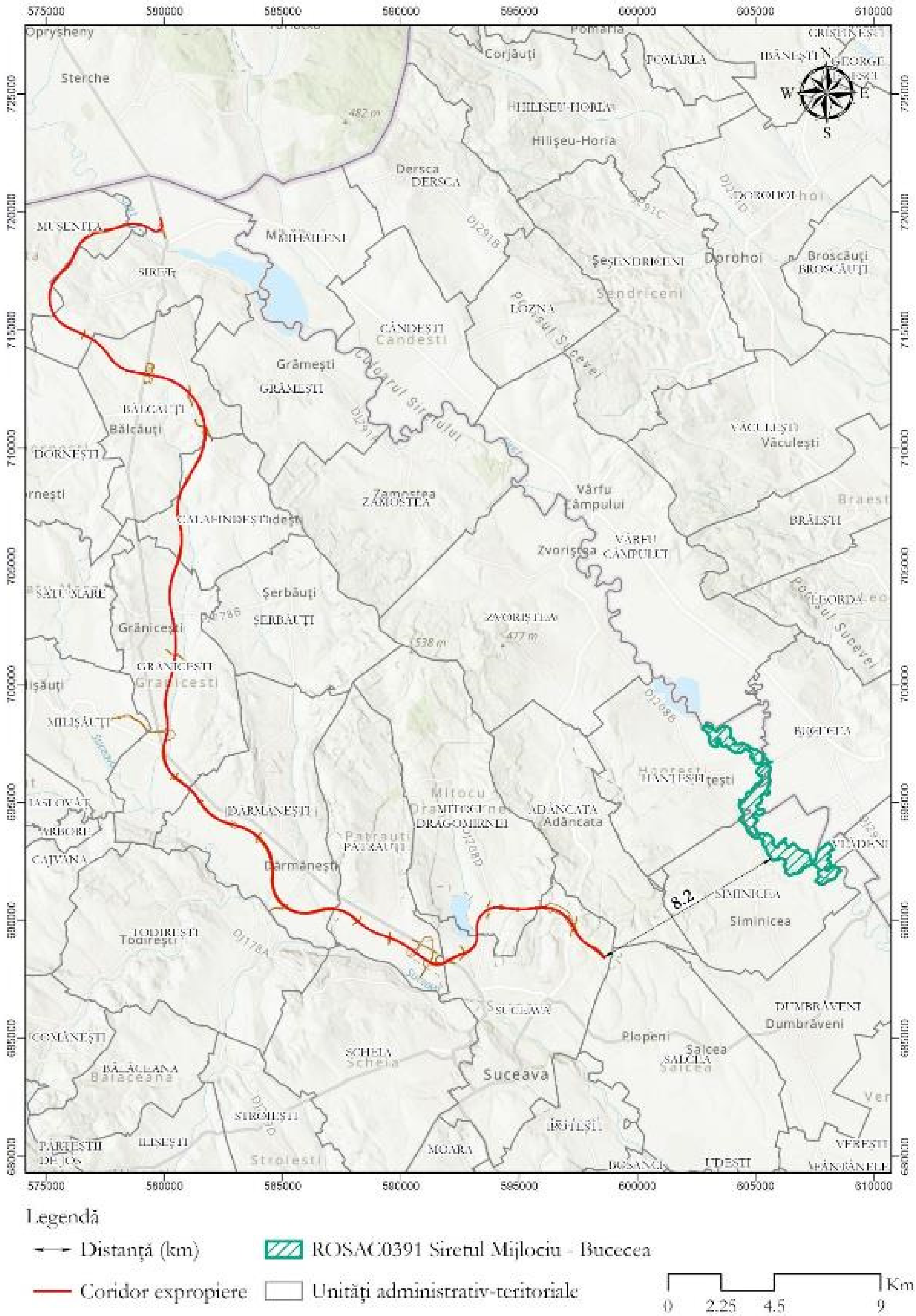


Figure no.4-15Location of the project in relation to the site ROSAC0391 Siretul Mijlociu - Bucecea

5.5.2.1.3 ROSPA0110 Accumularile Rogojesti – Bucecea

Regarding the Natura 2000 site ROSPA0110 Acumularile Rogojeşti - Bucecea, the information used was taken from the site's Standard Forms. It is located 0.4 km from the project site.

The site is located in the western part of Botoşani county, at the contact of the Moldavian Plain with the high plateau of Suceava, included from the point of view of geographical region in the sub-unit of the Suceva Plateau: Culmea Bour-Dealul Mare.

It is of particular importance for migratory birds, highlighting the large agglomerations of waterfowl during migration. It presents an abundant swamp vegetation near the banks, important nesting places for many species of waterfowl. Near the lakes there are marshes, pastures and agricultural crops that provide food for several species such as the white stork (*Ciconia ciconia*), but also the Western marsh harrier (*Circus aeroginosus*).

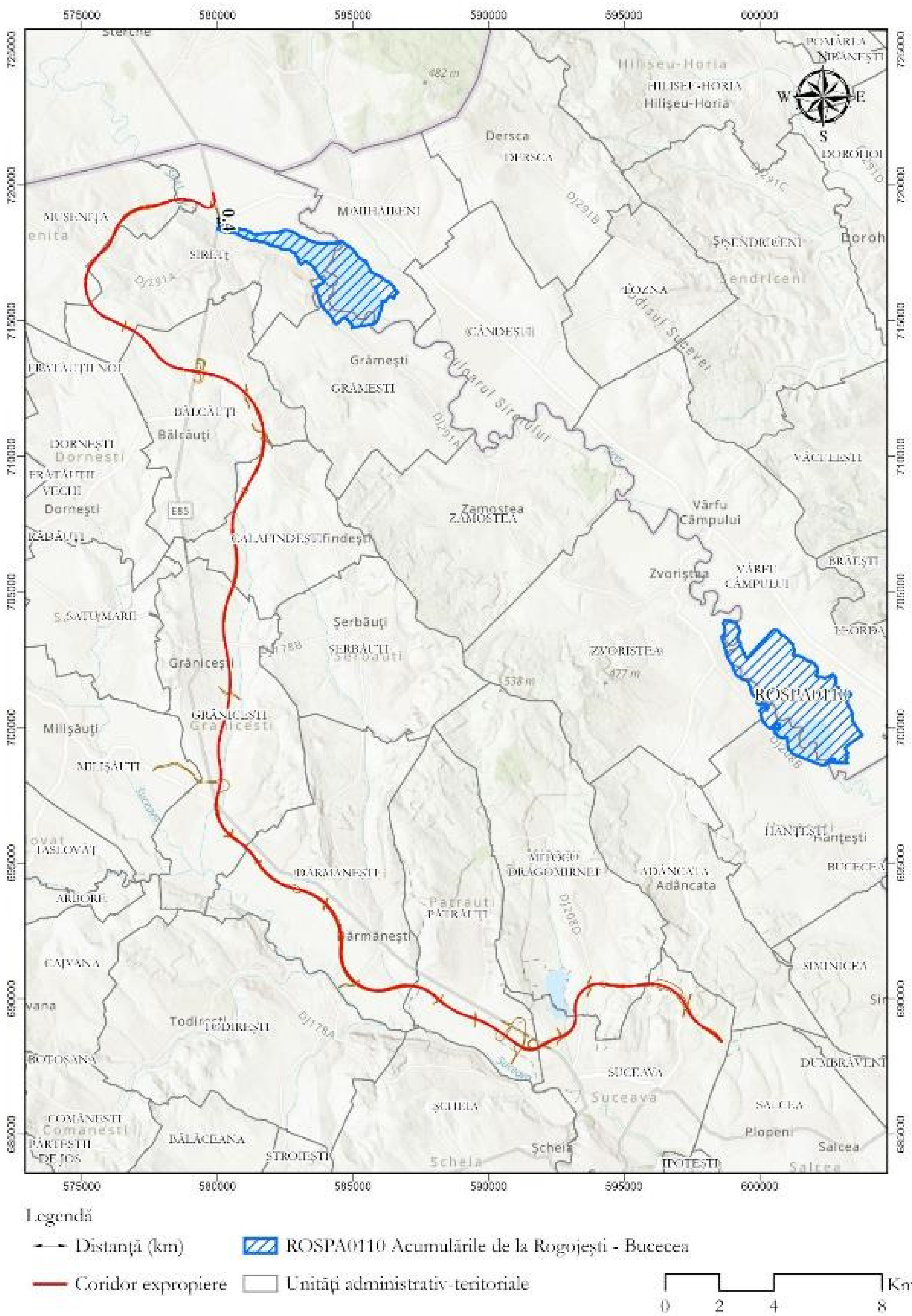


Figure no.4-16Location of the project in relation to the site ROSPA0110 Acumularile Rogojeşti – Bucecea, ROSCI0380 Suceava Liteni River

Regarding the Natura 2000 site ROSCI0380 Râul Suceava Liteni, the information was taken from the Standard Form version 2021. It is located 4.1 km from the project's catchment area.

It represents a specific habitat for four species of mammals of conservation interest, along with four species of reptiles and amphibians, and two species of fish of conservation interest.

It is of high importance for the species of *Bombina, Triturus cristatus*, and *Myotis*. Moreover, it is among the few sites designated for *Lutra lutra, Spermophillus citellus* and *Emys orbicularis*.

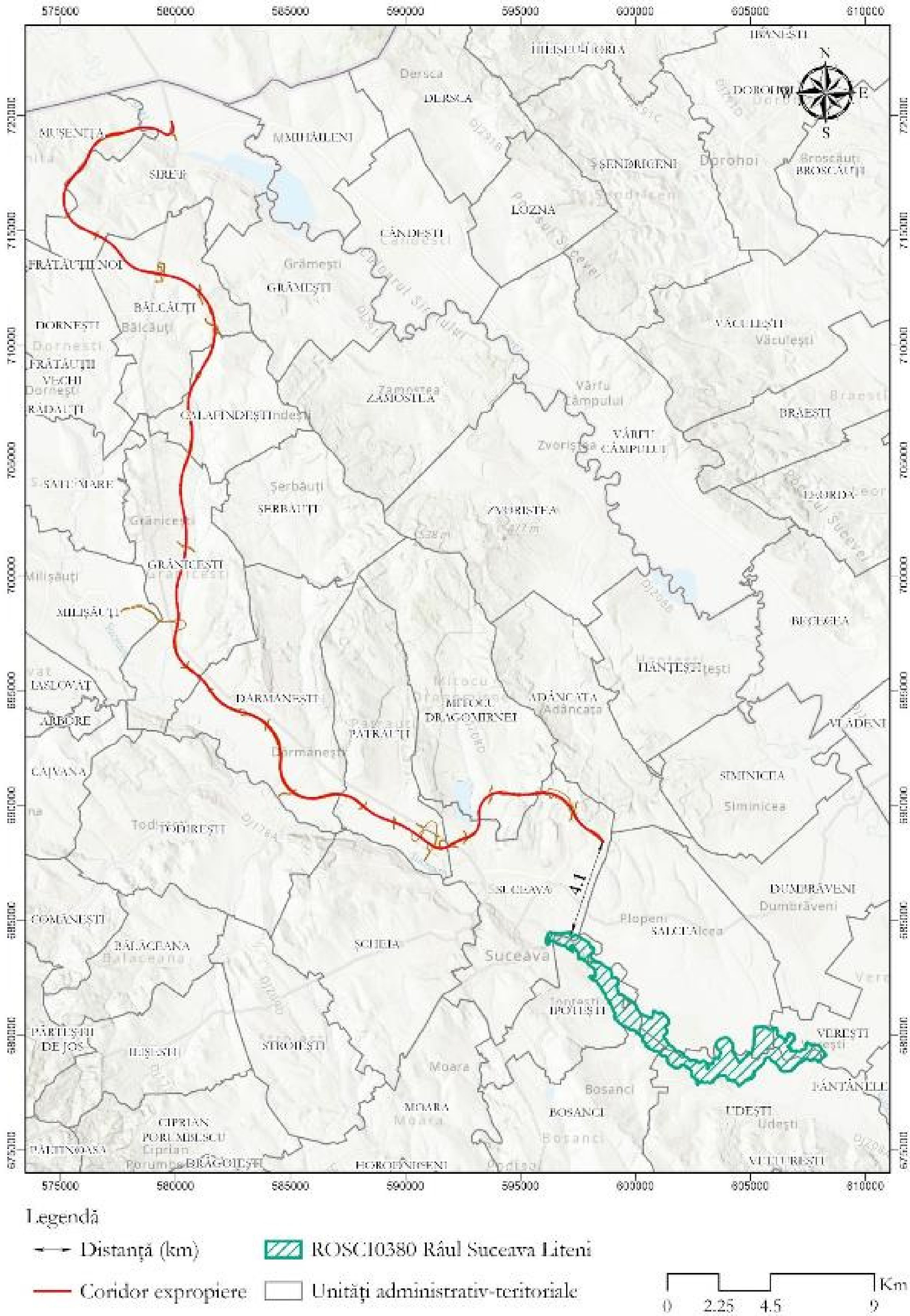


Figure no.4-17Location of the project in relation to the site ROSCI0380 Suceava Liteni River

5.5.2.2 Natural protected areas of national interest

5.5.2.2.1 RONPA0751 Fânețele seculare de la Calafindeşti

The reservation is of a floristic type, located entirely on the territory of the Calafindeşti commune, bordering the Horaiţ Stream, near the "La Stejari" point. It is located at a distance of 0.9 km from the project site.

The grassland in which a Eurosiberian population of rabbit cabbage (*Ligularia glauca*) and plants characteristic of the border of xerothermal forests survive, including some botanical monuments of nature: the martagon lily (*Lilium martagon*), the variegated tulip (*Fritillaria melearis*) and the globe flower (*Trollius europaeus*).

The herbaceous vegetation includes, among others, white cinquefoil (*Potentila alba*), Erect clematis (*Clematis recta*), bloody cranesbill (*Geranium sanguineum*), peach-leaved bellflower (*Campanula persiciflora*), Siberian iris (*Iris sibirica*), common grape-hyacinth (*Muscarii botryoides*), Turkish Marsh Gladiolus. (*Gladiolus imbricatus*), marsh marigold (*Caltha palustris*), gas plant (*Dictamnus albus*) and the three mentioned botanical monuments of nature. All these floristic elements ensure a great diversity of colors throughout the growing season.

5.5.3 Green Infrastructure

The route of the highway/express road intersects areas that form the green infrastructure, composed of all natural and semi-natural or anthropogenic ecosystems/habitats and "blue" (a component of the green infrastructure), consisting of natural and artificial water bodies. The essential components of the green infrastructure are represented by the Natura 2000 sites, they fulfill the role of ensuring the natural processes that maintain life and are mainly responsible for the production of ecosystem goods and services on which the maintenance of biodiversity depends, but also the maintenance/development of the socio-economic infrastructure.

Natural areas abound in elements of biodiversity, being vital by constituting the genetic and population reservoir, especially for degraded ecosystems. They are managed on a large spatio-temporal scale, while humanized areas (gardens, agricultural lands, parks, etc.) are managed on a small spatio-temporal scale. The anthropized green spaces are equally important, they represent dispersion environments for flora and fauna species.

Semi-natural habitats appear as a result of traditional agricultural activities and present a great diversity of species on their surface (Craioveanu and Rakosy, 2011). According to the thematic publication of the National Rural Development Network no. 42, year II, Agro-pastoral landscape and biodiversity[6], at the European level three types of agricultural land with high natural value were identified, respectively land characterized by large stretches of semi-natural vegetation (reduced intervention of the human population), land characterized by mosaic type landscapes (hedges, rows of trees etc.) or lands with low natural value, but which represent important ecological color for the

6National Rural Development Program for the period 2014 – 2020, Ministry of Agriculture and Rural Development (MADR) - General Directorate of Rural Development (AM PNDR) maintenance of habitats and rare species, important areas for the nesting of certain rare bird species or for migratory birds (cereal crops).

In Romania[7], lands with high natural value can be classified taking into account the criteria proposed by the European Forum for Nature Conservation and Pastoralism[8]) in natural and semi-natural meadows in the mountain area; extensive traditional orchards (the bottom of the old hayfields is preserved almost entirely); mosaic landscapes (meadows, trees, shrubs and agricultural plots with abundant biodiversity); meadows in the vicinity of forests characterized by a great diversity of fauna (birds, invertebrates, mammals, etc.).

A large part of the previously mentioned valuable lands can also be found in the area of the construction project of the Suceava DN2H highway and the Siret border DN2H expressway, these being represented in terms of geographical distribution in the figure below.

7 https://www.rndr.ro/comunicare/publicatii/publicatii-tematice.html

8 HTTP://WWW.EFNCP.ORG/WHAT-WE-DO/HIGH-NATURE-VALUE-FARMING/INDICATORS-HIGH-NATURE-VALUE-FARMING/

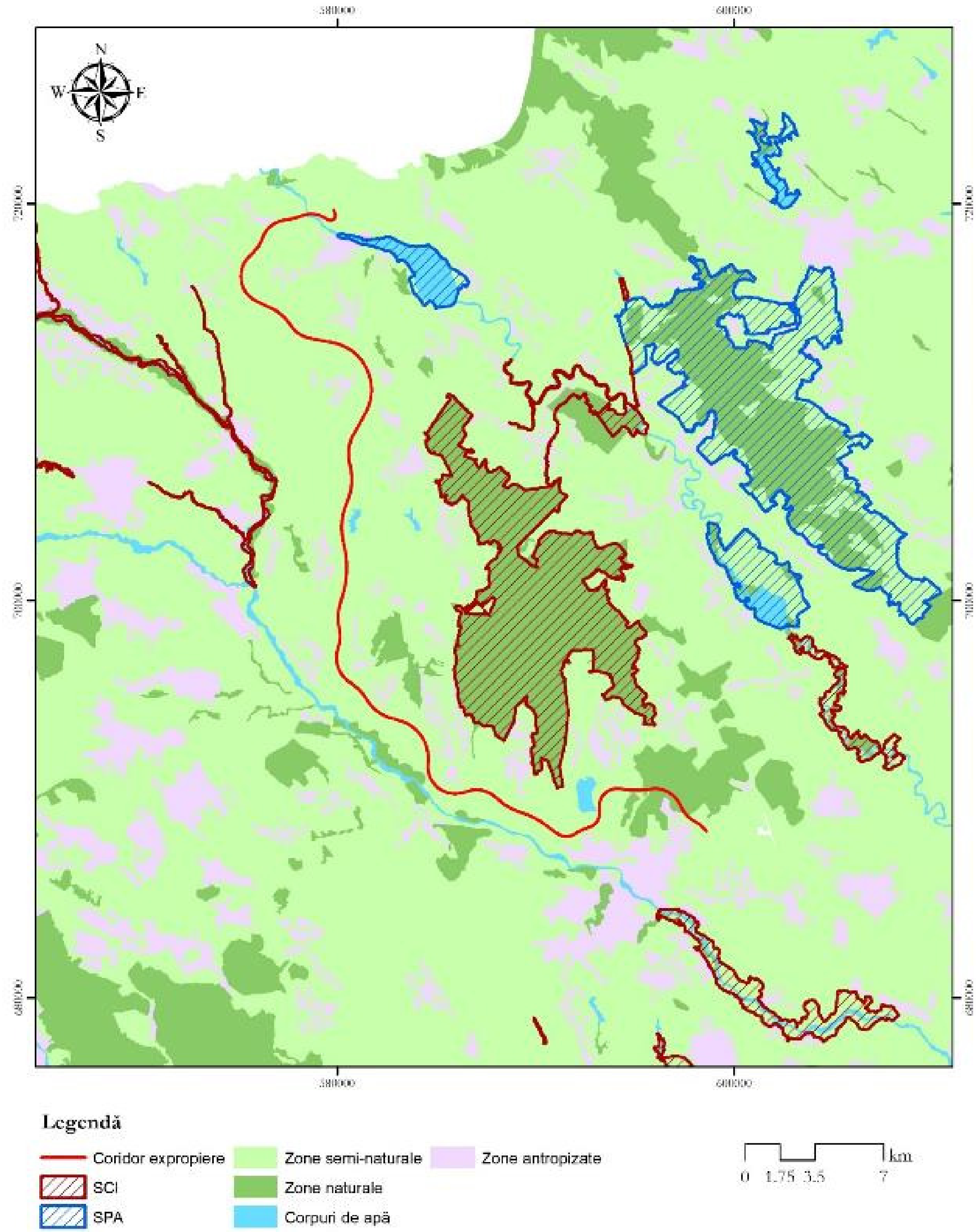


Figure no.4-18Green infrastructure in the project area

In the area of the Suceava DN2H highway and the DN 2H - Siret border expressway there are several key areas for biodiversity. Near the project, the main Key Biodiversity Area is the Acumulările Rogojești - *Bucecea*. Key Biodiversity Areas are established based on IUCN criteria.It is considered that they have a significant contribution to the global conservation of biodiversity (Key Biodiversity Areas KBA -www.keybiodiversityareas.com). The following figure shows the KBAs in the area of the Suceava DN2H highway and the DN2H Siret border expressway and represents an extract from the general map of the international KBAs[9]significant, including global KBAs, regional KBAs and those whose global/regional status is not yet determined.

[9] http://www.keybiodiversityareas.org/site/mapsearch

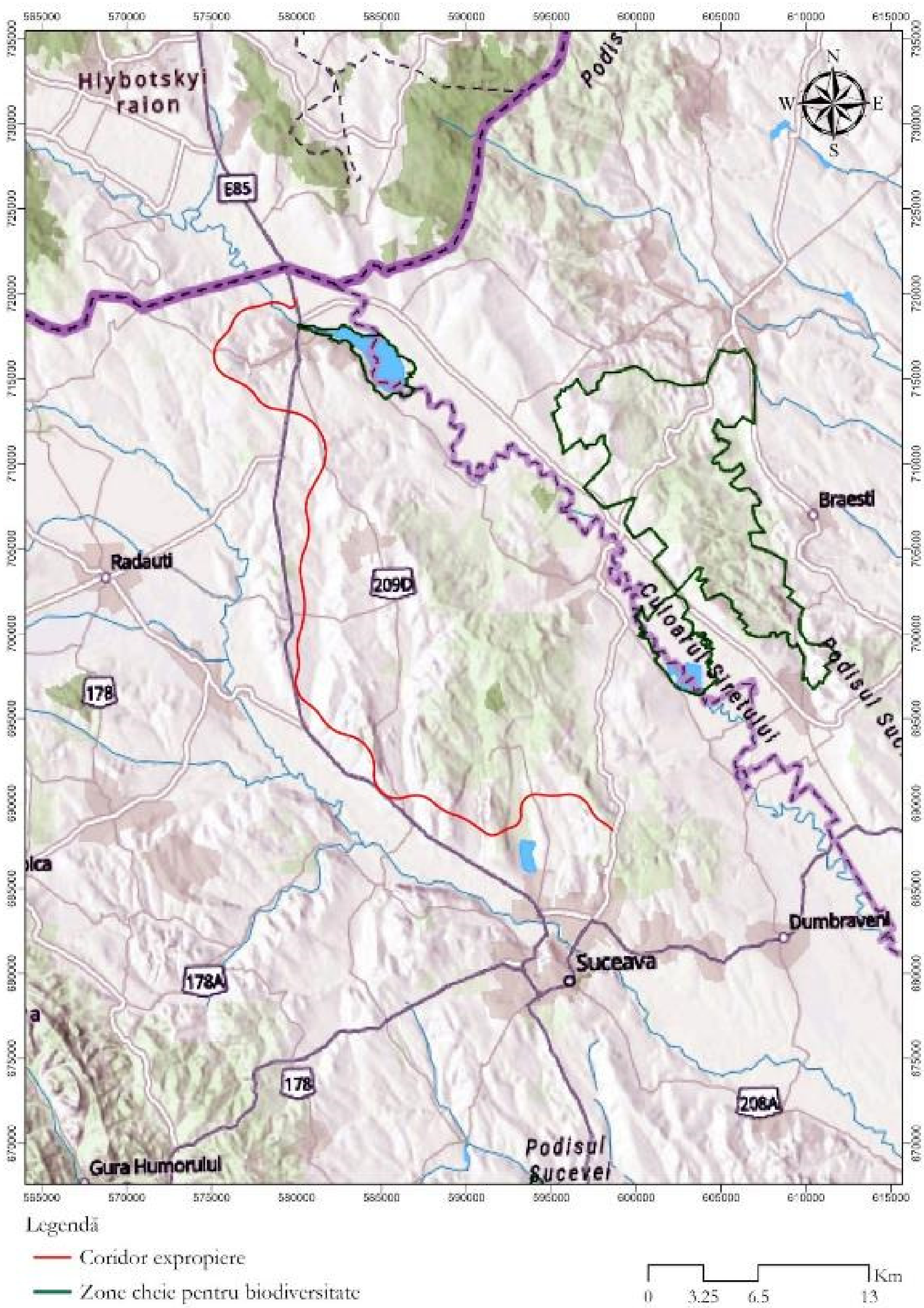


Figure no.4-19Key Biodiversity Areas, represented next to project boundaries and Natura 2000 sites - data sourcehttp://www.keybiodiversityareas.org/kba-data

5.5.4 Ecological corridors

For the highway and the expressway, an analysis was made of the existence of ecological corridor areas and of the known information regarding the movement of large carnivore species (especially bears) in the area proposed for the project. Data and information from the project were used"CoreHABS - Ecological corridors for habitats and species in Romania"[10]and information from other sources. A modeling of potential wildlife crossing areas was also carried out as part of this project. This modeling was based on the Circuitscape methodology and used the Gnarly Tools toolbox for ArcGIS

The results of the modeling of the connectivity areas by means of the Circuitscape methodology, as well as the information regarding the movement areas of large mammals, such as *Cervus elaphus* and *Canis lupus*, indicate an important passage area between the localities of Iacobeşti - Slobozia, Dărmăneşti - Costina, Adâncata - Scheia (county Suceava).The following figure shows the important areas for connectivity, as they were identified based on modeling and existing data and information in the specialized literature.

[10]The large mammal report resulting from this project is available athttp://corehabs.ro/images/rapoarte/1.%20METODOLOGIE%20CARNIVORE.pdf

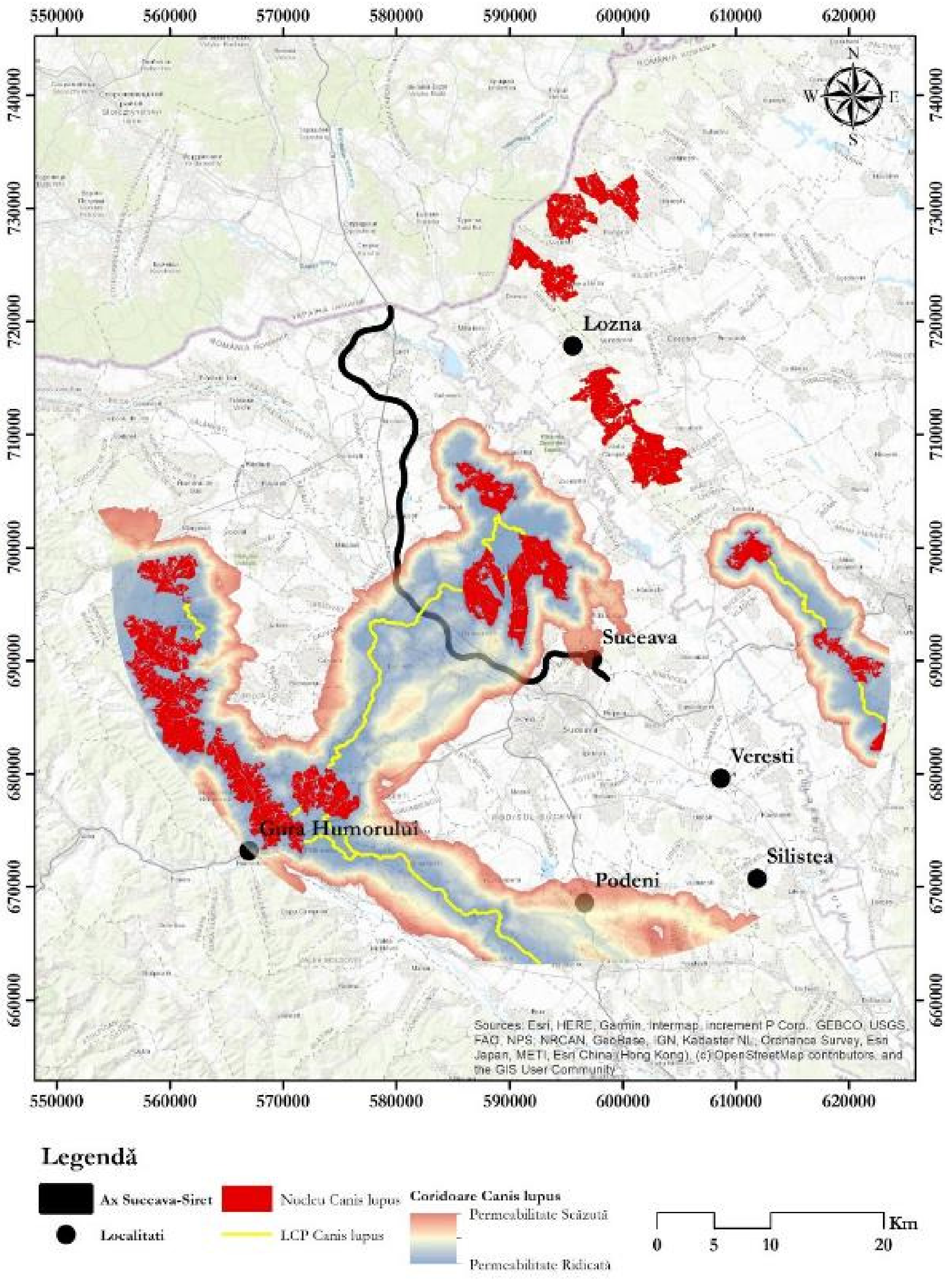


Table no.4-9The main area considered important for the movement of the *Canis lupus* species (marked in yellow). The areas were determined based on ecological connectivity modeling and observations from the specialized literature

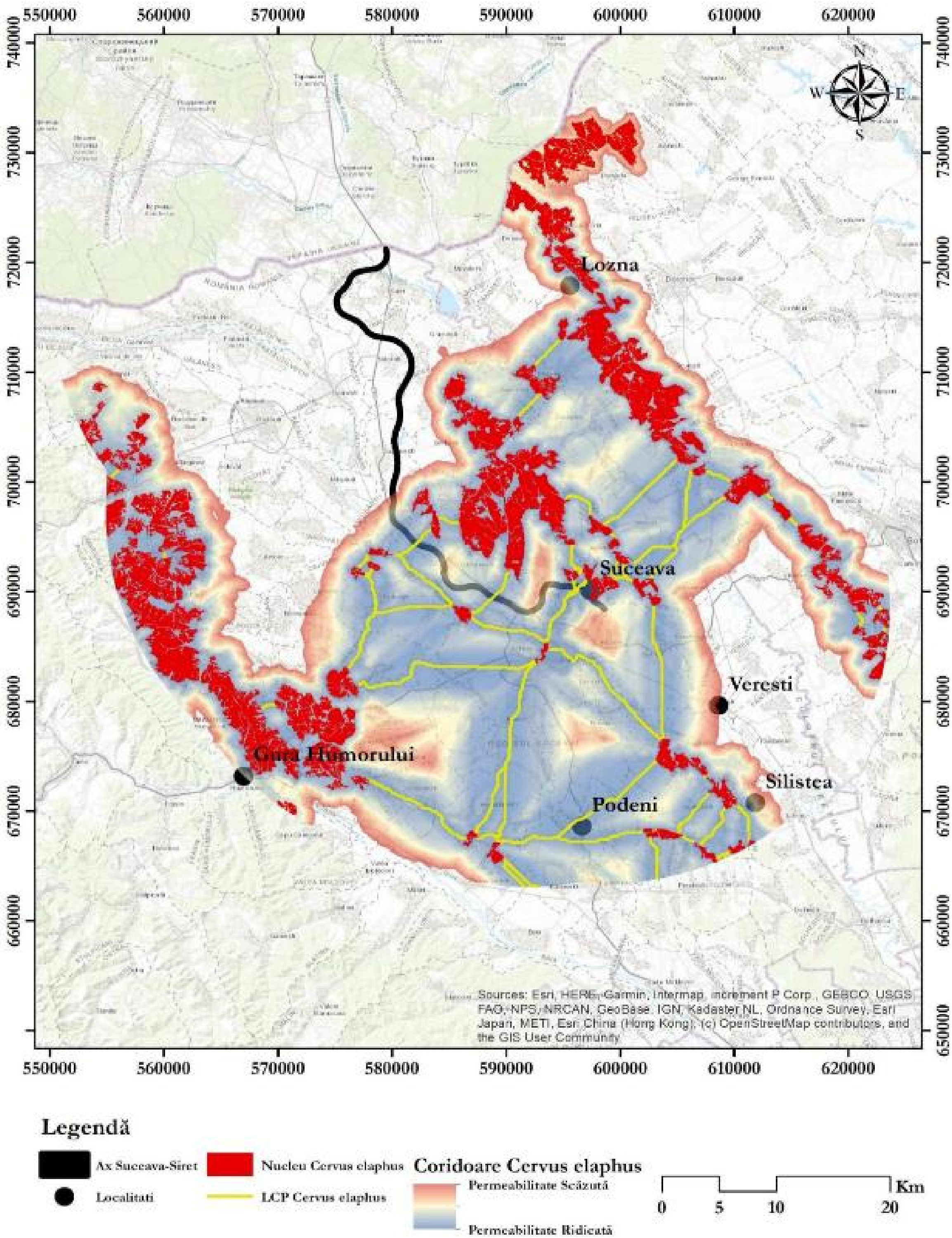


Figure no.4-20The main area considered important for the movement of the *Cervus elaphus* species (marked in yellow). The areas were determined based on ecological connectivity modeling and observations from the specialized literature

5.5.5 Information about local flora and fauna

The data on the biodiversity present within the project catchment, but also in its immediate vicinity, were collected both following visits to the field, being carried out intermittent trips, covering several periods of the year, as well as from the verification of specialized online databases.

5.5.5.1 Vegetation

The collection of data in the field for the types of habitats in the project area aimed to identify favorable areas for the species of community interest in the analyzed Natura 2000 sites. The project does not cross any Natura 2000 site, but the proposed route passes through areas with various types of vegetation that are preferred by some species of community interest.

The first stage, that of the office study, consisted in consulting the existing data contained in the management plans of the potentially affected sites (if available) and the updated standard forms of the protected natural areas potentially affected by the project. At the same time, scientific articles were analyzed that had as their subject the flora and fauna of the areas of interest and data from Romania's reports under the obligation of article 17 of the Habitats Directive.

This information was later supplemented with spatial data, where we benefited from it.

The second stage of data collection included field research, which required multiple trips during the growing seasons. For the analysis of the horizontal structure of plant phytocoenoses, the method of linear transects supplemented with the phytocenological survey method was used.

The method of linear transects involves the identification and notation of plant species/plant associations along a line whose length is established according to the complexity of the habitat.

The survey method is based on the notation of species abundance-dominance indices, according to the methodology developed by the Central European Floristic School (Braun-Blanquet), in order to graphically transpose relevant elements for the description of floristic associations.

On the highway route, the critical points identified after the first stage, that of the office study, were analyzed, where there would be the possibility of a significant impact. Different areas were traversed and observations through reliefs were arranged to capture all the relevant aspects from the point of view of plant associations.

- The survey includes the list of plant species recorded in the sample area accompanied by the notation of the abundance-dominance index (AD) for each species. The abundance-dominance index is assessed according to the Braun-Blanquet scale, completed by Tüxen and Ellenberg, a scale that includes seven main steps as follows: r = rare or isolated individuals (0.01-0.1%);
- + = rare individuals with very low degree of coverage (0.1-1%);
- 1 = numerous individuals but with low coverage or rare but with high coverage (1-10%);
- 2 = very numerous individuals or covering 10-25% of the sample area;
- 3 = coverage of 25-50% of the sample area, the number of individuals is indifferent;
- 4 = coverage of 50-75% of the sample area, the number of individuals is indifferent;
- 5 = coverage of 75-100% of the sample area, number of individuals regardless.

Field observations are standardized, using field sheets.

Plant species were identified by using specialized works such as Flora of Romania vol. I-XIII (Săvulescu et al., 1952-1976), Illustrated Flora of Romania. Pteridophyta et Spermatophyta (Ciocârlan, 2009), Vascular plants from Romania: illustrated determinant of terrain (Sârbu I., Ştefan N., Oprea A., 2013), Red List of Higher Plants from Romania (Oltean et al., 1994), Red book of vascular plants from Romania (Dihoru, G., & Negrean, G. (2009), Critical list of vascular plants from Romania (Oprea, A., 2005), Red list of extinct, endangered, vulnerable and rare vascular plants from the flora of Romania (Boşcaiu N. Şi et al., 1994). The nomenclature used to name the plant species is in accordance with the current regulations regarding aspects of taxonomy and systematic botany (www.theplantlist.org, www.emplantbase.org). Plant associations and natural habitats were identified by using specialized works such as the Phytocoenoses of Romania (Sanda et al., 2008), the Manual for the interpretation of Natural habitats from the European Union (EUR 28), completed with the national classification of habitats - the habitats of Romania (Doniţă et al., 2005).

The registration of the presence and distribution points was carried out with the help of a GPS receiver, the information on the bitus and stationary conditions being captured with the help of the camera, all the information being included in the project database.

Data collected in the field were analyzed using ArcGIS Desktop 10.4 software. The processing of the data collected in the field involved the transformation of GPS points and tracks (recorded in the GPS device in the geographic projection system with WGS84 datum) in STEREO 1970, the determination based on the photographs and the collected material of the unidentified species in the field and the compilation of the database final data.

In the images below you can see aspects from the collection of data from the field regarding the vegetation.

Figure no.4-21Aspects during the collection of data from the field regarding the vegetation

The areas crossed by the proposed route of the Suceava-Siret highway and the expressway are generally agricultural lands, but on some sections, the route intersects with small wooded areas or meadow areas.

In order to identify the types of land cover in the project area that overlap with the freeway, a spatial analysis of the project was carried out in relation to the land use categories according to Corine Land Cover (CLC) 2018. It should be noted that not in all cases the CLC situation faithfully reflects the situation in the field, given the rather large scale at which it is carried out.

The project works, both those that will temporarily affect the land surface, and those that will permanently occupy land surfaces, will be carried out mainly in areas with agricultural lands. The figure below shows the distribution of CLC classes in the project area.

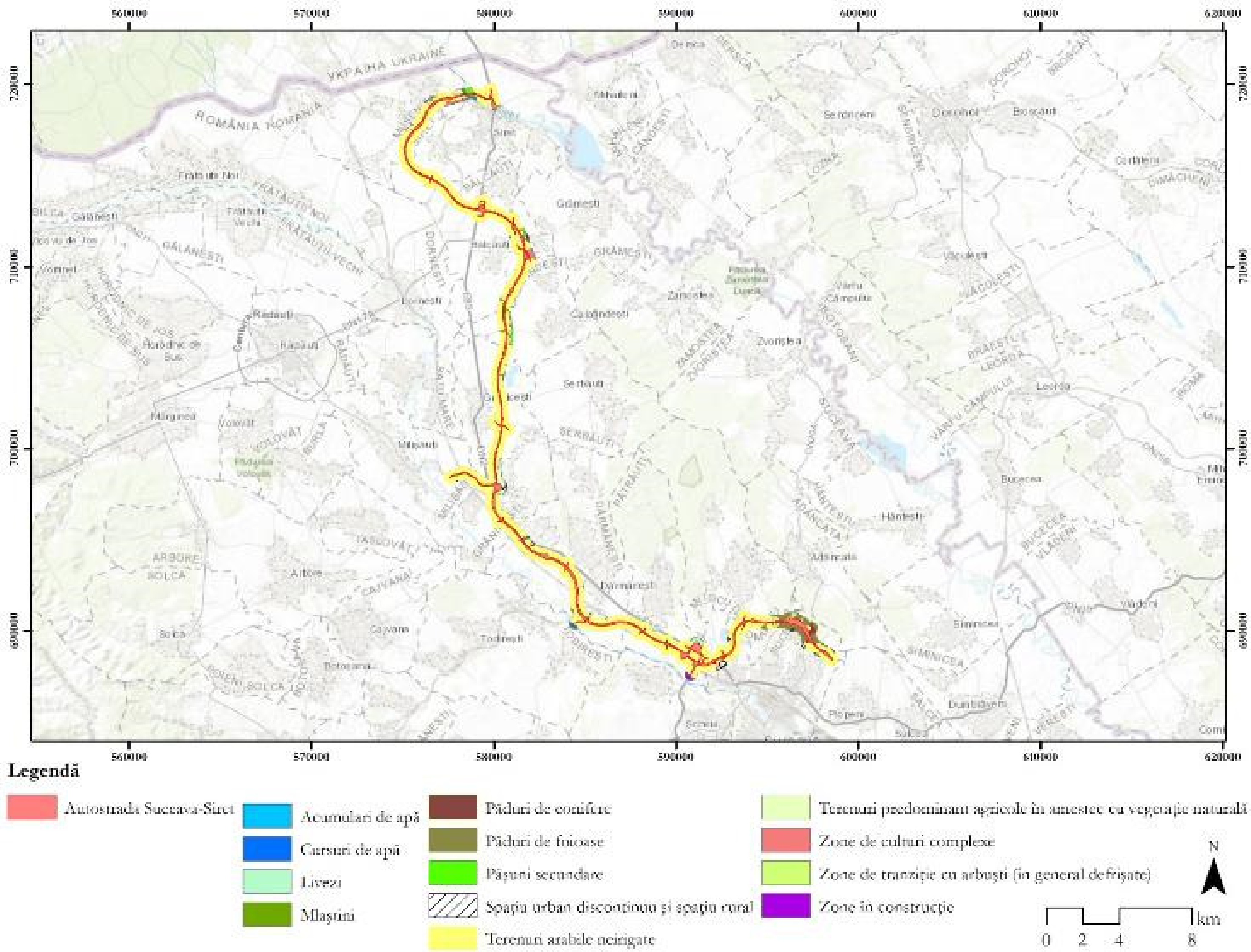


Figure no.4-22Land cover classes in the implementation area of the Suceava DN2H Motorway and DN2H Siret border expressway project, according to CLC 20

In the following, information is presented regarding the vegetation in the project area, as well as in the vicinity, mainly according to the data obtained in the field.

In the mileage intervals 0+000 - km 1+300, km 4+400 - km 7+950, km 8+050 - km 11+600, km 11+675 - km 14+950, km 15+000 - km 21+ 775, km 21+825 - km 22+150, km 22+500 - km 25+225, km 25+300 - km 26+025, km 26+425 - km 35+325, km 36+725 - km 42+ 000, km 42+200 - km 53+625, km 54+625 - km 55+700, the project intersects agricultural land, irrigation channels and areas with isolated trees and shrubs, but also forest curtains, where the vegetation is mainly composed of crop plant species, but also ruderal, segetal and common plant species, potentially invasive aliens (such as *Prunus cerasifera* and *Gleditsia triacanthos*) and invasive aliens (such as: *Amaranthus retroflexus, Ambrosia artemisiifolia, Amorpha fruticosa, Erigeron annuus subsp. annuus, Erigeron canadensis, Robinia pseudoacacia, Xanthium orientale subsp. italicum*). In these areas, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest or other important habitats for vegetation. Below are some images of aspects of the agricultural land areas present within the project catchment.





Figure no.4-23Aspects of the vegetation in the areas with agricultural lands intersected by the project

In the kilometer interval km 1+300 – km 3+750, the project intersects a forest habitat, where the vegetation is composed of plant species characteristic of deciduous forests, but also ruderal plant species. The dominant species in this habitat is *Quercus pedunculiflora*. In this kilometer interval, the project also intersects an area with abandoned agricultural land, where ruderal and common plant species have been installed. Thus, species were identified in this area, such as: *Acer campestre, Acer pseudoplatanus, Achillea sp., Ajuga reptans, Alliaria petiolata, Anemone nemorosa, Anemone ranunculoides, Aposeris foetida, Asarum europaeum, Athyrium filix-femina, Campanula patula, Campanula persicifolia, Calamagrostis arundinacea, Carex pilosa, Carex sylvatica, Carpinus betulus, Cichorium intybus, Cornus sanguinea, Crataegus monogyna, Crocus vernus, Cruciata glabra, Daucus carota, Epilobium collinum, Euphorbia amygdaloides, Fagus sylvatica, Ficaria verna, Fragaria vesca, Galium odoratum, Geranium phaeum, Glechoma hederacea, Lamium galeobdolon, Lotus corniculatus, Luzula campestris*, *Lysimachia nummularia, Maianthemum bifolium, Neottia nidus-avis, Nonea pulla, Pinus sylvestris, Populus nigra, Populus tremula, Primula veris, Pulmonaria mollis, Pulmonaria obscura, Pyrus pyraster, Quercus pedunculiflora, Rosa canina, Rubus caesius, Rubus sp., Rumex sp. ., Salix caprea, Salix cinerea, Sambucus nigra, Scilla bifolia, Stachys sylvatica, Tanacetum vulgare, Taraxacum officinale, Tilia cordata, Trifolium pratense, Trifolium repens, Tussilago farfara, Urtica dioica, Veronica sp., Viola sp., Viola odorata* etc. The species *Neottia nidus-avis* has the sozological status NT, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. The species *Epipactis helleborine* has the sozological status NT, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. Among the alien invasive plant species, *Erigeron annuus subsp. annuus, Erigeron canadensis, Ambrosia artemisiifolia, Impatiens glandulifera and Robinia pseudoacacia* have been identified. No plant species of community interest or other rare or threatened plants have been identified in this area, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.





















Epipactis helleborine

Neottia nidus-avis

Figure no.4-24Aspects of the vegetation in the interval km 1+300 – km 3+750

Between km 3+750 and km 4+400, the project intersects meadows, areas with shrubs and the Mitoc river. Grazing is practiced in the meadows of this area, the animals being watered at the Mitoc river. The vegetation is composed of riparian plant species, plants characteristic of scrub habitats, plants characteristic of meadow habitats, but also other common and ruderal plants, such as: *Acer campestre, Acer pseudoplatanus, Allium scorodoprasum, Alnus glutinosa, Anemone nemorosa, Aposeris foetida, Briza media, Campanula glomerata, Carlina vulgaris, Carpinus betulus, Chaerophyllum aromaticum, Convolvulus arvensis, Coronilla varia, Corydalis solida, Corylus avellana, Crataegus monogyna, Crocus vernus, Dactylis glomerata, Dipsacus fullonum, Equisetum arvense, Euphorbia amygdaloides, Euphorbia sp., Ficaria verna, Filipendula vulgaris, Fragaria vesca, Gagea minima, Geranium palustre, Hepatica nobilis, Hypericum perforatum, Juncus effusus, Knautia arvensis, Lamium purpureum*, *Leucanthemum sp., Linum perenne, Lysimachia nummularia, Melampyrum nemorosum, Nepeta nuda, Orobanche lutea, Pyrus pyraster, Quercus robur, Primula veris, Pulmonaria obscura, Quercus pedunculiflora, Ranunculus aquatilis, Ranunculus repens, Rhinanthus minor, Rubus caesius, Rumex sp., Salix alba, Salvia pratensis, Salix purpurea, Salvia sp., Sambucus ebulus, Sambucus nigra, Scilla bifolia, Serratula sp., Stachys officinalis, Tilia cordata, Tussilago farfara, Ulmus minor, Urtica dioica, Vicia sylvatica, Viburnum opulus*, etc. Among the alien invasive plant species, the species *Robinia pseudoacacia* was identified. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area

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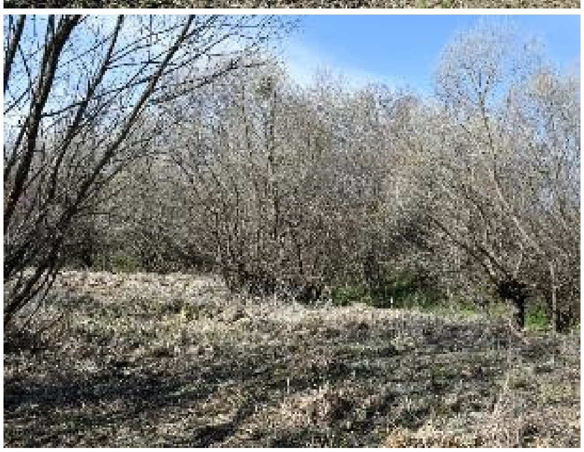















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Figure no.4-25Aspects of the vegetation in the area km 3+750– km 4+400

The project is located in the immediate vicinity of the Mitoc II lake, about 90 m away from km 4+225, where the vegetation is represented by riparian plant species, but also by common and ruderal plants, such as: *Salix alba, Salix sp., Phragmites australis, Alnus glutinosa, Rosa canina*, etc.. The lake area is anthropic, and the lake is artificially landscaped. In this area, no plant species of community interest, rare or threatened were identified, and those identified do not together form habitats of community interest. Below are some photos showing aspects of the vegetation in the described area.

Figure no.4-26Aspects of the vegetation in the Mitoc II lake area

The project is located in the vicinity of Lake Mitoc I, approximately 660 m away from km 4+500, where the vegetation is represented by riparian plant species, but also by common and ruderal plants, such as: *Phragmites australis, Alnus glutinosa, Picea abies, Betula pendula*, etc. Among the alien plant species, the species *Salix babylonica* was identified, being planted on the shores of the lake. The lake area is man-made, and the lake is artificially landscaped. In this area, no plant species of community interest, rare or threatened were identified, and those identified do not together form habitats of community interest. Below are some photos showing aspects of the vegetation in the described area.

Figure no.4-27Aspects of the vegetation in the Mitoc II lake area

The project is located in the immediate vicinity of the Dragomirna lake, about 120 m away from km 6+925, where the vegetation is represented by riparian plant species, but also by common and ruderal plants, such as: *Juncus inflexus, Lotus corniculatus, Ononis arvensis, Phragmites australis* (the vegetation here is dominated by this species), *Ranunculus aquatilis, Rosa canina, Salix alba*, etc.. No species of community interest, rare or threatened plants have been identified in this area, and those identified do not together form habitats of community interest. Below are some photos showing aspects of the vegetation in the described area.






Figure no.4-28Aspects of the vegetation in the Dragomirna lake area

The project crosses the Dragomirna river in the area km 7+950 – km 8+050. The vegetation in this area is represented by common riparian plant species, such as: *Allium scorodoprasum, Arctium minus, Artemisia sp., Cirsium sp., Conium maculatum, Cornus sanguinea, Dactylis glomerata, Dipsacus fullonum, Equisetum arvense, Galium mollugo, Glechoma hederacea*, *Hypericum perforatum, Juglans regia, Lamium purpureum, Marrubium peregrinum, Rumex* sp.*, Salix cinerea, Salix purpurea, Sambucus ebulus, Sambucus nigra, Typha latifolia, Typha minima, Urtica dioica* etc. This river is artificially arranged in the intersection area with the analyzed project. Among the potentially invasive allogeneic plant species, the species *Prunus cerasifera* was identified. On this river, downstream of the project, about 240 m from the project, the species *Typha minima* was identified. This species is in Annex I of the Bern Convention, according to the IUCN it has the sociological status at the European level DD, according to Olteanu et al. (1994) and Boşcaiu et al. (1994) is a rare species, and according to Oprea (2005) it has the sociological status NT. Below are pictures of the Typha minima species. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are some aspects of the vegetation in the area (photos).






Typha minima

Figure no.4-29Aspects of the vegetation in the area km 7+950 – km 8+050, the intersection of the project with the Dragomirna river

Adjacent to the project route, in the direction of km 9+650 – km 11+450, a clearing area is proposed, in an area with an orchard that seems abandoned, where common, ruderal and segetal plant species have been installed. Thus, species were identified here, such as: *Ajuga genevensis, Ajuga reptans, Capsella bursa-pastoris, Carex sp., Convolvulus arvensis, Crataegus monogyna, Eryngium campestre, Euphorbia cyparissias, Fragaria vesca, Populus nigra, Potentilla heptaphylla, Pyrus pyraster, Rosa canina, Rubus caesius, Taraxacum officinale, Thymus pulegioides, Veronica chamaedrys, Viola arvensis, Viola canina*. This area is pastured. In this area there is also a portion with an acacia plantation, *Robinia pseudoacacia*, the invasive alien species. Among the alien invasive species, in this area, in addition to *Robinia pseudoacacia*, the species *Erigeron annuus*subsp. annus was also identified In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.






Figure no.4-30Aspects of the vegetation in the borrow pit area from km 9+650 – km 11+450

In the interval km 11+600 – km 11+675 the project crosses the Pătrăuţeanca river. The vegetation is composed of riparian, common and ruderal plant species, such as:

*Alnus glutinosa, Anemone ranunculoides, Anemone nemorosa, Gagea minima, Populus nigra, Prunus spinosa, Rosa canina, Salix alba, Salix*sp., *Sambucus ebulus, Sambucus nigra*, etc. Among the alien invasive plant species, *Erigeron canadensis* and *Ambrosia artemisiifolia* were identified. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.






Figure no.4-31Aspects of the vegetation in the area km 11+600 – km 11+675, in the area of the intersection with the Pătrăuțeanca river

The project is located in the immediate vicinity of some private ponds, about 20 m away from the connecting road at km 13+225, where the vegetation is represented by marsh plant species, but also by common and ruderal plants. These ponds are arranged artificially. Also in this area, the project crosses a channel, where the vegetation is specific to riparian areas. Thus species were identified, such as:

*Allium scorodoprasum, Anthemis ruthenica, Arctium minus, Arctium*sp., *Artemisia vulgaris, Berula erecta, Calamagrostis arundinacea, Carex acuta, Cerinthe minor, Dactylis glomerata, Ficaria verna, Lactuca serriola, Lamium purpureum, Lysimachia nummularia, Papaver rhoeas, Phragmites australis, Potentilla reptans, Prunella vulgaris, Ranunculus repens, Rubus caesius, Rumex sp., Salix alba, Salix cinerea, Stellaria uliginosa, Symphytum officinale, Tussilago farfara, Typha angustifolia, Urtica dioica,* etc. Among the alien invasive plant species, the following were identified: *Erigeron annuus subsp. annuus, Erigeron canadensis, Robinia pseudoacacia.* Among the potentially invasive alien plant species, the species *Gleditsia triacanthos* was identified. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are some photos showing aspects of the vegetation in the described area.






Figure no.4-32Aspects of the vegetation in the area of the ponds near km 13+225 and in the area of the canal crossed by the project

In the km 14+950 – km 15+000 area, the project crosses the Hătnuța river, where the vegetation is characterized by riparian plant species, but also other common species, such as: *Anemone nemorosa, Cornus sanguinea, Ficaria verna, Galium aparine, Marrubium peregrinum, Rubus caesius, Salix alba, Salix cinerea, Salix purpurea*, etc. Among the invasive alien plants, the species *Echinocystis lobata* was identified in this area. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.

Figure no.4-33Aspects of the vegetation in the area of the intersection of the project with the Hătnuţa river, in the area km 14+950 – km 15+000

The proposed route of the project is parallel to the Suceava river and does not cross it. However, observations were also made in its area, considering that it is located near the project. Near km 17+100, the project is about 480 m from the Suceava river, the vegetation on the banks of the river in this area being made up of species such as: *Agrimonia eupatoria, Allium scorodoprasum, Alnus glutinosa, Alnus incana, Anchusa sp., Berteroa incana, Convolvulus arvensis, Cornus sanguinea, Coronilla varia, Crataegus monogyna, Dactylis glomerata, Dipsacus fullonum, Echium vulgare, Holcus lanatus, Humulus lupulus, Hypericum perforatum, Lamium purpureum, Linum perenne, Lotus corniculatus, Mentha pulegium, Myricaria germanica, Phragmites australis, Populus alba, Populus tremula, Potentilla reptans, Rubus caesius, Rubus sp., Rumex sp., Salix alba, Salix cinerea, Salix rosmarinifolia, Salvia sp., Sambucus ebulus, Sambucus nigra, Tanacetum vulgare, Trifolium pratense, Tussilago farfara, Typha latifolia, Urtica dioica,* etc.. Among the potentially invasive alien plant species, the species *Prunus cerasifera* was identified. Among the alien invasive plant species, the following were identified: *Ambrosia artemisiifolia, Amorpha fruticosa, Erigeron annuus subsp. annuus, Oenothera biennis, Parthenocissus quinquefolia, Robinia pseudoacacia, Xanthium orientale subsp. italic.* Adjacent to the Suceava river, near the project, about 115 m from km 17+275, there is a forest body, dominated by various species of poplar and willow, but in a portion of it, spruce is also planted. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.











Figure no.4-34Aspects of the vegetation on the banks of the Suceava river, near km 17+100

The project is adjacent to a forest habitat located inside the Natura 2000 site ROSCI0075 Pădurea Pătrăuți, respectively 9130, where the vegetation is composed of plant species characteristic of deciduous forests for this habitat, but also common plant species. It is located approximately 2.7 km from the project, respectively from km 18+800. The dominant species in this habitat is *Fagus* *sylvatica*, edifying species, which indicates the presence of the habitat of community interest 9130. Another edifying species for this habitat, which was identified in the field, is *Carpinus betulus*. In addition to the edifying species, other species characteristic of this habitat were also identified, thus confirming its presence, as presented in the site's Management Plan. Thus, species were identified in this area, such as: *Acer pseudoplatanus* (species present in the habitat structure), *Anemone nemorosa* (important species for the habitat), *Asarum europaeum* (important species for the habitat), *Campanula persicifolia* (important species for the habitat), *Carex pilosa* (species present in the habitat structure), *Carex sylvatica* (important species for the habitat), *Cornus sanguinea* (species present in the habitat structure), *Crataegus monogyna* (species present in the habitat structure), *Euonymus europaeus* (species present in the habitat structure), *Galium odoratum* (species present in the habitat structure), *Pulmonaria officinalis* (important species for the habitat), *Sambucus nigra* (species present in the habitat structure), *Sanicula europaea* (important species for the habitat), etc.. Other species identified in this area are species such as: *Acer campestre, Aegopodium podagraria, Alnus glutinosa, Aposeris foetida, Campanula patula, Carex sp., Chaerophyllum aromaticum, Chrysosplenium oppositifolium, Epipactis helleborine, Equisetum arvense, Ficaria verna, Fragaria vesca, Gagea lutea, Galium aparine, Geranium robertianum, Geum urbanum, Maianthemum bifolium, Neottia nidus-avis, Populus tremula, Prunella vulgaris, Prunus avium, Rubus caesius, Rubus sp., Stachys sylvatica, Tussilago farfara*, *Urtica dioica*, etc.. The species *Neottia nidus-avis* has the NT sozological status, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. The species Epipactis helleborine has the sozological status NT, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. No plant species of community interest or other rare or threatened plants have been identified in this area. Below are images that show aspects of the vegetation in the described area.







Epipactis helleborine


Neottia nidus-avis

Figure no.4-35Aspects of the vegetation in the range of the Natura 2000 site ROSCI0075 Pădurea Pătrăuţi, in the area with the presence of habitat 9130 and threatened plant species observed

In the area km 21+775 – km 21+825 the project intersects the Măriței stream, where the vegetation is characterized by species of riparian plants, but also other common species, such as: *Alnus glutinosa, Arctium lappa, Equisetum arvense, Ficaria verna, Juglans regia, Leonurus cardiaca, Populus nigra, Rubus caesius, Salix alba*, etc. Among the invasive alien plants, in this area the species *Xanthium orientale* subsp. *italicum*, *Erigeron annuus* subsp. *annuus* and *Amorpha fruticosa*. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.

Figure no.4-36Aspects of the vegetation in the area of the intersection of the project with the Măriței stream, in the area km 21+775 – km 21+825

In the km 22+150 – km 22+500 area, the project intersects a flood zone with willow groves and plant communities dominated by *Phragmites australis*. In this area, species were observed, such as: *Alnus glutinosa, Ranunculus repens, Rumex sp., Salix alba, Salix cinerea, Tussilago farfara*, etc. Among the invasive alien plants, the species *Amorpha fruticosa* and *Echinocystis lobata* were identified in this area. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.

Figure no.4-37Aspects of the vegetation in the area km 22+150 – km 22+500

The project crosses the Horaiţ river in 3 areas, respectively at km 25+225 – km 25+300, at km 26+025 – km 26+425 and at km 36+500 – km 36+725, where the vegetation is characterized by plant species riparian, but also other common species, such as: *Achillea millefolium, Alnus glutinosa, Anthriscus sylvestris, Arctium lappa, Carex sp., Cirsium vulgare, Conium maculatum, Dactylis glomerata, Dipsacus fullonum, Ficaria verna, Heracleum sphondylium, Gagea minima, Glechoma hederacea, Lamium maculatum, Lamium purpureum, Leucanthemum sp., Phragmites australis, Prunus avium, Rumex sp., Salix alba, Salix cinerea, Salix sp., Sambucus nigra, Silene latifolia, Taraxacum officinale, Tussilago farfara, Typha latifolia, Urtica dioica, Veronica sp ., Viola* sp. etc.. About 350 m from km 35+125, the treated waters from the treatment plant in the west of Calafindeşti are discharged into this river. In these areas, the project also crosses meadows, but these have no conservation value for the vegetation and are intensively grazed. Among the invasive alien plant species, the species were identified in these areas

*Amaranthus retroflexus, Ambrosia artemisiifolia, Erigeron annuus*subsp. *annuus* and *Echinocystis lobata*. In these areas, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described areas.
















Figure no.4-38Aspects of the vegetation in the area of the intersection of the project with the Horaiţ River and the discharge area of the treated water from the treatment plant in the west of Calafindeşti locality

The project crosses a heavily degraded meadow due to grazing, at km 35+325 – km 36+500. The vegetation here is poorly diversified. The plant species identified in this meadow are mainly ruderal (considering overgrazing), segetal (considering the fact that there are cultivated agricultural lands nearby) or common plant species. In this meadow there is also an irrigation canal, where mainly ruderal plant species have been installed, it retains water during rainfall, so there are quite a few characteristic plant species. No plant species of community interest, rare or threatened have been identified in this area. The plant species identified here do not form habitats of community interest or other important habitats for vegetation. Below are some images that capture aspects of the vegetation in the analyzed area.

Figure no.4-39Aspects of the vegetation in the project area, respectively km 35+325 – km 36+500

In the area km 42+000 – km 42+200 the project intersects the Negostina stream, where the vegetation is characterized by species of riparian plants, but also other common species, such as: *Arctium sp., Cornus sanguinea, Daucus carota, Galium aparine, Geranium sp. , Rosa canina, Salix cinerea, Salix sp. Sambucus nigra, Urtica dioica, Veronica* sp. etc. Among the invasive alien plants, the species *Amorpha fruticosa* was identified in this area. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are images that show aspects of the vegetation in the described area.

Figure no.4-40Aspects of the vegetation in the area of the intersection of the project with the Negostina stream, in the area km 42+000 – km 42+200

About 145 m from the project, km 48+850 is the Cuila river, where the vegetation is mainly represented by riparian plant species and other common plants, such as: *Alnus glutinosa, Galium aparine, Glechoma hirsuta, Lamium purpureum, Ranunculus repens, Rosa canina, Salix alba, Typha latifolia, Urtica dioica*, etc.. Among the species of invasive alien plants, the species *Robinia pseudoacacia* was identified. In this area, no plant species of community interest, rare or threatened, were identified, and those identified do not together form habitats of community interest. Below are some aspects of the vegetation in the area (photos).

Figure no.4-41Aspects of the vegetation in the area km 48+850, from the intersection with the Cuila river

The project crosses the Siret River and its banks, represented by willow groves and flooded meadows, at km 53+625 – km 54+625. The plant species identified in this area are species such as: *Achillea distans, Achillea millefolium, Achillea setacea, Agrimonia eupatoria, Agrostis sp., Alisma plantago-aquatica, Alnus glutinosa, Alnus incana, Anchusa officinalis, Anthemis arvensis, Anthemis ruthenica, Bellis perennis, Berteroa incana, Bromus hordeaceus, Bromus sp., Bromus tectorum, Butomus umbellatus, Campanula patula, Carex acuta, Carex sp., Cichorium intybus, Cirsium arvense, Convolvulus arvensis, Cornus sanguinea, Crataegus monogyna, Dactylis glomerata, Daucus carota, Echium vulgare, Epipactis palustris, Epipactis helleborine, Equisetum arvense, Eryngium campestre, Euphorbia cyparissias, Euphorbia sp., Galium aparine, Hypericum perforatum, Juncus compressus, Juncus inflexus, Lathyrus pratensis, Lathyrus tuberosus, Leucanthemum sp., Linum perenne, Linum tenuifolium, Lotus corniculatus, Mentha longifolia, Papaver rhoeas, Pastinaca sativa, Phragmites australis, Pimpinella sp., Plantago lanceolata, Populus alba, Populus nigra, Potamogeton natans, Potentilla argentea, Potentilla reptans, Prunus spinosa, Ranunculus polyanthemos, Ranunculus sp., Rubus caesius, Rumex acetosella, Salix alba, Salix cinerea, Salix rosmarinifolia, Salix sp., Salvia sp., Sambucus ebulus, Sambucus nigra, Saponaria officinalis, Scutellaria galericulata, Sedum acre, Tanacetum vulgare, Taraxacum officinale, Thymus pulegioides, Tragopogon dubius, Trifolium campestre, Trifolium pratense, Trifolium repens, Typha angustifolia, Typha latifolia, Typha minima, Urtica dioica, Verbascum sp., Vicia sativa* etc.. The species *Epipactis helleborine* has the sozological status NT, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. The species *Epipactis palustris* has the NT sozological status, according to Oprea (2005), according to Oltean et al. (1994) is a rare plant, and according to the IUCN, it has the sozological status LC. *Populus x canadensis* was identified among the potentially invasive alien plant species. Among the alien invasive plant species, the following were identified: *Erigeron annuus* subsp. *annuus*, *Erigeron canadensis, Oenothera biennis, Xanthium orientale* subsp. *italicum*. No plant species of community interest or other rare or threatened plants have been identified in this area, and those identified do not together form habitats of community interest. Below are some representative photos of the vegetation in the described area.






Figure no.4-42Aspects of the vegetation on the banks of the Siret river at km 53+625 – km 54+625

Allogeneic plant species, potentially invasive allogeneic and invasive allogeneic plant species were identified in the field in the project area and in its adjacent areas. Their distribution in the field was not carried out in all seasons and along the entire project route, but accidental data was collected regarding non-native plants, potentially invasive non-native plants and invasive non-native plants.

Among the alien plant species, the following were observed: *Malus domestica, Prunus* sp. (cultivated cherry), *Salix babylonica*. Among the potentially invasive alien species, the following species were observed: *Gleditsia triacanthos, Populus × canadensis* and *Prunus cerasifera*. Thus, the following invasive alien species were observed: *Amaranthus retroflexus, Ambrosia artemisiifolia, Amorpha fruticosa, Echinocystis lobata, Erigeron annuus subsp. annuus, Erigeron canadensis, Impatiens glandulifera, Oenothera biennis, Parthenocissus quinquefolia, Robinia pseudoacacia, Xanthium orientale subsp. italicum*. Also, aspects of them are shown in the images below. Below is a map of the distribution of these plants as observed in the field in the areas where observations were made.

Robinia pseudoacacia

*Xanthium orientale*subsp. italic

*Erigeron annuus*subsp. annual

Echinocystis lobata

Erigeron canadensis

*Populus*x canadensis

Oenothera biennis

Prunus cerasifera

Salix babylonica

Amorpha fruticosa

Malus domestica

*Prunus*sp. (cherry culture)

Amaranthus retroflexus

Ambrosia artemisiifolia

Parthenocissus quinquefolia

Oenothera biennis

Gleditsia triacanthos

Impatiens glandulifera

Figure no.4-43Aspects of non-native, potentially invasive non-native and invasive non-native plant species as observed in the field

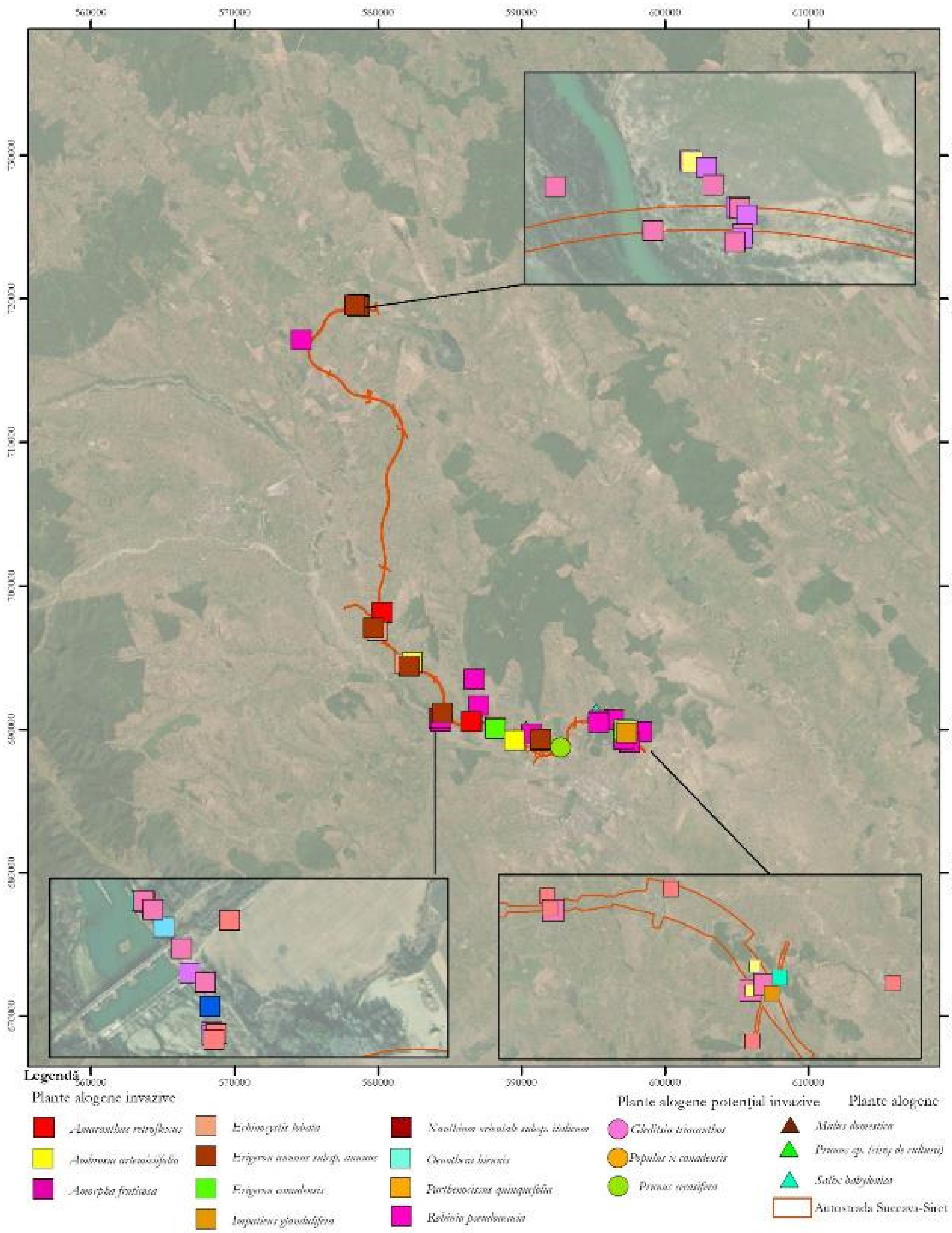

560000
570000
580000
590000
600000
610000
670000
680000
690000
700000
710000
720000
730000
Legendă
Plante alogene invazive
Amorpha fruticosa
Echinocystis lobata
Impatiens glandulifera
Robinia pseudoacacia
Plante alogene potențial invazive
Plante alogene
Autostrada Suceava-Siret

Figure no.4-44Distribution of non-native, potentially invasive non-native and invasive non-native plant species as observed in the field

5.5.5.2 INVERTEBRATES

Visual transects

The principle of the method is to walk along a transect over a fixed distance. The person performing the monitoring moves for a determined period of time in terrestrial habitats, visually detecting individuals or traces of their activity. The data collection methodology was drawn up according to the diurnal visual transect model used mainly for data collection for the Orthoptera, Coleoptera, Odonata and Lepidoptera orders, according to the Synthetic Guide for monitoring invertebrate species of community interest in Romania (Pârvulescu L. et al., 2015). The collection of data on the presence of invertebrate species involved the realization of diurnal visual transects, as well as the identification and thorough investigation of microhabitats favorable to invertebrate species of community interest, but also of other species present in the area. The areas of microhabitat associated with species of community interest reported in the area, forest edges, wet habitats, riverbanks, irrigation canals, etc., were mainly investigated.

Capture with the entomological net on a predetermined transect

This method was used especially for species associated with meadows or those characteristic of tall grassy vegetation and involves moving along a pre-established transect, making "mows" of the vegetation with the help of the entomological net, with the aim of the temporary containment of the individuals. After completing the transect, the net is visually examined and the individuals are subsequently released. Later, the identified species are registered in the application, for the generation of GPS points.

All the observations made were based on data recording (transects and species presence points) using the GPS Locus Map application and on photo captures. The obtained data were processed and entered into an electronic database.

To identify the species of invertebrates that were observed following field research, the Illustrated Determinator Butterflies of Britain and Europe (Haahtela el al., 2019) and the Illustrated Determinator Insects of Britain and Western Europe (Chiney, 2007) were used.

The information collected as a result of field observations was recorded in a database, and later analyzed using the ArcGIS Desktop 10.4 software. GPS waypoints were converted from WGS84 geographic projection to STEREO 1970.

Figure no.4-45Aspects during field data collection on invertebrates

The analysis of the invertebrates in the area also involved a check of the data and information available in the literature and online databases, related to this component. According to an analysis of the innaturalist.org database, we can outline an overall taxonomic picture based on the observations, which looks as follows: among invertebrates, the majority of observations are for insects, especially lepidopteran species. Among the species of conservation interest observed, we can mention the species *Lucanus cervus*.

It is important to mention that the project generally intersects non-irrigated agricultural land and a small percentage of pastures, habitats that are generally of little importance for invertebrate species but also areas with transitional forest vegetation and agro-forestry where a variety can be found greater number of invertebrate species of conservation interest.

Areas of agricultural lands and pastures are considered suboptimal habitats for the presence of invertebrates, especially those of conservation interest. Individuals belonging to the following orders were observed in the area: Lepidoptera (*Vanessa atalanta, Mamestra brassicae, Amata phegea*), Mantodea (*Mantis religiosa*), Coleoptera (*Monochamus galloprovincialis, Harpalus rufipes*) and Orthoptera (*Decticus verrucivorus, Tettigonia viridissima, Tettigidea lateralis*), but the abundance of invertebrates in these areas is not considered to be high.

Species specific to these areas, such as *Lucanus cervus*, were present in areas with transitional forest vegetation and agro-forestry.

Following the trips in the field, it was possible to identify several species of invertebrates belonging to several taxonomic orders: *Aquarius paludum, Pyrrhocoris apterus* from the order Hemiptera, *Aglais spec.*, *Aphantopus hyperantus, Camptogramma bilineata, Coenonympha pamphilus, Diacrisia sannio, Issoria lathonia, Plebejus idas, Vanessa cardui, Zygaena filipendulae*, species of butterflies belonging to the order Lepidoptera, *Calopteryx splenden, Coenagrion puella, Crocothemis erythraea, Libellula fulva, Orthetrum cancellatum, Platycnemis pennipes*, species of the order Odonata, as well as a representative of the order Orthoptera, *Anacridium aegyptium*, species from the Coleoptera order, respectively *Coccinella septempunctata*. Invertebrate species were also identified by the presence of galls on the host plants, namely the following: *Andricus kollari* (species identified on *Quercus pedunculiflora*), *Diplolepis rosae* (species identified on *Rosa canina*), *Lasyoptera rubi* (species identified on *Rosa canina*), *Rhabdophaga heterobia* (species identified on *Salix alba*), *Rabdophaga saliciperda* (species identified on *Salix alba*), *Rhabdophaga rosaria* (species identified on *Salix alba*), *Mikiola fagi* (species identified on *Fagus sylvatica*), *Pontania viminalis* (species identified on *Salix alba*), *Eriophyes leiosoma* (species identified on *Tilia* sp.). The invertebrate species identified in the field generally use diverse habitats, aquatic areas, meadows, edges of agricultural lands, clearings or forest edges around or within the scope of the project and are not subject to protection or conservation measures. Below you can see images of some individuals among the invertebrate species observed in the field.


Coenonympha pamphilus


Anacridium aegyptium


Idas plebejus


Aquarius paludum


Calopteryx splendens


Sanio diacrisis


Orthetrum cancellatum


Platycnemis pennipes


Carabus violaceus


Crococthemis erythraea


Zygaena filipendulae


Bilined camptogram

Vanessa cardui

Aphantopus hyperantus

Coccinella septempunctata

Andricus kollari

Diplolepis rosae

Pyrrhocoris apterus


Lasyoptera rubi


Rhabdophaga heterobia


Rhabdophaga saliciperda


Rhabdophaga rosaria


Mikiola do


Pontania viminalis

Eriophyes leiosoma

Figure no.4-46Invertebrate species observed in the field

Below is the table with the zoological and protection status of the invertebrate species identified in the field.

Table no.4-10The zoological status of the invertebrate species identified in the field

No. crt.	Species	IUCN (Europe)	Habitats Directive	GEO 57/2007	Berne Convention	The Red Book of Invertebrates from Romania (Murariu and Maican, 2022)
1.	*Anacridium aegyptium*	IC	-	-	-	-
2.	*Andricus kollari*	-	-	-	-	-
3.	*Aphantopus hyperantus*	IC	-	-	-	-
4.	*Aquarius paludum*	-	-	-	-	-
5.	*Calopteryx splendens*	IC	-	-	-	-
6.	*Camptogramma bilineata*	-	-	-	-	-
7.	*Coccinella septempunctata*	-	-	-	-	-
8.	*Coenagrion puella*	IC	-	-	-	-
9.	*Coenonympha pamphilus*	IC	-	-	-	-
10.	*Crocothemis erythraea*	IC	-	-	-	-
11.	*Diacrisia sannio*	-	-	-	-	-
12.	*Diplolepis rosae*	-	-	-	-	-
13.	*Eriophyes leiosoma*	-	-	-	-	-
14.	*Issoria lathonia*	IC	-	-	-	-
15.	*Lasyoptera rubi*					
16.	*Libellula fulva*	IC	-	-	-	-
17.	*Mikiola do*	-	-	-	-	-
18.	*Orthetrum cancellatum*	IC	-	-	-	-
19.	*Platycnemis pennipes*	IC	-	-	-	-
20.	*Idas plebejus*	IC	-	-	-	-
21.	*Pontania viminalis*	-	-	-	-	-
22.	*Pyrrhocoris apterus*	-	-	-	-	-
23.	*Rhabdophaga heterobia*	-	-	-	-	-
24.	*Rhabdophaga rosaria*	-	-	-	-	-
25.	*Rhabdophaga saliciperda*	-	-	-	-	-
26.	*Vanessa cardui*	IC	-	-	-	-
27.	*Zygaena filipendulae*	-	-	-	-	-

The legend:LC = "Least concern" (Low probability of extinction).

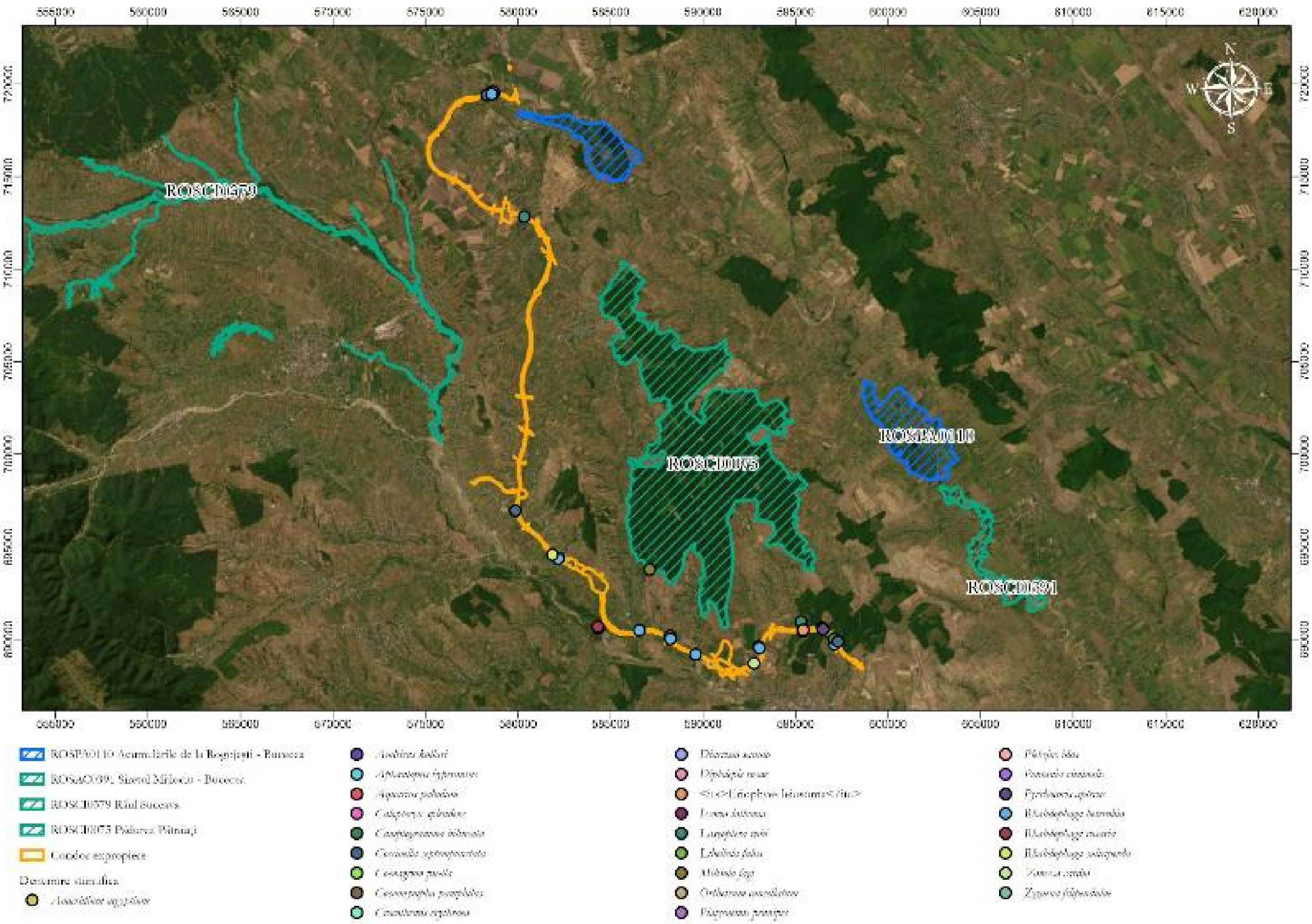


Figure no.4-47Reports of invertebrate species observed near the project during field trips

5.5.5.3 Ichtyofauna

Regarding the investigations of online databases and specialized literature regarding the presence of fish species in the project area, the investigations mainly focus on the Siret River and Rogojeşti Lake, these being the only bodies of water in the area with natural characteristics, optimal for the presence of ichthyofauna.

The Siret River presents a rich ichthyofauna, in this river there are many species of fish, both native and non-native species. The work "Ichthyofauna status in the Siret catchment area, with emphasis on the effect of the January 2001 pollution" presents 52 fish species as being present in the Siret river, of which 3 species are non-native and acclimatized and 2 are invasive species (Battes et et al. 2005).

Among the native species present in the Siret River are the following, considered rare: *Abramis ballerus, Cyprinus carpio, Tinca tinca, Acerina cernua, Esox lucius, Noemacheilus barbatusus, Barbus meridionalis, Blicca bjorkna, Carassius auratus, Sabanajewia aurata, Stizostedion lucioperca, Aspius aspius, Romanogobio kessleri, Eudontomyzon danfordi, Alburnoides bipunctatus, Leucaspius delineatus, Cobitis taenia*, etc. (Batter et al., 2005).

The Siret River is also frequently used for fishing by locals and sports fishermen.

The project also intersects tributaries of the Moldova River. The ichthyofauna in this river is characteristic of its location, being relatively similar to that of the Siret river.

5.5.5.4 Herpetological fauna

The diurnal aquatic visual transect

Method developed for the assessment of species of amphibians and aquatic reptiles for which determination there is no need to immobilize the specimens. The specialist systematically searches for the specimens present along a transect arranged parallel to the shore line, over a determined period of time, with the help of a trowel.

The diurnal terrestrial visual transect

Method developed for the identification of terrestrial reptile species. The specialist moves for a determined period of time in terrestrial habitats, visually detecting specimens. These diurnal transect methods are according to the Synthetic Guide for monitoring reptile and amphibian species in Romania (Török (Zs.) et al., 2013).

The collection of data on fauna species was carried out with the ObsMapp (Android) application from The Observation International Foundation, and for the rest of the points required for the report, the GPS Essentials (Android) application from Schollmeyer Software Engineering was used. Most of the species present in the vicinity of the site were also photographed with the help of a Nikon D850 camera and a Nikon AF-S Nikkor 200-400mm f/4G IF-ED VR II lens.

The information collected from the field was added, processed in a database and analyzed using the ArcMap 10.4.1 application. The data analysis consisted in the transformation of the coordinates of the GPS points resulting from the ObsMapp application from the WGS 84 coordinate system to

Stereo 70. Also, all the species photographed in the report were identified and entered into the database.


Figure no.4-48Aspects during field data collection of herpetopauna

Agricultural lands are the predominant representative habitats for this project, suboptimal for the presence of herpetofauna individuals. Aquatic breeding habitats in these areas are represented by habitats of the following types: drainage and irrigation canals along agricultural areas, temporary ponds, fish ponds, Rogojeşti Lake, the shore areas of the Siret River and the Suceava River along with their dead arms. These can potentially be used by species such as *Bombina variegata, Bombina bombina, Rana dalmatina, Pelophylax sp., Bufo* sp. etc.

The management plans of the sites ROSCI0075 Pădurea Pătrăuţi and ROSCI0391 Siretul Mijlociu — Bucecea, around the site indicate species such as: *Triturus cristatus, Bombina variegata, Bombina bombina, Rana dalmatiana, Pelobates fuscus, Hyla arborea, Bufo viridis* and *Emys orbicularis*. It should be noted the lack of observation data from the area in the online databases.

According to the online databases (openherpmaps.ro, inaturalist.org) there are reports of amphibian and reptile species around the project, but these being located at a relatively large distance, given the reduced mobility of the species, they cannot be taken into account. However, their presence in the site area cannot be excluded considering the existence of suitable habitats in the area. The species that are found in the online databases are the following: *Emys orbicularis, Lissotriton vulgaris, Pelophylax ridibundus, Pelophylax esculentus, Hyla cf. orientalis, Bufotes viridis, Pelobates fuscus, Lacerta agilis, Natrix natrix* and *Anguis colchica*.

Following field trips, 2 species belonging to the Reptilia class were identified, both species mentioned in Annex IV of the Habitats Directive for which strict protection is required: the smooth snake, *Coronella austriaca,* identified in the Natura 2000 site Pădurea Pătrăuţi and the sand lizard, *Lacerta agilis*, identified in several meadow areas within or near the project. 3 other species mentioned by the Habitats Directive in Annex IV, were found in the field, this time species belonging to the Amphibia class: the red-bellied frog, *Bombina bombina*, the yellow-bellied frog, *Bombina variegata* and the agile frog, *Rana dalmatina*. These species were identified within the forest bodies near the project. Around the aquatic habitats, either with standing or flowing water, specimens of the *Pelophylax* sp. amphibian genus could also be found in the field. Below are images of some of the herpetofauna species identified in the field.


Bombina bombina *Bombina variegata*


Coronella austriaca


*Pelophylax*sp. *Pelophylax* sp.

Lacerta agilis

Rana dalmatina

Figure no.4-49Species of amphibians and reptiles observed in the field

Below is the table with the zoological and protection status for the species of herpetofauna identified in the field.

Table no.4-11The zoological status of the herpetofauna species identified in the field

No. crt.	Species	IUCN (Europe)	Habitats Directive	GEO 57/2007	Berne Convention	The red book of vertebrates Botnariuc et al. (2005)
1.	*Bombina bombina*	IC	Appendix II	Appendix III	Appendix II	Near threatened speciesÞthread
2.	*Bombina variegata*	IC	Annex II, Annex IV	Appendix III	Appendix II	Near threatened species
3.	*Coronella austriaca*	IC	Appendix IV	Annex IVA	Appendix II	Vulnerable species
4.	*Lacerta agilis*	IC	Appendix IV	Annex IVA	Appendix II	It is not mentioned
5.	*Lacerta* p.	-	-	-	-	-
6.	*Pelophylax* sp.	-	-	-	-	-
7.	*Rana dalmatina*	IC	Appendix IV	Annex IVA	Appendix II	Vulnerable species

Caption: LC= "Least concern" (Low probability of disappearance); “ – “ = Unrated.

Figure no.4-50 Reports of herpetofauna species observed near the project, during field trips

5.5.5.5 avifauna

Given the relatively large length of the project, but even the variety of types of habitats that the project crosses, in order to obtain a satisfactory quality and quantity of data on avifauna, several monitoring methods were used.

Linear transect method

In the case of open areas, with arable land, meadows or river courses, the daily linear transect method was mainly used, according to the Standard Guide for Monitoring Bird Species of Community Interest in Romania (Domşa et al., 2014), which consists of traveling a predetermined route with the aim of identifying all individuals and families of species present in the project area, at the time of survey. The transect was traveled by car, where possible, or on foot, with the observer mooving at a low speed to ensure the observation of all individuals present. The advantage of this method is that it can cover a relatively large area of land in a relatively short time.

Fixed point method

For closed, forest-type habitats, but also for agglomerations of aquatic species, the method of observations from a fixed point was used. The method involves the initial establishment of some points in the field where the visibility of the habitat is optimal and later making observations on the avifauna from the predetermined points for a given period of time. The method is especially useful when dealing with a large number of species and/or a large number of individuals.

For each individual or group of individuals, data were noted, such as: the position of the species through a static point using the iObs (iPhone) application, developed by Stichting Observation International, information on behavior, age, date and time when it was observed the individual. Also, photographs were taken for most of the observations made. The data resulting from the field was then included in a database. Species identifications were made using the ornithological determinant Collins Bird Guide, 2nd edition (Svensson et al., 2011).

The equipment used to perform the observations consisted in a GPS device (Garmin E-trek 10), optical instruments (VANGUARD 10x42 binoculars, LEICA rear window) and o cameras (Nikon D800E with AF-S Nikkor 80-400 mm f/4.5-5.6 G ED telephoto lens).

The information collected from the field was added, processed in a database and analyzed using the ArcGIS Pro 2.5.0 application. The data analysis consisted in the transformation of the coordinates of the GPS points resulting from the transects from the WGS 84 coordinate system into Stereo 70, the processing of the photos taken, all the species photographed in the report being identified and entered into a project database.

Figure no.4-51 Aspects during transects (left) and fixed point observations (right) for avifauna

The method of passive bioacoustic observations

In addition to the diurnal transects carried out at the site, sound recording devices for avifauna were placed in their agglomeration areas. Recordings took place 90 minutes before and after sunrise, with the same settings being used for sunset.

Sound recording was performed using bioacoustic devices with external microphones (Titley Scientific Anabat Chorus 1.0). The analysis of the collected data consisted in the determination of the registered species with the Kaleidoscope 5.4.8 program and BirdNET-Analyzer, and the identifications were then entered into the project's database.

Figure no.4-52 Aspects during the installation of sound recorders for avifauna

The avifauna that defines the areas, habitats and ecosystems intersected by the project can be grouped into three major categories of presence: sedentary species (which can be observed at any time of the year, with exceptions that are limited to seasonal movements, especially from the mountain area to the areas with lower altitude or with more diversified trophic resources, mainly in the winter season), migratory species (which appear near the project only in a certain period of the year, nesting from spring to autumn or using the present habitats, in winter migrating to areas with wintering quarters) and passage species (only passing through the site area, towards breeding areas or wintering quarters).

Depending on the ecological requirements of the bird species present, they are divided into several categories, namely: bird species dependent on open aquatic habitats (which depend on the lakes or streams present to nest or feed, most of them having characters specific physiological conditions for this type of habitat), bird species dependent on open habitats (such as meadows, agricultural land present, species nesting and foraging in shrubs, trees or on the ground), bird species dependent on forest habitats (which depend of forest ecosystems for nesting or food procurement) and anthropophilic species (which depend to some extent on human agglomerations to fulfill one or more ecological requirements).

Species from the previously presented bird categories were identified within the checks of online databases (openbirdmaps.ro, inaturalist.org) and specialized literature. The specific diversity of the bird populations that populate the territories of the study area are influenced by certain factors such as: the general appearance of the flora and vegetation in the present biocenoses, the characteristics of the existing habitats, the variety and abundance of available food resources and the intensity of the activities carried out by the human component in the area of interest.

The special avifaunistic protection area ROSPA0110 Acumulările Rogojeşti - Bucecea are located at a short distance from the project site (approx. 450 m) considering the large movement capacity of bird species, at a distance of approximately 700 m. In this area and its surroundings, the diversity of species and the number of individuals are high, due to the body of water present in the area. Among the species identified are also species listed in Annex I, such as: *Ciconia ciconia, Egretta alba, Circus aeruginosus*, etc.. Also, the Management Plan of the site mention nesting species of conservation interest listed in Annex I of the Birds Directive observed in the area of the bodies of water, due to marshy vegetation e which is abundant along the banks and even forms large reed islands, among them are: *Alcedo athis, Ardea purpurea, Lanius collurio, Larus minutus, Sterna albifrons, Ixobrychus minutus, Botaurus stellaris* and *Chlidonias hybridus*. The area is an important stopping place for migratory birds, highlighting the large agglomerations of aquatic birds during migration , such as: *Chlidonias niger, Egretta garzetta, Sterna hirundo, Cygnus cygnus, Himantopus himantopus, Tringa glareola, Pluvialis apricaria, Mergus albellus, Phalacrocorax pygmeus, Philomachus pugnax*. Beside these bodies of water there are marshes, pasture and extensive agricultural crops that provide food and rest for several species of birds including: *Ciconia ciconia, Circus aeroginosus, Lanius minor, Lanius collurio, Egretta alba, Anser albifrons, Cygnus cygnus*, etc.

Also, the site is important for the species that winter in this area due to the favorable habitats offered by these bodies of water, among them we list: *Aythya marila, Haliaeetus albicilla, Circus cyaneus, Gavia stellata, Gavia arctica*, etc.

In the area, species that are found accidentally in our country were also observed, such as *Calidris subrufficolis*, a species that is native to North America and the northern tundras, migrating to Western Europe for the winter. This species is included in the IUCN NT (Near Threatened) category.

Observations according to specialized online databases, state that this perimeter permanently or temporarily hosts avifauna that can serve as bioindicators on the quality of the habitats that are intersected by the site or found in ROSPA0110.

The main habitats intersected by the project are represented by agricultural monocultures, among which there are also areas with spontaneous natural vegetation and meadow areas, but also areas with transitional forest vegetation and agro-forestry areas. Agricultural habitats represent an important source of feeding for bird species in passage or that prefer open habitats, being attracted to food sources, such as seeds from crops or micromammals and invertebrates present in them. Among them, the species of diurnal birds of prey represented by species such as: *Buteo buteo, Falco tinnunculus, Buteo lagopus, Circus cyaneus, Clanga pomarina*. The feeding area of the species *Clanga pomarina* (listed in Annex I of the Birds Directive and is an endangered species) intersects with the project site. Also, for the *Buteo buteo* species, the site intersects the feeding habitats in the area of a shoulder of the future expressway. For some species of diurnal birds of prey that were observed in feeding behavior, the location does not directly intersect the feeding habitats, although these were observed at a relatively small distance from the project (*Circus cyaneus* –500 m, *Falco tinnunculus* – 600 m). In addition to diurnal birds of prey, other species of conservation interest that prefer these areas of agricultural crops or open fields are: *Oenanthe oenanthe, Emberiza calandra, Galerida cristata, Crex crex, Alauda arvensis, Coturnix coturnix* and *Perdix perdix, Upupa epops*.

Forest habitats and agro-forestry areas present a high diversity of bird species. In the areas where the forest habitats are bordered by open mosaic agricultural lands, certain species of diurnal birds of prey have been observed, which prefer these areas, among them are species such as: *Pernis apivorus, Accipiter gentilis* and *Falco subbuteo*. Also, these areas are frequented by species of woodpeckers, such as: *Dendrocopos major, Dryobates minor* and *Picus viridis*. In addition to these, the edges are frequented by passerine species that nest in the forest bodies, but can frequent these areas in search of food, among them we list: *Turdus philomelos, Parus major, Ficedula albicollis, Periparus ater, Pyrrhula pyrrhula*, etc.

Wetlands, such as: rivers and irrigation and drainage canals that are positioned between the crop plots in the agricultural areas intersected by the project, represent favorable habitats for bird species dependent on aquatic habitats, which are used for nesting on the shore, resting, or feeding. Most of the observed species are dependent on open areas due to the habitats present in the project area. Among them, the species were observed: *Anas platyrhyncos, Fulica atra, Acrocephalus arundinaceus, Croicocephalus ridibundus, Sterna hirundo, Motacilla alba, Gavia arctica, Anas acuta, Ardea alba, Mareca strepera, Cygnus olor, Aythya fuligula, Larus cachinans, Mareca penelope, Pluvialis squatarola, Calidris alpina, Aythyna ferina, Anser albifrons, Spatula clypeata, Vanellus vanellus, Anas crecca, Tringa erythropus, Gallinago gallinago, Podiceps cristatus, Ciconia ciconia*, etc.

Urban areas are favorable habitats for opportunistic bird species that prefer the presence of humans to satisfy certain ecological requirements. Among them, highlighted in the following figure, we list passerine species: *Passer domesticus, Motacilla alba, Hirundo rustica, Carduelis carduelis, Turdus pilaris, Fringilla coelebs, Parus major, Sturnus vulgaris, Delichon urbicum, Phoenicurus ochruros, Passer monatnus, Aegithalos caudatus*, columbiformes: *Columba livia forma domestica, Streptopelia decaocto*, corvids: *Corvus frugilegus, Coloeus monedula, Pica pica*, charadriiformes: *Larus cachinnans* and *Croicocephalus ridibundus*, apodiformes: *Apus apus, Tachymarptis melba*, ciconiiformes: *Ciconia ciconia*, but also species of nocturnal predators such as: *Athene noctua, Asio otus* and *Otus scops*.

Orchard areas, groves and areas with vegetation, especially shrubs, around agricultural land are preferred by species that tolerate minimal human disturbance in the area, among them are: *Oriolus oriolus, Upupa epops, Garrulus glandarius, Sylvia communis, Columba palumbus, Emberiza citrinella, Lanius* *excubitor, Lanius collurio, Spinus spinus, Merops apiaster, Cyanistes caeruleus, Anthus spinoletta, Cuculus canorus*, etc.

Figure no.4-53 *Actitis hypoleucos* (left), *Fulica atra* (right)

Segment Km 0+000 – km 9+700

On this interval located north of Suceava Municipality, the project runs through a series of agricultural lands, crosses a body of forest for a distance of about 3.1 km and reaches a minimum distance of 130 meters from a water body, Lake Lipoveni, located on the Dragomirna River.

After traveling in the field, a number of species belonging to the Passeriformes order could be observed inside the forest body, including 4 species of woodpeckers: *Picus canus, Dendrocopos major, Picus viridis* and *Dendrocopos medius*, as well as other species of specific songbirds of this type of habitat: *Chloris chloris, Carduelis carduelis, Turdus merula, Turdus philomelos, Sitta europaea, Parus major, Cyanistes caeruleus, Fringilla coelebs, Phylloscopus collybita, Phylloscopus sibilatrix, Phylloscopus trochilus, Poecile palustris, Certhia familiaris, Sylvia atricapilla, Erithacus rubecula, Emberiza citrinella, Oriolus oriolus, Sturnus vulgaris, Garrulus glandarius, Corvus corax* and *Ficedula albicollis*. Also worth noting is the presence of a species of nocturnal bird of prey, *Strix aluco*, species characteristic of forest habitats with old and decaying trees.

Among the species characteristic of open areas, with agricultural lands and hayfields, the following passerine species were recorded: *Coturnix coturnix, Emberiza citrinella, Carduelis carduelis, Passer montanus, Passer domesticus, Linaria cannabina, Chloris chloris, Turdus pilaris, Pica pica, Corvus frugilegus, Corvus corax, Vanellus vanellus*. During field investigations, numerous specimens of *Buteo buteo*, a species of day raptor that uses open areas for feeding and resting, specimens of white stork, *Ciconia ciconia*, which looks for food in meadow areas and nests in the localities bordering the project (Mitocu Dragomirnei), but also other species of day raptors: *Accipiter nisus, Clanga pommarina, Falco subbuteo*.

Lake Lipoveni, located in the immediate vicinity of the project, is an aquatic area that concentrates important populations of species and specimens during the wintering and migration period, where the following characteristic species can be observed: *Ardea cinerea, Cygnus olor, Cygnus cygnus, Anas platyrhynchos, Spatula querquedula, Aythya ferina, Podiceps cristatus, Phalacrocorax carbo, Nycticorax nycticorax, Fulica atra, Chroicocephalus ridibundus, Vanellus vanellus, Sterna hirundo*. In the area of marshy habitats, the following species were identified: *Motacilla alba, Motacilla flava, Sturnus vulgaris, Passer montanus, Acrocephalus arundinaceus.*


Figure no.4-54 *Sterna hirundo* (left), *Passer domesticus* (right)

Segment Km 9+700 – km 24+400

This interval covered by the project includes a mosaic area, with lands covered by agricultural crops and hayfields, the project route being parallel to the Suceava River, from which it reaches a minimum distance of about 500 meters at km 17+200. In the north-eastern part of the project there is an important body of forest, Pătrăuți Forest. From an avifaunistic point of view, this interval is notable for the presence of numerous specimens of raptors during the day that use the habitats in the area for feeding both during the winter but also during the migration or nesting period. Among the daytime raptor species we mention: *Buteo buteo, Falco tinnunculus, Circus cyaneus.* Also, in the localities bordering the project (Pătrăuți, Dărmănești) we were able to review several nests of the white stork, *Ciconia ciconia*, a species that uses the habitats in the project area and nearby for feeding. The bird species specific to the agricultural areas found on this project range are: *Alauda arvensis, Sturnus vulgaris, Carduelis carduelis, Linaria cannabina, Pica pica, Turdus pilaris, Passer domesticus, Emberiza citrinella, Passer montanus, Saxicola rubetra, Columba palumbus, Vanellus vanellus, Curruca communis, , Chloris chloris.*

On the course of the Suceava river, on the segment parallel to the project, a series of characteristic aquatic species were identified: *Anas platyrhynchos, Ardea alba, Ardea cinerea, Cygnus olor, Charadrius dubius, Actitis hypoleucos* and a nesting colony belonging to the species *Sterna hirundo*, but also a series of species characteristic of riparian forest habitats: *Garrulus glandarius, Sitta europaea, Turdus merula, Turdus philomelos, Parus major, Fringilla coelebs, Emberiza citrinella, Periparus ater, Sylvia atricapilla, Phylloscopus collybita, Dendrocopos major, Erithacus rubecula, Curruca curruca, Chloris chloris.*


Figure no.4-55 *Cuculus canorus* (left), *Curruca communis* (right)

Segment Km 24+300 – km 56+000

In this interval, the project runs mostly through agricultural lands with the Suceava River in the eastern part and the Pătrăuți Forest in the western part, and at the northern end the project intersects the Siret River and reaches a distance of about 800 meters from the Rogojeşti Reservoir, part of area of avifaunistic importance ROSPA0110 Acumularea Rogojeşti - Bucecea. In this interval it was possible to ascertain, following field observations, the presence of diurnal raptor species that use the habitats from the project catchment and its surroundings for feeding, and here we mention *Buteo buteo, Circus aeruginosus, Falco tinnunculus* and *Accipiter nisus* with numerous specimens noted especially in the winter period, but individuals were also observed during the nesting period. *Ciconia ciconia* is also present in the project area, nests can be observed in the localities near the project (Grănicesti, Calafindeşti, Bălcăuți, Bănceşti, Muşeniţa), the species using hay habitats and nearby wetlands for feeding. Among the common species that use the open or scrubby areas we noted: *Sturnus vulgaris, Garrulus glandarius, Turdus pilaris, Fringilla coelebs, Pica pica, Chloris chloris, Emberiza citrinella, Passer montanus, Lanius excubitor, Corvus corax, Linaria cannabina, Curruca curruca, Columba palumbus, Carduelis carduelis, Alauda arvensis, Perdix perdix, Phasianus colchicus, Phylloscopus collybita, Emberiza calandra, Oriolus oriolus, Phoenicurus phoenicurus, Picus canus*. Below are images of some of the bird species identified in the field.

Perdix perdix

Charadrius dubius

Emberiza citrinella

Podiceps cristatus

Figure no.4-56Bird species observed in the field

The following table shows all the species identified during the field trip for the project, as well as their sozological and protection status, respectively if they are species of community interest, rare or threatened.

Table no.4-12The sozological status of the bird species identified in the field

No. crt.	Name of the species	GEO 57/2007	Birds Directive	IUCN List of Threatened Species	Bonn Convention	Bern Convention	Red Book of Vertebrates
1.	*Accipiter nisus*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
2.	*Actitis hypoleucos*	Appendix IV	–	G: LC, EU: LC	Appendix II	Appendix II	–
3.	*Alauda arvensis*	–	Annex II/B	G: LC, EU: LC	–	Appendix III	–
4.	*Anas platyrhynchos*	Appendix V	Annex II/A, Annex III/A	G: LC, EU: LC	Appendix II	Appendix III	–
5.	*Anas querquedula*	–	Annex II/A	G: LC, ME: VU	Appendix II	Appendix III	–
6.	*Anthus trivialis*	–	–	G: LC, EU: LC	–	Appendix II	–
7.	*Aquila pomarina*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Appendix II	Vulnerable species
8.	*Ardea cinerea*	–	–	G: LC, EU: LC	–	Appendix II	–
9.	*Aythya ferina*	Appendix V	Annex II/A, Annex III/B	G: VU, ME: VU	Appendix II	Appendix III	–
10.	*Aythya fuligula*	–	Annex II/A, Annex III/B	G: LC, EU: LC	–	Appendix III	–
11.	*Aythya nyroca*	Appendix III	Annex I	G: NT, EU: LC	Annex I, Annex II	Annex I, Annex III	Vulnerable species
12.	*Buteo buteo*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
13.	*Carduelis cannabina*	–	–	G: LC, EU: LC	–	Appendix II	–
14.	*Carduelis carduelis*	Appendix IV	–	G: LC, EU: LC	–	Appendix II	–
15.	*Carduelis chloris*	–	–	G: LC, EU: LC	–	Appendix II	–
16.	*Certhia familiaris*	–	–	G: LC, EU: LC	–	Appendix II	–
17.	*Charadrius dubius*	–		G: LC, EU: LC	Appendix II	Appendix II	–
18.	*Ciconia ciconia*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Appendix II	Vulnerable species
19.	*Circus aeruginosus*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Appendix II	–
20.	*Columba palumbus*	Appendix V	Annex II/A, Annex III/A	G: LC, EU: LC	–	–	–
21.	*Coracias garrulus*	Appendix III	Annex I	G: LC, EU: LC	Annex I	Annex I, Annex	–

No. crt.	Name of the species	GEO 57/2007	Birds Directive	IUCN List of Threatened Species	Bonn Convention	Bern Convention	Red Book of Vertebrates
						II	
22.	*Corvus corax*	Appendix IV	–	G: LC, EU: LC	–	Appendix III	Endangered species
23.	*Corvus corone*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
24.	*Corvus frugilegus*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
25.	*Corvus monedula*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
26.	*Cyanistes caeruleus*	–	–	G: LC, EU: LC	–	Appendix II	–
27.	*Cygnus cygnus*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Annex I, Annex II	–
28.	*Cygnus olor*	–	Annex II/B	G: LC, EU: LC	Appendix II	Appendix III	–
29.	*Dendrocopos major*	–	–	G: LC, EU: LC	–	Appendix II	–
30.	*Dendrocopos medius*	Appendix III	Annex I	G: LC, EU: LC	–	Appendix II	–
31.	*Egretta alba*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Appendix II	Endangered species
32.	*Emberiza citrinella*	–	–	G: LC, EU: LC	–	Appendix II	–
33.	*Emberiza schoeniclus*	–	–	G: LC, EU: LC	–	Appendix II	–
34.	*Erithacus rubecula*	Appendix IV	–	G: LC, EU: LC	Appendix II	Appendix II	–
35.	*Falco subbuteo*	Appendix IV	–	G: LC, EU: LC	Appendix II	Appendix II	–
36.	*Falco tinnunculus*	Appendix IV	–	G: LC, EU: LC	Appendix II	Appendix II	–
37.	*Ficedula albicollis*	Appendix III	Annex I	G: LC, EU: LC	Appendix II	Appendix II	–
38.	*Fringilla coelebs*	–	–	G: LC, EU: LC	–	Appendix III	–
39.	*Fulica atra*	Appendix V	Annex II/A	G: LC, EU: NT	–	Appendix III	–
40.	*Galerida cristata*	–	–	G: LC, EU: LC	–	Appendix III	–
41.	*Garrulus glandarius*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
42.	*Hirundo rustica*	–	–	G: LC, EU: LC	–	Appendix II	–
43.	*Lanius excubitor*	–	–	G: LC, EU: LC	–	Appendix II	–
44.	*Larus cachinnans*	–	Annex II/B	G: LC, EU: LC		Appendix III	–
45.	*Larus cachinnans/ Larus michahellis*	–	–	G: LC, EU: LC	–	Appendix III	–
46.	*Larus ridibundus*	–	Annex II/B	G: LC, EU: LC	–	Appendix III	–
47.	*Luscinia luscinia*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
48.	*Motacilla alba*	–	–	G: LC, EU: LC	–	Appendix II	–
49.	*Motacilla flava*	–	–	G: LC, EU: LC	–	Appendix II	–
50.	*Nycticorax nycticorax*	Appendix III	Annex I	G: LC, EU: LC	–	Appendix II	Vulnerable species
51.	*Parus ater*	–	–	G: LC, EU: LC	–	Appendix II	–

No. crt.	Name of the species	GEO 57/2007	Birds Directive	IUCN List of Threatened Species	Bonn Convention	Bern Convention	Red Book of Vertebrates
52.	*Parus major*	–	–	G: LC, EU: LC	–	Appendix II	–
53.	*Parus palustris*	–	–	G: LC, EU: LC	–	Appendix II	–
54.	*Passer domesticus*	–	–	G: LC, EU: LC	–	Appendix III	–
55.	*Passer montanus*	–	–	G: LC, EU: LC	–	Appendix III	–
56.	*Perdix perdix*	Appendix V	Annex II/A, Annex III/A	G: LC, EU: LC	–	Appendix III	–
57.	*Phalacrocorax carbo*	Appendix V	–	G: LC, EU: LC	–	Appendix III	–
58.	*Phasianus colchicus*	Appendix V	Annex II/A, Annex III/A	G: LC, EU: LC	–	Appendix III	–
59.	*Phylloscopus collybita*	Appendix IV	–	G: LC, EU: LC	Appendix II	Appendix II	–
60.	*Phylloscopus sibilatrix*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
61.	*Phylloscopus trochilus*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
62.	*Pica pica*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
63.	*Picus canus*	Appendix III	Annex I	G: LC, EU: LC	–	Appendix II	–
64.	*Podiceps cristatus*	–	–	G: LC, EU: LC	–	Appendix III	–
65.	*Saxicola rubetra*	–	–	G: LC, EU: LC	–	Appendix II	–
66.	*Sitta europaea*	–	–	G: LC, EU: LC	–	Appendix II	–
67.	*Sterna hirundo*	Appendix III	Annex I	G: LC, EU: LC	–	Appendix II	–
68.	*Streptopelia decaocto*	Appendix V	Annex II/B	G: LC, EU: LC	–	Appendix III	–
69.	*Strix aluco*	–	–	G: LC, EU: LC	–	Appendix II	–
70.	*Sturnus vulgaris*	Appendix V	Annex II/B	G: LC, EU: LC	–	–	–
71.	*Sylvia atricapilla*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
72.	*Sylvia curruca*	–	–	G: LC, EU: LC	Appendix II	Appendix II	–
73.	*Turdus merula*	–	Annex II/B	G: LC, EU: LC	–	Appendix III	–
74.	*Turdus philomelos*	Appendix V	Annex II/B	G: LC, EU: LC	–	Appendix III	–
75.	*Turdus pilaris*	–	Annex II/B	G: LC, EU: LC	–	Appendix III	–
76.	*Upupa epops*	Appendix IV	–	G: LC, EU: LC	–	Appendix II	Vulnerable species
77.	*Vanellus vanellus*	–	Annex II/B	G: NT, ME: VU	Appendix II	Appendix III	–

The legend:LC = "Least concern" (Low probability of disappearance); VU = vulnerable; NT = potentially threatened with extinction.

5.5.5.6 Mammals

To analyze the presence of mammal species in the project area, the following methods were used, adapted according to the recommendations of the Synthetic Monitoring Guide for mammal species of community interest in Romania, developed by the Institute of Biology in Bucharest:

- For diurnal mammals – diurnal transects to identify tracks, individuals and camera trapping;
- For chiropterans – ultrasound recordings within dedicated transects and investigations of optimal areas for colonies or individuals (eg: abandoned buildings, tree hollows).

Diurnal transect method

This method consists in following a predetermined route with the aim of identifying all the individuals and families of species present within the location of the station, at the time of travel. The transect was traversed at a walking pace, with the observer traveling at a low speed to ensure observation of all individuals or tracks present.

For each individual or track, data were noted, such as: the position in the site through a static point with the help of a GPS device (Garmin E-trek 30), information regarding behavior, age, date and time when the individual was observed. Photographs were also taken for most of the observations made within the project. The data resulting from the field was then included in a database.

The equipment used to perform the observations consisted in a GPS device (Garmin E-trek 30), optical instruments (Nikon Monarch 10 x42 5.5° binoculars) and cameras (Nikon D7500 with AF-S Nikkor 50-500 mm f/4.5-6.3 APO DG OS HSM telephoto lens).

The information collected from the field was added, processed in a database and analyzed using the ArcGIS Pro 2.5.0 application. The data analysis consisted in the transformation of the coordinates of the GPS points resulting from the transects from the WGS 84 coordinate system into Stereo 70, the processing of the photos taken, all the species photographed in the report being identified and entered into a project database.

Figure no.4-57Aspects during the collection of field data on mammals by the diurnal transect method

Camera with motion sensor

For this method, recording cameras with a motion sensor (WiFi830 Trap Camera) were used in areas of favorable habitat for fauna in the locations investigated within the project, they record information on the movements of fauna both during the day and at night, being activated by the infrared sensor.

For each individual identified in the resulting images, data such as the position relative to the camera in GPS coordinates were noted, the data being processed in a database and analyzed using the ArcGIS Pro 2.5.0 application. The data analysis consisted in transforming the coordinates of the resulting GPS points from transects in the WGS 84 coordinate system in Stereo 70, the processing of the photos taken, all the species photographed in the report being identified and entered into a database of the project.

Figure no.4-58 Aspects during the installation of motion sensor cameras for mammals

Passive bioacoustic observations

In order to have a complete picture of the presence of chiropteran species, sound recording devices for bats were used.

Sound recording was performed using bioacoustic devices with external microphones (Titley Scientific Anabat Chorus 1.0). The analysis of the collected data consisted in the determination of the recorded species with the Kaleidoscope 5.4.8 program, and the identifications were then entered into the project's database. Recordings with the Anabat Chorus device took place 90 minutes before and after sunrise, with the same settings being used for sunset.

Figure no.4-59Aspects during the installation of sound recorders for chiroptera

The analysis of the presence of mammals in the project area was carried out based on data and information from specialized literature, as well as online databases.

The project area is represented by agricultural areas and meadows, but also areas with forest vegetation. In general, relatively common mammal species were reported, which may represent important components in the trophic relationships that support biodiversity in the area.

Along the site and around it, the land is homogeneous, with agricultural land, meadows, forest areas are rarely present. Most of the observations in the project area were made for the species *Capreolus capreolus*, being also present species such as *Spermophilus cittelus, Meles meles, Castor fiber* and *Vulpes vulpes*. The habitat is represented by agricultural crops. According to the mammal species monitoring studies carried out for the Management Plan of the ROSCI0075 Pădurea Pătrăuți site, a number of 6 species of mammals are present in the area of the site, including: *Capreolus capreolus, Dama dama, Cervus elaphus, Lepus europaeus, Sus scrofa* and *Felis silvestris*.

Bat

The field investigations for the identification of chiroptera were carried out in order to achieve the study of the Management Plan of the ROSCI0075 Pădurea Pătrăuți site, which is located at a relatively short distance (approx. 1900 m - 2000 m) from the project site, which makes this category not be excluded from the list of species that may be affected by the project. In the field study regarding ultrasound detection, 10 chiropteran species were recorded, among which: *Pipistellus nathusi, Pipistrellus kuhlii, Pipistrellus pipistellus, Myotis myotis, Myotis dasycneme, Myotis mystacinus, Barbastrella barbastrellus, Nyctalus leisleri, Nyctalus noctula* and *Eptesicus serotinus*. It should be noted that the species *Myotis myotis, M. dasycneme, Barbastella barbastellus* are species listed in Annex II of the Habitats Directive that require the designation of special protection areas (Natura Sites 2000). The rest of the chiroptera species are strictly protected and do not require special protection areas. This area is one of the most sensitive areas in terms of the distribution and abundance of chiroptera species, these being species with a limited character of dispersion, vulnerable to fragmentation and collision with motor vehicles. This area also represents a mosaic of forest habitats interspersed with pastures, rivers and small settlements, which provide both optimal shelters for chiroptera and feeding areas.

Following field observations, the presence of mammal species was reported. Among these are species of community interest that require strict protection, being mentioned in Annex IV of the Habitats Directive. In the following, the observations made in the project area, but also in its vicinity, are presented by kilometer segments.

Segment Km 0+000 – km 9+700

In the forest body located to the North of Suceava Municipality, an area crossed by the project over a distance of about 3.1 km, relatively common mammal species were identified for this type of habitat: *Capreolus capreolus, Sus scrofa, Meles meles, Talpa europaeaa, Sciurus vulgaris*, as well as 7 species of microchiroptera: serotine bat (*Eptesicus serotinus),* noctule bat (*Nyctalus noctula*), greater noctule (*Nyctalus lasiopterus*), Nathusius's pipistrelle (*Pipistrellus nathusii*), - Kuhl's pipistrelle (*Pipistrellus kuhlii*), Common pipistrelle (*Pipistrellus pipistrellus*), Parti-coloured bat (*Vespertilio murinus*), Daubenton's bat (*Myotis daubentonii*). All bat species are subject to conservation at the EU level, being mentioned in Annex IV of the Habitats Directive, in addition the species *Nyctalus lasiopterus* is listed by the IUCN as vulnerable, and the main reason for the decline of the species is represented by the loss of forest habitats with mature trees.

Segment Km 9+700 – km 24+400

In this segment, the mammal species are characteristic of open habitats and during field visits the following were identified: *Capreolus capreolus, Lepus europaeus, Meles meles, Talpa europaea.*

Segment Km 24+300 – km 56+000

At the northern end of this segment, the project crosses the Siret River, and in this area 4 species of bats have been identified: the northern bat (*Eptesicus nilssonii*), common noctule (*Nyctalus noctula*), the greater noctule (*Nyctalus lasiopterus*), serotine bat (*Eptesicus serotinus).* Also in this area, on the banks of the Siret river, as part of the project, traces of the *Castor fiber* species were also identified. In the open habitats of this segment of the project, numerous traces of the *Talpa europaea* species were identified, as well as traces of *Sus scrofa.*

Below are some images of some mammal species identified in the field.

Lepus europaeus

Capreolus capreolus

Traces of *Castor fiber*

Vulpes vulpes

Sciurus vulgaris

Figure no.4-60 Species of mammals and traces of their presence observed in the field

Below is the sozological status table for the mammal species identified in the field.

Table no.4-13The sozological status of the mammal species identified in the field

No. Crt.	Name of the species	GEO 57/2007	Habitats Directive	IUCN List of Threatened Species	Bonn Convention	Bern Convention	Red Book of Vertebrates	EUROBATS Convention
1.	*Capreolus capreolus*	Appendix VB	-	G: LC, EU: LC	-	Appendix III	-	-
2.	*Castor fiber*	Annex III, Annex IV A	Annex II, Annex IV, Annex V	G: LC, EU: LC	-	Appendix III	-	-
3.	*Eptesicus nilssonii*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix II	-	Found in the Eurobats convention
4.	*Eptesicus serotinus*	Annex IV A	Appendix IV	G: LC, EU: LC	-	Appendix II	-	Found in the Eurobats convention
5.	*Lepus europaeus*	Appendix VB	-	G: LC, EU: LC	-	Appendix III	-	-
6.	*Meles meles*	Appendix VB	-	G: LC, EU: LC	-	Appendix III	-	-

No. Crt.	Name of the species	GEO 57/2007	Habitats Directive	IUCN List of Threatened Species	Bonn Convention	Bern Convention	Red Book of Vertebrates	EUROBATS Convention
7.	*Microtidae indet.*	-	-	-	-	-	-	-
8.	*Myotis daubentonii*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix II	-	Found in the Eurobats convention
9.	*Nyctalus lasiopterus*	Annex IV A	Appendix IV	G: VU, ME: DD	Appendix II	Appendix III	Endangered species	Found in the Eurobats convention
10.	*Nyctalus noctula*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix II	-	Found in the Eurobats convention
11.	*Pipistrellus kuhlii*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix III	-	Found in the Eurobats convention
12.	*Pipistrellus nathusii*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix III	Endangered species	Found in the Eurobats convention
13.	*Pipistrellus pipistrellus*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix III	-	Found in the Eurobats convention
14.	*Sciurus vulgaris*	Appendix VB	-	G: LC, EU: LC	-	Appendix III	-	-
15.	*Sus scrofa*	Appendix VB		G: LC, EU: LC	-	Appendix III	-	-
16.	*Talpa europaea*	-	-	G: LC, EU: LC	-	-	-	-
17.	*Vespertilio murinus*	Annex IV A	Appendix IV	G: LC, EU: LC	Appendix II	Appendix II	-	Found in the Eurobats convention
18.	*Vulpes vulpes*	Appendix VB	-	G: LC, EU: LC	-	-	-	-

The legend: LC = "Least concern", EU = European level, G = Global level.

Figure no.4-61 Reports of mammal species observed in the project area during field trips

5.6 THE LANDSCAPE

According to the European Environment Agency's Report "Landscape fragmentation in Europe" from 2011, Romania presents low values of the landscape fragmentation index, compared to most European states, especially those in Western Europe. However, according to the same report, the road network included in the fragmentation analysis was not complete, so the results of the calculations do not present a precise and realistic situation of the fragmentation of the landscape in Romania.

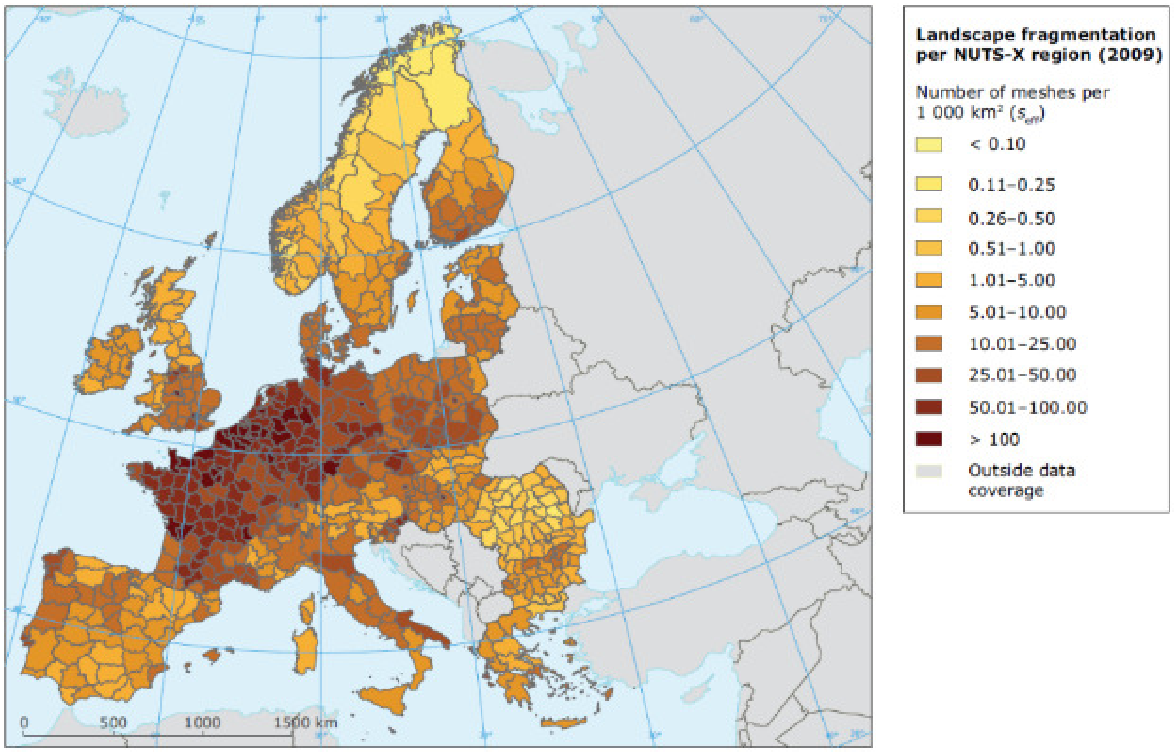


Figure no.4-62 Landscape fragmentation at European level according to the European Environment Agency's Report "Landscape fragmentation in Europe" 2011

Landscape fragmentation is assessed using the "effective mesh size" indicator (meff, km^2), which takes into account the probability that two random points in an area are connected without encountering obstacles ("Landscape fragmentation in Europe"). This indicator is used in some countries of the European Union to assess the state of the environment, more precisely to understand the ecological processes at the landscape level. The following figure shows the variability of relief fragmentation in the project area, on a 20 km left-right buffer around the axis of the future road, using data from the European Environment Agency (EEA). The smaller the "effective mesh size" value, the more fragmented the landscape and shows reduced connectivity. The indicator underlying the map takes into account "medium and major anthropogenic fragmentation" (roads, railways, built-up areas) and excludes natural barriers. It can thus be observed that the highest values of landscape fragmentation are predominantly found in the area of urban agglomerations, namely localities such as Suceava, Mitocu Dragomirnei, Dărmăneşti, Măriţeia Mică, Dănila, Româneşti, Grăniceşti, Bălcăuţi, Negostina, Mănăstioara, Bănceşti, Văşcăuţi, Siret.

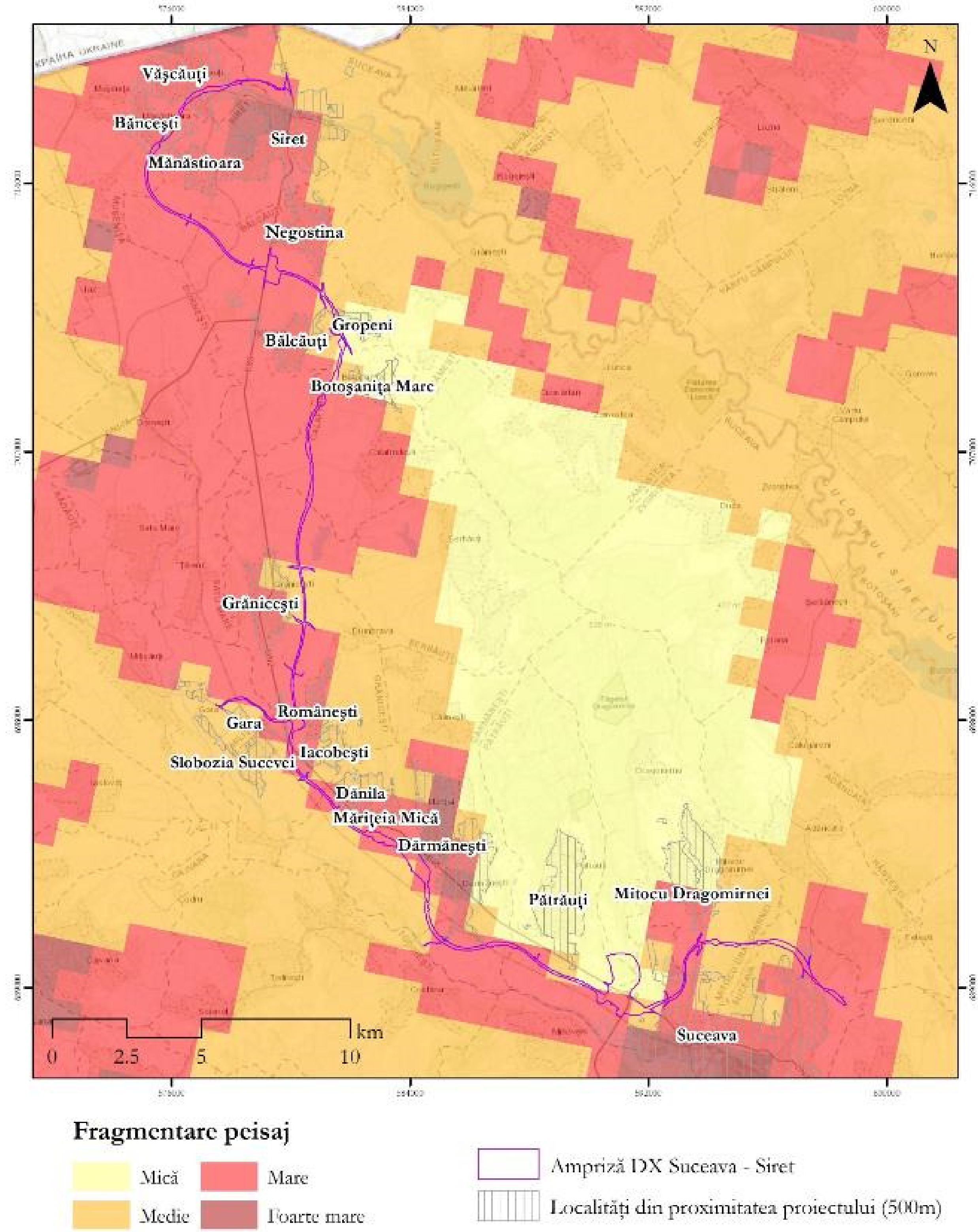


Figure no.4-63 Variability of landscape fragmentation in the area of the Suceava - Siret project

To identify the types of landscape in the project area, the LANMAP2 database existing at the European level was used. Landscape types are established based on criteria that consider the following elements:

- The type of climate of the area;
- Land topography;
- The parent material of the rock;
- Land use.

Table no.4-14 Landscape types identified in the project area (within a radius of 20 km from the project boundary) according to LANMAP2

Type of landscape	Climate	Altitude (m)	Land use
Alpine area-Mountains-Rocky-Forest	Alpine	500-700	Forest
Continental-Hills-Sediments-Arable land	Continental	300-500	Arable land
Continental-Hills-Sediments-Forest		200-300	Forest
Continental-Hills-Sediments-Agricultural areas. heterogeneous		100-200	Arable land
Continental-Hills-Rocky-Forest		300-500	Arable land
Continental-Plains-Sediments-Arable land		50-100	Forest
Urban		200-300	Urban

The following figure shows the spatial distribution of existing landscape types in the analyzed project area.

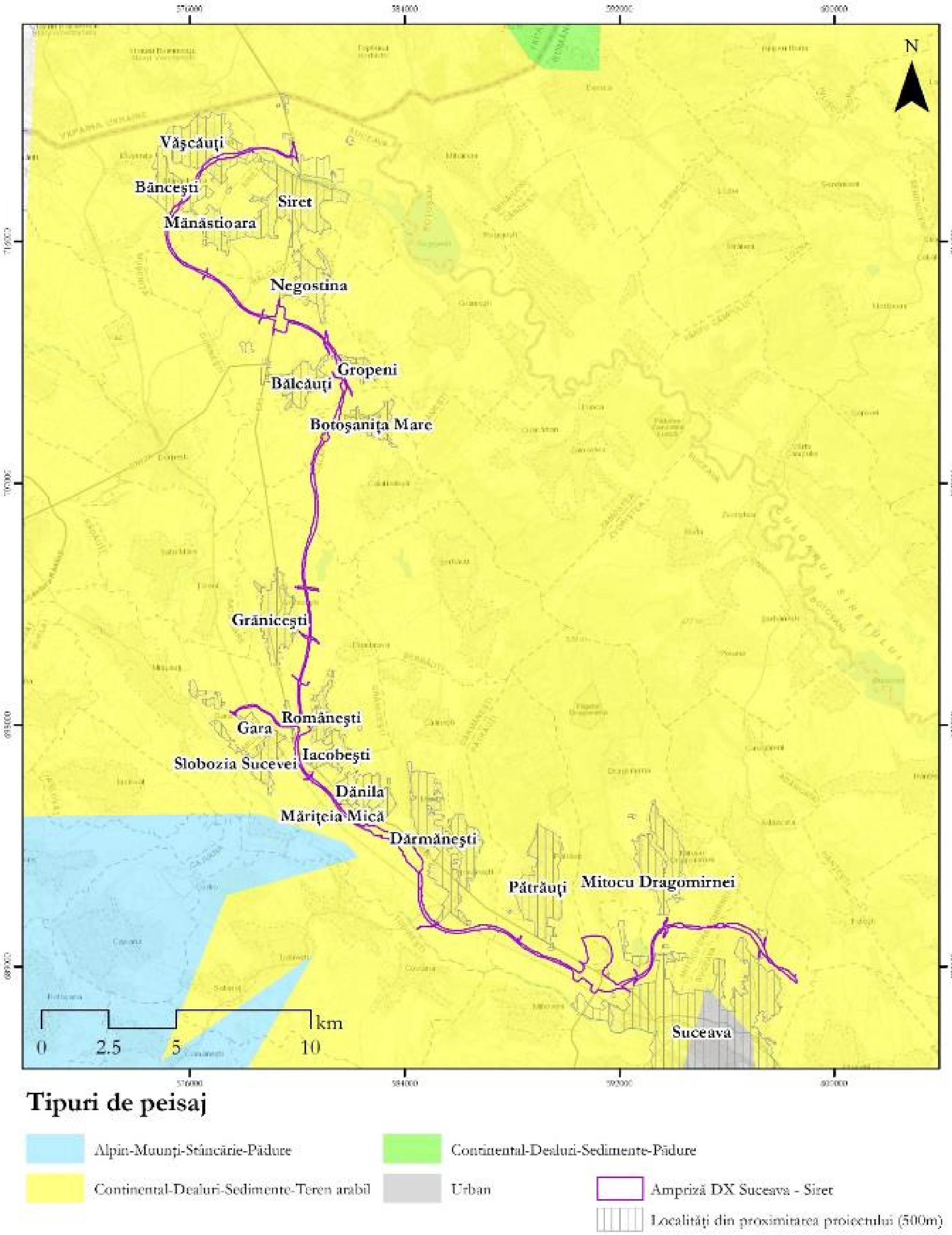


Figure no.4-64 Existing landscape types in the Suceava – Siret project area

As can be seen in the analysis above, the project takes place in an area with a predominantly arable and forest landscape, dominated by hilly landforms with average altitudes of approximately 300-500 m.

The project implementation area is not an important area from a tourist point of view, the closest tourist objectives being concentrated inside the Suceava Municipality. The scope of the project does not cross any protected natural area or any area included in a tourist circuit. Also, in the study area, they did not identify landscape elements with traditional characteristics with a distinctive character, specific to the area.

The study area is located in the major relief unit of the Moldavian Plateau, in its northwest. In the longitudinal plane, the altitude increases slightly from south to north, the meadow of the Suceava River in the southern half, then the route continues along the Horaiţ River, in a landscape with gently sloping hills.

The figure below shows the landscapes in the area of the expropriation corridor.

km 1+900

km 8+850

km 16+500

km 25+500

km 41+000

km 55+200

Figure no.4-65 The appearance of the landscape in the area of the expropriation corridor for the Suceava - Siret project (source: Google Earth)

Throughout the project route, the landscape is relatively heavily anthropized, with a fairly dense road network, either paved roads or unpaved local roads, streets, exploitation and/or agricultural roads. The extravillage lands are predominantly used for agricultural purposes. Most of the route crosses rural areas, where mainly agricultural activities are carried out, grain crops, vegetables, orchards and raising domestic animals.

The project is over 1.5 km away from the Natura 2000 site ROSCI0075 Pădurea Pătrăuți. Although the site is at a short distance from the urban centers of Suceava, Botoșani, Rădăuți and Siret, due to low promotion and against the background of insufficient infrastructure, ecotourism activities in this area are very limited. The only area in the immediate vicinity of the protected area where ecotourism activities are currently carried out is the perimeter of the Dragomirna Monastery.

The tourist attractions in Suceava belong both to the category of archaeological sites and to the category of cultural edifices and historical monuments. Thus, in the southern area of the project, there are a number of tourist attractions located in the vicinity of the project: from the category of archaeological sites - the archaeological site Cetatea Şcheia, at a distance of approx. 2.6 km. The figure below shows the Şcheia Fortress. And the archaeological site of Mihoveni - Cahla Morii is of particular importance for Suceava tourism, being situated at a distance of approx. 1.5 km.

Figure no.4-66Scheia Citadel (source: Google Earth)

The touristic objectives identified in the study area (at a distance of up to 1 km from it) are mainly represented by cultural-religious objectives. These religious edifices are located in the localities bordering the project, among them we can list: the church "Sf. Cruce" from Pătrăuţi, the church "Sf. Treime" from Burdujeni, the church "Sf. Onufrie" from Mănăstioara, the church "Adormirea Maicii Domnului" from Văşcăuţi, the church "Sf. Treime " from Siret and the "Ioan Botezătorul" church from Siret.

Biserica "Sf. Cruce" din Pătrăuţi

Biserica "Sf. Treime" din Burdujeni

Biserica "Sf. Onufrie" din Mănăstioara

Biserica "Adorm. M. Dom. din Văşcăuţi"

Biserica "Sf. Treime" din Siret

Biserica "Ioan Botezătorul" din Siret

Figure no.4-67 Churches located in the localities near the project (source: Google Earth)

Also, as far as the religious objectives are concerned, in the project area there are also a series of old wooden places of worship, with an architecture specific to the area. They are located in the localities of Siret, Rudeşti, Botaşaniţa, Darmăneşti and Bănceşti.

Siret

Rudești

Botașanița

Dărmănești

Băncești

Figure no.4-68 Frames with the wooden places of worship located in the vicinity of the project

The map below shows the touristic objectives identified in the study area, in relation to the catchment of the project.

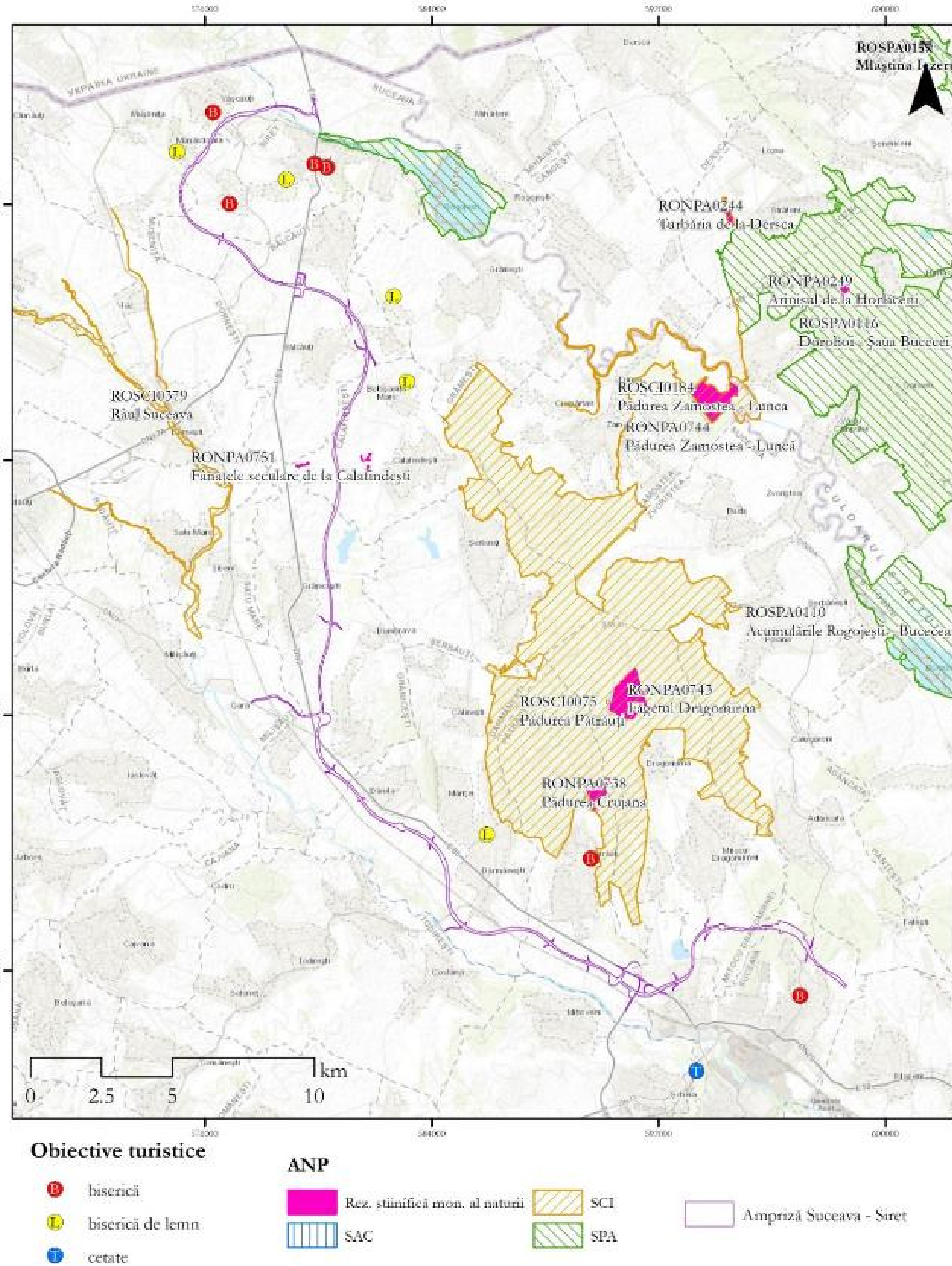


Figure no.4-69Touristic and religious sights in the vicinity of the project

The area near the project is quite densely populated, but from the point of view of the architecture of the buildings, it is rare to see houses/households built in the traditional architectural style for the Moldavian area, which include specific features such as dormers with decorative elements and ornamental, wooden fences with roofs, households with houses and outbuildings (house, barn, etc.) on a wooden structure and covered with shingles.

Figure no.4-70House with a shed, with a shingle roof and a wooden fence with a roof in Botoşaniţa, Suceava county (source Google Earth)

From the point of view of the sensitive visual receptors in the project area, they are represented by the inhabitants of the areas in the vicinity of the future road.

5.7 THE SOCIAL AND ECONOMIC ENVIRONMENT

5.7.1 The size and structure of the population in the project area

5.7.1.1 Population size

The Suceava - DN2H highway and the DN2H - Siret border Expressway cross 10 territorial administrative units that are located in Suceava county, respectively: Suceava, Mitocul Dragomirnei, Pătrăuţi, Dărmăneşti, Grăniceşti, Calafindeşti, Bălcăuţi, Siret, Musenita.

The following table shows the number of inhabitants for the UATs of interest (territorial administrative units), exclusively from the localities neighboring/crossing the project, for which population data were available from the 2011 Census.

Table no.4-15Localities in the UATs intersected by the project and adjacent to it

County	failed	The total population in UAT[11]	Localities in the vicinity of the project	The population in the localities of interest[12]
Suceava	Suceava	92121	Suceava	92121
	Mitocul Dragomirnei	4438	Mitocu Dragomirnei	3065
	Pătrăuți	4567	Pătrăuți	4567
	Dărmănești	5228	Dărmănești	965
			Danila	734
			Măriţeia Mică	187
	Granicesti	4440	Iacobesti	454
			Slobozia Sucevei	523
			Romanesti	569
			Granicesti	1796
	Milisăuți	5005	Gara	439
	Calafindesti	2549	Botosaniţa Mare	300
	Balcauti	3070	Balcauti	1425
			Negostina	1272
	Siret	7976	Manastioara	439
			Siret	7031
	Musenita	1871	Băncești	116
			Vascauti	584

The total population of the project implementation area is 117,171 inhabitants.

5.7.1.2 Structure by age group of the population

The structure analysis by age groups of the population was considered exclusively for the UATs intersected by the Suceava - DN2H highway and DN2H - Frontiera Siret Expressway. The data collected from the INS were classified by UATs. Thus, through this methodology, we can observe and compare demographic trends based on the UATs crossed by the project. The size of the population in the 10 UATs was classified based on 6 age groups, namely "0-14", "15-29", "30-44", "45-59", "60-74" and "75+", where the increase/decrease trend was evaluated during the years 2012 - 2022.

At the level of territorial administrative units in Suceava County, located in the study area, the age category of the predominant population in 2022 is 30-44 years.

[12] https://www.recensamantromania.ro/rpl-2011/rezultate-2011/

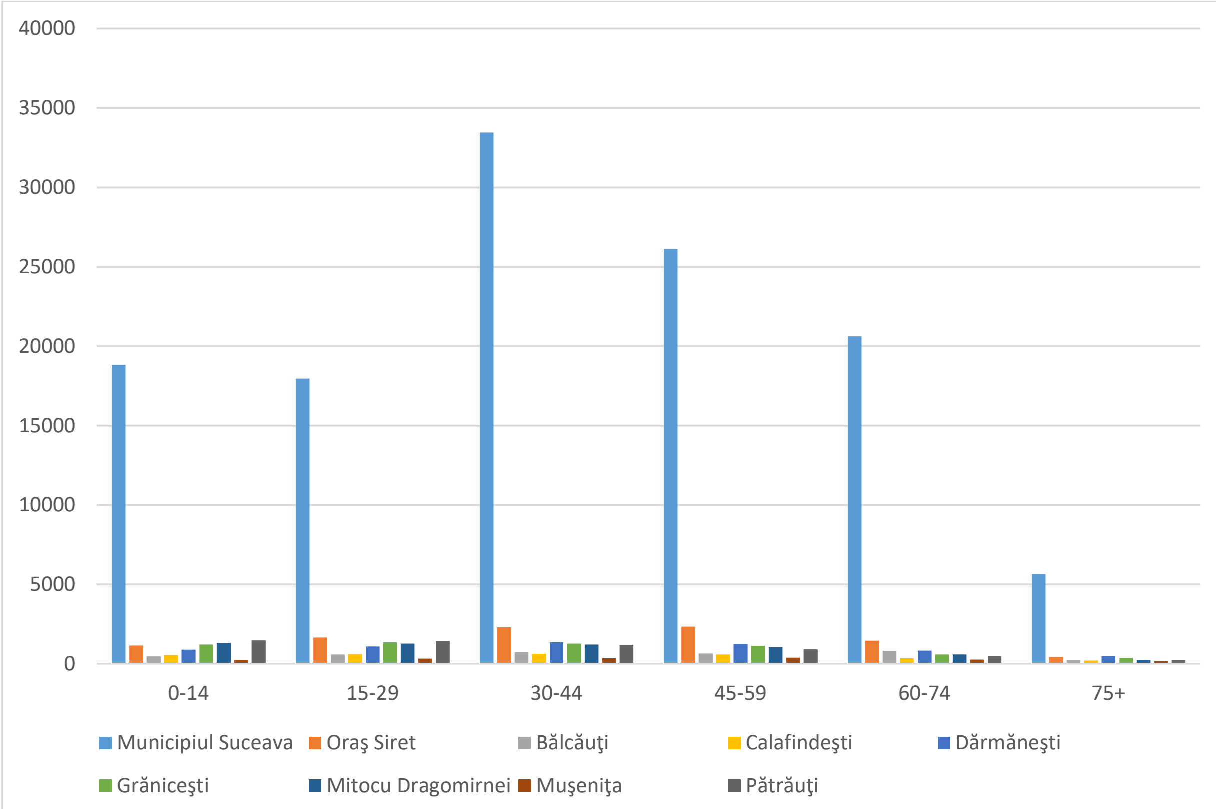


Figure no.4-71Population by age groups in the UATs of interest in 2022

At the UAT level, the Municipality of Suceava can observe an increasing trend in the number of inhabitants aged between "0-14" years, "30-44" years and "60-74" years. The predominant age group of the population is "30-44" years.

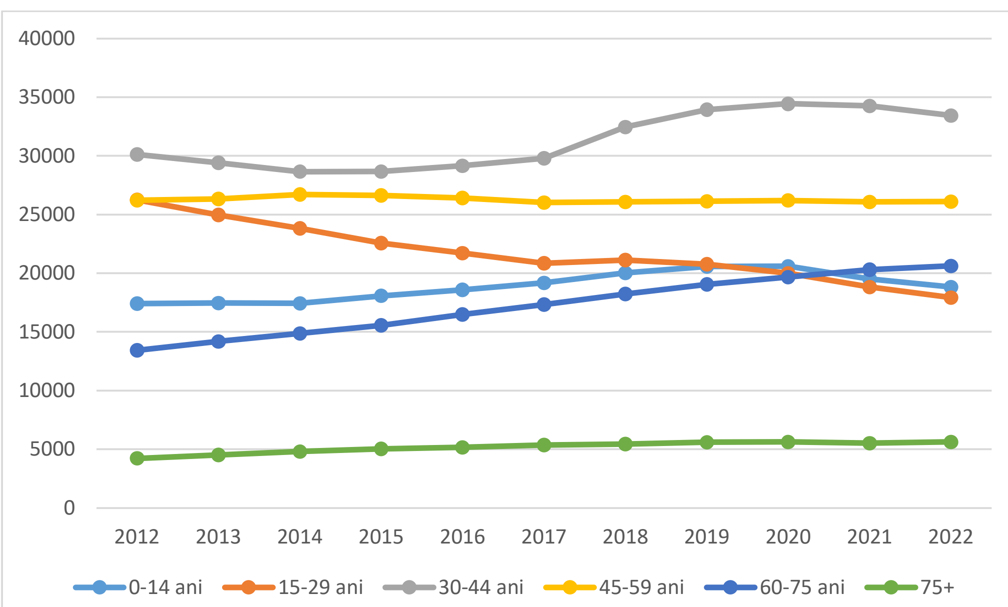


Figure no.4-72The population by age groups in the UAT Suceava Municipality

Regarding the evolution of the population of the UAT of the Municipality of Siret, an increase in the number of inhabitants for the age categories "60-74" years and "45-59" years is highlighted. A downward trend in the number of inhabitants is observed for the age categories "0-14", "15-29" and "30-44". In the case of the "75+" age category, the trend shows very small fluctuations.

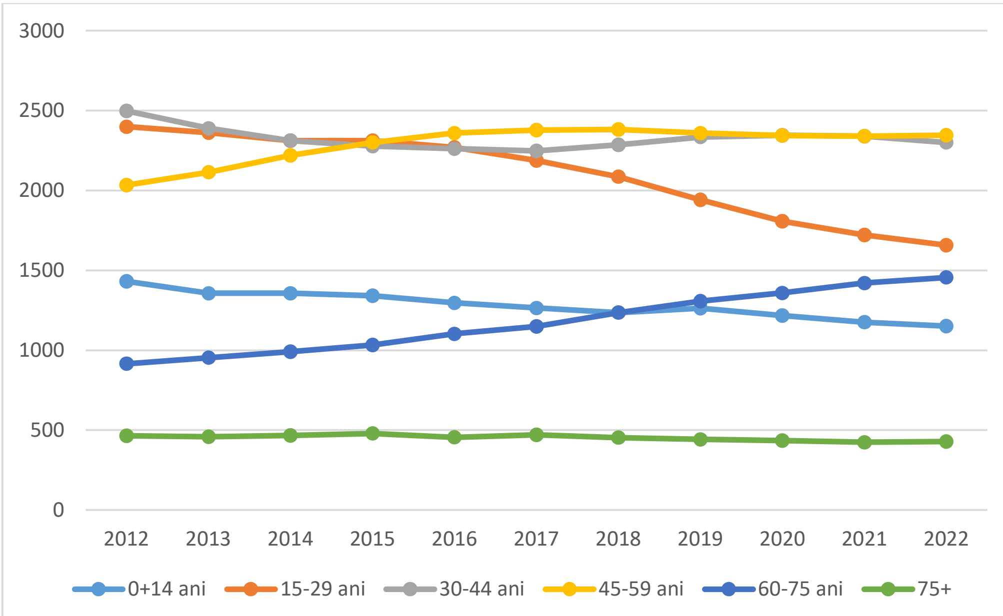


Figure no.4-73Population by age groups in UAT Siret

In the case of the Bălcăuți UAT, the dominant population represented by the 15-29 age group can be observed, which shows a downward trend.

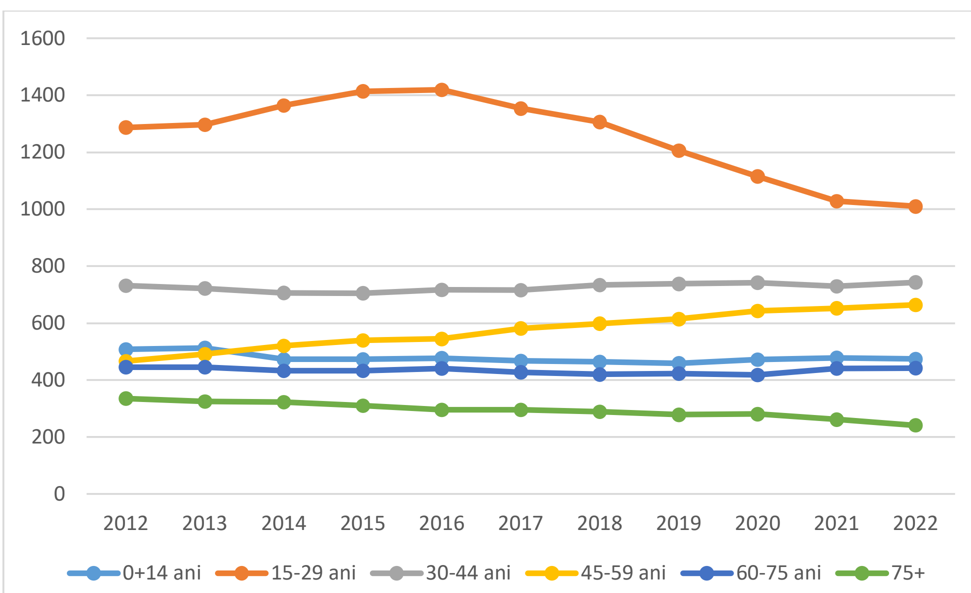


Figure no.4-74 Population by age groups in UAT Balcăuți

At the UAT Calafindeşti level, it is highlighted how the predominant population is a young one, the age categories "0-14", "15-29", "30-44" being dominant. At the same time, during the analyzed period, the population aged between "45-59" registered an increase.

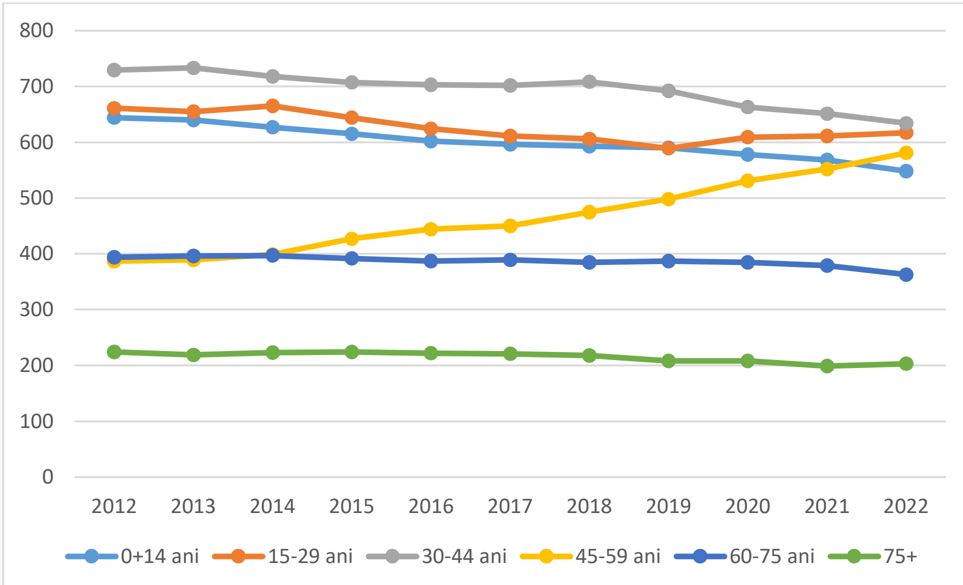


Figure no.4-75 Population by age groups in UAT Calafindeşti

In the case of UAT Dărmăneşti, the demographic trend during the analyzed period shows small fluctuations, with the exception of the "45-59" age category, which shows an increase.

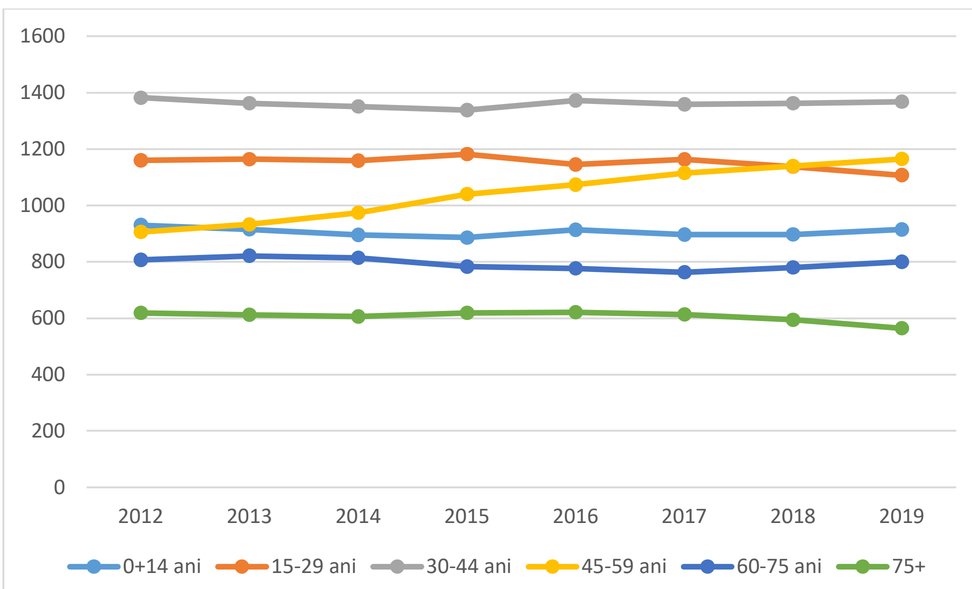


Figure no.4-76 Population by age groups in UAT Dărmanesti

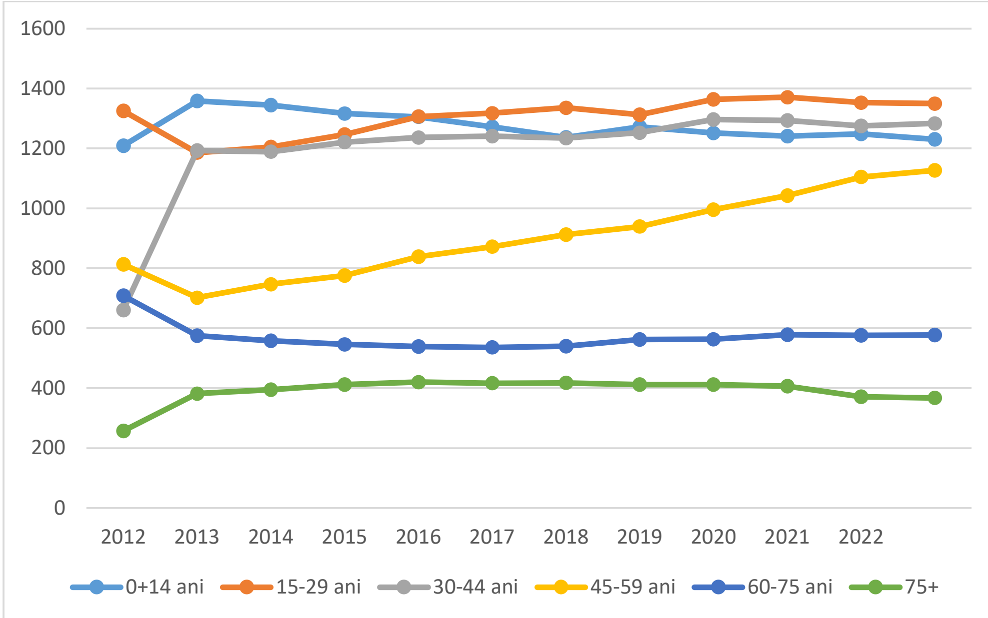


Figure no.4-77 Population by age groups in UAT Grănicesti

In the case of UAT Dragomirna, the demographic trend during the analyzed period shows small fluctuations, except for the "45-59" age category which shows an increase.

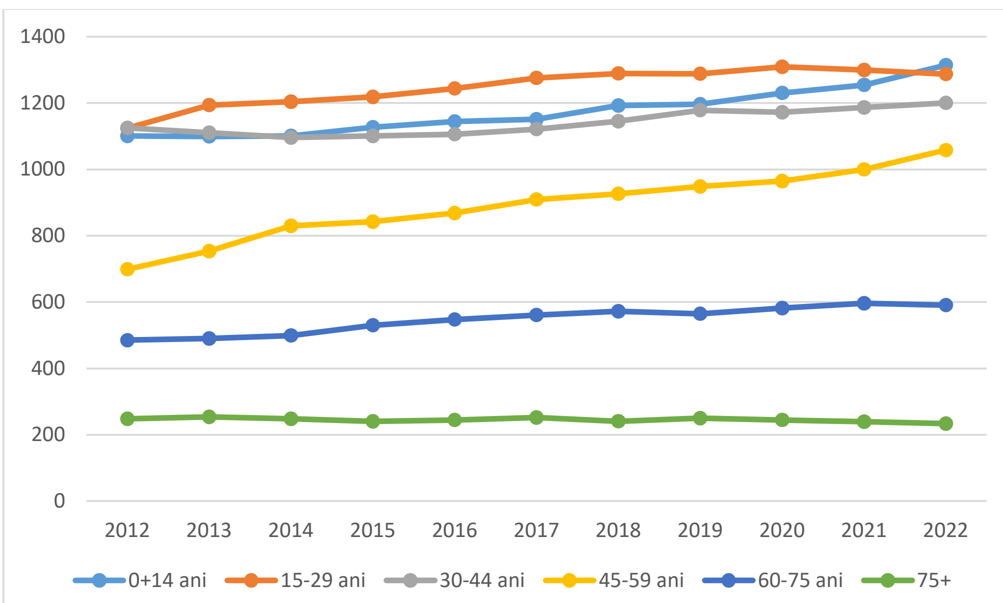


Figure no.4-78 Population by age groups in UAT Mitocul Dragomirnei

In the case of Mușesnița UAT, a demographic downward trend can be noted, with the exception of the "45-59" age category, which shows an increasing trend.

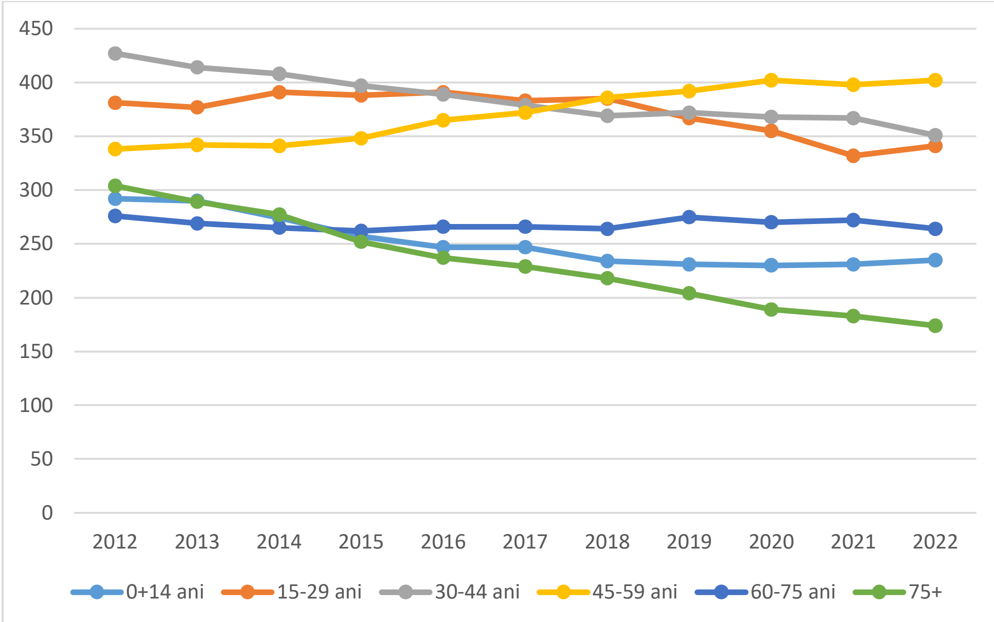


Figure no.4-79 Population by age groups in UAT Muşesniţa

In the case of UAT Pătrăuţi, the demographic trend during the analyzed period shows small fluctuations, except for the age categories "30-44" years and "45-59" years which show an increase.

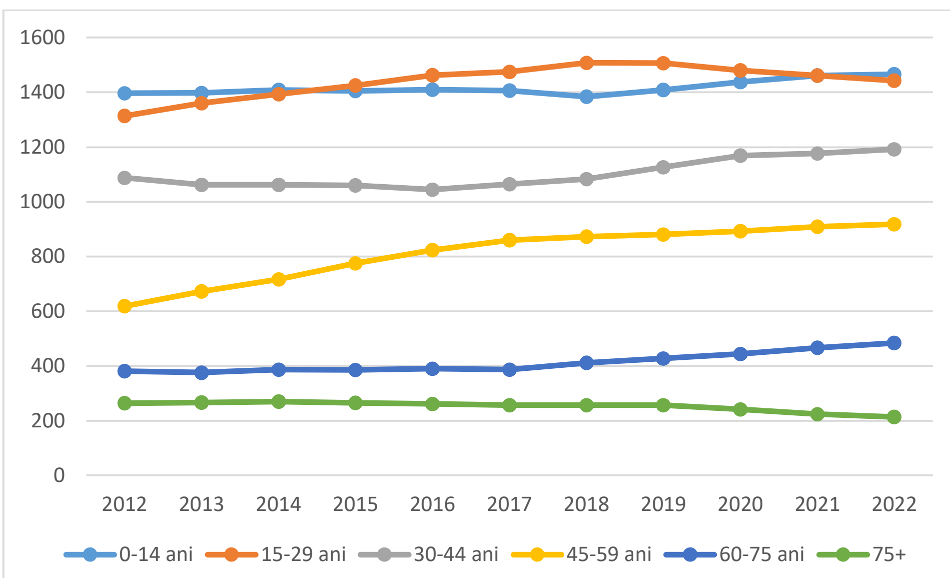


Figure no.4-80 The population by age groups in Pătrăuţi UAT

5.7.1.3 The ethnic structure of the population

According to the final data of the 2011 census, in the UATs of interest in the study area, the population of Romanian ethnicity predominates, followed by Russians, Ukrainians, Romans and other minorities such as German and Hungarian. The ethnic Russian population is best represented in the UAT Suceava Municipality. The figure below shows the ethnic structure for each UAT.

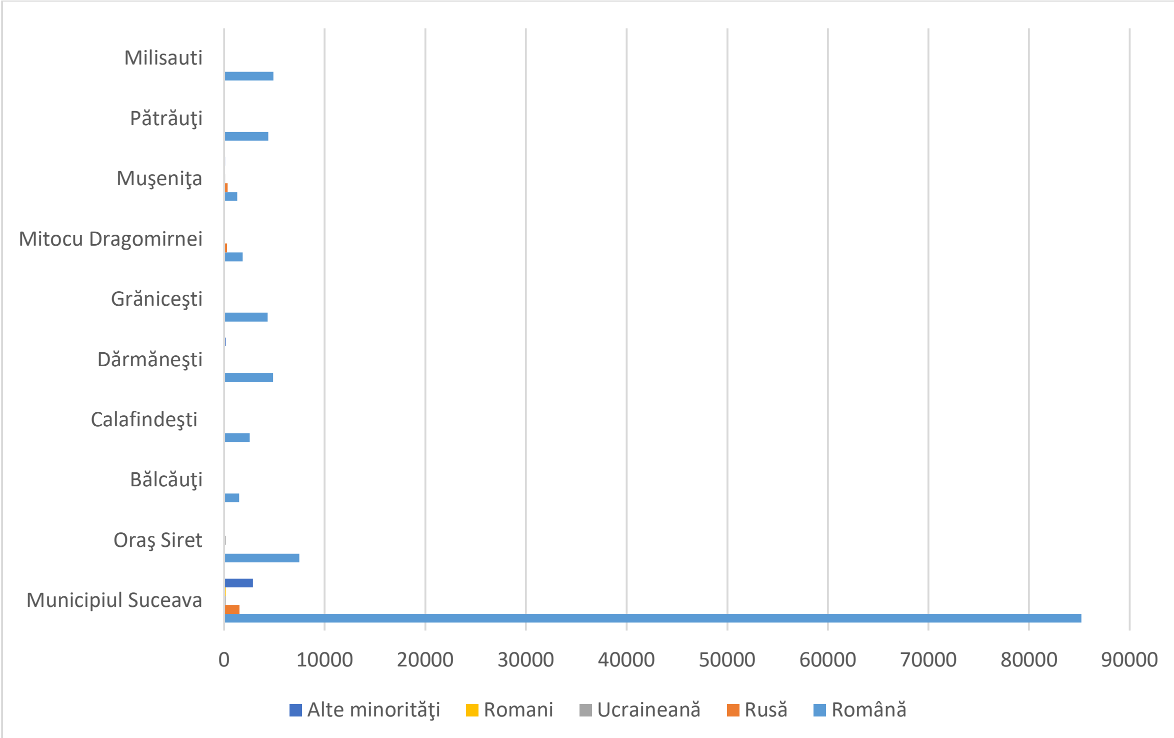


Figure no.4-81 The ethnic structure within the UATs of interest[13]

5.7.2 Health status

Mortality measures the total number of deaths within a population during a defined period of time. The variation in mortality rates, to a large extent, determines the level of natural growth and life expectancy. In turn, mortality is the most sensitive indicator influenced by socio-economic and biological factors (environment, lifestyle), as well as by health services.

Based on data from the INS, mortality in the counties crossed by the project was analyzed over the period 2012-2021. It is observed that an almost constant trend is maintained with small variations between 2012-2019 and more visible increases after 2019, most likely during the COVID-19 pandemic, which caused numerous deaths.

[13]The stable population according to the main mother tongues at the 2011 census TS6.xls (recensamantromania.ro)

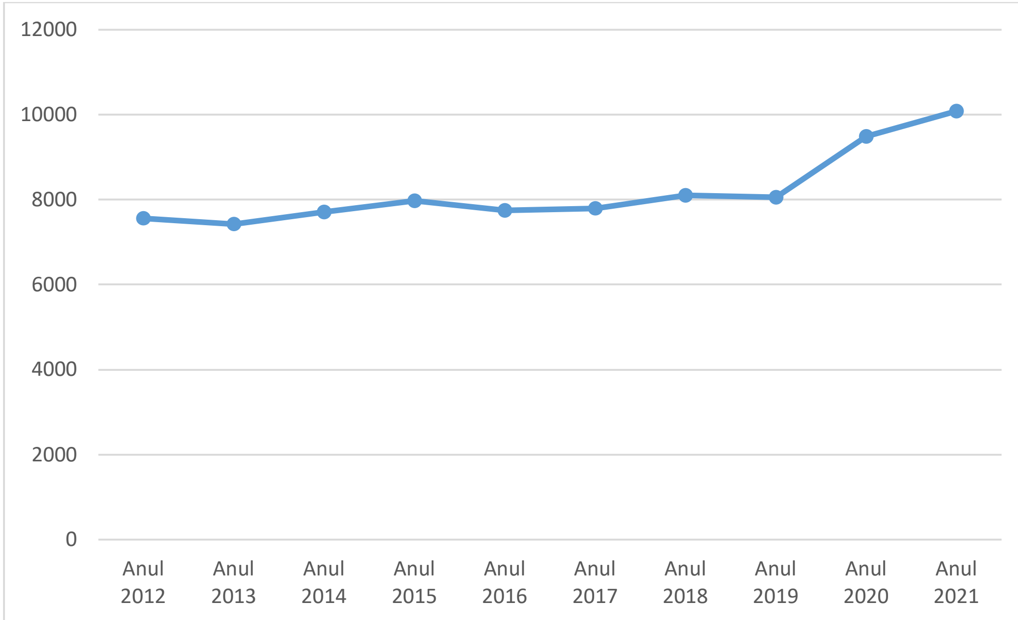


Figure no.4-82 Mortality (Deaths with usual residence in Romania) at the level of Suceava county

As can be seen in the graphs below, according to the public data available on the website of the National Institute of Statistics, the main classes of diseases with the highest incidence and with the most deaths due to them are: diseases of the circulatory system, tumors and diseases of the respiratory system. The main causes of the appearance of these diseases are represented by the aging of the population, increased pollution and improper nutrition. This trend shows very small fluctuations and an increase in the number of deaths caused by respiratory diseases can be observed in 2020, most likely during the COVID-19 pandemic.

Figure no.4-83 Mortality by the main classes of diseases in Suceava county, in the period 2012-2021

source: INS

5.7.3 Economic aspects

5.7.3.1 Standard of living

According to INS statistics, the number of unemployed in Suceava County shows a decreasing trend in the analyzed interval, as can be seen in **Figure no.4-84**.

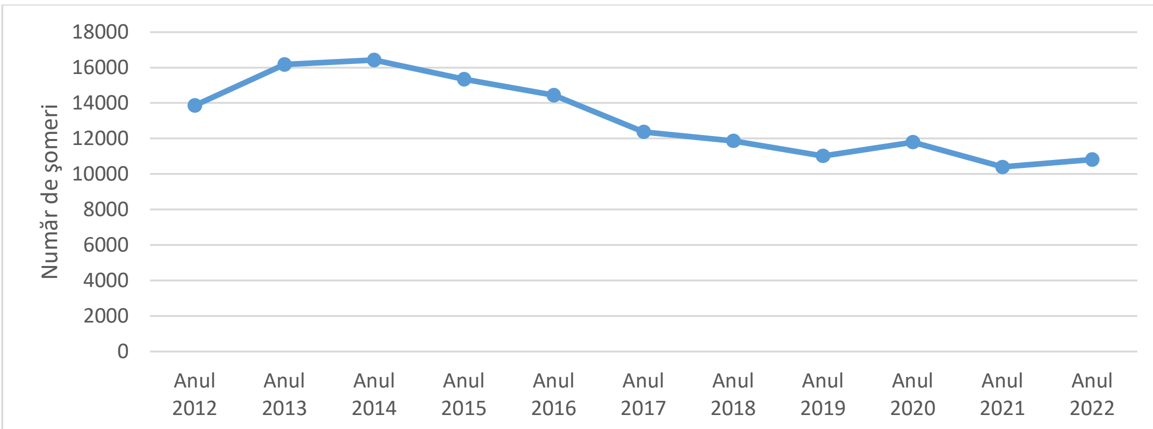


Figure no.4-84 Unemployed registered annually in Suceava

As regards the UATs in Suceava County, the largest number of unemployed was registered in the period 2012-2020 in the Municipality of Suceava, and from 2021 the first place will be taken over by the Pătrăuţi UAT. As for the values, the values corresponding to the UAT-s of interest, they registered a general downward trend.

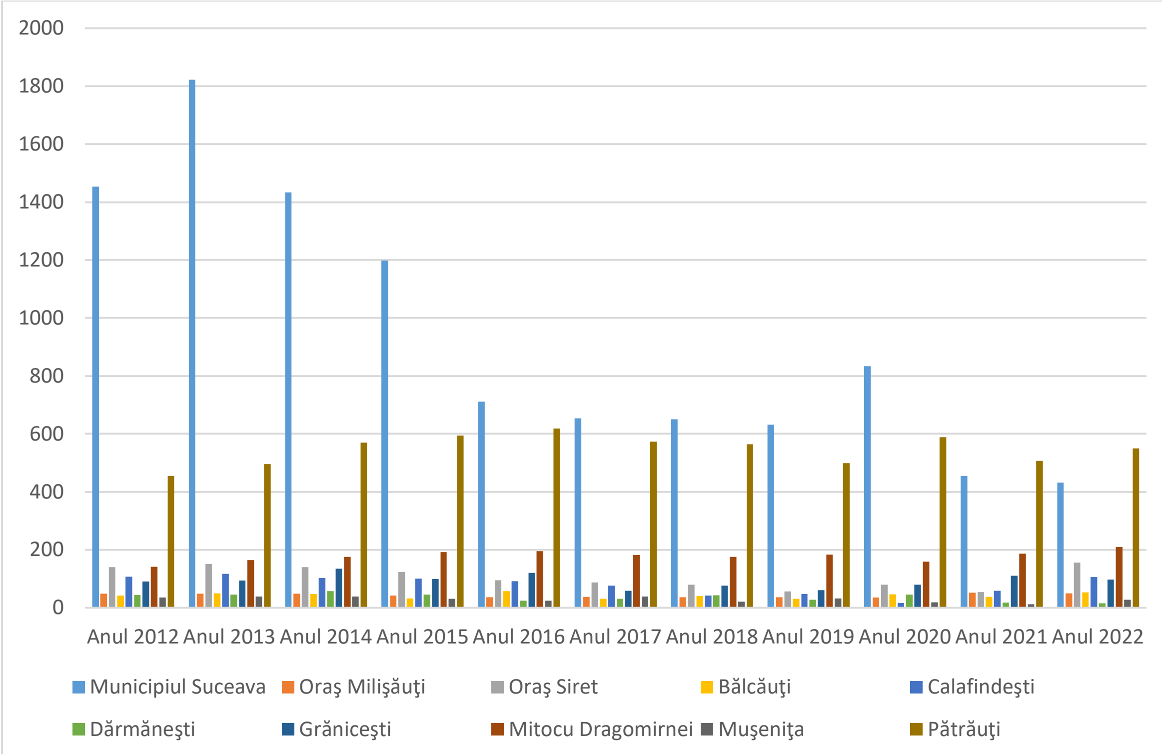


Figure no.4-85 The unemployed registered annually in the UATs of interest in Suceava county

5.7.3.2 Economic activities

The level of the gross domestic product (GDP) represents the sum of consumption expenditures of private households and private non-profit organizations, gross expenditures for investments, state expenditures, investments for the purpose of storage as well as export earnings from which import expenditures are deducted. Analyzing the county intersected by the project route, it can be seen that there is an upward trend in the gross domestic product level between 2000 and 2020.

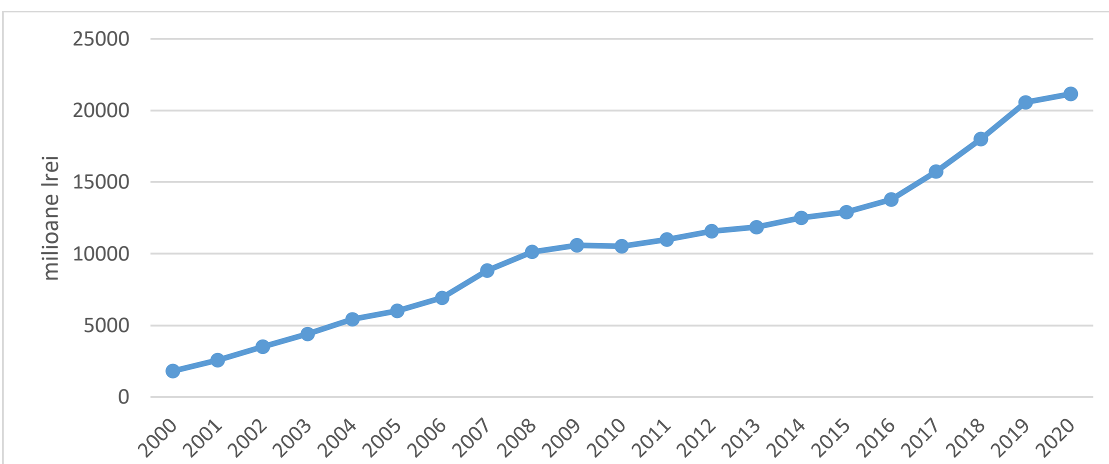


Figure no.4-86 GDP in the period 2000-2020

The activities carried out at the level of the UATs of interest are:

- Industry;
- Agriculture, forestry and fishing;
- Constructions;
- Education;
- Transport and storage;
- Health and social assistance.

Agriculture and forestry are practiced especially in the rural areas, and industry and trade in the urban area of Suceava.

The following table shows the land areas according to the type of use at the level of the UATs in the project area, according to the INS, from 2014. The predominant land use type in all the UATs of interest in the three counties is agricultural land, followed by of arable land and non-agricultural land.

Table no.4-16Land use in UAT in the project area

County	UAT	Area (ha)											
		agricultural	Arable	Grassland	Rough	Vineyards and wine nurseries	Fruit orchards and nurseries	Non-agricultural lands	Forests and other forest vegetation	Waters/Ponds	construction	Communication ways and railways	Degraded and unproductive lands
Suceava	The municipality of Suceava	2301	1984	273	40	0	4	2909	573	186	2071	53	26
	Milišauti city	2778	2533	225	20	0	0	603	50	80	118	31	324
	City of Siret	3160	2661	275	214	0	10	1180	137	511	362	80	90
	Balcauti	2927	2578	208	135	0	6	663	51	137	123	320	32
	Calafindesti	2217	1807	208	199	0	3	183	5	28	105	45	0
	Dărmăneşti	3575	2800	736	34	0	5	1476	1003	170	123	175	5
	Granicesti	3923	3129	400	388	0	6	1018	546	123	175	106	68
	Mitocu Dragomirnei	2354	1530	639	170	0	15	2931	2650	two hundred	70	10	1
	Pătrăuţi	1472	942	375	89	0	66	2301	1814	98	333	44	12

5.7.3.3 Material goods

Places

The largest number of dwellings in the UATs that are intersected/adjoined by the Pascani - Suceava freeway route is registered in the Municipality of Suceava with 46,511 dwellings, also having the largest living area, namely 2,106,404 m^2. The lowest number of dwellings according to INS is registered in UAT Calafindesti with a total number of dwellings 1,244, and the smallest living area is registered by UAT Balcauti, of 61,480 m^2.

Table no.4-17Statistics of the total number of dwellings and the living area in 2021 from the UATs in the vicinity of the project

County	UAT	No. total housing 2021	Living area m² (2021)
Suceava	Municipality of Suceava	46511	2106404
	Milisauti	2133	119260
	Siret	3399	157123
	Balcauti	1381	61480
	Calafindesti	1244	61651
	Dărmănești	2449	115158
	Grănicești	1697	73757
	Mitocu Dragomirnei	1814	122394
	Pătrăuți	1457	65355

According to the Atlas of Marginalized Rural Zones, there are two main types of marginalized areas spread across all counties and regions of the country:

- Geographically isolated villages. At the national level, the share of villages with one or more marginalized areas is 7% to 8% in mountain and hilly mountain villages, 11% in hilly lowland villages and over 29% in lowland villages. This type of rural areas have access to areas of interest (other municipalities, villages, cities) only through an unpaved or paved road, impracticable in the cold season. Considering these aspects, in the project area, there are no geographically isolated villages, all of them have communal roads;
- Areas on the outskirts of well-connected villages. These areas are described as Roma communities, being clearly demarcated from the villages.

In the following table, the UATs within the project are presented, at the level of which there are rural localities with marginalized areas.

Table no.4-18 Rural localities with marginalized areas from the UATs of interest (source: Atlas of Rural Marginalized Areas)

County	commune	Marginalization rate	The type of marginalization	villages
Suceava	Mitocu Dragomirnei	0.1-<6.1%	Marginalization below average	Mitocu Dragomirnei - over 20% of the Roma population in marginal areas
	Pătrăuți	12-<24%	Marginalization above average	Pătrăuți - over 20% of the Roma population in marginal areas

Current state of transport infrastructure

In Suceava county, the transport infrastructure has public roads totaling 3,172 km, of which 656 km are national roads, 1129 km county roads and 1387 km communal roads.

Touristic resorts

The certified touristic resorts of national interest, respectively local, from Suceava County, according to the list attached to Government Decision no. 852/2008 updated by HG 843/2021, can be found in the following table.

Table no.4-19Tourist resorts of national interest

County	The tourist resort of national interest	Distance from the project (km)
Suceava	Câmpulung Moldovenesc	53.7
	Gura Humorului	30.9
	Sucevita	44.8
	Vatra Dornei	72.2

Table no.4-20Tourist resorts of local interest

County	Tourist resort of local interest	Distance from the project (km)
Suceava	Cacica	28.8
	Ciocanesti	78.5
	Cosna	89.7
	Dorna Arini	76.3
	Dorna Candrenilor	83
	Frumosu	46.5
	Malini	26.8
	Mănăstirea Humorului	33
	Moldovița	55.7
	Panaci	81.7
	Poiana Stampei	93.7
	Pojorâta	62
	Putna	54
	Sodova	61
	Saru Dornei	81
	Solca	34.5
	Vama	46.3
	Vatra Moldoviţei	52.5
	The tourist area of Fălticeni municipality	18.4
	Siret tourist area	33

Tourist reception structures

In 2022, the main UATs in the project area where tourist activities were carried out are: Mitocul Dragomirnei (respectively 5 tourist structures), Pătrăuţi (respectively two tourist structures), Siret (respectively 3 tourist structures) and Suceava Municipality (respectively 24 structures tourism).

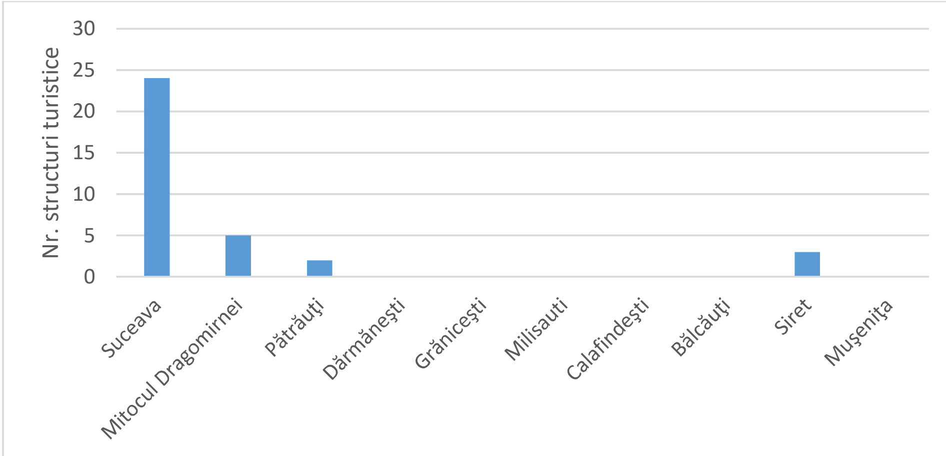


Figure no.4-87 The number of tourist reception structures in the UATs of interest (Source: INS)

NGO activity

In 2015, at the level of Romania, of the total number of registered non-governmental organizations, 3% represented environmental/ecological NGOs. At the level of Suceava county, an environmental NGO is active.

It should be noted that in the county intersected by the highway and the expressway, numerous NGOs are active that promote tourism, being present numerous touristic objectives of national or local interest. NGOs are also involved in sports and cultural activities as well as associations for the protection of animals.

5.8 Cultural heritage

5.8.1 Historical monuments and archaeological sites

The route of the highway and expressway does not overlap with internationally designated sites in the UNESCO heritage for the protection of cultural values.

According to the List of Historical Monuments (2015) approved by Order no. 2314/2004, with subsequent amendments and additions, to the National Archaeological Repertory (cIMeC) and the National Heritage Institute - eGISpat Romania, 45 cultural monuments were identified in the UATs in the project implementation area. Details about them and the approximate distances to the project are presented in the table below

Table no. 5-4-21. Cultural monuments and their distance from the project.

No. crt.	Description of the heritage element	Address	landmark	Dating	Distance approx. against the project limit	Identification code
1.	Orthodox Church Sfanta Treime Burdujeni	Str. December 22, no. 185	Close to the exit from the city, towards Adâncata and	Medieval era (14th century)	approx. 1 km	RAN 146664.04

No. crt.	Description of the heritage element	Address	landmark	Dating	Distance approx. against the project limit	Identification code
			Dorohoi			
2.	Sf. Haralambie Orthodox Church Suceava	Pleveni Street	Near the Psychiatric hospital	-	approx. 2 km	-
3.	Teodoreni Orthodox Monastery	Str. Ecaterina Teodoroiu, no. 16	Towards the Dorohoi exit, towards DN29A	1595	approx. 2 km	SV-II-mB-05463.1
4.	Sf. Petru şi Pavel Iţcani Orthodox Church	Str. Grigore Alexandru Ghica	At the exit from the Itcani district, towards Rădăuţi, after the road crossing, over the railway	-	Approx. 400 m	-
5.	Pentecostal Church No. 1 Itcani Suceava	Str. Grigore Alexandru Ghica	Between Grigore Alexandru Ghica street and Zefirului street, to the right of the CFR Stadium	-	Approx. 700 m	-
6.	Sf. Arhangheli Church	Str. Stations no. 17	Near de North Station	-	Approx. 1 km	-
7.	Sf. Elisabeta Romano Catholic Church Itcani Suceava	Str. Stations no. 19	Close to the North Station and the Itcani Station Park	1902	Approx. 1 km	-
8.	Darmăneşti Cemetery Church	-	Near the Darmăneşti Cultural Home	-	Approx. 1 km	-
9.	Darmanesti Orthodox Church	-	In the vicinity of the village cemetery	1924	Approx. 800 m	SV-II-mB-05526
10.	The wooden church from Dănilă	-	In the village cemetery	-	Approx. 2 km	-
11.	The Orthodox Church in Marîţei	-	In the village cemetery	-	Approx. 1 km	-
12.	Orthodox Church Slobozia Sucevei	-	-	-	Approx. 1.5 km	-
13.	Romanesti Orthodox Church	DC40C	-	-	Approx. 576 m	-
14.	New Orthodox Church, Granicesti	-	Near the European Road E85	-	Approx. 900 m	-
15.	Botoşaniţa Mare Orthodox Church	-	-	-	Approx. 1 km	-
16.	Gropeni Greek Catholic Church	-	-	-	Approx. 800 m	-
17.	Gropeni Orthodox Church	-	-	-	Approx. 672 m	-
18.	Balcauti Orthodox Church	Inside the cemetery	-	-	Approx. 800 m	-
19.	Negostina Orthodox Church	Inside the cemetery	-	-	Approx. 2 km	-
20.	Siret Monastery Orthodox Cemetery Chapel	Laţcu Vodă Street	-	The year 1730	Approx. 900 m	-
21.	The church	Monastery,	The church is located		Approx. 1 km	RAN

No. crt.	Description of the heritage element	Address	landmark	Dating	Distance approx. against the project limit	Identification code
	dedicated to "St. Onufrie" from Mănăstioara	Suceava county	in the southern part of the town.	Medieval era (17th century)		146673.01
22.	Vicşani Orthodox Church	DJ291A	-	-	Approx. 1.7 km	-
23.	Bancesti Orthodox Church	-	-	-	Approx. 750 m	-
24.	Musenita Orthodox Church	-	-	-	Approx. 1.8 km	-
25.	The wooden church dedicated to "Cuvioasa Parascheva" from Mitocaşi	Mitocaşi, Suceava county	The church is located in the eastern sector of the town.	Late medieval period (18th century)	Approx. 2.9 km	
26.	The archaeological site from Mitocul Dragomirnei - La Stratulat	Mitocu Dragomirnei, Suceava county	The site is located on the Hranita stream, about 500 m east of the Lipoveni water treatment plant	Neolithic	Approx. 5 km	RAN 146334.01
27.	The archaeological site from Mihoveni - Cahla Morii	Mihoveni, Suceava county	The site is located approx. 2 km from the village, on DJ 178A, approx. 200 m from the barracks of the gendarmerie unit, on the upper terrace of the right bank of the Suceava river	La Tène (II-IV century AD)	Approx. 1.5 km	RAN 146469.01
28.	The archaeological site of the Church „Înălțarea Sf. Cruci"Patrăuți	Patrăuți, Suceava county	The archaeological site is located approximately 35 m north of the historical monument	The Medieval Age (1487)	Approx. 1.5 km	RAN 149842.01
29.	Church of St. Dumitru, Rudeşti	Rudeşti, Suceava county	The church is located in the northern part of the town, in the cemetery.	Late medieval period (18th century)	Approx. 1.5 km	RAN 148952.02
30.	Church of St. George, Costâna	Costâna village, Todireşti commune, Suceava County	-	1457-1504	Approx. 1.4 km	SV-II-mB-05524
31.	Church „Biserica Tuturor Sfinților", Parhăuți	-	-	-	Approx. 1.9 km	-
32.	The Great Mosaic Temple, Siret	Str. Lime no. 4	On the road leading from Galita	Before the 16th century.	Approx. 3 km	SV-IV-sB-05715
33.	„Biserica Creştina după Evanghelie" , Haru Siret	Str. May 1 no. 15	-	-	Approx. 4 km	-

No. crt.	Description of the heritage element	Address	landmark	Dating	Distance approx. against the project limit	Identification code
34.	Orthodox Church Mărițeia Mică	Village Mărței, Commune Dărmanesti, Suceava County	In the village cemetery	19th century	Approx. 1.4 km	-
35.	Church„Adormirea Maicii Domnului”, Vascauti	Str. Nicolae Labiş, no. 17	On the left of the road that goes up from the Suceva valley towards the old voivodeship residence of Moldavia	17th century	Approx. 400 m	SV-II-mA-05473
36.	Church„Sfinții **Arhangheli**”, Mihoveni	Village Mihoveni, Commune Şcheia, Suceava County	In the center of the town	1871-1877	Approx. 1.7 km	SV-IsB-05423
37.	Sf. Gheorghe Church, Costâna	Todireşti commune, Suceava county	-	1490	-	SV-II-mB-05524
38.	The church dedicated to "Sf. Ioan Botezătorul" from Siret	9 Mai Street, no. 2	The church is located in the center of the city, in Republic Square, no. 1.	Medieval era (17th century)	Approx. 1.6 km	RAN 146664.06
39.	The church dedicated to "Sf. Treime" from Siret	Near St. Trinity Street	The church is located in the eastern part of the town, on Victoriei Street, no. 10.	Medieval era (14th century)	Approx. 1.6 km	RAN 146664.04
40.	The fortification from Iacobeşti - Dealul Ocup	Iacobeşti, Suceava county	It is located approx. 3 km from Iacobeşti.	Medieval era (15th century)	Approx. 1 km	RAN 149012.01
41.	The archaeological site from Milişauţi - Badeuţi	Milišauţi, Suceava county	The site was identified on both banks of the Bădeuţi stream, the right tributary of the Suceviţa, starting from the road bridge of this stream, which intersects the road segment 209A between Suceava and Rădăuţi.	The Bronze Age	Approx. 1.6 km	RAN 146986.03
42.	The ruins of the princely court from Milişauţi-In the cemetery	Milišauţi, Suceava county	100 m SW from the ruins of the Church of Stephen the Great (on the border with the village of Badeuţi)	Medieval era (15th century)	Approx. 3.4 km	RAN 146986.01
43.	The medieval center of Siret	Siret city, Suceava county	Between the center of Siret and the Siret river	Medieval era (14th-16th centuries)	Approx. 1 km	RAN 146664.05
44.	The archaeological	Siret city,	The site is located in	Eneolithic	Approx. 1.5 km	RAN

No. crt.	Description of the heritage element	Address	landmark	Dating	Distance approx. against the project limit	Identification code
	site from Siret – Dealul Horodişte	Suceava county	the current Jewish cemetery.			146664.01
45.	The archaeological site from Siret – Dealul Sasca	Siret city, Suceava county	The archaeological site is located approx. 300 m S of the city, on the E20 road	The Iron Age	Approx. 1.8 km	RAN 146664.03

The following figures show the cultural monuments (cultural buildings, sites and monuments) located in the vicinity of the Suceava – DN2H highway and DN2H – Siret Expressway project.

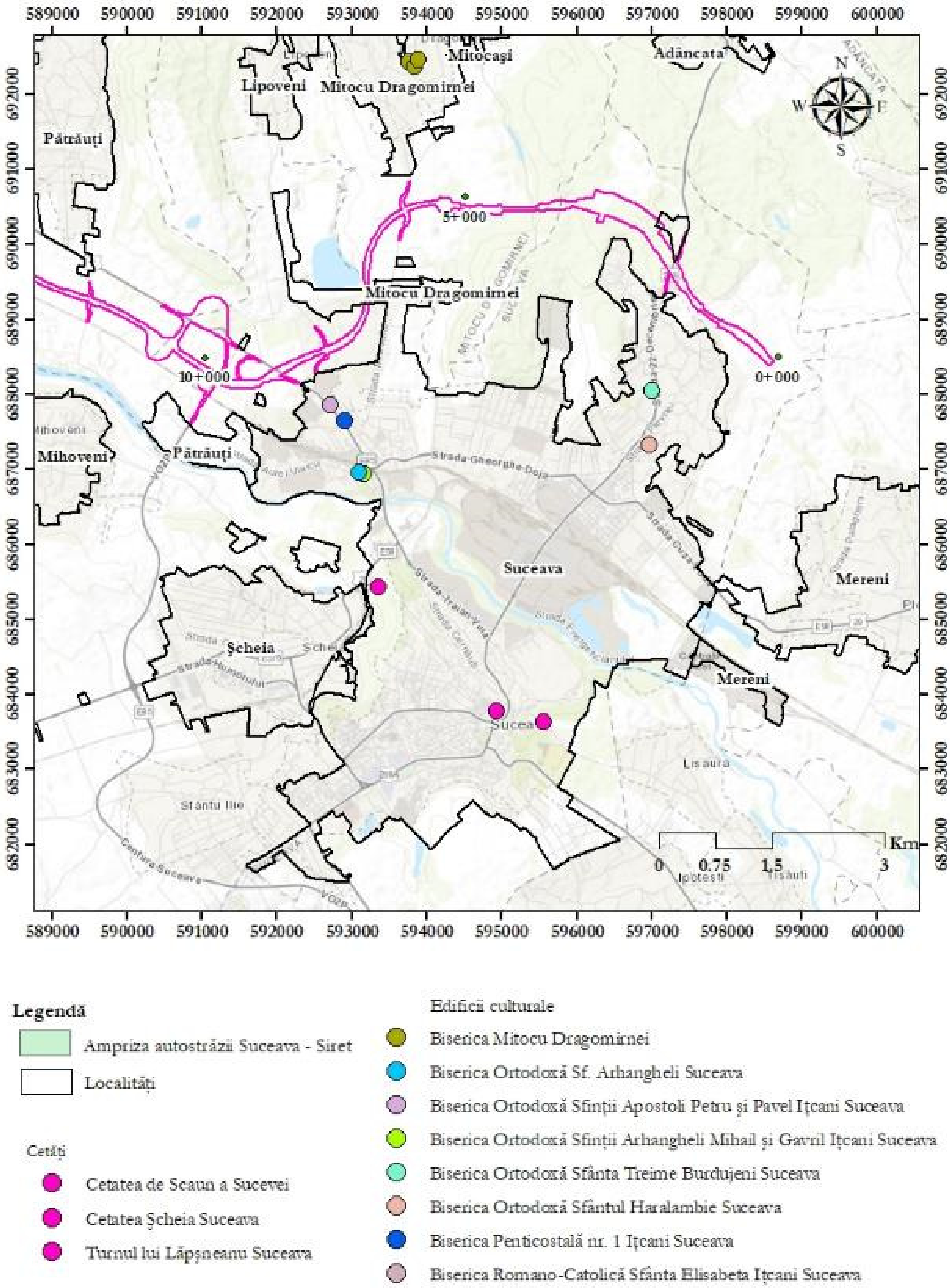


Figure no.4-88The cultural monuments in the vicinity of the project, on the Suceava - Pătrăuți section

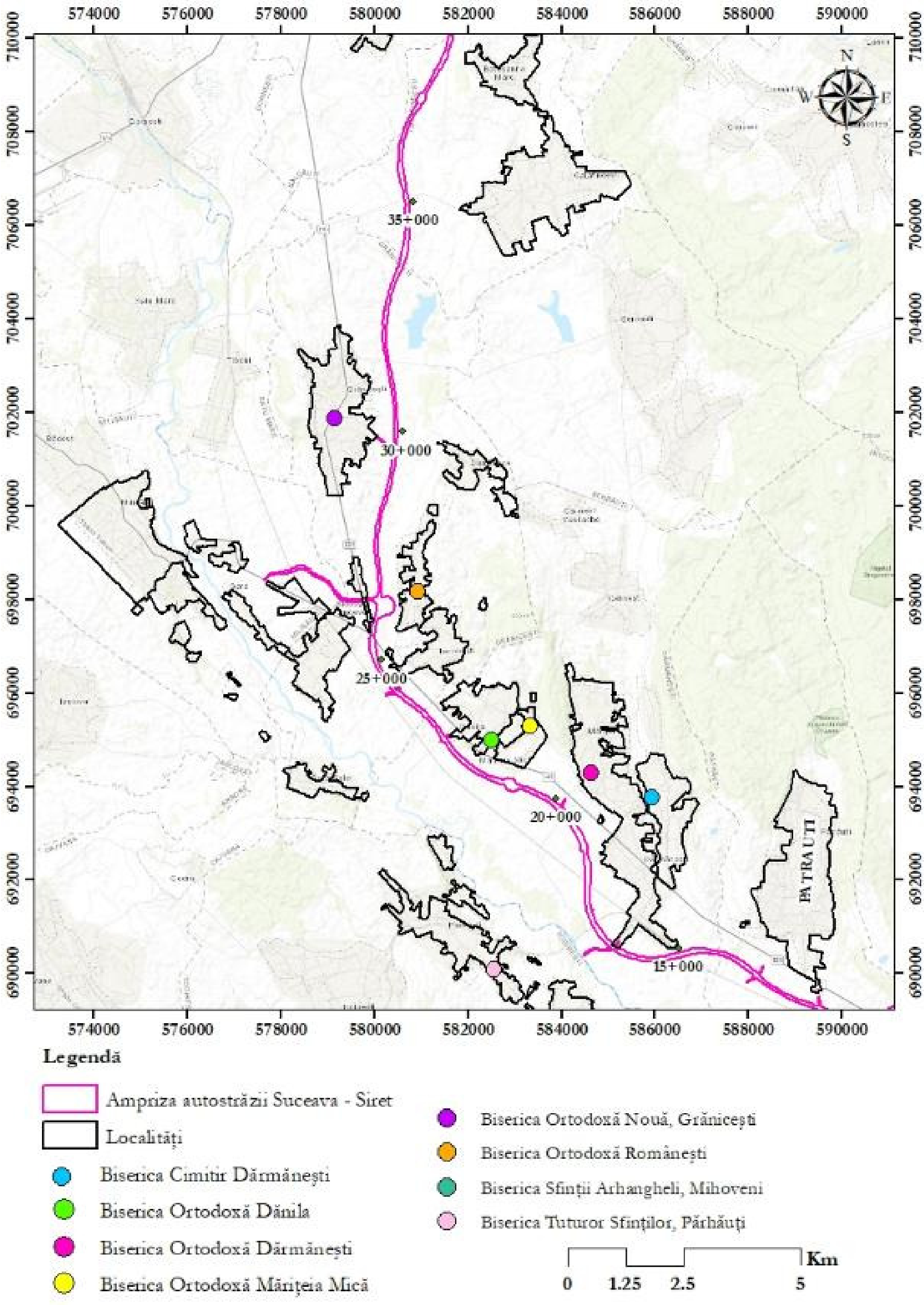


Figure no.4-89 The cultural monuments in the vicinity of the project, on the Pătrăuți - Calafindeşti section.

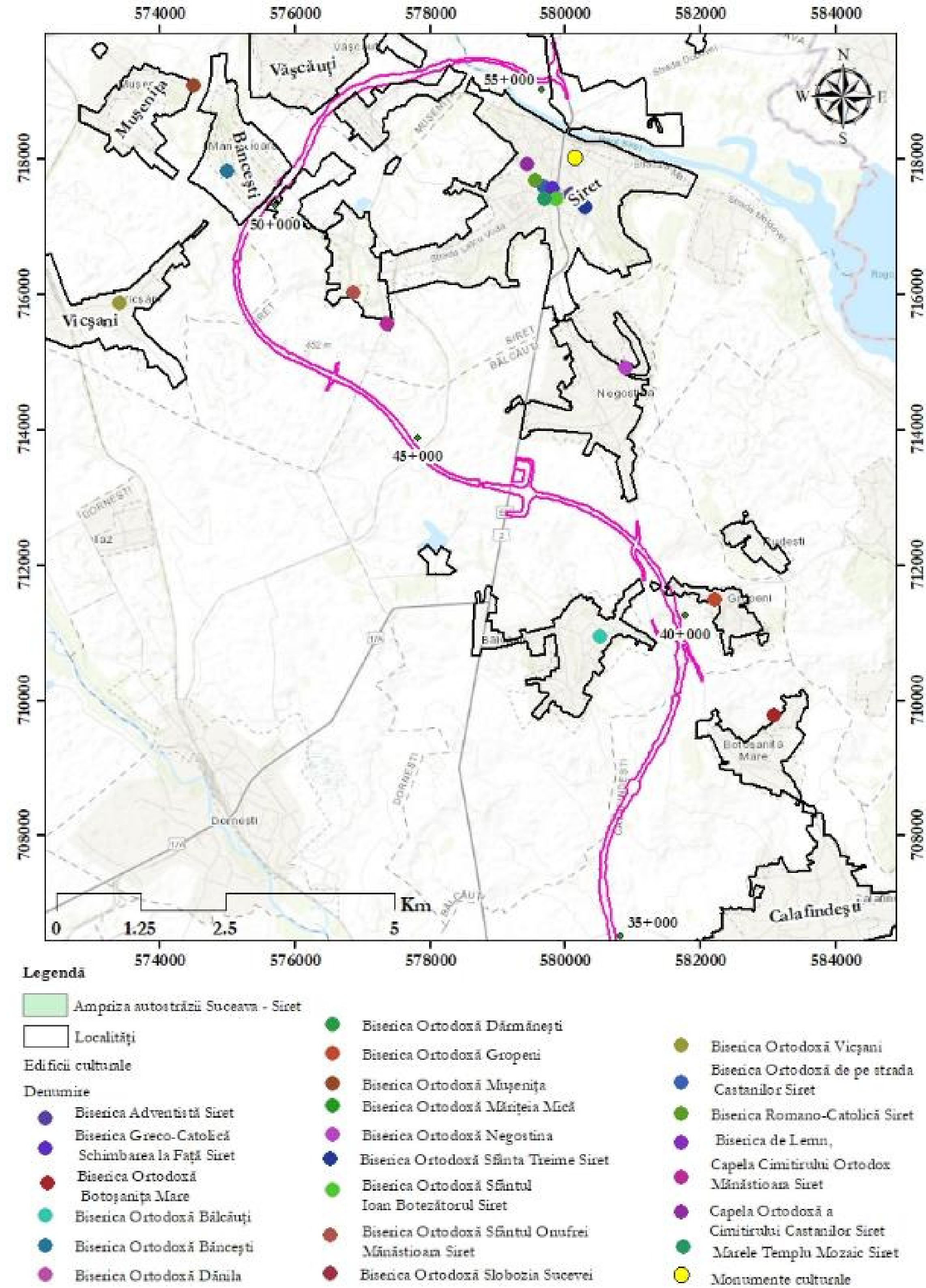
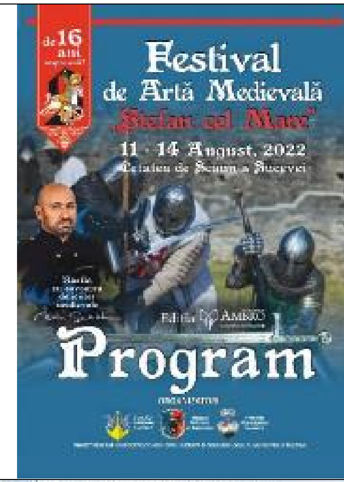


Figure no.4-90 The cultural monuments in the proximity of the project, on the Calafindeşti - Siret section.

5.8.2 Habits and traditions

The following table presents the calendar of the main cultural-artistic and traditional activities in the implementation area of the proposed project.

Table no.4-22Main cultural-artistic and traditional activities in the project area

CITY	Date	Event	Location	Event description	Photos
Suceava	August 11-14, 2022	„Ștefan cel Mare” Medieval Festival	The Seat Fortress of Suceva	Show	
Suceava	November 4-6, 2022	Festivalul Plăcintelor (Festival of Pies)	The Seat Fortress of Suceva	Culinary festival	

CITY	Date	Event	Location	Event description	Photos
Suceava	September 11-15	Târgul de Toamnă – Produs in Bucovina (Autumn Fair – Produced in Bucovina)	Esplanade of the House of Culture in Suceava	Shopping fair	

Table no.4-23Customs and traditions of the study area

CITY	Date	Event	Location	Event description	Photos
lace	May 20-21, 2022	Zaga Folk Festival	Siret	Music festival	

5.8.3 Tourist attractions in Suceava

Suceava Fortress

The Seat Fortress of Suceava is an important historical monument, being an excellent center for defense against the Ottomans in the 14th century.

Bucovinean Village Museum (Muzeul Satului Bucovinean)

A museum located in the open air in Suceava County, today it has over 30 tourist attractions such as wooden houses, popular technical installations, craft workshops and a series of community buildings. Along with all those listed above, in the heart of the village there is the church and the bell tower în Vama, the tavern and the school from Securiceni.

It covers an area of 6 ha, near theSeat Fortress , which prompts tourists to visit both the Bucovinean Village Museum and the Seat Fortress .

Voronet Monastery

The Voronet Monastery is very valuable from a cultural point of view, due to the special paintings it benefits from, and especially due to their importance, being paintings made by Ştefan cel Mare.

It is also called the Sistine Chapel of the East and is a medieval monastic complex built only 36 km from the city of Suceava, in the village of Voronet.

Ciocăneşti village

This tourist objective benefits from a special location, right in the heart of Bucovina, and is the most beautiful rural settlement in Romania.

The feature that highlights Ciocăneşti Village is represented by the houses painted in traditional motifs, and another valuable element of the village due to the presence of the Museum of Painted Eggs („Muzeul Ouălor Încondeiate"), together intertwining customs and characteristics specific to Bucovina.

The cell of Daniil the Hermit (Chilia lui Daniil Sihastrul)

This tourist attraction is located near the village of Putna, being represented by a cave dug in the rock in the second half of the 15th century.

Cacica Salt mine

This salt mine is recognized for the largest exploitations of recrystallized salt in Europe and is also well known for its water springs.

Already during the 18th century, the salt mine was exploited, and with the passage of time, it became an important tourist attraction in Suceava County, and therefore became accessible to tourists.

Suceviţa Monastery

It is a historical monument representative of the whole of Romania, through its architecture that combines elements of Gothic and Byzantine art, among which there are also local architectural elements. This tourist objective was added to the List of historical monuments in Suceava county in 2015.

Putna monastery

This cultural edifice is of special importance due to its name by Mihai Eminescu as "Jerusalem of the Romanian Nation". It is located only 33 km from Rădăuţi and is one of the most important tourist attractions in Suceva County.

Probota Monastery

Built in 1530, today it is part of the UNESCO World Heritage, but it has the role of a princely castle of Moldova, representing a place of special importance for the history of Romania.

Dragomirna Monastery

The Dragomirna Monastery cultural building is actually a fortified monastic complex, built between 1602-1609, with the role of a medieval church, which stands out for its characteristic features: the originality of the style, the architectural elegance and its antiquity.

5.8.4 Tourist attractions in Siret

The town of Siret is located on the right bank of the Siret river, and is also the oldest town in Bucovina. Siret was present in the Portulan of Angelino Dulcert, in the year 1339, as a commercial center and a transcontinental stopping point.

It is also important to specify the fact that it is a city rich in tourist attractions, especially through its presence in one of the most important cultural attractions in Romania, namely Bucovina.

„Sfânta Treime" Orthodox Church

An extremely important tourist attraction in the City of Siret, which stands out especially for its architectural style that attracts tourists: the exterior is built of unquarried stone, only in the area of the facades plain or glazed brick was used. This cultural edifice was added to the List of Historical Monuments in 2004.

„Sfântul Ioan Botezătorul" Church

A holy place of particular importance for the inhabitants of the City of Siret, a cultural edifice recognized as a local historical monument, was added to the List of historical monuments in 2004, it is a foundation of the ruler Ştefan Petriceicu himself. This historical monument is of particular importance for the tourism of the City of Siret through the countless conversions to Catholicism.

„Sf. Onufrie" Church

This religious edifice comes with a special story from the other cultural edifices: during the reign of Alexandru Lăpuşneanul, the priest from the City of Siret received a piece of land where he planted a garden of fruit trees, and in the middle of it he built a wooden church, which he later dedicated to the Putna Monastery.

Romano-Catholic Church

A historical monument that once had a special significance for the Ukrainian Greek-Catholic residents who used this church to hold religious services. Later, the disintegration of the Austro-

Hungarian Empire and the union of Romania with Bucovina regulated new relations between Romania and the Vatican.

The medieval Jewish cemetery

The Medieval Jewish Cemetery enjoys the distinction of being the oldest cemetery in Eastern Europe, having tombstones with various traditional Hebrew artistic motifs, and the oldest stone dating back to 1560, which helps it to occupy the place of the oldest cemetery from Eastern Europe. In turn, it was declared a local historical monument.

Jewish Synagogue (Great Temple)

A Jewish place of worship in the center of the City of Siret, this temple has paintings with the names of 400 Jews who died in Transnistria, and inside it there was also a Hasidic school.

5.9 Brief description of the likely evolution of the state of the environment if the project is not implemented

The following table provides a brief description of the likely evolution of the state of the environment if the project is not implemented, to the extent that natural changes from the baseline scenario can be reasonably assessed based on environmental information and scientific knowledge available. The most important aspects relevant to the analyzed project have been preserved in this section.

Table no.4-24Brief description of the likely evolution of the state of the environment if the project is not implemented

compound	The main characteristics of the current state of the environment	The probable evolution of the state of the environment if the project is not implemented	The global assessment of the probable evolution of the state of the environment
Surface water	According to the updated Management Plan of the Siret hydrographic space, most of the water bodies intersected by the project have reached the environmental objectives associated with the ecological status in the period 2016-2021. A single body of water (RORW12.1.17.30b_B1 Podul Vătafului) did not reach its objective, with the deadline for reaching the objective for the ecological state in 2027. From the point of view of the chemical state, the environmental objective was achieved in the period 2016-2021.	By not implementing the project, the water bodies in the area will not undergo hydromorphological changes, thus maintaining their current state. There will be no additional pressures on water bodies that do not have the achieved objective associated with the ecological status/ecological potential.	Maintain
Ground water	The project implementation area overlaps with a ROSI03 Lunca Siretului și afluenții săi ground water body, having a good state, both from the point of view of the chemical state and the quantitative state.	By not implementing the project, there will be no additional pressure on the underground water bodies. The potentially contaminated rainwater collected from the existing road infrastructures in the study area is not collected and managed properly at the present moment, they constitute potential pressures on the quality of the ground water body ROSI03, as a result of infiltrations. Through the implementation of the project, the traffic on the existing roads will be significantly reduced and implicitly the pollutant loads from the rainwater collected from them will also be reduced. At the same time, rainwater collected from the highway will be collected through a sealed system of channels and properly pre-purified before discharge. Considering, however, that in the Management Plan of the Siret hydrographic area, road infrastructures are not identified as pressures on the underground water bodies, it is estimated that even in the case of non-implementation of the project, the qualitative and quantitative state of the underground water bodies will be maintained.	Maintain
Air	According to the dispersion maps presented within the PMCA Suceava, at the level of 2025 (the modeled base scenario), no exceedances of the analyzed relevant pollutants (PM10, PM2.5, NO_2, SO_2, CO) were estimated. Based on the existing monitoring data at EPA, it was found that in the project area, no exceedances of the concentrations of the PM10, NOx and NO_2 indicators were forecast. In the case of the PM10 indicator, in the inhabited areas with higher density, respectively in the localities of Suceava and Siret and in the localities bordering the project, higher values are observed, relatively close to the limit value (with average annual concentrations in the range of 19-25 $\mu g/m^3$), the main sources of air	By not implementing the project, the air quality at the level of sensitive receptors will worsen as a result of the growing trend of the car park at the national level and implicitly of the traffic. At the same time, the main road arteries existing in the project area, but also the county roads that directly transit the inhabited areas, lead to high concentrations of atmospheric pollutants at the level of sensitive receptors, especially during the periods when traffic jams are formed. The implementation of the project would lead to the	worse

compound	The main characteristics of the current state of the environment	The probable evolution of the state of the environment if the project is not implemented	The global assessment of the probable evolution of the state of the environment
	pollution that can influence the concentrations of this indicator in these areas are the road traffic carried out on the roads passing through these localities as well as agricultural activities. For NO_2, the air quality maps indicate higher values in the localities of Suceava and Siret, but located below the limit value, the range being between 10-20 µg/m^3. According to the dispersion maps presented within the PMCA Suceava, at the level of 2025 (the modeled base scenario), no exceedances of the analyzed relevant pollutants (PM10, PM2.5, NO_2, SO_2, CO) were estimated.	highway taking over a significant volume of vehicles from the existing roads and implicitly to their release in an area with a significantly lower density of sensitive receptors.	
ground	At the level of the project implementation area, no potentially contaminated sites were identified. The areas that are proposed for the implementation of the project are mostly represented by agricultural lands, pastures. The project takes place on an area with lands with fertile soils, this aspect being confirmed by the categories of current mainly agricultural activities in the project area.	In case of non-implementation of the project, no changes are expected at the level of soil quality, compared to the existing situation.	Maintain
Subsoil geology	In the study area, there are no natural reserves/monuments of geological/paleontological interest, nor perimeters for oil exploration or exploration or quarries for the exploitation of mineral resources.	By not implementing the project, the exploitation of material from ballast yards and quarries to provide filling materials would be avoided, thus maintaining the current geological conditions at the local level.	Maintain
biodiversity	The route of the highway/express road does not cross any protected natural area (Natura 2000 sites, protected natural areas of national interest, or other protected natural areas). However, the route is close to several Natura 2000 sites. The highway/express road route also intersects areas that form the green infrastructure, composed of all the natural and semi-natural or anthropogenic ecosystems/habitats and "blue" (a component of the green infrastructure), formed by bodies of surface water. Within the Green Infrastructure network, ecological corridors ensure the flow of genetic information between the main cores, an essential function for the long-term maintenance of plant and animal species populations, in a way that ensures their resistance and resilience over time. In the area of the Suceava - DN2H highway and the DN2H - Frontiera Siret expressway there is an important area for green infrastructure that is intersected, in the southern part of the project, to the north of Suceava town.	In the case of non-implementation of the project, no important changes are expected compared to the existing situation. There will be no more loss of habitat (favorable habitats for some species in the Natura 2000 sites, located in the vicinity of the project) following the occupation of some areas and also no effects of population reduction for fauna species will be recorded. At the same time, the non-implementation of the project will no longer affect the ecological connectivity for mammal species in the forest area north of Suceava.	Maintain
Landscape	The study area is characterized as an area with a predominantly anthropic landscape (dominated by agricultural land and urban areas) and a large and very large fragmentation, having a low sensitivity. The project implementation area is not an important area from a tourist point of view, the closest tourist objectives being concentrated inside the Suceava	In the case of non-implementation of the project, no important changes are expected compared to the existing situation.	Maintain

compound	The main characteristics of the current state of the environment	The probable evolution of the state of the environment if the project is not implemented	The global assessment of the probable evolution of the state of the environment
	Municipality. The main tourist attractions in the highway area belong both to the category of archaeological sites and to the category of cultural edifices and historical monuments.		
The social and economic environment	According to the integrated urban development strategy of the Suceava urban area 2021-2030, the demographic aging index in the Suceava municipality and the urban functional area are located well mfar below the national average of 115.6, this being in 2020 at 86.7 in the municipality and 75.4 in ZUF– ie there are 86.7 and respectively 75.4 elderly persons for every 100 children. An aging population is noticeable at the level of the UAT intersected by the project, according to INS data. According to INS data, the main classes of diseases with the highest incidence and with the most deaths due to them, in the county intersected by the analyzed project, are: diseases of the circulatory system, tumors and diseases of the respiratory system. Regarding the economic aspect, based on INS data, an increase in GDP was found in Suceava county. The activities carried out at the level of the UATs of interest are: industry, agriculture and forestry, construction, education, transport and storage, health and social assistance.	In the case of non-implementation of the project, the evolution trend of the social and economic environmental component is expected to be negative considering the need of local residents for mobility in order to secure jobs. The duration of the transport of passengers and goods will increase as a result of the growing trend of the car fleet and traffic both at the national level and at the level of the study area. At the same time, by not implementing the project, the trend of increasing the number of road accidents will be maintained. In the case of non-implementation of the project, the evolution trend of the social and economic environmental component is expected to be negative.	worse
Cultural heritage	The highway/express road route does not overlap with internationally designated UNESCO heritage sites for the protection of cultural values. The closest archaeological site to the project is at a distance of 0.4 km, being the Church „Sfinţii Arhangheli" , Mihoveni. The nearest archaeological site is located at a distance of about 1 km - the Iacobeşti Fortification - Dealul Ocup.	In the case of non-implementation of the project, the conservation status of the areas where archaeological elements have been identified will be maintained.	Maintain

Possible evolution compared to the existing situation

classes	Explanation
Improvement	The trend of evolution is a positive one
worse	The trend of evolution is negative
maintain	No important changes are expected compared to the existing situation
-	The project is not directly related to the current state or its evolution in the future.

6 DESCRIPTION OF THE ENVIRONMENTAL FACTORS LIKELY TO BE SIGNIFICANTLY AFFECTED BY THE PROJECT

"Significant damage" means the occurrence of a significant impact, respectively, a number of situations in which the magnitude of the changes caused by the project would correspond to the small negative - very large negative range and the sensitivity of the component modified by the project would correspond to the moderate - very large range (see chapter 3.6 "Evaluation of the significance of impacts"). Affect implicitly refers to a negative impact.

In the following, the situations that correspond to a significant level of impact on the relevant environmental factors for the analyzed project are highlighted. The situations presented below represent strictly theoretical situations, formulated before the actual evaluation, presented in chapter 7 of the RIM.

In formulating the significant impact situations, we took into account all the factors (environmental components) studied within the RIM, regardless of the probability of significant impacts for each of them.

The description below focuses on situations where significant negative impacts may occur. Situations corresponding to significant positive impacts were not described.

Human population

The significant damage to the human population would require the registration of one of the following situations, as a result of the construction and operation of the project:

1. Destruction/degradation of a resource(s) on which local communities depend. It can be the case for example of water resources: the project leads to the impossibility of using the local water resource or prevents the access of the residents to the drinking water supply. Secondly, it can be the case of any other resource (eg: agricultural land that could be heavily modified as a result of the implementation of the project);

2. Changing the ethnic structure of localities through the expropriation of some areas where minorities mainly live;

3. Many local residents leave the communities either as a result of expropriations or due to the appearance of some forms of impact or risks due to/aggravated by the implementation of the project (eg floods, landslides, etc.);

4. The closure of several businesses either as a result of the impossibility of competing in the new market conditions (conditions modified by the project), or as a result of affecting the local resources on which they depend.

The most exposed communities are small localities dependent on a specific resource, confronting labor force problems with declining ethnic minorities. There are no such localities in the project area.

Human health

The significant damage on human health would imply the registration of one of the following situations as a result of the construction and operation of the project:

1. The increase in the risk of illness as a result of the change in air quality in the sense of increasing the concentrations of some pollutants above the maximum admissible limits, according to the legal requirements in force;

2. The increase of the equivalent level of noise in the project implementation areas exceeding the maximum admissible values, according to the legal requirements in force.

Biodiversity

Significant damage to biodiversity components would involve the registration of one of the following situations:

1. Changing the current state of conservation (in the sense of worsening) of any habitat or any species of community interest in the Natura 2000 site in the project area and/or preventing the achievement of a favorable state of conservation (impossibility of achieving the management objectives of the Natura 2000 site);

2. Loss, alteration or degradation of habitats and/or favorable habitats for species of conservation interest within protected areas of national interest, protected areas of international interest and valuable natural areas;

3. Interruption of connectivity at the level of ecological corridors.

From the three situations, the project can have a significant impact on the interruption of connectivity at the level of ecological corridors, as well as on the population of some protected species that are listed in the Natura 2000 Standard Forms of the analyzed sites in this Report.

Soil and land use

Significant damage to the soil and land use would require the registration of one of the following situations:

1. Physical degradation, loss of productive capacity or soil contamination at the level of gardens and households in communities;
2. Preventing any projects or activities for the rehabilitation of contaminated lands or those affected by acidification or salinization.

Water

Significant damage to water resources would require the registration of one of the following situations:

1. Quantitative or qualitative impairment of sanitary protection zones;

2. Quantitative and qualitative changes leading to deterioration of the state of surface and/or underground water bodies;

3. Quantitative and qualitative changes that prevent the improvement of the state of surface and/or underground water bodies (achieving the environmental objectives formulated at basin level).

Air

Significant air pollution would require the registration of one of the following situations:

1. Degradation of air quality with medium and long-term exceeding of the maximum allowed concentration values according to the legal requirements in force;
2. Preventing the implementation of the measures provided for in the Air Quality Maintenance Plans at the level of the counties crossed by the project.

Climate and climate change (including disaster management)

This is an area of concern that includes how the project adapts to the effects of climate change (eg: changing extreme temperatures, increasing the frequency and magnitude of events responsible for producing disasters), but also the extent to which the project manages to reduce contributions to climate change , mainly by reducing greenhouse gas emissions.

A significant impairment in this case would involve the registration of one of the following situations:

1. The production of hazards with particularly serious consequences;
2. Favoring or amplifying the effects of natural hazards with particularly serious consequences;
3. The generation of higher mass flows of greenhouse gas emissions than in the initial conditions.

Material assets

Significant damage to material assets would require the registration of one of the following situations:

1. The loss of more than 20% of the ecosystem services of high importance existing in the project implementation area;
2. Loss of more than 20% of critical infrastructures, cultural-historical objectives or economic activities in the project implementation area.

Conventionally, for "ecosystem services" will be considered all the surfaces occupied with natural and semi-natural ecosystems on which the existence of local communities depends (the surface occupied with wetlands, with meadows and pastures, respectively with agricultural lands).

Cultural heritage, including architectural and archaeological aspects

Significant damage to cultural heritage would require the registration of one of the following situations:

1. Partial or total alteration of a UNESCO site;
2. Partial or total alteration of a monument or site of archaeological, historical or cultural importance designated at national level.

There are no UNESCO sites in the project implementation areafor the protection of cultural values.

Landscape

The significant impact on the landscape would require the registration of one of the following situations:

1. The alteration of some areas of landscape importance designated at the international level (UNESCO heritage, natural sites of the universal heritage);
2. The alteration of some landscape areas in an excellent state of conservation (traditional landscapes) with a high level of aesthetic, cultural and natural value.

Alteration implies both definitive and temporary (reversible) changes. Temporary but long-term changes (> 10 years) can also generate significant impact. In the assessment of the impact on the landscape, the changes from a visual point of view, caused by the construction works and the existence of permanent structures, but also the harmony of the landscape components, must be taken into account. In the case of natural landscapes, harmony is ensured both by the structure and the functionality of natural ecosystems. For example: the pollution of surface water bodies can significantly affect the landscape even in the absence of structural changes at the level of the aquatic ecosystem (it does not decrease the water level or its surface).

Compared to all the environmental factors presented previously, the analyzed project can generate significant impacts (without the implementation of avoidance and reduction measures) on:

1. biodiversity components, especially on the size of species populations inside the Natura 2000 sites ROSCI0075 Pădurea Pătrăuţi, ROSCI0380 Suceava Liteni River and ROSPA0110 Rogojeşti-Bucecea Accumulations, as well as on other species, from the sites in the vicinity of the project. The project can also contribute to the fragmentation of local movement areas for mammal species.
2. the social component as a result of the increase in the noise level at the sensitive receivers located near the highway and the expressway.

7 POTENTIAL IMPACT, INCLUDING CROSS-BORDER IMPACT, ON ENVIRONMENTAL COMPONENTS

7.1 IDENTIFICATION OF EFFECTS AND FORMS OF IMPACT

7.1.1 Construction and operation of the project

A correct understanding of the effects and impacts requires the analysis of all the changes that take place in the different implementation stages of the project, as well as the interdependence between them.

The identification of the forms of impact involved the following steps:

- Analysis of all interventions proposed within the project;
- Identification of all activities resulting from the implementation and operation of the interventions;
- Identification of all the changes (effects) that occur in the physical and socio-economic environment as a result of the implementation and operation of the interventions;
- Identification of all changes that could take place from a qualitative and quantitative point of view at the level of sensitive receptors (impacts);
- Grouping of results to eliminate redundancies and ensure a unified assessment (grouping of causes that lead to the appearance of the same effect, grouping of effects that lead to the appearance of the same form of impact).

The interventions proposed for the analyzed project and identified as having the potential to generate impacts are presented in the table below.

Table no.7-1 The interventions identified for the project

Code	Type of intervention	Activities included
I.E1.	Site organizations	Offices, manufacturing platforms/storage platforms, asphalt and concrete stations.
I.E.2	Utility networks relocation	Changes to underground and above-ground utility networks
I.E.3	Roads relocation	Changes to existing roads
I.E.4	Earthworks	Excavations in profile, excavations in borrow pits, fillings, including in the area of road junctions, service spaces, short-term parking lots and CIC
I.E.5	Structures (Above ground)	Construction of decks, bridges and passages
I.E.6	Consolidation works	Construction of defense walls and retaining walls
I.E.7	Hydrotechnical works	All works related to water
I.E.8	Works on the highway and expressway	The superstructure (form layer, foundation, asphalt mixtures, wear layer), traffic safety works, environmental protection works, signs and markings
I.E.9	Rehabilitation works of the lands temporarily affected by the works	Restoration and redevelopment of green areas (including short-term parking lots and CIC).
I.O.1.	The development of car traffic	Car traffic on the highway and side roads, including the

Code	Type of intervention	Activities included
		fencing of the roadway area and risks related to car traffic.
I.O.2.	Precipitation management	Drainage of rainwater, snow removal, frost prevention
I.O.3.	Maintenance works	Including repairs, asphalting, etc.
I.O.4.	The activity of short-term parking lots and CIC	Operation of short-term parking lots and CIC

Legend: IE – Interventions during the execution period; IO – Interventions during the operating period

In general, the identification and evaluation process focused on those effects and forms of impact that have the potential to become significant.

In the following sections, all the identified forms of impact are evaluated, regardless of whether they manifest themselves exclusively in one of the project stages (construction, operation or decommissioning period) or throughout the entire life of the project. In assessing the impact, the cumulative contribution of several effects was taken into account, where appropriate.

Table no.7-2 Identification of cause-effect-impact relationships for the construction and operation of the Suceava - Siret highway and expressway

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
I.E.1	Site organizations	Temporary arrangements	Soil	Soil compaction	Alteration of the productive capacity of the soil	Alteration of habitats
			Biodiversity	Reducing the degree of vegetation cover	Alteration of habitats	Loss of habitats
		Creation of definitive platforms	ground	Soil insulation	The loss of the productive capacity of the soil	Loss of habitats
			biodiversity	Vegetation removal	Loss of habitats	-
		Underground water supply	Groundwater	Debit charges	Quantitative alterations of groundwater	-
		Preparation of concrete and asphalt mixtures	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
		Material / waste storage	Groundwater	Pollutants reach phreatic groundwater	Alteration of undergroundwater quality	-
			Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Biodiversity	Covering the vegetation with soil and other materials	Alteration of habitats	Loss of habitats
		Material / waste storage	Soil	Pollutants reach the soil	Alteration of soil quality	Alteration of habitats
		Accidental spills of pollutants on the soil	Ground water	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
			Soil	Pollutants reach the soil	Alteration of soil quality	Alteration of habitats
			Surface water	Diffusion of pollutants in surface waters	Alteration of surface water quality	-
		Drainage of rainwater from OS	Surface water	Pollutants into surface waters	Alteration of surface water quality	-
		Hiring the workforce	Population	Temporary establishments with residence in the project area	Changes in the structure of the human population	-
			Material assets	Temporary employment of local people in construction activities	Financial gains	-
			Soil	Soil compaction	Alteration of the productive capacity of the soil	Alteration of habitats
			Biodiversity	Vegetation removal	Loss of habitats	-
			Surface water	Alteration of the substrate and the banks of the river bed	Deterioration of the ecological state of the water body	-
			Biodiversity	Interruption of longitudinal connectivity	Fragmentation of habitats	-
		Fertile soil storage	Biodiversity	Covering the vegetation with soil and other materials	Alteration of habitats	Loss of habitats
		Accidental spills of pollutants on the soil	Groundwater	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
			Soil	Diffusion of pollutants in the soil	Alteration of soil quality	-
		Construction site	Air quality	Emissions of atmospheric pollutants	Change in air quality	-

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
		traffic	Biodiversity	Increasing noise level	Disturbance of species activity	-
			Human health	Increasing noise level	Discomfort generated by noise	-
			Material assets	Vibrations	Immovable property damage	-
			Material assets	Increasing the level of traffic on public roads	Financial losses	-
			Cultural heritage	Vibrations	Affecting cultural heritage	Loss of cultural heritage
			Landscape	Heavy traffic growth	Reducing the aesthetic value of the landscape	Financial losses
I.E.2	Utility networks relocation	Earthworks	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Soil	Soil compaction	Alteration of the productive capacity of the soil	Alteration of habitats
			Biodiversity	Vegetation removal	Alteration of habitats	-
			Biodiversity	Vegetation removal	Loss of habitats	-
		Soil storage	biodiversity	Vegetation removal	Alteration of habitats	-
		Construction of foundations	ground	Soil removal	Quantitative soil losses	-
			biodiversity	Vegetation removal	Loss of habitats	-
		Welding and assembly operations	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
		Accidental spills of pollutants on the soil	Groundwater	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
			Soil	Pollutants reach the soil	Alteration of soil quality	-
I.E.3	Roads relocation	Earthworks	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Soil	Soil compaction	The loss of the productive capacity of the soil	-
			Biodiversity	Vegetation removal	Loss of habitats	-
		Soil storage	Biodiversity	Covering the vegetation with earth and other materials	Alteration of habitats	Loss of habitats
		Accidental spills of pollutants on the soil	Groundwater	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
			Soil	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
		Pouring asphalt mixtures	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
		Traffic diversion				-
			Material assets	Increasing the level of traffic on public roads	Financial losses	-
I.E.4	Earthworks	Expropriation	Material assets	Differences between compensation values and values of the real estate	Financial losses	-
			Population	Change of residence (relocation)	Changes in the size of the population in localities	Abandonment of the locality
			Population	Change of residence	Changes in the ethnic structure of localities	The disappearance of a minority at the

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
						locality level
			Biodiversity	Destruction of shelters and nests	Loss of habitats	-
			Biodiversity	Destruction of shelters and nests	Reduction of the population	The disappearance of some plant / animal populations
		Clearing the road area (armament only)	Human health	Extraction of weapons with a risk of explosion	Avoiding loss of human life	-
			Goods	Extraction of weapons with a risk of explosion	Avoiding economic losses	-
		Soil handling	Human health	Increasing noise level	Discomfort generated by noise	-
			Population	Vibrations	Financial losses	-
			Human health	Emissions of atmospheric pollutants	The increase in the incidence of diseases	-
			Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Soil	Soil removal	Quantitative soil losses	-
				Changing the topography of the land by land storage	Alteration of soil quality	-
				Contaminated soil handling (identification of contaminated sites)	Alteration of soil quality	-
				The production of landslides	The loss of the productive capacity of the soil	-
			Geology	Structural changes due to the execution of the cutting	Losses from the geological substratum	-
			Biodiversity	The production of landslides	Alteration of habitats	Loss of habitats
			Goods	The production of landslides	Financial losses	Abandonment of the locality
			Cultural heritage	The production of landslides	Affecting cultural heritage	Loss of cultural heritage
			Cultural heritage	Construction works inside some archaeological sites	Affecting cultural heritage	Loss of cultural heritage
			Landscape	The production of landslides	Reducing the aesthetic value of the landscape	Financial losses
			Biodiversity	Vegetation removal	Loss of habitats	-
				Destruction of shelters and nests	Loss of habitats	-
				The collision of fauna with construction site traffic	Reduction of the population	The disappearance of some plant / animal populations
				Increasing noise level	Disturbance of species activity	-
				Invasion of non-native species	Alteration of habitats	Loss of habitats
				The appearance of physical barriers for wildlife	Fragmentation of habitats	Loss of habitats
		Accidental spills of	Groundwater	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
		pollutants on the soil	Soil	Pollutants reach the soil	Alteration of soil quality	Alteration of habitats
I.E.5	Structures (Above ground)	Building bridges	Surface water	Removal of riparian vegetation	Deterioration of the ecological state of the water body	-
			Surface water	Hydro-morphological changes due to the construction of piles in the minor bed	Deterioration of the ecological state of the water body	-
			Soil	Soil compaction	Alteration of the productive capacity of the soil	Alteration of habitats
			Soil	Soil removal	The loss of the productive capacity of the soil	-
			Geology	Structural changes due to the execution of the foundations	Alteration of the geological substrate	-
			Biodiversity	Removal of riparian vegetation	Loss of habitats	-
			Biodiversity	The appearance of physical barriers for wildlife (only during construction)	Fragmentation of habitats	-
			Human health	Increasing noise level	Discomfort generated by noise	-
			Human health	Emissions of atmospheric pollutants	The increase in the incidence of diseases	-
			Material assets	Vibrations	Immovable property damage	-
			Cultural heritage	Construction works inside some archaeological sites	Affecting cultural heritage	Loss of cultural heritage
			Landscape	The creation of massive artificial structures	Reducing the aesthetic value of the landscape	Financial losses
I.E.6	Consolidation works	Construction of consolidation works	Groundwater	Interruption of groundwater connectivity	Lowering of the groundwater level	Abandonment of the locality
			Surface water	Alteration of the banks of the bed	Deterioration of the ecological state of the water body	-
			Surface water	Removal of riparian vegetation	Deterioration of the ecological state of the water body	-
			Soil	Soil removal	The loss of the productive capacity of the soil	-
			Geology	Structural modifications of the substrate	Alteration of the geological substrate	-
			Biodiversity	The appearance of physical barriers for wildlife	Fragmentation of habitats	Loss of habitats
			Human health	Prevention of disasters (landslides)	Avoiding loss of human life	-
			Material assets	Prevention of disasters (landslides)	Avoiding economic losses	-
			Landscape	Realization of massive artificial structures	Reducing the aesthetic value of the landscape	Financial losses
I.E.7	Hydrotechnical works	Bed recalibrations	Surface water	Alteration of the banks of the bed	Deterioration of the ecological state of the water body	-
			Biodiversity	Alteration of the banks of the bed	Loss of habitats	-

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
		Bed recalibration	Surface water	Alteration of the substrate and the banks of the bed	Deterioration of the ecological state of the water body	-
			Biodiversity	Alteration of the substrate and the banks of the bed	Loss of habitats	-
		Protection of bridge piles	Surface water	Alteration of the banks of the bed	Deterioration of the ecological state of the water body	-
			Biodiversity	Alteration of the banks of the bed	Loss of habitats	-
		Road embankment slope protection	Surface water	Alteration of the banks of the bed	Deterioration of the ecological state of the water body	-
			Biodiversity	Alteration of the banks of the bed	Loss of habitats	-
I.E.8	Works on the highway and expressway	Realization of the superstructure	Groundwater	Interruption of the groundwater supply with meteoric waters	Quantitative alterations of groundwater	-
			Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Human health	Emissions of atmospheric pollutants	The increase in the incidence of diseases	-
		Installation of fences	Biodiversity	Disruption of ecological connectivity for terrestrial wildlife	Fragmentation of habitats	Loss of habitats
			Biodiversity	Avoiding wildlife from entering the roadway	Maintaining the population	-
			Human health	Avoiding wildlife from entering the roadway	Avoiding loss of human life	-
		Construction of undercrossings / overcrossings for fauna	Soil	Soil removal	The loss of the productive capacity of the soil	-
			Geology	Structural changes due to the execution of the foundations	Alteration of the geological substrate	-
			Biodiversity	Vegetation removal	Loss of habitats	-
I.E.9	Rehabilitation works of the lands temporarily affected by the works	Planting grass and vegetation restoration works	Biodiversity	Appearance of non-native and invasive species	Alteration of habitats	-
			Landscape	Landscaping restoration of temporarily affected surfaces	Maintaining the aesthetic value of the landscape	-
I.O.1	Traffic flow	Highway and expressway traffic	Air quality	Emissions of atmospheric pollutants	Change in air quality	Alteration of habitats
			Air quality	Emissions of atmospheric pollutants	Reduction of mass flows of emitted air pollutants	-
			Soil	Deposition of atmospheric pollutants on the ground	Alteration of soil quality	-
			Biodiversity	Facilitating the spread of non-native and invasive species	Alteration of habitats	Loss of habitats
			Biodiversity	Emissions of atmospheric pollutants	Alteration of habitats	Loss of habitats
			biodiversity	Increasing noise level	Disturbance of species activity	Loss of habitats

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
			Biodiversity	Wildlife collision with car traffic	Reduction of the population	The disappearance of some plant / animal populations
			Climate conditions	Reduction of greenhouse gas emissions	Reducing contributions to climate change	-
			Population	New residential establishments in the project area	Changes in the structure of the human population	-
			Material assets	Economic development of the areas bordering the highway	Financial gains	-
			Human health	Emissions of atmospheric pollutants	The increase in the incidence of diseases	-
			Human health	Increasing noise level	Discomfort generated by noise	The increase in the incidence of diseases
			Cultural heritage	Emissions of atmospheric pollutants	Affecting cultural heritage	Loss of cultural heritage
			Cultural heritage	vibration	Affecting cultural heritage	Loss of cultural heritage
			Cultural heritage	The increase in the number of tourists	Capitalizing on cultural heritage	Financial gains
			Landscape	The increase in the number of tourists	Capitalizing on natural heritage	Financial gains
			Landscape	Increase in road traffic (including at night)	Reducing the aesthetic value of the landscape	Financial losses
			Air quality	The occurrence of fires	Change in air quality	-
			biodiversity	The occurrence of fires	Alteration of habitats	-
			Human health	The occurrence of fires	Loss of human life	-
			Goods	The occurrence of fires	Financial losses	Abandonment of the locality
			Human health	Prevention of road accidents	Avoiding loss of human life	-
			Material asstes	Prevention of road accidents	Avoiding economic losses	-
			Material asstes	Reducing traffic times	Avoiding economic losses	-
I.O.2	Precipitation management	Evacuation of pre-purified rainwater in outfalls	Surface water	Diffusion of pollutants in surface waters	Alteration of surface water quality	-
			Biodiversity	Diffusion of pollutants in surface waters	Alteration of habitats	-
		Snow removal and frost prevention activities (including snow storage)	Surface water	Diffusion of pollutants in surface waters	Alteration of surface water quality	-
			Biodiversity	Diffusion of pollutants in surface waters	Alteration of habitats	-
			Soil	Pollutants reach the soil	Alteration of soil quality	Alteration of habitats
			Groundwater	Pollutants reach phreatic groundwater	Alteration of groundwater quality	-
I.O.3	Maintenance works	Road resurfacing / roadway repairs	Air quality	Emissions of atmospheric pollutants	Change in air quality	-
			Human health	Emissions of atmospheric pollutants	The increase in the incidence of diseases	-
I.O.4	The activity of parking lots,	Material / waste storage	Biodiversity	Attracting wildlife to household waste storage areas	Disturbance of species activity	Reduction of the population

Type of intervention		CAUSE (Activities)	Environmental factors	Effects / Risks	Direct impacts	Secondary impacts
	service spaces and maintenance centers	Groundwater supply	Groundwater	Debit charges	Quantitative alterations of groundwater	-

7.1.2 Use of natural resources

The main natural resources used in the project are represented by: water, wood, soil, natural aggregates, land and vegetation (ruderal) existing in the areas temporarily or permanently affected by works. The temporarily and permanently affected surfaces are not significant compared to the surfaces and availability of these resources at the level of UATs.

The impact generated by the project on natural resources is assessed in Section 7.10 of this RIM.

7.1.3 Emissions of pollutants, noise, vibrations, light, heat and radiation, the creation of discomfort, the disposal and recovery of waste

A presentation of the emissions of physical and chemical pollutants, as well as the types and quantities of waste generated by the implementation of the project, can be found in section 2.8 of the RIM.

Air and water pollutant emissions, noise, vibrations, waste are relevant from the point of view of the analyzed project. Light and radiation emissions are present, but cannot produce higher effects than in the case of houses.

The impact generated by these emissions, is analyzed in detail in the sections dedicated to each environmental factor (7.2 – 7.10).

7.1.4 Risks to human health, cultural heritage or the environment (for example due to accidents or disasters)

The analyzed project does not fall under the scope of the national normative acts transposing the community legislation regarding SEVESO. Although mainly in the execution stage chemicals will be used and stored dangerous, the risk of them leading to major accidents with significant effects on the environment and the population is reduced.

From the point of view of natural disasters, the main risks are represented by: earthquakes and floods. Risks to human health and the environment due to disasters are determined by the risks that the proposed infrastructure will be out of service for longer periods of time, as well as the risk of loss of human life and property damage if such events would occur while there is traffic on the road. The design of the proposed investments was made taking into account these risk factors (Chapter 10 of the RIM), so it is estimated that the risks for human health and the environment are reduced.

In the project implementation area, a series of objectives belonging to the cultural heritage described in section 5.8 Cultural Heritage were identified. They are not crossed by the proposed highway and expressway route, but some of them are located relatively close to the project. The proposed project implementation works have been established in such a way as to avoid and minimize the risks of degradation of these objectives during the execution period. Measures have been provided for the protection of cultural heritage objectives during the implementation period, in which the works may present a risk from the point of view of direct or indirect damage through vibrations. No additional risks were identified for the cultural objectives during the operation period.

7.1.5 Technologies and substances used

The necessary technologies and substances are those commonly used in road infrastructure construction projects. Details regarding the technological processes required for the execution and operation of the project, as well as the substances that will be used, are presented in sections 2.3.4 and 2.4.4.

In the evaluation of the potential effects on the environmental factors carried out in the sections dedicated to each environmental factor (7.2 – 7.10), the technologies and substances used were taken into account, both during the execution period and during the operation period.

The substances present on the sites do not have an impact on the environment except in situations where they would be released into the environment as a result of accidents.

7.1.6 Climatic changes

As part of the project, a Climate Change Study was developed, which is based on the requirements of the guide developed by the General Directorate for Climate Policies (DG Climate) within the European Commission - "*Technical guidance on the climate proofing of infrastructure in the period 2021 - 2027*". Additionally, the guides were also consulted "*Guidelines for Project Managers: Making vulnerable investments climate resilient*", "*Climate change and major projects*" developed by the European Commission and the guide developed by Jaspers in 2017, "*The Basics of Climate Change Adaptation Vulnerability and Risk Assessment*", their requirements being applied for the "Suceava - DN2H Highway and DN2H Expressway - Siret border project, depending on relevance and available data.

The sections below summarize the analyzes carried out within the Climate Change Study and the adaptation measures proposed to be implemented in the project.

7.1.6.1 Exposure of the project area to climate change

The sensitivity of the project to climate change was analyzed in the Climate Change Study in relationship with a set of key climatic variables, which were selected based on the specific requirements of road infrastructure projects, as well as the characteristics of the area where the project will be carried out.

Climate change sensivity was assessed for each of the 3 components of the road infrastructure project: goods and processes, outputs and transport links.

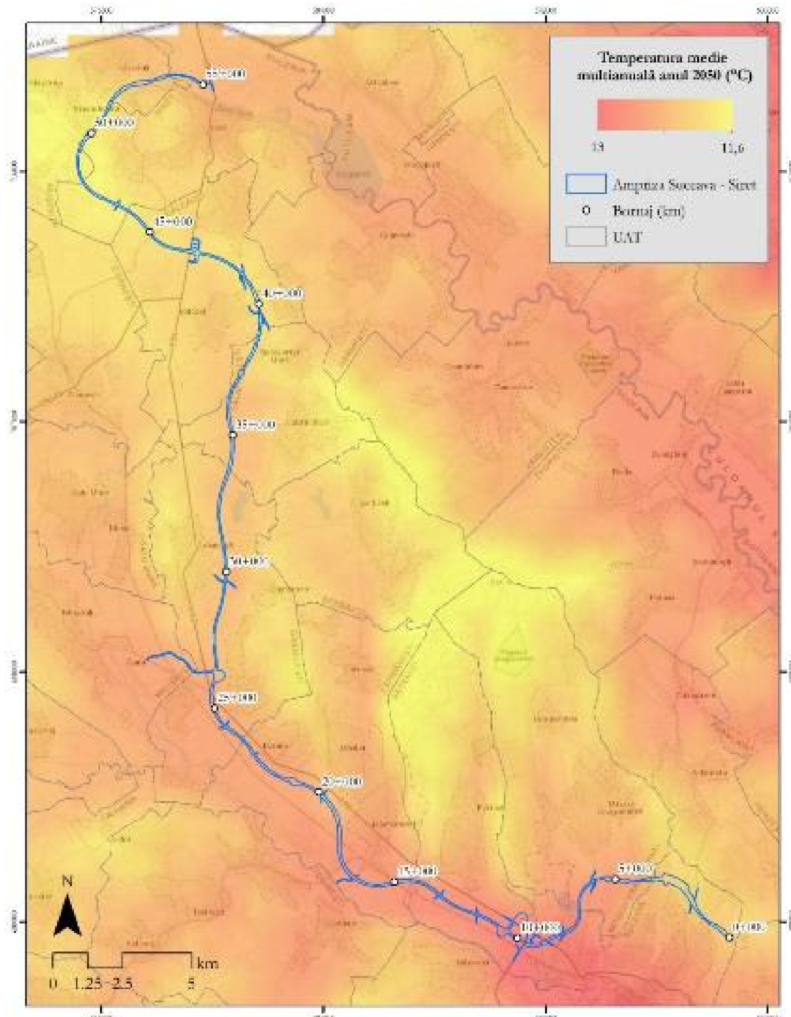
In the case of road infrastructure projects, goods and processes are represented by road traffic generated by all types of vehicles (cars, trucks, buses, etc.), the benefits are represented by reduced transit time, increased comfort, etc., and elements such as road superstructure, bridges, telecommunications systems and road markings are included in the category of transport links. The outputs are represented by the users of the road, the requirements of the users and the benefits offered by the use of the road (reduction of transit time, increased comfort, etc.).

In order to evaluate the exposure of the project implementation area (without taking into account the project) for each of the selected climate variables, public data were used regarding temperature, precipitation, wind speed, aridity, evapotranspiration, hazard maps, Landsat 8 satellite images, etc. .

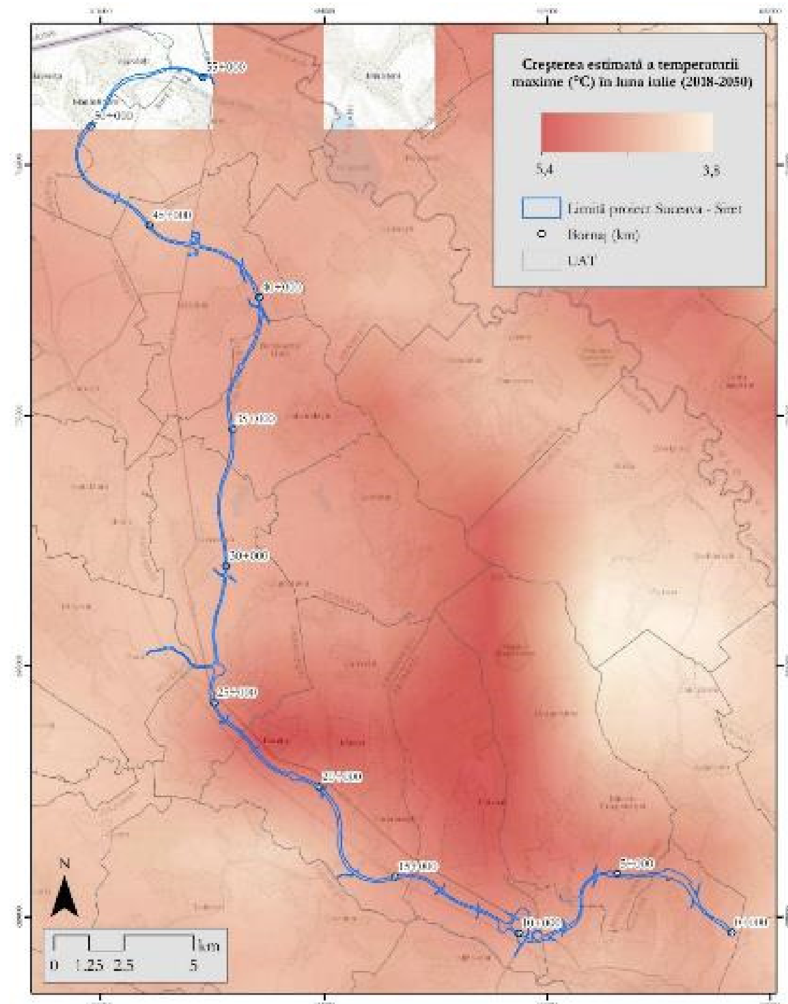
Climate variables include both the primary effects of climate change and the secondary effects directly dependent on the primary effects. In turn, the components of a project are interdependent, so that affecting some components can have consequences on other components. For example, the impact of some transport links by the phenomena generated by climate change can lead to the interruption of road and rail traffic, to the increase of travel time and to the generation of higher transport costs.

The climate variables analyzed in the Climate Change Study, developed for the project of the Suceava – DN2H highway and the DN2H expressway – Siret border were:

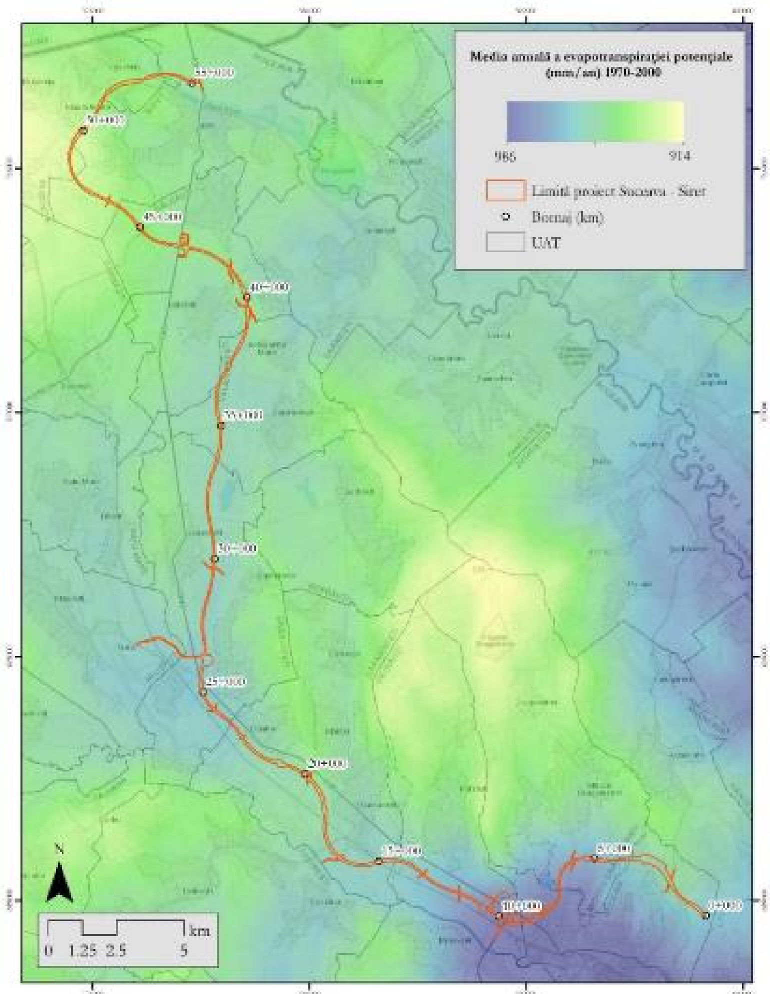
- Increase in average temperature;
- Increase in extreme temperatures;
- Increasing the number of extreme periods;
- Increasing the number of dry periods;
- Solar radiation;
- Changes in the average amounts of precipitation;
- Changes in the amounts of extreme precipitation;
- Snowfall and ice;
- Humidity;
- Wind speed;
- Storms;
- Floods;
- Soil erosion;
- Landslides;
- Vegetation fires;



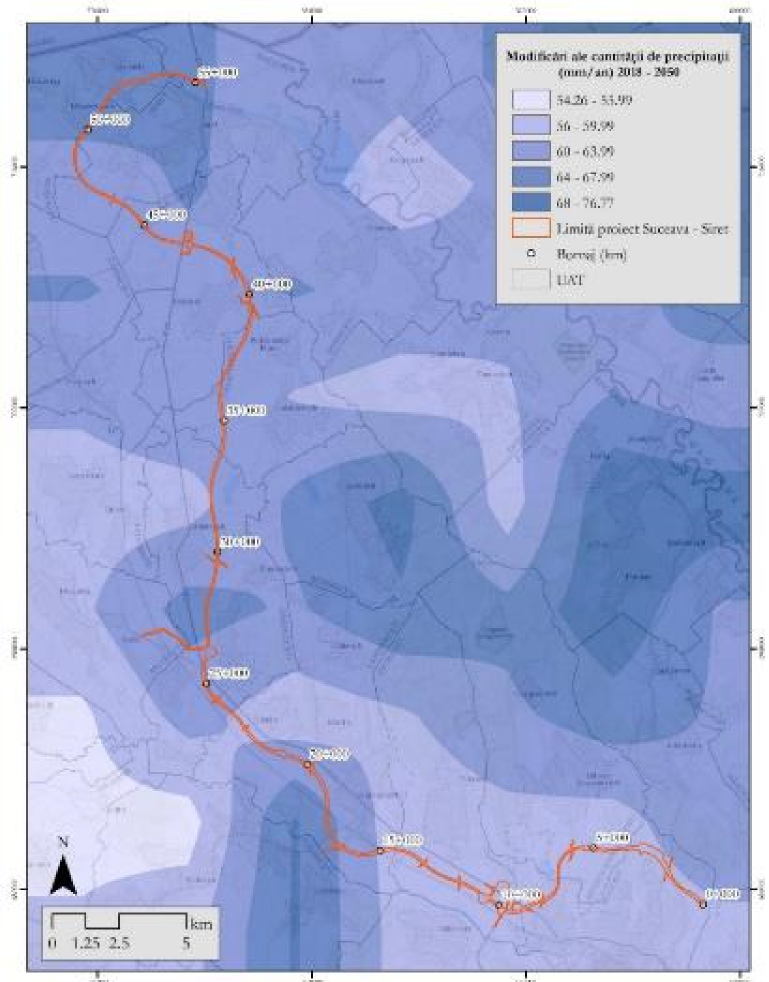
Multiannual mean temperature in the year 2050 (°C) (Data source: www.worldclim.org)



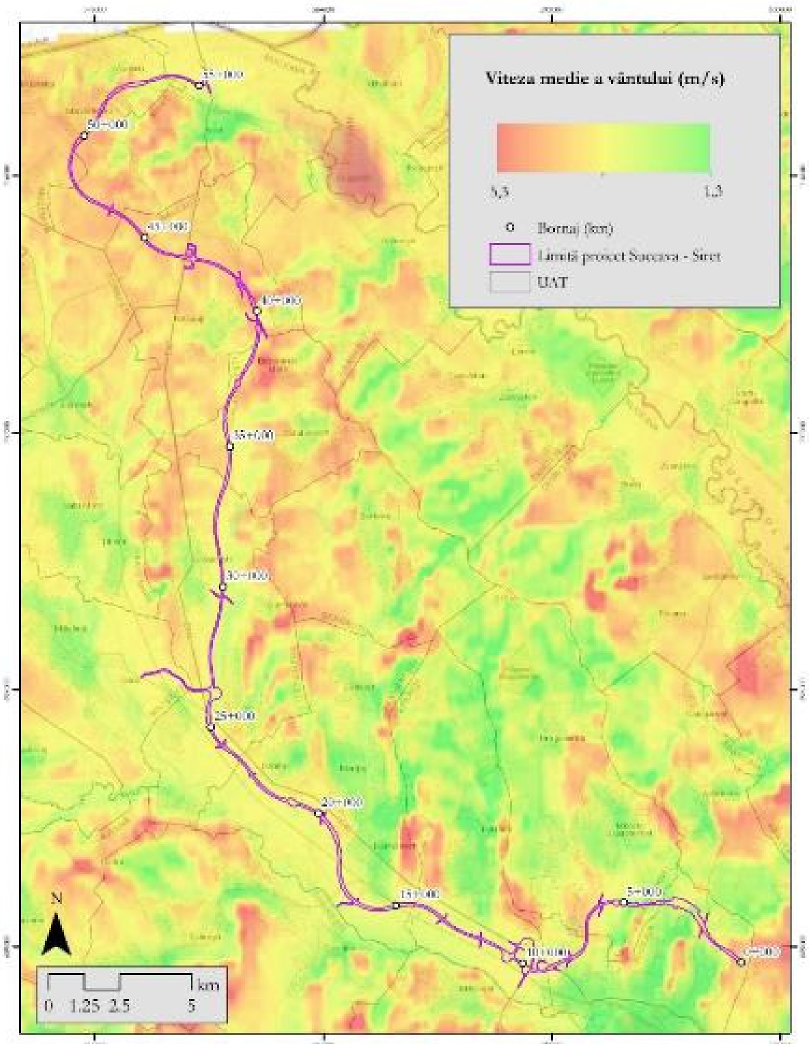
Map of the estimated increase in maximum temperature in 2050 (°C)



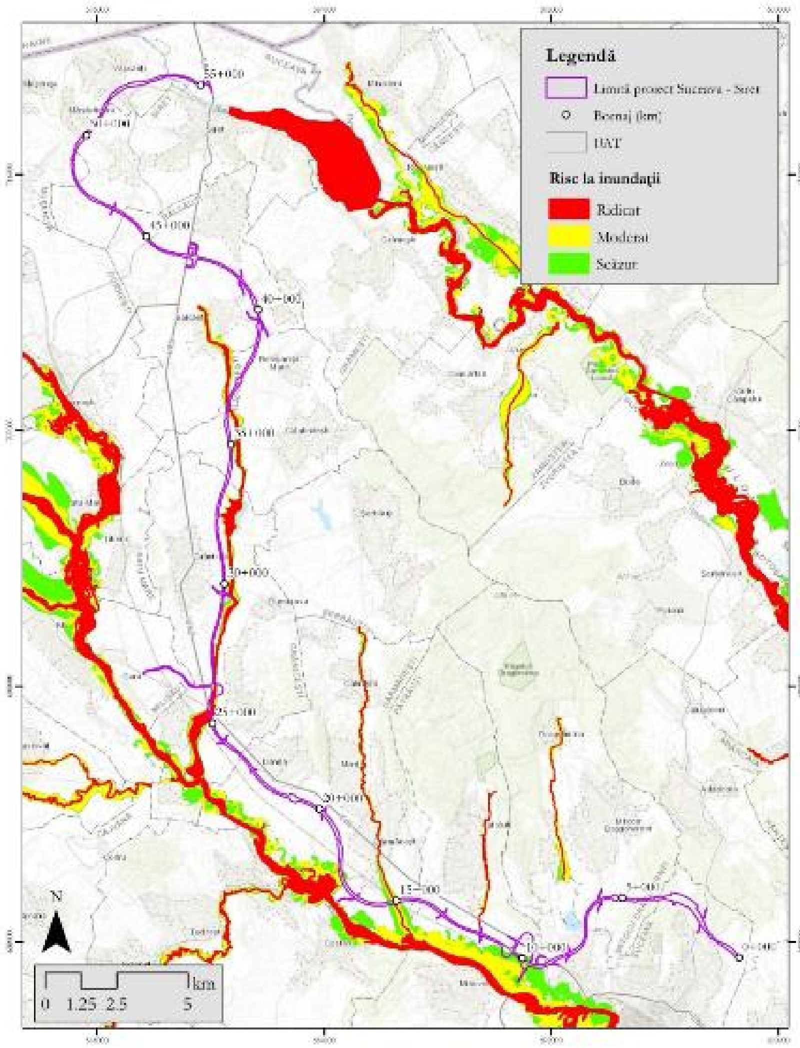
Annual average of potential evapotranspiration (mm/year) in the period 1970-2000 in the project implementation area



Increase in the average annual amount of precipitation in the year 2050 mm/year



Average wind speed (m/s) in 2020



Flood risk map in the project area (Source: "Romanian Waters" National Administration)

From the Climate Change Study, the results of the analysis to identify the sensitivity of the project in relation to the climate variables were synthesized, being presented in the following table.

Table no.7-3 Identification of the sensitivity of the project in relation to climatic variables

No.	Climatic variables	Road infrastructure projects			
		Goods and processes	inputs	outputs	Transport networks
1.	Increase in average temperature	2	1	1	2
2.	Increase in extreme temperatures	3	2	2	3
3.	Increasing the number and intensity of dry periods	2	1	1	2
4.	Solar radiation	1	1	1	1
5.	Changes in average amounts of precipitation	2	1	1	2
6.	Changes in the amounts of extreme precipitation	2	2	2	2
7.	Snowfall and frost	3	2	2	3
8.	Moisture	1	1	1	1
9.	Wind speed	2	1	1	2
10.	Thunderstorms	2	2	2	2
11.	Floods	2	2	2	3
12.	Soil erosion	2	1	1	2
13.	Coastal erosion	3	3	3	3
14.	Landslides	3	2	2	3
15.	Vegetation fires	2	2	2	3
16.	Sea level rise	3	1	2	2
17.	Increase in sea water temperature	2	1	1	1
18.	Increasing acidity of seas and oceans	2	1	1	1

From the 18 climate variables analyzed, the sensitivity assessment indicated 7 climate variables with high sensitivity, 8 climate variables with medium sensitivity and 3 variables with low sensitivity.

The exposure of the project to climatic conditions was analyzed within the Climate Change Study. Based on the analysis of available information on climate change in the study area, an accentuated increase in average annual temperatures, maximum temperatures, the number and intensity of dry periods, an increase in extreme precipitation, and floods was identified.

The following table presents the results of a comparative analysis of the project's exposure to current and future climatic conditions for the highway and the expressway.

Table no.7-4 Evaluation of the exposure of the study area in relation to the climatic variables

No.	Climatic variables	Exposure to current conditions		Exposure to future conditions	
1.	Increase in average temperature	2	Average annual temperature recorded in the period 1970-2000 is approx. 9°C.	3	By 2050, the average annual temperature will rise to 13°C, this fact means an estimated increase of 4°C compared to the period 1970-2000.
2.	Increase in extreme temperatures	2	The maximum temperature of July in 2018 is about 26°C. During the period 1970-2000, around 4 days of heat waves were recorded during the summer. The minimum temperature of January in 2018 is between -3.8and -	3	The maximum temperature of July in 2050 will have values of approx. 31°C. Unlike in 2018, the maximum July temperature in 2050 will be 3.8-5.4°C higher. Heat waves during the summer will increase by approx. 12 days.

No.	Climatic variables	Exposure to current conditions		Exposure to future conditions	
			3.8 °C.		In January 2050, the minimum temperature will be between -0.2°Cand -1.8°Cin the project area, which means an increase of 2.6°Cup to 3.6°Ccompared to 2018.
3.	Increasing the number and intensity of dry periods	1	The study area is located in a space with incipient drought, according to the Plamer index.	2	In the current conditions of increasing maximum temperatures and heat waves, the drought phenomenon is expected to intensify in the future.
4.	Solar radiation	2	Radiate solar energy varies between -199 – -150 Mj m². in the project area.	3	For the period 2031-2050, it is estimated that solar radiation in the project area will exceed 200 Mj m².
5.	Changes in average amounts of precipitation	1	In 2018, the average amount of precipitation is between 494-563 mm/year.	2	In 2050, the amount of precipitation will increase by 59 mm/year compared to the reference year.
6.	Changes in the amounts of extreme precipitation	2	Extreme precipitation has values of 20-25 mm/day in the period 1970-2000.	3	An increase in extreme precipitation amounts of 4 mm/day (summer and autumn) is expected. It will also increase the number of days with precipitation exceeding 20 mm/day by 1 - 1.75 days in the 2021-2050 time horizon..
7.	Snowfall and frost	2	The number of freeze-thaw days per year in the period 1970-2000 is approximately 32 days. The frost depth is between 100-110 cm along the project.	2	According to the RCP 4.5 scenario in the period 2021-2050, unlike the period 1971-2000, in the project area there is a reduction of the snow cover between 30-40%
8.	Moisture	1	No trend of excess humidity was found in the period 1970-2000.	1	In accordance with the trend of increasing temperature, it can be appreciated that the humidity in the project area will also register a slight decrease, especially in dry periods. Air humidity will be increased in episodes of heavy precipitation followed by periods of increased temperature.
9.	Wind speed	1	In the year 2000, the average wind speed is 1.4 – 5.3 m/s.	1	Reduction in annual average wind speed of 0.5 m/s in the time horizon 2071-2100. (RCP 4.5)
10.	Thunderstorms	2	During the period 1990-2013, the average number of reports of severe storms in the area of interest is 0.30 – 0.37 tornadoes/year.	2	No future forecast data is currently available. However, this trend can be maintained or increased in the context of climate change, especially extreme temperature changes and temperature differences.
11.	Floods	2	Near the localities of Slobozia Sucevei and Româneşti, at the intersection of the highway with the Horăiţ river, the project crosses an area with a high risk of flooding.	3	Possible increase in the intensity and frequency of floods at the intersection with the Siret and Suceava rivers. The water cycle altered by climate change will increase the frequency of increasingly heavy rainfall episodes, over limited areas and for short durations, which will cause increasingly frequent flash floods.
12.	Soil erosion	2	Land susceptibility to wind erosion during 1981-2010 is very low to low	2	In the year 2050, it is expected that in the the RCP 4.5 scenario soil erosion will maintain

No.	Climatic variables	Exposure to current conditions		Exposure to future conditions	
			(1981-2010). Regarding soil erosion generated by water, the areas are not in a prone area, only on the sections where the highway intersects areas with high erosion related to the Suceava river. Soil erosion is 5-10 mg/ha/year in Suceava county.		the current value of the index.
13.	Landslides	2	The risk of landslides is low and moderate in the project area, especially north of Româneşti.	2	Possibility of development of this phenomenon. There is a risk that areas where it is considered low risk become areas with moderate risk of landslides.
14.	Vegetation fires	2	Average general risk of vegetation fiers	2	In the future, the current trends will be preserved. According to the IMPACT2C atlas, the risk will be medium in the future.

7.1.6.2 Vulnerability of the project to climate change

Vulnerability analysis was carried out in the Climate Change Study as a result of the correlation between sensitivity and exposure. The results of the analysis of the project's vulnerability to climate change, both under current and future conditions, are presented in the following tables.

Table no.7-5 Current vulnerability of the project to climate variables

No.	Climatic variables	Sensitivity				Exposure to current conditions	Current vulnerability			
		Goods and processes	Inputs	Outputs	Transport networks		Goods and processes	Inputs	Outputs	Transport networks
1.	Increase in average temperature	2	1	1	2	2	4	2	2	4
2.	Increase in extreme temperatures	3	2	2	3	2	6	4	4	6
3.	Increasing the number and intensity of dry periods	2	1	1	2	1	2	1	1	2
4.	Solar radiation	1	1	1	1	1	1	1	1	1
5.	Changes in average amounts of precipitation	2	1	1	2	1	2	1	1	2
6.	Changes in the amounts of extreme precipitation	2	2	2	2	2	4	4	4	4
7.	Snowfall and frost	3	2	2	3	2	6	4	4	6
8.	Humidity	1	1	1	1	1	1	1	1	1
9.	Wind speed	2	1	1	2	1	2	1	1	2
10.	Thunderstorms	2	2	2	2	2	4	4	4	4
11.	Floods	2	2	2	3	2	4	4	4	6
12.	Soil erosion	2	1	1	2	2	4	2	2	4
13.	Landslides	3	2	2	3	2	6	4	4	6
14.	Vegetation fires	2	2	2	3	2	4	4	4	6

Legend:

Sensitivity	no sensitivity (0)	small (1)	average (2)	raised (3)
Exposure	no exposure (0)	small (1)	average (2)	raised (3)
Vulnerability	no vulnerability (0)	small (1-2)	average (3-4)	high (6-9)

According to the vulnerability analysis, the climatic variables that could generate a high and medium vulnerability in the current conditions are represented by the increase in average temperatures, the increase in extreme temperatures, the amounts of extreme precipitation, floods, storms, soil erosion, landslides, falls of snow and ice and wildfires.

Table no.7-6 Identifying the future vulnerability of the project in relation to climate variables

No.	Climatic variables	Sensitivity				Exposure to future conditions	Future vulnerability			
		Goods and processes	Inputs	Outputs	Transport networks		Goods and processes	inputs	outputs	Transport networks
1.	Increase in average temperature	2	1	1	2	3	6	3	3	6
2.	Increase in extreme temperatures	3	2	2	3	3	9	6	6	9
3.	Increasing the number and intensity of dry periods	2	1	1	2	2	4	2	2	4
4.	Solar radiation	1	1	1	1	3	3	3	3	3
5.	Changes in average amounts of precipitation	2	1	1	2	2	4	2	2	4
6.	Changes in the amounts of extreme precipitation	2	2	2	2	3	6	6	6	6
7.	Snowfall and frost	3	2	2	3	2	6	4	4	6
8.	Humidity	1	1	1	1	1	1	1	1	1
9.	Wind speed	2	1	1	2	1	2	1	1	2
10.	Thunderstorms	2	2	2	2	2	4	4	4	4
11.	Floods	2	2	2	3	3	6	6	6	9
12.	Soil erosion	2	1	1	2	2	4	2	2	4
13.	Landslides	3	2	2	3	3	9	6	6	9
14.	Vegetation fires	2	2	2	3	2	4	4	4	6

Legend:

Sensitivity	no sensitivity (0)	small (1)	average (2)	raised (3)
Exposure	no exposure (0)	small (1)	average (2)	raised (3)
Vulnerability	no vulnerability (0)	small (1-2)	average (3-4)	high (6-9)

According to the vulnerability analysis, the climatic variables that could generate a high and medium vulnerability in the current conditions are represented by the increase in average temperatures, the increase in extreme temperatures, the amounts of extreme precipitation, floods, storms, soil erosion, landslides, falls of snow and ice and vegetation fiers.

7.1.6.3 Risk evaluation

The main climatic variables that can affect the project components are represented by temperature and precipitation, together with the secondary effects generated by them: floods, landslides and drought. In theTable no.7-7 the potential impacts on the highway project are presented.

Table no.7-7 Potential impacts on road infrastructure generated by climatic variables

The climate variable	The trend of the climate variable	Risk
Temperature	- Increase in average temperature; - Increase in extreme temperatures; - Increasing the number and intensity of dry periods; - Solar radiation.	- Degradation of the asphalt carpet, damage to the expansion joints of bridges as a result of thermal expansion; - The destruction of some assets that generate increased costs for road infrastructure operators (repair costs, emergency services).
rainfall	- Increase in average annual precipitation; - Increase in the frequency and intensity of extreme precipitation.	- Roadway degradation; - Flooding of certain sections of the road and exceeding the designed capacity of the infrastructure for the collection and pre-purification of rainwater; - Aquaplaning of old cars; - Restrictions/disturbance of road traffic.
Snowfall and freeze-thaw	- Large number of freeze-thaw days currently - Downward trend in the future	- Impeding or interrupting traffic by depositing snow on the road platform or by the formation of ice; - Blockage of cars in the snow or the occurrence of accidents due to the slippery road; - Affecting the integrity of the asphalt coating, which can lead to the appearance of cracks and pits.
Thunderstorms	- Increase in extreme temperatures - Increase in the frequency and intensity of extreme precipitation - Increasing wind speed - Increase in the frequency of occurrence of strong winds	- Traffic restrictions and/or interruptionsÞtake the road.
Floods	- Increase in the frequency and intensity of extreme precipitation.	- Flooding of transport infrastructures; - Damage to embankments and bridge collapses; - Restrictions/disturbances of road traffic or the closure of some road sectors.
Soil erosion	- Erosion accentuated at present	- Damage to some road sections of the transport infrastructure.
Landslides	- Increase in average annual precipitation; - Increasing the frequency and intensity of extreme precipitation; - Increase in extreme temperatures.	- Damage to parts of the transport infrastructure; - Restrictions/disturbances of road traffic or the closure of some road sectors.
Vegetation	- Maximum temperature increase - Increase in the frequency of	- Damage to transport infrastructure; - Reducing/blocking visibility for vehicles in traffic

The climate variable	The trend of the climate variable	Risk
fires	occurrence of strong winds - Increasing the number of dry periods	with increased risks of accidents.

The assessment of the risks identified for the project, estimated based on their probability and severity are presented in the table below.

Table no.7-8 Risk assessment matrix for high vulnerability project components

Climate Variable	Associated risks (or project consequences)	Areas of risk	Probability	Impact Analysis (Magnitude)		Risk
Temperature	Degradation of the asphalt, damage to the expansion joints of bridges as a result of thermal expansion; The destruction of some assets that generate increased costs for road infrastructure operators (repair costs, emergency services).	Active damages, engineering, functional aspects	Almost sure	Moderate	Moderate	Extreme
		Safety and health		Minor		
		Environment, cultural heritage		Minor		
		Social		Minor		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Rainfall	Roadway degradation; Flooding of certain sections of the road and exceeding the designed capacity of the infrastructure for the collection and pre-purification of rainwater; Aquaplaning of vehicles;	Active damages, engineering, functional aspects	Almost certain	Moderate	Moderate	Extreme
		Safety and health		Minor		
		Environment, cultural heritage		Minor		

Climate Variable	Associated risks (or project consequences)	Areas of risk	Probability	Impact Analysis (Magnitude)		Risk
	Restrictions/disturbance of road traffic.	Social		Minor		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Snowfall and freeze-thaw	Impeding or interrupting traffic by depositing snow on the road platform or by the formation of ice; Blockage of cars in the snow or the occurrence of accidents due to the slippery road; Affecting the integrity of the asphalt coating, which can lead to the appearance of cracks and pits.	Active damages, engineering, functional aspects	Probable	Moderate	Moderate	High
		Safety and health		Moderate		
		Environment, cultural heritage		Minor		
		Social		Minor		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Thunderstorms	Restrictions and/or interruptions of road traffic.	Active damages, engineering, functional aspects	Probable	Moderate	Moderate	High
		Safety and health		Moderate		
		Environment, cultural heritage		Minor		
		Social		Moderate		
		Financial		Moderate		

Climate Variable	Associated risks (or project consequences)	Areas of risk	Probability	Impact Analysis (Magnitude)		Risk
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Floods	Flooding of transport infrastructures; Damage to embankments and bridge collapses; Restrictions/disturbances of road traffic or the closure of some road sectors.	Active damages, engineering, functional aspects	Almost sure	Moderate	Moderate	Extreme
		Safety and health		Moderate		
		Environment, cultural heritage		Minor		
		Social		Moderate		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Soil erosion	Damage to some road sections of the transport infrastructure.	Active damages, engineering, functional aspects	Moderate	Minor	Minor	Medium
		Safety and health		Minor		
		Environment, cultural heritage		Minor		
		Social		Minor		
		Financial		Minor		
		Reputation		Minor		
		Any other relevant risk areas		Minor		
Landslides	Damage to parts of the transport infrastructure; Restrictions/disturbances of road traffic or the closure of some road sectors.	Active damages, engineering, functional aspects	Probable	Major	Major	Extreme
		Safety and health		Minor		
		Environment, cultural heritage		Minor		

Climate Variable	Associated risks (or project consequences)	Areas of risk	Probability	Impact Analysis (Magnitude)		Risk
		Social		Moderate		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		
Vegetation fires	Damage to transport infrastructure; Reducing/blocking visibility for vehicles in traffic with increased risks of accidents.	Active damages, engineering, functional aspects	Moderate	Moderate	Moderate	High
		Safety and health		Moderate		
		Environment, cultural heritage		Minor		
		Social		Minor		
		Financial		Moderate		
		Reputation		Minor		
		Any other relevant risk areas		Insignificant		

7.1.6.4 Adaptation measures

For the risks associated with climate change specific to road infrastructure projects, identified in the previous stage, a series of related adaptation measures were identified, presented in Table no.7-9.

Table no.7-9 Risks associated with climate change and possible adaptation measures

No.	Category	Adaptation measures
1	**Temperature** (Increasing average temperature; Increasing extreme temperatures; Increasing the number and intensity of dry periods)	The use of technical solutions that allow adaptation to the current maximum temperatures and to the expected increases in the short and medium term (e.g. contraction-expansion joints in bridges adapted to the temperatures in the geographical area of the project, stabilized asphalt mixes and modified bitumen/mixture with fibers).
		Constant monitoring of the behavior of the infrastructure in the context of its use
2	**Rainfall** (Increase in average annual precipitation;	The use of geotextiles and geogrids
		Road embankment consolidation works.
		Designing the infrastructure for the collection of rainwater in such a

No.	Category	Adaptation measures
	Increase in the frequency and intensity of extreme precipitation)	way that it can cope with high amounts of precipitation, in accordance with the values expected for the future situation in terms of precipitation;
		Permanent maintenance of the infrastructure for the collection of rainwater.
		The design of the infrastructure for the collection of rainwater in such a way as to cope with high amounts of precipitation.
		All of the above measures.
3	**Snowfall and freeze-thaw** (High number of freeze-thaw days at present, Declining trend in the future)	Imposing speed restrictions on the highway in case of adverse weather conditions;
		Regular snow removal;
		The use of anti-skid solutions on the highway surface to prevent the formation of snow.
		All of the above measures.
		The design of the road structure in accordance with the climate specifics of the area - ensuring durability through the judicious choice of construction materials of the constructive systems intended to eliminate the causes of premature degradation, as well as through the anti-corrosive and decorative protection of the surfaces exposed to aggressive agents;
		Freeze-thaw check of the proposed road structures.
4	**Thunderstorms** (Increasing extreme temperatures Increasing the frequency and intensity of extreme precipitation Increasing wind speed Increasing the frequency of strong winds)	Imposing speed restrictions on certain sectors
		Monitoring road segments for storm damage
5	**Floods** (Increasing the frequency and intensity of extreme precipitation)	The technical design of the structures will take into account the flows provided by INHGA with a probability of exceeding 2%, and the verification will be carried out with flows with a probability of occurrence of 1%;
		The provision of drainage slopes and collection trenches adapted to a 20% margin of potential changes in climatic variables caused by climate change.
		Works to consolidate the embankments and bridges related to the road;
		Monitoring and intervention in case of damage caused by floods.
		All of the above measures
6	**Soil erosion** (Currently accentuated erosion)	Consolidation of the foundations of the transport infrastructure.
7	**Landslides** (Increase in average annual precipitation; Increase in the frequency and intensity of extreme precipitation; Increase in extreme temperatures)	Consolidation of the geometric elements of the road platform;
		Supporting the road platform;
		Consolidation of embankment and embankment slopes;
		Improving the bearing capacity of the natural land on which high embankments are executed;
		Water drainage from slopes, slopes and foundation land.
		All of the above measures.
8	**Vegetation fires** (Increasing maximum temperature Increasing the frequency of occurrence of strong winds Increasing the number of dry	Realization of highway facilities (parking lots, service areas, CIC) in areas less exposed to the risk of wildfires (e.g. outside wooded areas);
		The provision within the Monitoring and Maintenance Center of appropriate monitoring services, ensured through intelligent transport systems;

No.	Category	Adaptation measures
	periods)	The provision of adequate fire extinguishing systems within the objectives included in the project;
		Maintenance activities/vegetation removal from the side of the road.

7.2 WATER/BODIES OF WATER

7.2.1 Sensitivity classes and magnitude classes for water

The significance of the potential impacts on the Water environmental factor was analyzed based on two criteria:

- the sensitivity of the project implementation areas
- the magnitude of the changes proposed by the project.

The methodological considerations are described in Chapter 3 of this report, the sensitivity and magnitude classes used in the evaluation being presented in the following sections..

7.2.1.1 Sensitivity classes

7.2.1.1.1 Surface water

The sensitivity classes for surface water were established according to the current stateUmfrom the ecological and chemical point of view of water courses/bodiesUmof surfaceUm, as well as from the point of view of the existence of some restrictionsÞrelated to the management of foodUmrivers with waterUm.

Figure no.7-1 The sensitivity classes used in the assessment of the impact on the surface water component

Sensitivity	Description
Very high	Sanitary protection zones for water supply Protected areas designated by ANAR Natural water bodies (CAN) with good ecological status and reaching good chemical status Highly modified water bodies (CAPM) with maximum and good ecological potential that reach good chemical status
High	Natural water bodies (CAN) with moderate ecological status and achieving good chemical status Natural water bodies (CAN) with good ecological status and not reaching good chemical status Highly modified water bodies (CAPM) with very good ecological potential that do not reach the good chemical state Highly modified water bodies (CAPM) with moderate ecological potential that reach the good chemical status
Moderate	Natural water bodies (CAN) with moderate ecological status and which do not reach good chemical status Natural water bodies (CAN) with poor ecological status and reaching good chemical status Highly modified water bodies (CAPM) with moderate ecological potential that do not reach good chemical status Heavily modified water bodies (CAPM) with poor ecological potential that reach good chemical status Permanent watercourses that are hydrological connected to bodies of water
Low	Natural water bodies (CAN) with poor ecological status and which do not reach good chemical status Natural water bodies (CAN) with poor ecological status and reaching good chemical status Highly modified water bodies (CAPM) with poor ecological potential that do not reach good

Sensitivity	Description
	chemical status Heavily modified water bodies (CAPM) with poor ecological potential that reach good chemical status ANIF channels that have a hydrological connection with water bodies
Very low/insensitive	Natural water bodies (CAN) with poor ecological status that do not reach good chemical status Highly modified water bodies (CAPM) with poor ecological potential, which do not reach the good chemical status Non-permanent watercourses (torrents) that have a hydrological connection with bodies of water

Based on the analyses, the following classes of sensitivity were identified:

- **Very high** in the case of water bodies RORW12.1.17.24a_B1 Horait, RORW12.1.17.27_B1 Hatnuța + Bocancea, RORW12.1.17.28_B1 Pătrăuțeanca, RORW12-1-17-30-B3 Dragomira (Lac Dragomirna – CF Suceava), RORW12.1.17. 30a_B1 Mitoc, RORW12.1.3_B1 Negostina. In the project area, no sanitary protection zones for drinking water intakes have been identified.
- **High** in the case of the water body RORW12-1-17-30B-1 PodulVătafului.

7.2.1.1.2 Groundwater

The sensitivity classes for underground water were established depending on the current state from a qualitative and quantitative point of view, as well as from the point of view of the existence of hydrogeological protection zones in the project area.

Table no.7-10 The sensitivity classes used in the assessment of the impact on the groundwater component

Sensitivity	Description
Very high	Hydrogeological protection zones
High	Water bodies with good quantitative status and good chemical status
Moderate	Water bodies with good chemical status, which register exceedances of indicator values
Low	Water bodies with good quantitative status and poor chemical status Water bodies with poor quantitative status and good chemical status
Very low/insensitive	Water bodies with poor quantitative status and poor chemical status

The project is located in the area of the underground phreatic water body ROSI03 Lunca Siretului şi a afluenţilor săi, which has a good quantitative and chemical status, thus being considered a high sensitivity. Also, the project is located in the area of the ROSI06 Suceava groundwater body, but it is not likely that the project will affect this water body, as it is a deep water body. The project is not located in hydrogeological protection zones, and no sanitary protection zones have been identified for drinking water catchments.

7.2.1.2 Magnitude classes

7.2.1.2.1 Surface water

The magnitude classes for identifying the impact on surface waters were established taking into account the size of the changes in the quality elements related to the total surfaces/lengths of the water bodies that can be influenced due the implementation of the project.

Table no.7-11 Magnitude classes used in the assessment of the impact on the surface water component

Magnitude		Descripti on
NEGATIVE	Very high	Changes in the quality elements that lead to the deterioration of the state of the water body (the surface/length on which changes are recorded is ≥ 20% of the surface/length of the water body) Changes that directly contribute to preventing the improvement of the chemical state and/or the status/ecological potential of the water body
	High	Changes of the quality elements on a length/surface between 10-20% of the length/surface of the water body
	Moderate	Changes of the quality elements on a length/surface between 5- 10% of the length/surface of the water body
	Low	Changes of quality elements on a length/surface between 2.5- 5% of the length/surface of the water body
	Very low	Changes in quality elements on a length/area <2.5% of length/surface of the body of water
No detectable change		There are no sources of air contamination or their contribution is undetectable
POSITIVE	Very low	Changes that improve the quality elements of the water body on o ength/surface <2.5% of the length/surface of the water body
	Low	Changes that improve quality elements over a length/area comprised between 2.5-5% of the length/surface of the water body
	Moderate	Changes that improve quality elements over a length/area comprised between 5-10% of the length/surface of the water body
	High	Changes that improve quality elements over a length/area comprised between 10-20% of the length/surface of the water body
	Very high	Actions leading to the improvement (moving to a higher class) of the chemical status and/or ecological status/potential of the water body Changes that improve the status of one or more quality elements on a length/surface ≥20% of the length/surface of the water body

Within the project, a magnitude of the impact on surface waters was identified, as a result of the existence of a risk of accidental pollution. The risk mainly occurs during the construction phase, for example through accidental leaks from machinery (oils, other residues). During the operation phase, the risk is low, considering the fact that the project includes a rainwater management system, which prevents the entry of polluted substances from the highway and the expressway into water bodies.

7.2.1.2.2 Groundwater

The magnitude classes for identifying the impact on groundwater were established taking into account the size of the qualitative and quantitative changes relative to the total surfaces of the water bodies that can be influenced following the implementation of the project.

Table no.7-12 Magnitude classes used in assessing the impact on the groundwater component

Magnitude		Description
NEGATIVE	Very high	Quantitative changes (e.g. significant withdrawals of flows) that can lead to the deterioration of the quantitative state of the water body (the surface on which significant decreases are recorded is ≥ 20% of the surface of the water body) and/or Significant qualitative changes that can lead to the deterioration the quality state of the water body (the area where threshold values/quality standards are exceeded is ≥ 20% of the water body's surface) Changes that directly contribute to preventing the improvement of the quantitative status and/or quality of the water body
	High	Quantitative changes leading to significant decreases on an area between 10% and 20% of the surface of the water body and/or Qualitative changes leading to exceedances of the threshold values/quality standards on an area between 10% and 20% of the surface body of water
	Moderate	Quantitative changes leading to significant decreases on an area between 5% and 10% of the surface of the water body and/or Qualitative changes leading to exceedances of threshold values/quality standards on an area between 5% and 10% of the surface body of water
	Low	Quantitative changes leading to significant decreases on an area between 2.5% and 5% of the surface of the water body and/or Qualitative changes leading to exceedances of threshold values/quality standards on an area between 2.5% and 5% of the surface of the water body
	Very low	Quantitative changes leading to significant decreases on a surface <2.5% of the surface of the water body and/or Qualitative changes leading to exceedances of the threshold values/quality standards on an area <2.5% of the surface of the water body
No detectable change		There are no sources of air contamination or their contribution is undetectable
POSITIVE	Very low	Actions leading to the avoidance/reduction of significant decreases on an area <2.5% of the surface of the water body and/or Actions leading to the avoidance/reduction of exceedances of threshold values/quality standards on an area <2.5% from the surface of the water body
	Low	Actions leading to the avoidance/reduction of significant decreases on an area between 2.5% and 5% of the surface of the water body and/or Actions leading to the avoidance/reduction of exceedances of threshold values/quality standards on an area comprised between 2.5% and 5% of the surface of the body of water
	Moderate	Actions leading to the avoidance/reduction of significant decreases on an area between 5% and 10% of the surface of the water body and/or Actions leading to the avoidance/reduction of exceedances of threshold values/quality standards on an area between 5 % and 10% of the surface of the water body
	High	Actions leading to the avoidance/reduction of significant decreases on a surface between 10% and 20% of the surface of the water body and/or Actions leading to the avoidance/reduction of threshold values/quality standards being exceeded on a surface between 10% and 20% of the surface of the body of water
	Very high	Actions leading to the improvement of the quantitative and/or qualitative status of the water body (change from poor to good status) and/or Actions leading to the avoidance/reduction of significant declines on a surface ≥20% of the surface of the water body and /or Actions leading to the avoidance/reduction of exceedances of threshold values/quality standards on a surface ≥20% of the surface of the water body

Within the project, a class of magnitude of impact on groundwater (ROSI03) was identified, namely low negative magnitude, specific to the execution phase. The potential impact may occur following the completion of the works (through accidental discharges of pollutants from machinery or from the improper storage of some substances within the site organizations). Also, during the execution phase, it is possible to damage the ROSI03 water body during the construction of the drilled piles necessary for the foundations of the bridge piles.

In the operating phase, groundwater pollution can only be considered likely to be accidental (eg in the case of road accidents during the transport of dangerous goods).

7.2.2 Impact prediction

7.2.2.1 Water bodies - SEICA conclusions

Within the " Suceava - DN2H Highway and DN2H Expressway - Siret border" project, potential cause-effect mechanisms were identified for all 8 bodies of surface water intersected by the project.

For the surface water bodies, cause-effect mechanisms were identified, as a result of the works that will take place both in the major water bodies and in the minor water bodies (only in the case of the Horaiţ water bodies - RORW12-1-17- 24A_B1 and Negostina RORW12-1-3_B1).

In the case of water bodies *Mitoc - RORW12-1-17-30A_B1, Dragomirna (Lake Dragomirna - cf Suceava) - RORW12-1-17-30_B3, Pătrăuţeanca - RORW12-1-17-28_B1, Hătnuţa +Bocancea - RORW12-1- 17-27_B1* and Siret (border - Lake Rogojeşti) - RORW12-1_B0 the effects can be recorded on the Structure of the riparian zone due to the location in the main bed of the support structures (piles and abutments) related to bridges and viaducts.

The works designed in the minor bed, respectively the diversions and bed protections designed on the *Dragomirna water bodies (Lake Dragomirna - cf Suceava) - RORW12-1-17-30_B3, Pătrăuţeanca - RORW12-1-17-28_B1, Horaiţ - RORW12-1- 17-24A_B1* and *Negostina - RORW12-1-3_B1* and the foundation elements of the bridge designed on the water body Vătafului Bridge - RORW12-1-17-30B_B1, can generate potential cause-effect mechanisms on the following quality elements: *Depth and width of the river , Structure and substrate of the river bed, Structure of the riparian zone, Phytobenthos, Macrophytes, Benthic Invertebrate Fauna* and *Fish Fauna.*

Although 5 of the water bodies studied, namely *Podul Vătafului – RORW2-1-17-30B_B1, Pătrăuţeanca – RORW12-1-17-28_B1, Hătnuţa +Bocancea - RORW12-1-17-27_B1, Negostina - RORW12-1-3_B1 and Siret (border - lake Rogojeşti) - RORW12-1_B0*, crosses protected areas for habitats and species where water is an important factor, no cause-effect mechanisms induced by the project on these protected areas were identified, the limits of the protected areas being located at considerable distances in relation to the intersection area of the project with water bodies.

In the case of the projects planned in the study area, cumulative cause-effect mechanisms were identified in the case of 4 bodies of surface water: *Podul Vătafului - RORW12-1-17-30B_B1*, *Dragomirna (lake Dragomirna - cf Suceava) - RORW12-1-17-30_B3, Pătrăuţeanca - RORW12-1-17-28_B1* and *Horaiţ - RORW12-1-17-24A_B.*

Regarding groundwater bodies, potential cause-effect mechanisms were identified only on the ground water body ROSI03 Lunca and the terraces of the Siret River and its tributaries. They appear on the *Underground water level* indicator, as a result of the construction of the drilled piles for the foundations of piles and abutments.

In the area related to the project, hydrogeological protection zones were identified designated for drinking water intakes for the Siret city, consisting of a drain and a borehole that captures the infiltrated water from the left bank of the Siret river. The project does not intersect the hydrogeological protection area and the area of sanitary protection with a severe regime related to this capture front. The bridge designed over the Siret river is located approx. 570 m upstream from the catchment front (measured along the route of the minor bed).

No cause-effect mechanisms have been identified on the qualitative state of underground water bodies.

No projects that could generate cumulative effects were identified on any of the intersected underground water bodies.

7.2.2.2 Surface watercourses

SEICA analyzes the potential impacts on water bodies designated according to the Water Framework Directive. The project does not cross other rivers or lakes that are not designated as water bodies, and it is not necessary to carry out an additional assessment on other water courses, compared to SEICA.

A less analyzed aspect in SEICA is represented by the risk of pollution of water courses/bodies. Following the implementation of the project, there is a risk of affecting water courses / bodies, but this is more likely during the construction period, as a result of the appearance of some pollutants:

- Solid suspensions originating mainly from activities involving the handling of earth masses;
- Hazardous chemical substances (fuels or oils from machinery) originating mainly from machinery involved in construction site activities.

Pollution with solid suspensions. In the construction phase, the most likely effect is an increase in turbidity in the watercourses / bodies of water intersected by the project, especially in the case of those where several interventions proposed (such as the Horaiţ or Negostina watercourses, where more bridges are proposed, as well as hydrotechnical works). The increase in water turbidity can occur as a result of the surface runoff of solid suspensions from the soil in areas uncovered by vegetation inside the construction site. Solid suspensions can come from both soil and powdery construction materials such as concrete, bentonite, etc. used in carrying out the works, emitted accidentally or during the cleaning of the equipment involved in the site activities. Disposing of fresh concrete from mixing and pouring machinery and equipment into waterways is harmful due to the highly alkaline nature of concrete. The increase in the turbidity of the water course in the project implementation area can lead to changes in the biota. In the construction phase, a moderate negative impact is estimated, with a local character, which will manifest itself over a short period of time.

Accidental pollution with chemical substances. Another potential source of water pollution during the construction phase can be caused by the accidental leakage of hydrocarbons from the construction machinery, but also from other substances used on the site such as: lubricants, solvents, paints, etc. The main locations where the risk of such pollution is higher are the work fronts in the area of the watercourses/ water bodies intersected by the project and the storage areas of materials used in construction.

The main interventions considered to have a potential impact on surface water bodies in the operation phase were considered:

- The collection of rainwater from the highway embankment and its discharge into the intersected watercourses could lead to the alteration of water quality. An insignificant negative impact is estimated, not being used in the population water supply,
- Loading the surface water course with specific substances used in snow removal and frost prevention activities. The most common substance used in this process is salt (NaCl), its transport in surface waters can lead to the increase of salt concentrations and implicitly to the alteration of surface water quality. An insignificant negative impact is estimated considering that the magnitude of the changes is moderate as a result of the fact that the project has decanters and hydrocarbon separators for the pre-treatment of rainwater and from the CIC premises.
- Activity from short-term parking lots, service spaces and CIC - household waste water generators. An insignificant negative impact is estimated, the project providing for compliant installations for the collection and evacuation of waste water, there being no possibility that they will be discharged directly into watercourses.

In the decommissioning phase, the main interventions considered to have a potential effect on surface waters were represented by the creation of site organizations and material storage areas.

The potential sources that can generate negative effects on water (surface and underground) in this stage are similar to the construction phase.

However, in the event of highway decommissioning activities, generally positive effects are expected to occur, as a result of the reduction of pressure on surface water bodies. However, it is recommended that at the time of decommissioning, studies should be carried out to analyze the impact of the works and to take into account the characteristics of the water bodies at that time.In conclusion, regarding the "surface water courses" component, no significant negative impacts were identified in any of the phases of the project.

7.2.2.3 Groundwater

From the point of view of underground water bodies, the main risk in the **execution phase** refers to the pollutants that are reaching the phreatic groundwater. This phenomenon is considered to occur mainly from the following works:

- Realization of site organizations;
- Realization of earthworks;
- Realization of consolidation works.

Potential sources of groundwater pollution during the **construction phase** are represented by the accidental leakage of hydrocarbons from the construction machinery as well as from the chemical substances used in the works. Also, an important source is represented by the waste and material storage areas set up in the construction site organizations but also temporarily in the work fronts. The quality of underground water bodies in the project implementation area may be affected as a result of the infiltration of chemical substances into the soil and their subsequent percolation into the aquifer.

During the **operational phase**, snow removal and frost prevention activities may have the potential to generate an insignificant negative impact on groundwater bodies. Their spatial extent is estimated to be very small, and within the present RIM, measures are provided to reduce the risks on the chemical state of water bodies.

During the **decommissioning phase**, negative effects may occur on the underground water bodies, mainly in the case of accidental discharges. It is estimated that, similar to the construction period, the level of impact on underground water bodies will be low.

7.2.3 Measures to avoid and reduce the impact

The measures to reduce the impact on water bodies established within SEICA are reproduced below:

- At the end of the construction works, rehabilitation works will be carried out in the riparian area, which consists in the planting of some native tree or shrub plant associations.
- Site organizations must be located as far as possible from surface water bodies, in no case less than 50 m from their banks.
- The temporary access roads will be located as far as possible from the surface water bodies and damage to the vegetation specific to the riparian zone, the banks and the bed substrate will be avoided.
- In the case of temporary arrangements for crossing watercourses, bridges will be provided in such a way as to ensure the flow section and avoid the interruption of longitudinal connectivity, including during periods with low flows. Solutions will be adopted that do not lead to the alteration of the banks and the substrate of the watercourse.
- A mixed transverse profile will be made on the axis of the protected bed with the gabion mat, which will allow a reduction of the flow section and an optimal water level in the minor bed during periods with low flows.
- The works in the bed will be carried out only after isolating the working front with temporary dikes, which must be executed in such a way as not to affect the longitudinal connectivity of the water body. The works in the bed will be carried out by maneuvering the constructions machinery on the bank.
- During the execution of the works in the river bed, if there are species of ichthyofauna, temporary barriers with filters will be set up on the water level, which will have the role of controlling the turbidity of the water, respectively of the sediments entrained in the water during execution of works..
- During the execution period of the works in the river bed, if there are sanitary protection zones for drinking water capture, temporary barriers with filters will be set up on the water body that will have the role of controlling pollutants and water turbidity, respectively sediments carried into the water during the works.

- During the execution period, in all points/intersection areas of the project with the adduction, transport, water supply, gravity sewerage and pressure sewerage pipes existing on the proposed sites, the underground building networks will be diverted or relocated on a another route that will not be affected by the proposed construction works, according to the provisions of SR 8591/97 which establishes the minimum distances between underground building networks, based on documentation at the level of the PT-DDE technical execution project approved by ACET SA Suceava.
- During the execution period, for all the materials/components that will be assembled/put into operation, "FAM" material approval sheets will be presented, which will be confirmed by ACET SA Suceava before the preparation of the necessary documentation.
- Before the execution of the diversion/replacement works of the water supply and sewerage pipes, the beneficiary will obtain all the authorizations and approvals necessary for the execution of the works, in accordance with the legislation in force.
- At the end of the works of diverting/replacing the water supply and sewage pipes (gravity/under pressure), the beneficiary will start handover-acceptance procedures of the new resulting installations in compliance with all the conditions imposed by the owners.

7.3 Air

7.3.1 Sensitivity classes and magnitude classes for assessing the impact on the air environment factor

7.3.1.1 Sensitivity classes

The sensitivity classes for the air environment factor were established according to the current state of air quality in the project area.

Table no.7-13 The sensitivity classes used in the assessment of the impact on the air component

Sensitivity	Description
Very high	Areas where there are frequent exceedances of maximum permissible concentrations (CMA: limit values and critical levels) for several air pollutants relevant to the proposed project.
High	Areas where exceedances of the maximum permissible concentrations are occasionally recorded (CMA: limit values and critical levels) for several relevant air pollutants for the proposed project.
Moderate	Areas where there are no exceedances of the maximum permissible concentrations (CMA: values limit and critical levels) for air pollutants relevant for the proposed project. The values fall within the range of 70% - 100% of the CMA.
Low	Areas where there are no exceedances of the maximum permissible concentrations (CMA: values limit and critical levels) for air pollutants relevant for the proposed project. Values fall within 50% - 70% of the CMA..
Very low/insensitive	Areas where there are no exceedances of the maximum permissible concentrations (CMA: values limit and critical levels) for air pollutants relevant for the proposed project. Values are less than 50% of the CMA.

Based on the air quality maps presented in chapter 5.2 of this RIM, it can be estimated that at the level of the entire project, the sensitivity class is very low for all the analyzed indicators - the maximum values of the NOx, NO2 and PM10 indicators being estimated below 50% of the CMA.

7.3.1.2 Magnitude classes

The magnitude classes for identifying the impact on the air were established taking into account the size of the qualitative changes.

Table no.7-14 Magnitude classes used in assessing the impact on the air component

Magnitude		Description
NEGATIVE	Very high	Exceeding the maximum allowed concentrations (MA) of pollutants in the ambient air as a result of the contribution of the project plus the values already existing in the initial conditions.
	High	The contribution of the project plus the values already existing in the initial conditions lead to concentrations between 70-99% of the CMA.
	Moderate	The contribution of the project plus the values already existing in the initial conditions lead to concentrations between 50-70% of the CMA.
	Low	The contribution of the project plus the values already existing in the initial conditions lead to concentrations between 20-50% of the CMA.
	Very low	The contribution of the project plus the values already existing in the initial conditions lead to concentrations <20% of the CMA.
No detectable change		There are no sources of air contamination or their contribution is undetectable
POSITIVE	Very low	Actions that contribute to the reduction of atmospheric pollutant concentrations by <10% of the CMA
	Low	Actions that contribute to the reduction of atmospheric pollutant concentrations by 10-20% of the CMA
	Moderate	Actions that contribute to the reduction of atmospheric pollutant concentrations by 20-50% of the CMA
	High	Actions that contribute to the reduction of atmospheric pollutant concentrations by 50-70% of the CMA
	Very high	Actions that contribute to the reduction of atmospheric pollutant concentrations by >70% of the CMA

For the air environment component, the following magnitude classes of the project were established, taking into account the results of air modeling.

Construction phase (or execution phase)

- Very high negative as a result of interventions associated with large-scale construction works, which require a longer execution time (I.E.4÷I.E.8). According to the air modeling carried out for the execution stage, the maximum permissible concentrations (CMA) of the relevant pollutants were exceeded (NO_X, NO_2 and PM_{10}) in the ambient air;
- Low negative as a result of interventions associated with construction works that are smaller in volume and execution time (I.E.1÷I.E.3).

Operating phase (IO1)

- Very high negative - on the interval between Suceava Nord (the beginning of the project) and Siret Sud road junction. According to air modeling, the maximum permissible concentrations (MA) were exceeded only in the case of the indicator NO_X;

- High negative - on the interval between the Siret South road junction and the Siret North road junction (the end of the project). According to the air modeling, concentrations between 70-99% of the CMA resulted only in the case of the NOX indicator;
- **Low negative:**
  - according to the air modelling, values of concentrations of the PM10 indicator included in the range of 20-50% of the CMA on the Suceava North and Suceava West Road Junctions;
  - according to the air modelling, valuesof concentrations of the NO2 indicator in the range of 20-50% of the CMA on the Suceava Nord, Suceava West and Rădăuți Road Junctions (DN2H).
- **Very low negative:**
  - according to the air modelling, values of concentrations of the PM10 indicator <20% of the CMA on the highway, on the expressway and on the Rădăuți, Siret Sud and Siret Nord road junctions;
  - according to the air modelling, values of concentrations of the NO2 indicator <20% of the CMA on the highway, on the expressway and on the Siret Sud and Siret Nord road junctions.

7.3.1.3 Significance thresholds

The analysis of the impact on air quality is carried out taking into account the alert and intervention threshold values provided in *Law 104/2011 on ambient air quality and STAS 12574-87 – Air from protected areas (quality conditions)*.

7.3.2 Impact prediction

The impact on air quality during the execution phase

In order to estimate the concentrations of relevant atmospheric pollutants NOx, NO2 and PM10 resulting from the construction works, as a result of the operation of the machines, a numerical modeling was carried out with the help of the software CadnaA Version 2023, using the Austal 2000 calculation model.

The scenario was developed in the proximity areaof the highway towards the town of Suceava (km 8+700 – km 11+500),this being considered one of the most unfavorable areas in the context of the potential to change air quality due to the following aspects:the existence of oneconstruction sites (constant long-term emissions) and the construction of a road junction with a large volume of earthworks.

The scenario assumes the simultaneous operation of all the equipment and machines involved in the construction activities on the work front and in the site organization. Modeling was done exclusively during the day. In this context, specific machinery for construction works was selected
roads, presented in the following table.

Table no.7-15 Sources of atmospheric emissions considered in modeling the dispersion of atmospheric pollutants - execution stage

Emission sources	Number of sources
Bulldozer	5
Excavator	5
Compactor	1
Mobile crane 20T	1
Generator 330 kW	1
Transport dump trucks	24

The chosen scenario presents five groups of machines (1 excavator and 1 bulldozer) intended for construction works. Three of these were assigned to the earthworks related to the highway, two groups being intended for the earthworks related to the DN2/DN2P road junction.

A number of 24 dump trucks/day transporting the fill material or the material resulting from the excavations was considered. A compactor, a truck crane (for handling materials in the construction site) and a 330 kW generator were also considered in the modeling. The working schedule for the operation of the equipment is 10 hours/day. In order to capture the cumulative effects, the modeling also took into account road traffic on the DN2 and Suceava Ring roads in the study area.

The input data used in the model built with CadnaA software are:

- The digital terrain model – .asc format in Stereo 70 projection;
- Suceava – Siret highway/expressway axis – .shp format in Stereo 70 projection;
- Road traffic data for the DN2 and Suceava Belt roads - according to the Traffic Study;
- Average vehicle speed – default settings in CadnaA;
- Road infrastructure characteristics – road type (default settings in CadnaA);
- The position of the machines - sources of point emissions (coordinates in the STEREO 70 projection);
- The quantities of atmospheric pollutants related to the emissions generated by each type of equipment and machinery;
- The height of the emission source;
- Height of sensitive receptors;
- The surface source prone to wind erosion - PM10 (the expropriation corridor considered uncovered on the entire land surface in the analyzed area);
- Meteorological conditions in the area of the study area.

The modeling results in the worst case scenario are illustrated in the following figures. The figures indicate that there is a possibility of exceeding the limit values for the average annual concentrations of all the evaluated indicators (NO_2, NO_X and PM_{10}).

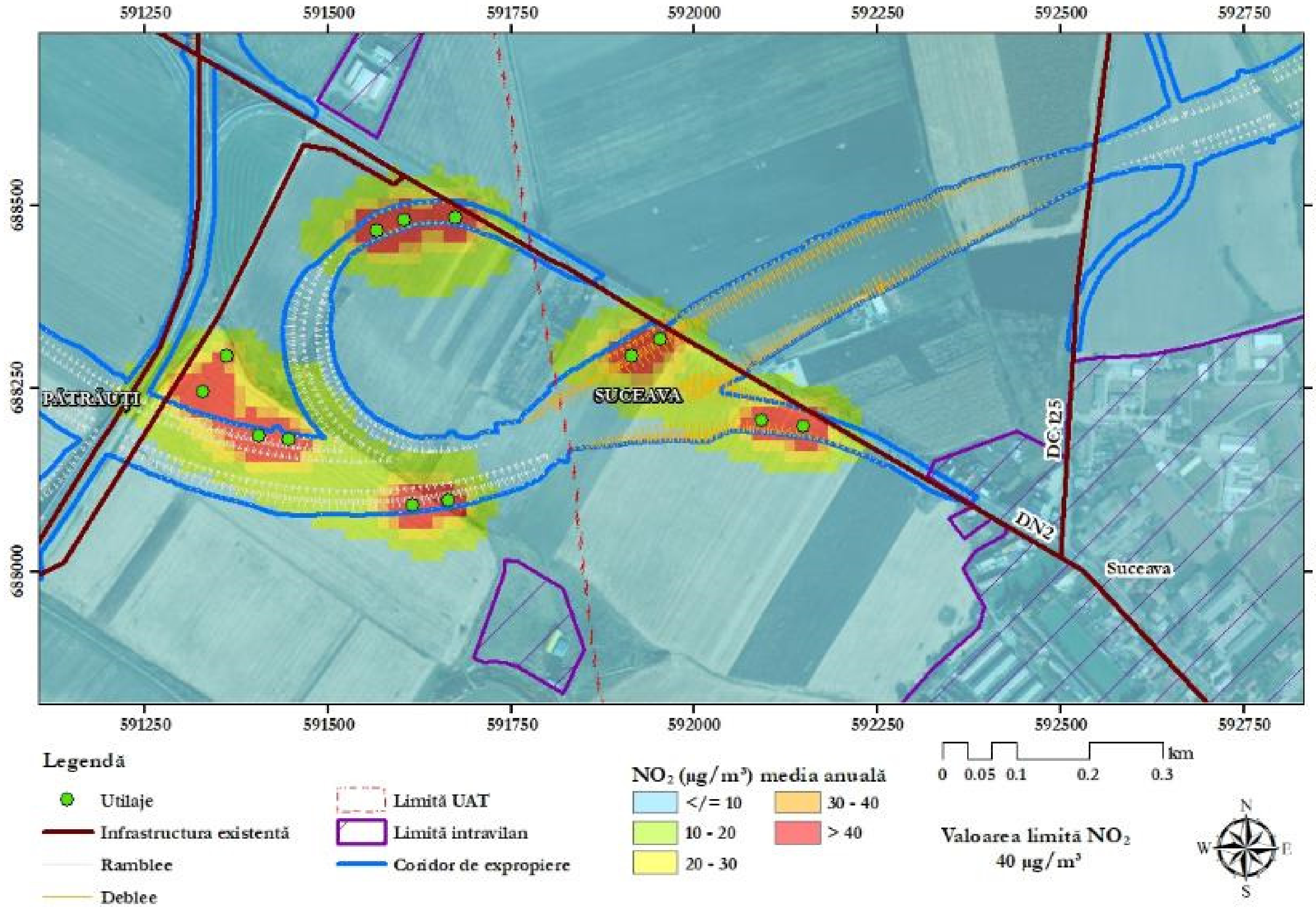


Figure no.7-2 NO2 dispersion – average annual concentration – execution phase

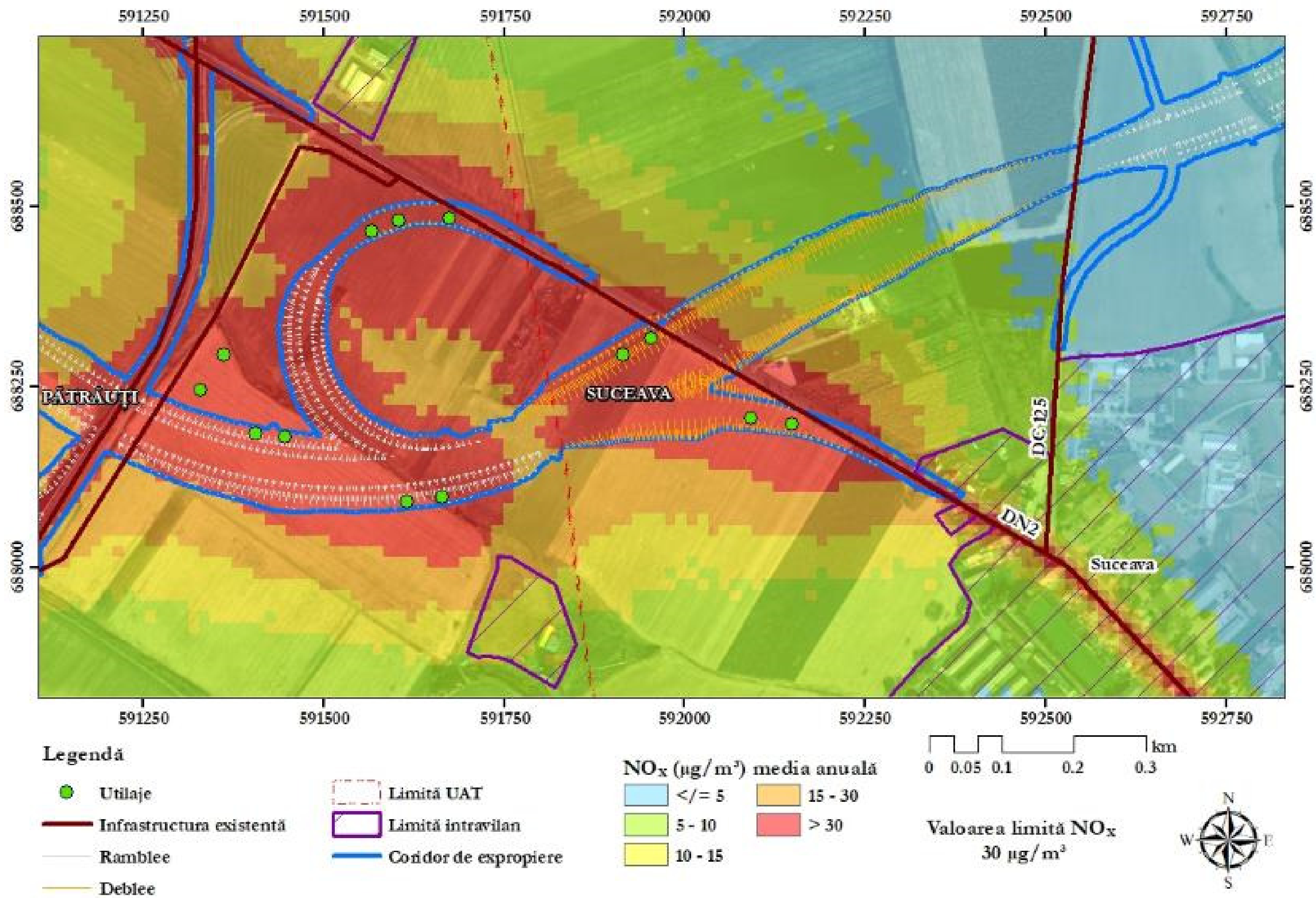


Figure no.7-3NOX dispersion – annual average concentration – execution phase

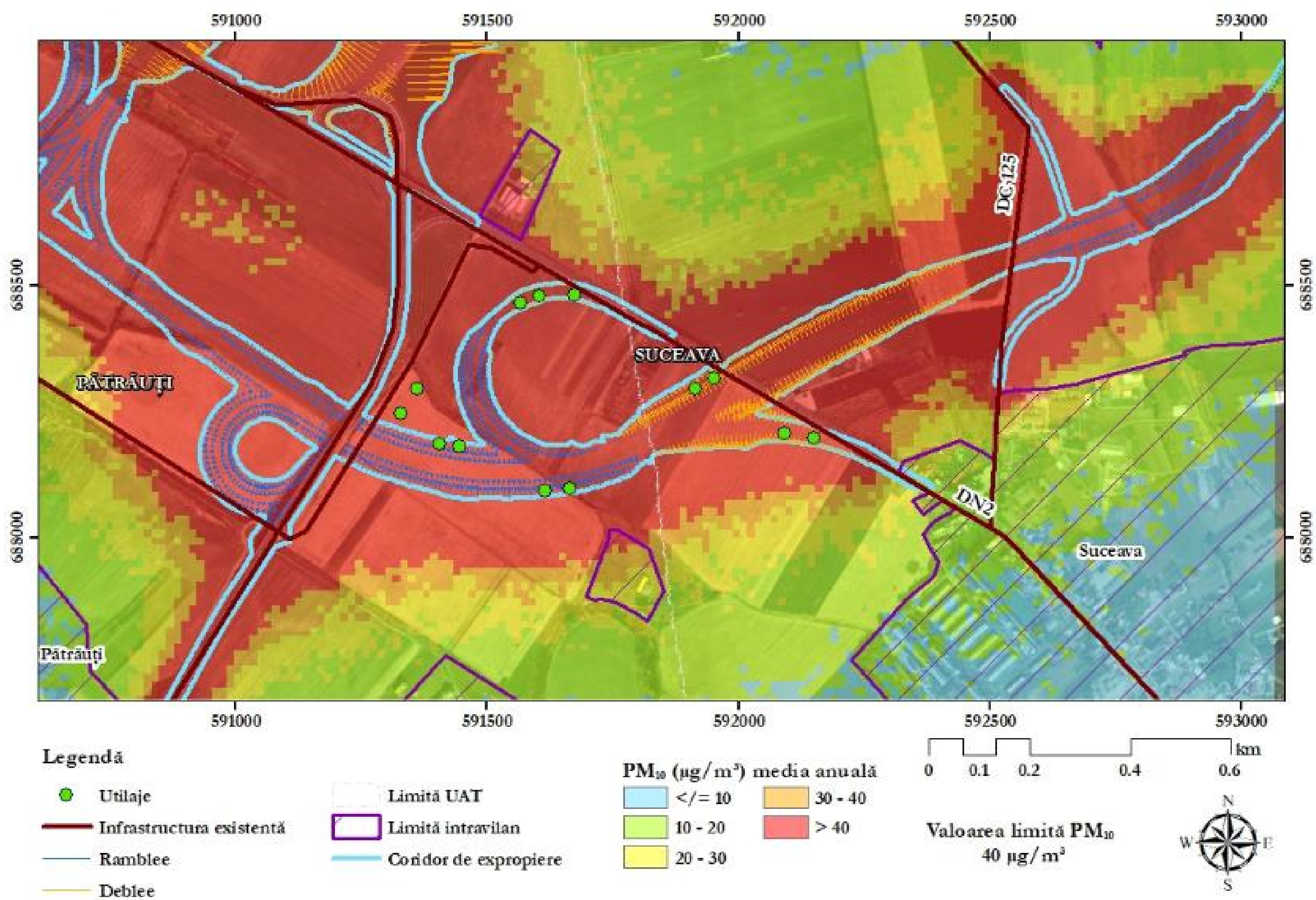


Figure no.7-4 PM10 dispersion – annual average concentration – execution phase

The maximum values resulting from modeling are 672.5 µg/m3 for the NO2 indicator, 2330.5 µg/m3 for NOX and respectively 612.8 µg/m3 PM10.

There are multiple reasons for reaching these increased values in the case of NO2 and NOX pollutants, but the most important is that machines are not considered mobile sources in the modelling. As a result of the reduced mobility in the work fronts, emission calculation methodologies classify machinery as "other mobile sources" and assign considerably higher emission factors compared to mobile sources. At the same time, the low height of the exhaust stacks does not allow optimal conditions for the dispersion of emissions, thus resulting in high values of the estimated concentrations near the sources.

The main source responsible for the high concentrations of dust emissions (including PM10) in the atmosphere during the construction stage is the exposed surface of the expropriation corridor which is an open source throughout the highway/expressway construction stage. In the modelling, the entire surface of the expropriation corridor in the Suceava area was considered. The distances up to which exceedances of the CMA can be registered for the analyzed pollutants, determined on the basis of mathematical modeling, are presented in the following table.

Table no.7-16 Distances from sources up to which exceedances of the CMA can be registered

Road sign	Maximum distance up to which CMA exceedances can occur (m)
PM_{10} (µg/m3)	250
NOx (µg/m3)	250
NO_2 (µg/m3)	60

Although during the construction phase there are exceedances of the concentrations of NO_X, NO_2 and PM_{10} pollutants, the pressure exerted by the construction works is temporary with local extension. Taking into account the average period of manifestation of the pressures associated with the project in the execution phase (2.5 years) and the low level of sensitivity of the analyzed area, the impact on air quality in the construction stage of the project was considered to be insignificant. It is not estimated that the execution works of the project will cause irreversible changes to the air quality in the study area.

Impact on air quality during operation

Similar to the execution stage, a numerical modeling of the dispersion of atmospheric pollutants was carried out using the CadnaA software 2023. The input data used were:

- The digital terrain model – .asc format in Stereo 70 projection;
- Suceava – Siret highway/expressway axis – .shp format in Stereo 70 projection;
- Data regarding road traffic on the roads in the vicinity of the project (extracted from a radius of 2 km away from the road axis) - according to the Traffic Study and the Cestrin 2015 traffic census;
- Average vehicle speed – default settings in CadnaA;
- Road infrastructure characteristics – road type (default settings in CadnaA);
- Wooded surfaces – which function in modeling as obstacles.

The model took into account the traffic values estimated in the Traffic Study carried out for the Suceava – Siret highway/expressway for the year 2050. The traffic values for the roads in the existing network corresponding to this highway segment were taken from the Cestrin 2015 traffic census.

The considered scenario represents the most unfavorable situation, based on traffic values that did not take into account the subsequent technological developments related to the improvement of the emission exhaust systems at the automobile level, the evolution of the electric and hybrid car market, but also the regulations related to pollutant emissions adopted at national and European Union level. **The graphical representations of the atmospheric pollutant dispersion modeling for the representative pollutants: NOx NO_2 and PM_{10}, expressed in average annual concentrations, can be consulted in the Annex to this Report.**

According to the results of atmospheric dispersion modeling, in the operating stage, exceedances of the CMA for the NOx indicator are estimated on the highway section Suceava Nord - Rădăuţi node (DN2H) and near the Siret Sud road junction, which intersects the heavily trafficked road DN2. From the modelling, it can be seen that the area where CMA exceedances are estimated occurs up to a maximum distance of 50 m from the road axis. The concentrations of the NO2 and PM10 indicators are far below the limits imposed by the legislation in force. As a result of the improvement of transport conditions and the provision of constant vehicle speeds on the highway, a reduced contribution of the project to the background level of atmospheric concentrations is estimated. It is thus appreciated that compared to the current situation, the project will not lead to a significant negative impact on the air quality in the study area.

Given that during the operational stage the sources of air pollution associated with road traffic will manifest themselves over a long period of time and with relatively constant emission values, it is estimated that the project may lead to changes in air quality at the local level, especially in the case of the NOx indicator. Taking into account the very high magnitude recorded on the highway segment between Suceava Nord and Suceava Sud nodes and the very low sensitivity of the area, an insignificant negative impact on air quality is appreciated.

The implementation of the project will have overall positive effects as a result of the relocation of a large volume of traffic from more sensitive areas within the localities through which important road arteries currently pass, to areas with low sensitivity proposed for the implementation of the project (mainly agricultural lands).

7.3.3 Measures to avoid and reduce the impact

During the construction period, as protective measures, those in the category of preventive measures are imposed, which can be achieved by supervising the operation of the objectives within the designed limits, and in the event of the appearance of a defect, it is required to detect it quickly, followed by the remedy in a short time.

To reduce the impact on air quality, it is recommended to take the following measures during the execution of the works:

- the limitation of particle emissions generated by the activities of handling earth masses will be achieved by:
  - surface wetting activities;
  - limiting the speed of movement of heavy vehicles for the transport of materials.
- limitation of atmospheric pollutant emissions at concrete and asphalt preparation plants by equipping them with pollutant and dust retention systems (capture-purification);
- the use of equipment and machinery technically compliant with the best existing technologies;
- in periods without precipitation, wetting of access roads and areas with active works will be ensured in order to reduce particle emissions and bring concentrations (PM_{10}/ $PM_{2.5}$) within the limit values provided by the legislation in force;
- the transport of soil, waste and any materials that release dust will be carried out at the level of the entire project exclusively with trucks covered with tarpaulins (tarpaulins for pits) in order to reduce particle emissions;
- cleaning vehicle wheels before leaving the construction site on public roads;
- periodic technical checks of vehicles and equipment used to carry out the works;
- avoiding the execution of works that involve the handling of soil quantities (excavation/filling) during periods with strong winds;
- ensuring a correct management of the materials used during the construction period;
- stopping the machines engines during the periods when they are not involved in the activity; appropriate disposal of the resulting waste;
- the stabilization of the areas where construction materials were obtained, respectively the areas where slope works were carried out and where the deposits of surplus excavated material were set up;
- rehabilitation of all areas affected by the execution works.

During the **operating phase:**

- based on air quality monitoring in the localities adjacent to the highway, traffic adaptation measures will be implemented so as to avoid exceeding the maximum concentrations of atmospheric pollutants at the level of the closest sensitive receptors;
- the most important measure to reduce air pollution at the highway level will be to comply with the European norms regarding the quality of fuels and vehicles in terms of the imposed pollution norms;
- the only measures that can influence the dispersion in the atmosphere of pollutants emitted by car traffic on the highway are represented by sound-absorbing panels (with a role in reducing the horizontal dispersion of pollutants and favoring vertical dispersion) and the plantations that are the object of landscaping.

During the **decommissioning phase**, measures similar to those during the construction period will be provided.

7.4 Soil

7.4.1 Sensitivity classes and magnitude classes for assessing the impact on the soil

The significance of the potential impacts on the Soil environmental factor was analyzed based on two criteria: the sensitivity of the implementation areas and the magnitude of the changes proposed by the project, according to the general methodological indications presented in Chapter 3.

7.4.1.1 Sensitivity classes

The sensitivity classes used in the assessment are shown in the table below.

Table no.7-17The sensitivity classes used in the assessment of the impact on the Soil component

Sensitivity	Description
Very high	Gardens from households and communities Natural areas protected from a pedological aspect
High	Agricultural land used for horticulture, fruit growing and other valuable crops Forest areas (soil with moderate or high fertility according to the LUCAS classification)
Moderate	Agricultural land used for grain crops GRASSLAND
Low	Land used for grazing domestic animals Unproductive lands
Very low/insensitive	Industrial areas and other heavily anthropogenically modified lands

Considering that the project is mostly carried out on surfaces occupied by non-irrigated agricultural lands, in the case of its implementation, only one sensitivity class was considered, respectively moderate.

The project overlaps with agricultural areas where, according to the LUCAS classification, soil fertility (organic carbon content in the soil) is considered moderate or even high on smaller areas. However, the sensitivity of the area was considered moderate, the total area occupied by the fertile areas being reduced compared to the entire area with fertile soil in Suceava County.

7.4.1.2 Magnitude classes

The magnitude classes used in the assessment are shown in the table below.

Table no.7-18 Magnitude classes used in assessing the impact on the Soil component

Magnitude		Description
NEGATIVE	Very high	Exceeding the concentrations of pollutants in the soil corresponding to the intervention thresholds. Loss of productive capacity over a period of more than 10 years.

Magnitude		Description
		Accidental discharges of pollutants that lead to extensive damage and for which it is not possible to rehabilitate to the level of initial conditions in less than 1 year.
	High	Exceeding the concentrations of pollutants in the soil by more than 75% of the intervention thresholds. Loss of productive capacity over a period of 5-10 years. Accidental discharges of pollutants that lead to extensive damage and for which it is not possible to rehabilitate to the level of initial conditions in less than 6 months - 1 year.
	Moderate	Exceeding the concentrations of pollutants in the soil corresponding to the alert thresholds. Loss of productive capacity over a period between 1-5 years. Accidental discharges of pollutants that lead to extensive damage and for which it is not possible to rehabilitate to the level of initial conditions in less than 6 months.
	Low	Exceeding the concentrations of pollutants in the soil by more than 75% of the alert thresholds. Loss of productive capacity for a maximum period of 1 year. Accidental discharges of pollutants that lead to damage on limited areas and for which it is not possible to rehabilitate to the level of initial conditions in less than 6 months.
	Very low	Pollutant concentrations in the soil with values between normal values and 75% of the alert thresholds. No loss of the productive capacity of the soil. Accidental discharges of pollutants that lead to damage in limited areas and for which short-term rehabilitation is possible (max. 1 month).
No detectable change		There are no sources of contamination/structural alteration of the soil or their contribution is undetectable.
POSITIVE	Very low	Actions that lead to the reduction of pollutant concentrations in the soil below the intervention threshold limit, but not lower than 75% of the intervention threshold.
	Low	Actions leading to the reduction of pollutant concentrations in the soil and falling within the range >alert threshold, <75% of the intervention threshold.
	Moderate	Actions leading to the reduction of pollutant concentrations in the soil and falling within the range of >75% of the alert threshold, <alert threshold.
	High	Actions leading to the reduction of pollutant concentrations in the soil and falling within the range >50% of the alert threshold, <75% of the alert threshold.
	Very high	Actions leading to the reduction of pollutant concentrations in the soil and falling within the range of normal values.

In the construction phase, a moderate magnitude of changes was estimated for all types of interventions, soil pollution in this stage could only occur accidentally. The magnitude of these types of accidental events was assessed as being low, with the potential to cause some damage in limited areas that can be rehabilitated in less than 6 months.

In correlation with the results of the modeling of atmospheric dispersions (presented in chapter 7.3.2), it is estimated that the deposition of solid pollutants at the ground level as a result of the road traffic carried out during the operational stage can lead to exceeding the limit values for the vegetation at the level of the node in the area of the node Suceava West, Mihoveni locality, but on small areas. Only at the level of these surfaces we can consider a moderate magnitude of the impact, on the rest of the surfaces in the vicinity of the highway the magnitude being very low.

7.4.1.3 Significance thresholds

The analysis of the impact on soil quality is carried out taking into account the alert and intervention threshold values provided in Order no. 756/1997 with subsequent amendments and additions.

7.4.2 Impact prediction

The assessment of the "Soil" environmental component was carried out based on the analysis of the project interventions, the effects and the potential impacts generated by them on the soil. The form of impact considered in the soil analysis is represented by the loss of productive capacity of the soil as a result of physical changes and the change in the quality of the soil / subsoil as a result of contamination. We mention the fact that the proposed project does not intersect natural areas protected from a pedological aspect.

Construction phase

From the perspective of land use, according to the land use analysis (CLC 2018), the areas temporarily occupied during the implementation of the project belong to the category of land with moderate sensitivity, namely agricultural land.

From the perspective of land use, the areas temporarily occupied during the implementation of the project are from categories with moderate sensitivity, respectively non-irrigated agricultural lands. The total areas temporarily occupied by the site organizations are 41.25 ha of non-irrigated agricultural land. In the table below are the surfaces of construction site organizations in relation to the total surface of the UATs in which they are proposed, the types of use being extracted from the CLC database, year 2018. It is noted that the surfaces occupied by construction site organizations represent 2, 47% of the total available surfaces, thus indicating a very low magnitude of changes. Considering this aspect, during the execution stage of the project, the impact on the soil as a result of the temporary change in land use is assessed to be insignificant, manifested in the short term.

Table no.7-19 The percentages of temporarily occupied surfaces in UAT (according to CLC, 2018)

County	UAT	Type of use (CLC, 2018)	Occupied area of UAT (%)
Suceava	Bălcăuţi	Non-irrigated agricultural land	0.39
	Grănicesti	Non-irrigated agricultural land	0.19
	Pătăuţi	Non-irrigated agricultural land	0.23
	Siret	Non-irrigated agricultural land	0.21

Upon completion of the works, the temporarily occupied surfaces will be rehabilitated to their initial ecological state, by using topsoil (depending on the capacity of the builders, it is preferable to use the same topsoil that was uncovered to prepare for the temporary use of the surfaces), seeded with species plants to reconstruct the associations present at the time of land preparation. The rehabilitation measure ensures the return of the lands to the category of use and their production capacity prior to the interventions necessary for the realization of the project.

The definitively occupied surfaces, through the arrangement of the roadway, service spaces or other spaces necessary for safe operation, are shown in percentage form in the following table, the definitively occupied surfaces being related to the land surfaces available in each intersected UAT.

Table no.7-20 The percentage of permanently occupied surfaces in UAT (according to CLC, 2018)

UAT	Land use type (%)										Total from UAT
	Non-irrigated arable land	Agro-forestry areas	Transitional forest vegetation s	Land occupied mainly by agriculture, with significant areas of vegetation	Grassland	Coniferous forests	Complex cultivation patterns	Fruit trees and berry plantations	Discontinuous industrial-urban space	Water courses	
Bălcăuţi	2.80	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.03	0.00	2.90
Calafindeşi	2.30	0.00	0.00	0.00	0.09	0.00	0.04	0.00	0.00	0.00	2.42
Dărmăneşti	3.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
Grăniceşti	2.08	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	2.33
Milişăuţi	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32
Mitocul Dragomirnei	0.53	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
Muşeniţa	1.04	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.01	1.10
Pătrăuţi	2.86	0.00	0.00	0.00	0.10	0.00	0.00	0.49	0.00	0.00	3.46
Siret	1.04	0.00	0.00	0.00	0.07	0.00	0.01	0.00	0.00	0.00	1.11
Suceava	0.75	0.46	0.31	0.00	0.04	0.07	0.00	0.00	0.00	0.00	1.63
Total	**17.64**	**0.49**	**0.35**	**0.31**	**0.29**	**0.07**	**0.12**	**0.49**	**0.03**	**0.01**	19.80

According to CLC 2018, of the areas definitively occupied by the realization of the project, it can be noted that in proportion to 17.64% the route of the future highway will take place on land that is part of the use category "non-irrigated agricultural land". At the same time, following the percentage analysis of the definitively occupied surfaces from the total surface of each intersected UAT, it is noted that only in the case of the Dărmăneşti UAT, a maximum percentage of 3.93% will be reached, which represents a low value.

We can thus state that the future highway project will not affect highly sensitive soils, which have an important qualitative value.

Given that the project has a low magnitude of changes, compared to the available surfaces in each UAT, in the execution phase the impact on the soil as a result of the permanent change in land use is assessed as insignificant.

The impact on the soil during the operational phase

Regarding the operational phase, an analysis carried out by Leitão (2007) on 30 case studies from 10 European countries highlighted the increase in heavy metal concentrations in the soils in the vicinity of heavily trafficked roads. There are significant differences between the soil concentrations of various heavy metals as well as between different locations, the author indicating that these differences are due to the level of traffic but also to numerous other factors such as topography, precipitation, wind direction and speed, soil conditions, etc. The concentrations of heavy metals in the soil decrease proportionally with the distance from the road and with the depth from the ground level. Leitão's analysis indicates that for all the cases studied, the intervention thresholds were exceeded only in the first 5 m away from the road, occasionally at distances of up to 30 m the alert thresholds could be exceeded. One of the conclusions of the study, consistent with the results of previous studies, is that the diffuse pollution generated by traffic generally influences the soil at a distance of less than 25 m from the edge of the roadway.

In the analysis of the impact of the present RIM, the value of 25 m from the edge of the roadway was used to identify the soil surfaces most likely to be affected by pollutants emitted by car traffic, during the operational period of the highway. The situation of the percentages of the used surface in relation to the total surface in each category of land use per territorial administrative unit is shown in the following table.

Table no.7-21 The percentage of potentially altered soil surfaces, depending on the land use category, on the UATs crossed (according to CLC, 2018)

failed	Land use type (%)									
	Non-irrigated arable land	Agro-forestry areas	Transitional forest vegetation	Land occupied mainly by agriculture, with significant areas of vegetation	Grassland	Coniferous forests	Complex cultivation patterns	Fruit trees and berry plantations	Discontinuous industrial-urban space	Water courses
Bălcăuţi	1.78	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.01	0.00
Calafindeşi	1.48	0.00	0.00	0.00	0.08	0.00	0.01	0.00	0.00	0.00
Dărmăneşti	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grăniceşti	1.72	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00
Milişăuţi	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mitocul Dragomirnei	0.43	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Muşeniţa	0.67	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.01
Pătrăuţi	1.76	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Siret	0.86	0.00	0.00	0.00	0.07	0.00	0.01	0.00	0.00	0.00
Suceava	0.56	0.38	0.14	0.00	0.00	0.06	0.00	0.00	0.00	0.00
Total	10.92	0.39	0.17	0.16	0.15	0.06	0.07	0.01	0.01	0.01

The potential of road traffic to alter the quality of soils, through deposits of heavy metals resulting from the burning of fossil fuels, is variable, depending on the weather conditions and the fluidity of the traffic. The soils most exposed to the risk of alteration by heavy metal deposits are, according to the previous table, those belonging to the use category with moderate sensitivity "Non-irrigated agricultural lands" in the proportion of approx. 11% on which heavy metal deposits are conditioned by the available absorption surface, the magnetic susceptibility of the component crystals and the mineral aggregates of which are part of it.

As a result of the traffic on the highway, an insignificant negative impact on the soil quality elements was estimated during the operation stage.

The impact on the soil during the decommissioning phase

The similarity of the activities in the decommissioning stage and that of the execution of the highway indicate similar potential causes, a fact for which we can consider the effects and implicitly the impacts generated to be close in magnitude and severity, to which is added the positive impact generated by the restoration of the areas occupied by the highway.

The estimated level of the impact in the decommissioning stage is considered moderately negative exclusively in the case of the realization of site organizations for the decommissioning of the highway (a reversible and temporary intervention). In the case of restoration works from the decommissioning stage, the estimated level of impact is positively reduced, as a result of the application of fertile soil in the restored areas of the highway.

7.4.3 Measures to avoid and reduce the impact

Several measures will be implemented to avoid and reduce the impact on the soil and subsoil.

For the **construction phase**, the following measures are recommended:

- solutions that ensure the reduction of the areas at which it is necessary to remove the natural vegetation, as well as the construction of foundations and definitive platforms, will be used with priority within the construction site organizations;
- the topsoil layer will be gradually removed, as the earthworks progress. The fertile soil will be stored in separate piles for reuse during the rehabilitation works, both in the areas with temporary works and on the surface of the rehabilitated areas in the permanent works;
- when choosing storage areas for uncovered fertile soil and/or other excavated land, valuable surfaces from the point of view of the productive capacity of the soil (surfaces with natural vegetation and agricultural lands) will be avoided;
- coordination of construction activities (within the same section as well as between project sections) so as to achieve a maximum exploitation of the excavated earth with the minimization of the surfaces and durations of temporary storage as well as of the surfaces of permanent storage of the earth/rocks that cannot be reused as construction materials;

- soil pollution with oils and petroleum products will be avoided by ensuring the proper operation of equipment and carrying out maintenance operations in specially designated spaces;
- avoiding the direct placement of construction materials and waste resulting from the works on the ground;
- the temporary on-site storage of waste resulting from the works, as well as household waste, until it is taken over by specialized companies for final disposal or recovery, will be carried out in appropriate containers, in specially designed spaces;
- a Soil Erosion Prevention and Landscape Management Plan must be developed in the design stage to ensure consideration of the erosion issues generated by stormwater runoff and to identify appropriate solutions for the collection and evacuation of these waters. The solutions are needed both in the area of the work fronts and of the site organizations, and of the excavated soil storage areas and will include the following aspects:
    - the storage areas of the excavated material will be designed and managed in such a way as to ensure the control of sediment entrainment in meteoric waters by minimizing the length and angle of the slopes;
    - the installation of local control measures such as sediment retention fences or decanters;
    - collection and discharge of meteoric waters to avoid their mixing with waters containing sediments.
- the use of vehicles suitable from a technical point of view for the execution of the works, as well as for the transport of materials and for the collection and transport of waste resulting from the construction works;
- the maintenance, refueling or cleaning of vehicles and machinery will be carried out in specially arranged places, located away from sensitive areas or inside the site organizations;
- the storage of dangerous substances and the setting up of asphalt/concrete stations will be done on specially arranged platforms, in order to protect the soil from accidental leaks and infiltrations;
- strict compliance with the rules of waste management, fuel distribution and supply, disposal of waste water and emptying of ecological toilets;
- the occupation of some land surfaces in addition to those provided by the project will be avoided;
- the lands temporarily occupied for the placement of roads and temporary platforms will be limited only to the surfaces necessary for the work front, and the occupied space will be fenced;
- the layer of topsoil removed will be stored in separate piles and will be reinstalled after the completion of the works, to make possible the natural re-installation of the vegetation;
- in case of soil contamination, the affected portion will be removed and treated / disposed of depending on the type of contamination; site organizations will be properly equipped with specific absorbent materials for each type of material / substance that can cause pollution following improper management;

- upon completion of the construction works, the temporarily affected lands will be rehabilitated; it is recommended to use the topsoil uncovered at the beginning of the works, in order to preserve the same structural qualities of it, respectively the maintenance of the seed bank;
- the areas that were affected by the removal of vegetation will be properly stabilized, and in the areas left free after the completion of the constructions, the initial vegetation will be restored.

The following are recommended for the **operatinal phase:**

- land consolidation works will be permanently checked and maintained;
- maintenance, refueling or cleaning of vehicles and maintenance equipment will be carried out in specially arranged places, far from sensitive areas;
- strict compliance with the rules of waste management, fuel distribution and supply, disposal of waste water and emptying of ecological toilets;
- monitoring the concentrations of pollutants in the soil on the lands in the immediate vicinity of the highway, with the notification of the competent environmental authorities and the town halls in case the concentrations exceed the alert thresholds provided by the legislation in force.

For the **decommissioning phase**, the following are recommended:

- quantities of material obtained from the decommissioning of the project or some sections of the project will not be stored on natural soil;
- the temporary storage of the waste resulting from the demolitions will be carried out on the surface occupied by the highway and within the site organizations, without the occupation of additional land surfaces;
- upon completion of the decommissioning works, the affected lands will be brought back to their original state; it is recommended to use the topsoil uncovered at the beginning of the works, in order to preserve the same structural qualities of it, respectively the maintenance of the seed bank;

The restoration works after the decommissioning stage will aim to restore the soil to a level similar to that before the construction stage and will take into account the particularities of the neighboring soil from that moment.

7.5 Subsoil geology

7.5.1 Sensitivity classes and magnitude classes for assessing the impact on the subsoil

The significance of the potential impacts on the Geology environmental factor was analyzed based on two criteria: the sensitivity of the implementation areas and the magnitude of the changes proposed by the project, according to the general methodological indications presented in Chapter 3.

7.5.1.1 Sensitivity classes

The sensitivity classes used in the assessment are shown in the table below.

Table no.7-22 Sensitivity assessment matrix for the Geology component

Sensitivity	Description
Very high	Scientific reserves designated for the protection of geological, paleontological or speleological values. Important areas for geological, paleontological or speleological research.
High	Natural reserves designated for the preservation of geological, paleontological or speleological values. Geoparks designated and recognized in the Global Network of Geoparks. Areas with the potential to be designated scientific reserves for the protection of geological, paleontological or speleological values.
Moderate	Geoparks in the process of being designated or designated at national level and not included in the Global Network of Geoparks. Areas with a history of geological exploitation. Areas with valuable geological elements, which have the potential to become geoparks.
Low	Important areas from the petrographic point of view or the presence of valuable minerals as a resource.
Very low/ Insensitive	Areas without special geological features and where materials of paleontological interest are not present.

At the level of the whole project it was considered Very low sensitivity/not sensitive.

7.5.1.2 Magnitude classes

The magnitude classes used in the assessment are shown in the table below.

Table no.7-23Magnitude assessment matrix for the Geology component

The magnitude of the change		Description
Negative	Very high	Loss or alteration of ≥20% of the identified geological resource.
	High	Loss or alteration of 10 - 20% of the identified geological resource.
	Moderate	Loss or alteration of 5 - 10% of the identified geological resource.
	Low	Loss or alteration of 2.5-5% of the identified geological resource.
	Very small	Loss or alteration of <2.5% of the identified geological resource.
No detectable change		Changes that do not influence the geological resource.
Positive	Very low	Changes that improve <2.5% of the identified geological resource.
	Low	Changes that improve 2.5-5% of the identified geological resource.
	Moderate	Changes that improve 5-10% of the identified geological resource.
	High	Changes that improve 10-20% of the identified geological resource.
	Very high	Changes that improve ≥20% of the identified geological resource.

In the context of the project, the interventions considered to have an impact on the geology component are: the works of art (IE 6) and the consolidation works (IE 7), both involving the construction of drilled piles. The magnitude of the changes in the case of these interventions was assessed as low.

7.5.2 Impact prediction

The execution of the works for the construction of the highway will generate an impact on the geological environment, especially in the case of:

- making piles and bridges for bridges;
- large-sized debles.

In the case of the other elements of the highway, the works will be carried out with the superficial damage to the soil layers (up to a depth of 2-4 m) so that they will not have an impact on the geological environment. Also, during the operation period of the highway, there will be no impact on the geological environment.

In the case of making piles and abutments for bridges, the impact on the geological environment is reduced due to the magnitude of these works: small occupied surface, small excavated volume, relatively small depth of the works.

Regarding slope instability, the excavation of an underground work involves the redistribution of stresses with local increases in deflection stresses. The overall effect depends on the following elements: excavation characteristics (location, shape and size), excavation technique, type of excavated material.

In the case of the current project, for the realization of the Suceava West node, near the Mihoveni locality, a series of excavation works will be carried out on the southern slope of the hill located north of the project.

The construction of the Suceava - Siret highway and expressway project does not involve the construction of tunnels, meaning that there will not be significant excavations in the geological substratum. From the geological structure point of view, the project overlaps only 3 types of geological structures. The geological structure is mostly made up of clay marls and compact marls, both with intercalations of sand, and near the northern extremity of the project, a narrow strip of gravel and sand intersects.

In conclusion, it is estimated that during the **execution phase**, the impact generated on the geological component will be insignificantly negative. In the execution of the structures, under the conditions of the implementation of all specific construction techniques, the risk of significant effects on the geological environment is low.

In the **operational phase** of the project, probable effects on the geological component are not considered.

In the **decommissioning stage**, environmental restoration works are considered by bringing the occupied lands to their original state. If this stage is carried out, we mention that it will not be proposed to decommission the piles, piles or molded walls, their extraction may affect both the groundwater and the surface water.

7.5.3 Measures to avoid and reduce the impact

In the **execution phase** of the works necessary for the construction of the highway, the following measures will be implemented:

- during the execution of the works, measures will be taken to support and consolidate the areas susceptible to collapse or sliding;
- the methodology for carrying out construction works will include techniques that incorporate the assessment of risks for excavations and requirements for slope stability, both inside and outside the project boundary (including in the area of site organizations and excavated soil storage areas);
- in the event that the water table will be intercepted, appropriate drainage and correction measures will be taken;
- the slopes will be arranged to ensure stability and will be grassed.

Both in the operation stage and in the decommissioning stage of the project, no special measures are necessary to avoid or reduce the impact on the geological environment.

7.6 BIODIVERSITY

7.6.1 Sensitivity classes and magnitude classes for assessing the impact on biodiversity

General methodological indications can be found in Chapter 3 of this report. The particular aspects of the impact assessment on biodiversity components are outlined in the sections below.

The evaluation of the significance of the impact was carried out based on the following two criteria:

- **Sensitivity**the area and the components located in the study area;
- **The magnitude**the changes proposed through the implementation of the project.

7.6.1.1 Sensitivity classes

The sensitivity classes used in the evaluation of the significance of the impacts on the biodiversity components are presented in the following table.

Table no.7-24Sensitivity classes used in assessing the impact on biodiversity components

Sensitivity	Description
Very high	Scientific reservations; Areas of strict protection and areas of integral protection within the protected natural areas of national interest; Virgin forests; Wilderness Areas; Priority habitats; Habitats of priority species, endangered, critically endangered.
High	Natura 2000 habitats and habitats of Natura 2000 species located within the boundaries of Natura 2000 sites; Natural reservations; Monuments of nature; Protected natural areas of county and local interest; Buffer zones (sustainable conservation zones, sustainable management zones) within the protected natural areas of national interest; Wetlands of international importance; Important Bird Areas (IBAs); Ecological corridors; Critical habitats of species of community and national interest; Critical habitats of vulnerable and near-threatened species.
Moderate	Sustainable development areas within natural areas protected by national interest; Favorable habitats for species of community and national interest, outside protected natural areas (species are abundant/newly recorded; main migration corridors are identified); Meadows of high natural value (HNV), meadows important for birds, meadows important for butterflies, traditional orchards, with hay, in the hill and mountain area; Semi-natural ecosystems that are not subject to conservation (eg: seed reserves, dendrological parks, urban parks and gardens, etc.).
Low	Anthropogenic habitats (eg: plantations, agricultural crops, abandoned agricultural lands, ruderal plant communities, etc.) without management objectives and without the presence of species of conservation interest.
Very low / Insensitive	Habitats located within human communities, strongly influenced by their activities (e.g: lawns, raw land, etc.).

The following sensitivity classes are present on the route of the analyzed project:

- **Areas with moderate sensitivity: favorable habitats for species of community and national interest, located outside the natural protected areas (species are abundant/newly recorded; main movement colors are identified);**
- **Areas with low sensitivity**: anthropized areas, mainly the agricultural crops intersected by the project and roadside vegetation, according to the CLC classes that correspond to these characteristics;
- **Areas with very low sensitivity**: areas inside human settlements or heavily anthropized surfaces, according to the CLC classes that correspond to these characteristics.

No areas of high and very high sensitivity have been identified in the project area, because it will not intersect scientific / natural reserves, strict protection areas and integral protection areas within natural areas protected of national interest, virgin forests, wilderness areas, priority habitats, habitats of priority, endangered, critically endangered, species etc.

The sensitivity class with the largest area in the project area is represented by low sensitivity, followed by very low sensitivity, moderate sensitivity. The table below shows the areas intersected by the project, depending on the sensitivity classes.

Table no.7-25 The surface of the sensitivity classes intersected with the project

Sensitivity class	Area intersected with the project (ha)
Moderate sensitivity	50.89
Low sensitivity	638.21
Very low sensitivity	133.73

In the following figure, the sensitivity classes at the project level are represented.

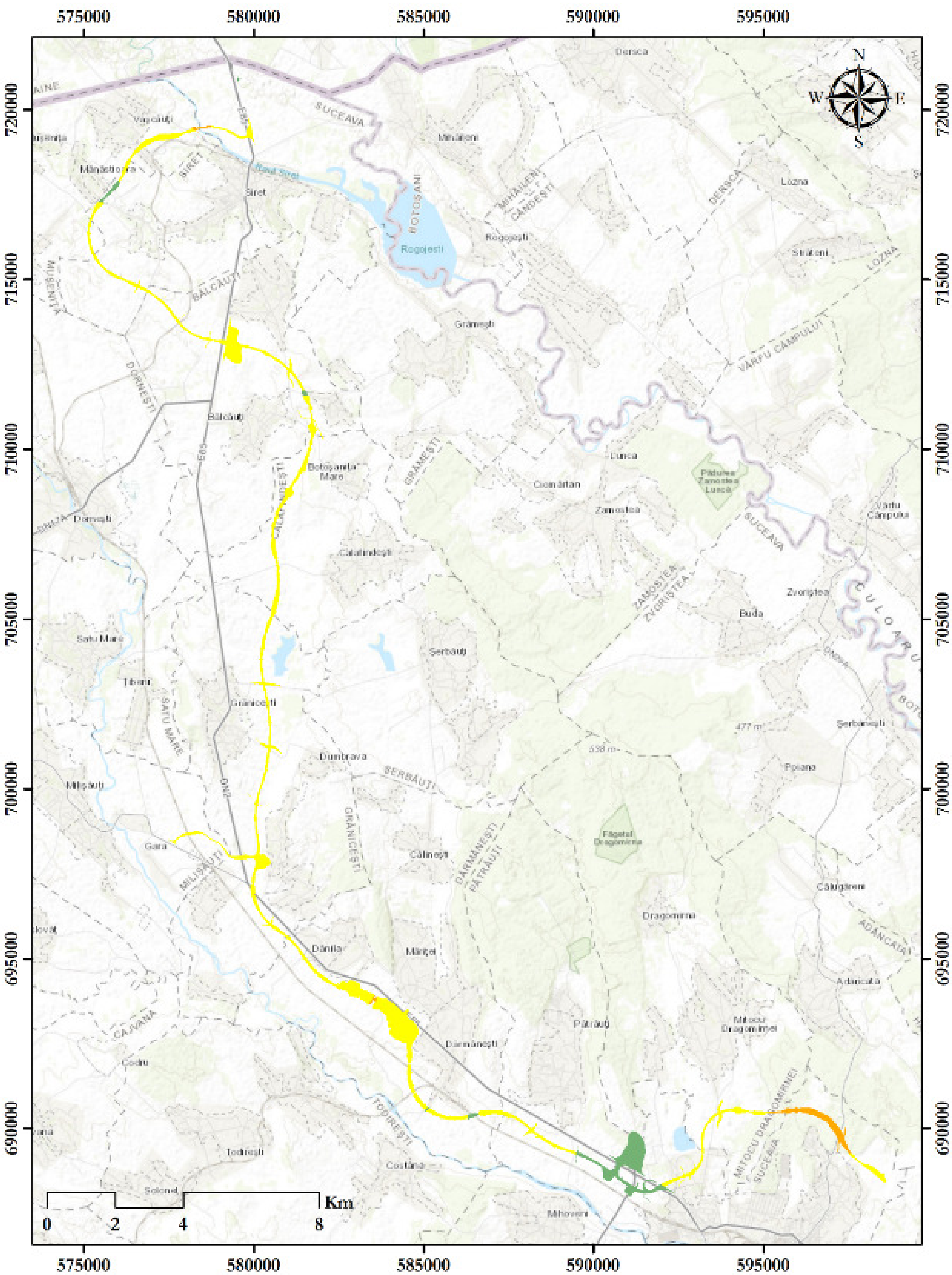


Figure no.7-5 Sensitivity classes for biodiversity in the project area

7.6.1.2 The magnitude of the proposed changes

The two-dimensionality of the impact assessment analyzes the sensitive elements (spatially delimited areas and receptors), potentially affected by the implementation of the proposed investments, from the perspective of the degree of magnitude expressed by the value of the changes generated under negative and positive aspects for all biodiversity components considered relevant within the project, respectively: Natura 2000 sites, habitats and species of community interest, habitats and species of national interest, relevant dendrological elements, etc. The magnitude of the changes directly reflects the value of the potential generating impact of a proposed type of intervention/activity. In the following table, five classes of magnitude with negative and positive values are shown, taking into account the situation where a type of intervention/action does not influence and/or does not propose changes at the level of the analyzed biodiversity component.

Table no.7-26 Magnitude classes used in assessing the impact on biodiversity components

Magnitude		Biodiversity
Negative	Very high	Actions that, along with other pressures and threats, lead to the damage of the biological component exceeding the established thresholds for maintaining good conservation status (in the absence of thresholds, the damage of ≥20% of the biological component)
	High	Actions that, along with other pressures and threats, lead to damage to the biological component exceeding 50% of the threshold value established for maintaining good conservation status (in the absence of thresholds, damage to 10-20% of the biological component)
	Moderate	Actions that along with other pressures and threats lead to the damage of the biological component by 25-50% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the damage of 5-10% of the biological component)
	Low	Actions that along with other pressures and threats lead to the damage of the biological component by 10-25% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the damage of 2.5-5% of the biological component)
	Very low	Actions that, alongr with other pressures and threats, lead to the damage of the biological component by a maximum of 10% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the damage of a maximum of 2.5% of the biological component)
No detectable change		Actions that do not influence the biodiversity components or the changes produced are not detectable.
Positive	Very low	Actions that lead to the improvement of the biological component by a maximum of 10% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the improvement of a maximum of 2.5% of the biological component)
	Low	Actions that lead to the improvement of the biological component by 10-25% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the improvement of 2.5-5% of the biological component)
	Moderate	Actions leading to the improvement of the biological component by 25-50% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the improvement of 5-10% of the biological component)
	High	Actions leading to the improvement of the biological component by ≥50% of the threshold value established for maintaining good conservation status (in the absence of thresholds, the improvement of 10-20% of the biological component)
	Very high	Actions that significantly contribute to the improvement of the state of conservation (moving to a higher state of conservation). If there are no thresholds, the improvement of the conditions of the biological component by more than 20% compared to the initial state.

The interventions proposed within the project involve activities that can generate changes with a significant negative impact on the biodiversity components. The previously presented magnitude thresholds are used to evaluate the significance of the impact at the project level.

7.6.2 Conclusions of the Appropriate assessment report

This document represents the Appropriate assessment report regarding the potential effects that the implementation of the project "Suceava - DN2H Highway and DN2H Expressway - Siret border" can generate on the protected natural areas of community interest in its area. The study was elaborated in order to obtain the Environmental Agreement for the investment.

The appropriate assessment report was elaborated according to the requirements of the Methodological Guide regarding the appropriate assessment of the potential effects of plans or projects on natural areas protected by community interest (Order no. 262/2020 amended by Order no. 1682/2023) and in accordance with the provisions of art. 28 of the Government Emergency Ordinance no. 57/ 2007 regarding the regime of natural protected areas, conservation of natural habitats, flora and fauna, approved by Law no. 49/ 2011, with subsequent amendments and additions.

From an administrative point of view, the route of this highway is located in Suceava county.

Suceava - DN2H Highway and DN2H Expressway - Siret border have a length of 56 km. This is part of the Paşcani - Suceava - Siret road project. The highway will be part of the Bucharest - Ukraine corridor, which will ensure a fast connection between the south of the country via the A7 highway to the north in the Moldoveni region and to the neighboring country in north, Ukraine.

Suceava - DN2H Highway and DN2H Expressway - Siret border Siret do not cross any Natura 2000 site, but are adjacent to 4 Natura 2000 sites that have the potential to be influenced by its construction: ROSCI0075 Pădurea Pătrăuți, ROSAC0391 Siretul Mijlociu – Bucecea, ROSPA0110 Accumulations Rogojesti – Bucecea, ROSCI0380 Suceava Liteni River.

These sites were analyzed in the present study, from the point of view of the impact of the project on their integrity.

The project intersects areas of ecological corridors for deer and wolves in the kilometer interval km 2+000 – km 22+000. Apart from this area, the water bodies intersected by the project also represent corridor areas for ichthyofauna and for semi-aquatic mammals (mainly otter).

The assessment of the impact of the project on the potentially affected Natura 2000 sites was carried out on the basis of the Specific Conservation Objectives established by ANANP in 2022 for all sites considered in the assessment. The assessment took into account the potential cumulative impact with other large infrastructure projects proposed in the area (DX5B Suceava – Botoşani, Paşcani – Suceava highway, CF modernization: Ilva Mica – Suceava, CF modernization: Paşcani – Dărmăneşti, DX5B Suceava – Botoşani, CF Paşcani - Darmanesti, CF electrification: Darmanesti – Vicşani, etc.).

Following the evaluation, it was concluded that the Suceava DN2H Highway and the Siret border DN2H expressway (in some cases cumulatively with the other projects included in the analysis) are able to generate significant impacts and affect the integrity of the Natura 2000 sites ROSCI0075, ROSCI0380, ROSPA0110 .

Considering the fact that the project does not intersect Natura 2000 sites, it will not lead to losses of the surface of the habitats of community interest within the sites or of the favorable habitats of the species of community interest in the sites. A potential risk of altering aquatic habitats may occur in the event of accidental pollution, but the impact was considered insignificant, taking into account its accidental nature and the large distance between the intersection of the project with the river and the Natura 2000 site area.

From the point of view of habitat fragmentation, the main impacts are related to the interruption of some ecological corridor areas by the highway. These were addressed by improving the permeability of the highway, resulting in a project that ensures, in the current configuration, the permeability necessary for the movement of fauna.

A potential disturbance to the activity of bird species may occur in the adjacent area between the project and ROSPA0110, as a result of the increase in the noise level during the construction period and during the operation period. In order to reduce this potential impact, the implementation of sound-absorbing panels was proposed, which will also have a role in reducing the noise level in the area of the localities in the vicinity of the highway and reducing the risk of collision of flying fauna species (invertebrates, bats, birds).

The most important potential form of impact associated with the project is represented by the reduction of fauna populations, which may occur during the construction and operation phases, as a result of the works, the collision with construction site traffic or car traffic. This form of impact can mainly affect mammal species in Natura 2000 sites (including remote sites) and birds. The reduction of population numbers is able to have a significant level on the populations of fauna species and affect the parameters related to the population size of the specific conservation objectives established for the species.

The measures proposed in this study to avoid and reduce the impact cover all the identified forms of impact.

Among the most important measures proposed are a series of sound-absorbing and anti-collision panels, proposed along the highway, in sensitive areas from the point of view of fauna, such as areas adjacent to SPAs or areas where it is possible for fauna species to move for feeding . The sound-absorbing panels have the role of reducing the noise level in these sensitive areas for fauna, and the anti-collision panels will reduce the level of impact caused by the collision of birds and chiroptera with road traffic, during the operation period of the project. Measures were also proposed to avoid some traps during the construction of the highway and expressway and to enclose it with an additional small fence, for small fauna.

The measures to avoid and reduce the impact have been dimensioned in such a way as to ensure either avoiding the occurrence of impacts or reducing them to an insignificant level. It is estimated that the residual impact will be insignificant for all habitats and species in the analyzed sites. This also assumes that the implementation of the measures will ensure the avoidance of affecting the integrity of the Natura 2000 sites.

The Appropriate assessment report identified the need to implement some measures that can ensure the maintenance of an insignificant residual impact. To validate the effectiveness of the avoidance and reduction measures, a monitoring program was proposed that includes provisions for both the construction period and the operation period. The implementation of the monitoring program is essential to be able to ensure the correct implementation and functionality of the measures to avoid and reduce the impact.

7.6.3 The predicted impact

The evaluation of the impact on the Biodiversity components was carried out separately for the three phases of the project: Construction, Operation and Decommissioning. The detailed assessment of the impact on habitats and species of community interest is carried out in the Appropriate Assessment Report.

The most sensitive areas, in general, are represented by natural protected areas and ecological corridors and areas where species have low population numbers. In the case of this project, the proposed route does not cross such areas. However, the project can generate an impact on biodiversity, which is presented below.

7.6.3.1 Construction phase

The interventions for the realization of the project during the construction period (I.E1 – I.E.9) generate the following forms of impact at the level of biodiversity components:

- losses and alterations from the surface of some habitats;
- disrupting the activity of some species of fauna;
- possible reductions in the population of fauna species.

Losses from the surface of some habitats are produced in the places where the project foresees permanent works, being represented by any terrestrial or aquatic surface on which the initial habitats can no longer be resettled, and their surface can no longer be used by the characteristic species of fauna or flora in order to ensure the conditions of existence, reproduction, feeding and shelter. Considering the fact that the analyzed project is a completely new project, it will generate habitat loss along the entire route, but it will not lead to a significant impact from this point of view, since most of the areas that will be occupied by the project are represented by areas with agricultural land or areas that are not important from a conservation point of view. The project involves the loss of some favorable habitats for fauna species (feeding, breeding, resting habitats), being especially important for bird species. This type of impact manifests itself in the long term through the definitive occupation of some land surfaces, through works for the organization of the construction site (I.E.1), relocation of utility networks or roads (I.E.2, I.E.3), earthworks (I.E.4), art works (I.E.5), consolidation works (I.E.6), hydrological works (I.E.7), highway worksand on the expressway (I.E.8), but it can be reversible following a stage of decommissioning of the built objectives and the ecological reconstruction of the affected surfaces. Habitat losses outside Natura 2000 sites are considered to have an insignificant level, considering the type of habitat occupied by the project (predominantly agricultural). The current project does not cross Natura 2000 sites or other types of natural protected areas, so there is no impact caused by the loss of habitats within Natura 2000 sites.

Alteration of habitats occurs as a result of physical, chemical and biological changes produced at the level of terrestrial and aquatic habitats, and includes those structural and functional changes that, by duration, frequency and intensity, can lead to the degradation and/or decrease of the supporting capacity of the habitats. Over time, altered habitats can lead to the loss of favorable habitats for species of community or national interest.

Alteration of habitats during the construction stage of the analyzed project can come from accidental pollution, due to leaks of oils or dangerous substances from the machines used in the execution of the works, but also through the penetration, in various ways (by anemochorous or hydrochorous way), of species of invasive plants in habitats, competing with native species.

The risk of alteration of aquatic habitats during the construction stage may occur mainly in areas where the project intersects water bodies / streams, but also in areas where the project involves works in or near rivers. The hydrotechnical works proposed in the project will not be carried out in areas of crucial importance for fish species and are not able to lead to significant alteration of aquatic habitats. Any potential alteration of aquatic habitats can occur strictly accidentally, having a temporary character and being considered insignificant.

From the point of view of **habitat fragmentation**, according to the results of the CoreHABS project, the present project does not intersect ecological corridors of fauna species. During the execution period, barriers (physical or behavioral) will be determined by construction works, human presence and related activities (site traffic, machinery operation, etc.). At this stage, a reduced level of fragmentation due to behavioral barriers is estimated, mainly taking into account the fact that the construction works will not take place simultaneously along the entire length of the highway and the expressway, but in work fronts and the fact that, in general, for the project existing roads will be used.

Disturbance of species activity in the construction stage it is mainly caused by the noise and vibrations generated during the works (machinery activity, handling of materials, etc.). It also contributes to this form of impact artificial lighting and human presence.

Reduction of the population sizes may appear during the construction period as a result of the removal of some individuals from the area where construction will be carried out. A significant potential impact can occur as a result of the construction works in the case of plant species, on the route proposed for the project, the presence of a rare plant - *Neottia nidus-avis* - has been identified, in the kilometer interval km 1+300 – km 3+750.

The project may also generate accidental casualties as a result of the construction works. Victims may result from the destruction of nests/shelters, the injury of fauna, the crushing of bridges, the accidental pollution of the water of the rivers crossed by the project or the involuntary creation of traps for small fauna. The impact generated by the reduction of population numbers can be significant for some species of fauna.

In sectors with moderate sensitivity, during the construction stage, the impact generated by the project on biodiversity components is estimated to be significant in the case of species, as a result of the existence of a mortality risk. The magnitude of the works in the area occupied by the project is estimated to be very high negative.

In the sectors with low sensitivity, during the construction stage, the impact generated by the project on the biodiversity components is estimated to be insignificant. The magnitude of the works in the area occupied by the project is estimated to be very negative. Low sensitivity was considered mainly in the areas with agricultural lands, outside the protected areas, where no species of community interest were identified in the project area, anthropized areas, mainly the agricultural crops crossed by the project and roadside vegetation, according to the classes CLCs that correspond to these characteristics.

In the sectors with very low sensitivity, during the construction stage, the impact generated by the project on the biodiversity components is insignificant. The very low sensitivity from the point of view of biodiversity was considered mainly in the inner city of the localities intersected by the project, which are heavily anthropized areas, according to the CLC classes that correspond to these characteristics.

Table no.7-27 The areas of manifestation of the significant impact on biodiversity during the construction phase

Areas of manifestation of the impact		Interventions	Sensitive receptors	Sensitivity	Extension	Duration	Frequency	Probability	Reversibility	Magnitude
From km	At km									
km 1+300	km 3+750	IE4, IE5, IE6., IE7	*Neottia nidus-avis*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 1+225	km 4+375	IE9	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 1+225	km 4+375	IE4, IE5, IE6., IE7	*Capreolus capreolus, Sus scrofa, Vulpes vulpes*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 20+250	km 20+375	IE9	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 53+525	km 54+025	IE9	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 53+525	km 54+025	IE4, IE5, IE6., IE7	*Castor fiber*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative

7.6.3.2 Operation stage

The operation stage will not lead to additional losses of some areas of habitat or favorable habitat of fauna species.

Alteration of habitatsfavorable conditions for animal species (Natura 2000 species analyzed in the Report: birds, bats, *Spermophilus citellus, Lutra Lutra, Cricetus cricetus*) during the operating period may be possible, considering that there is a risk of the spread of some invasive plant species following the circulation on roadway and the execution of maintenance works. There is a risk of them spreading over the entire highway route. Roadsides are known to be dispersal corridors for invasive plant species (e.g. Brothers 1992; Matlack 2002; Dark 2004; Essl 2005, cited in Christen, & Matlack, 2009[14]). Spreading is possible through 2 mechanisms:

- First, populations can expand by a simple diffuse process through random dispersal in all directions (Andow et al. 1990). The expansion is channeled along the road axis, through the linear structure of roadside habitats. Some indirect evidence suggests that sometimes native plant populations expand along linear structures such as hedgerows or connected habitat patches (Corbit et al. 1999; Verheyen et al. 2003; Kirchner et al. 2003; Matlack 2005 cited in Christen, & Matlack, 2009) thus considering that this expansion/spread is also possible in the case of alien invasive plant species.
- The second mechanism is that dispersion can be facilitated along the way by non-random spread. Seeds can be dispersed by animals or vehicles traveling on the road (Schmidt, 1989; Tewksbury et al. 2002; Haddad et al. 2003, cited in Christen, & Matlack, 2009), or they can be carried by wind along a road lined with trees. Wind-dispersed seeds can be carried by air currents behind cars, as is the case of trains (Kent 1960; Mack 1986 cited in Christen, & Matlack, 2009).

The risk of dispersion of invasive plant species can generate a significant impact, especially in areas with moderate sensitivity, during the operation phase.

From the point of view of habitat fragmentation, the project will not cross ecological corridors. However, it is expected that the forest area north of Suceava will be fragmented following the construction of the Suceava – DN2H highway. The potential impact in this case can be significant.

Disturbance of species activity in the operating stage it can be generated by two main causes: noise associated with car traffic and artificial lighting. In general, open areas allow greater spatial dispersion of noise compared to forested areas (Lucas et. al, 2017). According to the modeling of the noise level generated during the operation period, it is expected that a large area of the areas considered to have a moderate sensitivity will be affected by increases in the noise level. In this case, it can be considered that there is a risk of a significant impact.

Mortality risk during the operating period it is almost exclusively due to accidental causes. Mortality is at this stage primarily associated with car traffic. The area of production of victims is represented by the highway and expressway. The main causes that can lead to the appearance of victims among fauna species are:

- Hitting by motor vehicles of individuals of fauna that can reach the roadway area, on the expressway or on adjacent roads. In the case of small fauna (eg: reptiles, micromammals, etc.), the risk zone is mainly represented by the surface of the road lanes where the wheels of vehicles pass. In the case of invertebrates, birds and mammals, the risk zone can be represented by the entire surface of moving vehicles;
- The appearance of "traps" at the level of the road (including its associated infrastructure, such as bridges and footbridges), in which animals, as a result of containment, may die due to dehydration, cold or lack of food;

[14] Christen, DC, & Matlack, GR (2009). The habitat and conduit functions of roads in the spread of three invasive plant species. Biological invasions, 11, 453-465

- Accidents on the road, where oils and fuels can leak into waters of bodies crossed by the road. This is mainly associated with fish species, but also with other species of aquatic fauna.

Secondary, the mortality of some specimens of fauna can also occur in the following situations:

- During road maintenance works, as a result of the collision or as a result of accidental discharges of pollutants;
- Modification of fish habitat conditions as a result of accidental spills in watercourses.

All species of terrestrial fauna are exposed to the risk of collision, but not in the case of all, the occurrence of victims could have an impact at the population level.

For terrestrial invertebrate species, an insignificant impact may occur, mainly due to the risk of collision. For example, during the operation period of the project, for the invertebrate species *Lucanus cervus* and *Carabus variolosus*, which are included in Annex II of the Habitats Directive, there will be an impact on them but it will be insignificant considering the distance of the specific habitats from the project and their reduced mobility.

In the case of herpetofauna there may be a risk of mortality especially in areas close to aquatic habitats, either lotic or lentic.

A high risk of mortality is also reported for mammal species, mainly in the areas in the immediate vicinity of the site with Natura 2000 sites. The structures with the highest level of risk in terms of the risk of collision are the road junctions, through which fauna wild animals can enter the site., but the risk of mortality exists on the entire site. For example, for the otter - *Lutra lutra*, the operating period presents a risk of collision of individuals with car traffic, but the impact is considered to be insignificant, because the Suceava River, the river with the largest area in the site and where there is specific habitat for the species, is not intersected by the project. The only river inside the site that is crossed by the project is the river Podul Vătafului, but this river is only in the lower part inside the site, respectively at the discharge into the river Suceava. The project also intersects the Dragomirna and Mitoc rivers, but they are not inside the site, but individuals of the species can use these rivers for movement, because the Dragomirna river flows into the Mitoc river, which in turn flows into the Suceava river, so it has connectivity with the river from the Natura 2000 site.

A high risk of mortality is reported for chiropteran species. Even if the road does not cross the site or the habitat of the chiropteran species *Myotis myotis, Myotis dasycneme, Barbastella barbastellu*s, present inside the site ROSCI0075, but there is a risk of the species colliding with car traffic, especially during the operating period, considering the fact that the species travel long distances of over 10 km, resulting in a significant impact.

For the bird species *Alcedo atthis, Ardea purpurea, Aythya nyroca, Gavia stellata,*during the operation there is a significant impact on the species due to the collision with car traffic due primarily to the reduced number of individuals in the site but also to their conservation status, being included in Annex I of the Birds Directive.

The following table shows the areas with significant impact in the operation stage.

Table no.7-28 The areas of manifestation of the significant impact on biodiversity in the operational phase

Areas of manifestation of the impact		Interventions	Sensitive receptors	Sensitivity	Extension	Duration	Frequency	Probability	Reversibility	Magnitude
From km	At km									
km 1+225	km 4+375	IO1, IO3	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 1+225	km 4+375	IO1	*Capreolus capreolus, Sus scrofa, Vulpes vulpes*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 1+225	km 4+375	IO1	*Capreolus capreolus, Sus scrofa, Vulpes vulpes* Invertebrate species, herpetofauna species, bat species	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 20+250	km 20+375	IO1, IO3	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 20+250	km 20+375	IO1	*Capreolus capreolus, Sus scrofa, Vulpes vulpes* Invertebrate species, herpetofauna species, bat species	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 53+525	km 54+025	IO1, IO3,	*Favorable habitats of fauna species*	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative
km 53+525	km 54+025	IO1	*Capreolus capreolus, Sus scrofa, Vulpes vulpes* Invertebrate species, herpetofauna species, bat species, bird species	Moderate	Local	Long term	Permanent	Very likely	Irreversible	Very high negative

7.6.3.3 Decommissioning stage

The decommissioning stage can lead to the appearance of effects similar to those analyzed for the execution stage. The differences from the execution stage are as follows:

- From the point of view of the loss of habitats, the decommissioning works will allow the surface of the highway and the expressway to be returned to the natural circuit. Conventionally, we can consider that the surface of the watershed could constitute an area of expansion of natural habitats;
- However, the elimination of constructions will lead to a very large area on which soil and vegetation rehabilitation works will be necessary, as well as invasive species control;
- The decommissioning process will generate significant amounts of waste for which temporary/permanent storage solutions will have to be identified.

The alteration of habitats can reach a significant level following the decommissioning of the highway and in the absence of an ecological reconstruction program of the surface occupied by the highway embankment.

From the point of view of habitat fragmentation, the decommissioning of the highway will lead to the elimination of the main behavioral barrier: car traffic. Removal of the highway embankment would allow the restoration of a high degree of permeability for all species of fauna.

Decommissioning works may cause a low level of wildlife disturbance, which will most likely be felt by bird and mammal species. The effects are similar to those in the execution stage. In the post-decommissioning phase, any disturbance effect generated by the highway on wildlife will cease.

In the unlikely event of the implementation of a highway and expressway decommissioning project, it should be considered that the risk of mortality during decommissioning works is relatively similar to that previously described for construction/rehabilitation works.

The post-decommissioning period would imply a return to the situation: without car traffic on the highway, but with increasing road traffic on the other roads and without the implementation of measures to avoid/reduce collisions at the level of road arteries. It should be cautiously considered that such a scenario is unfavorable from the point of view of collision rates and therefore of the impact on the population of the species of community interest.

7.6.4 Measures to avoid and reduce the impact

To reduce the level of potential impact on biodiversity, the following measures are proposed:

Execution phase

- General measures:
  - The hydrotechnical works will be carried out in compliance with the provisions of the Technical Regulations for hydrotechnical works NTLH-001 "Criteria and principles for the evaluation and selection of technical solutions for the design and realization of hydrotechnical works for the development/redevelopment of watercourses, in order to achieve the environmental objectives in the field waters" approved by Order no. 1215/2008.;

- For the execution of the project, an Environmental Management Plan (EMP) is being elabortaed which will detail the implementation methods of all the measures to avoid and reduce the impact (along with other requirements) provided in the Adequate Assessment Study, the Report on the Impact on the Environment, the Study of Impact Assessment on Water Bodies, Environmental Agreement and Water Management Approval. The PMM is elaborated after the issuance of the Environmental Agreement and is revised as follows:

  1. Before starting construction works;
  2. Every 6 months during the construction works;
  3. Before putting the highway into operation;
  4. To any modification of the project related to the constructive solutions or measures to avoid and reduce the impact, as well as to the revision of regulatory acts;
  5. When decommissioning the highway;

- Carrying out periodic training for all personnel involved in the construction / decommissioning works, regarding general environmental issues, habitats and protected species and measures to avoid and reduce impacts. Greater attention will be paid to aspects related to the prohibition of the collection of plants and animals or the deliberate injury/killing of protected species;

⚙ Measures for **habitat loss:**

- Construction activities will be strictly limited to the project limit included in the Environmental Agreement. During the execution stage, additional surfaces will not be occupied to this limit, especially in natural areas, meadows, pastures or forests.

- The works of crossing the water bodies will be carried out with minimum damage to the riparian vegetation on the banks of the rivers and canals crossed by the highway, exclusively inside the expropriation corridor.

- The cleaning works of the agricultural areas inside the expropriation limit of the project must be carried out between August and February, outside the nesting period of species dependent on open or semi-open habitats.

⚙ Measures for **habitat alteration:**

- In the case of equipment and personnel that were involved in areas where the presence of invasive non-native species was indicated, the equipment of the work personnel (shoes) and the equipment will be passed through a cleaning ramp where all traces of soil and debris will be removed vegetables.

  The resulting waters will be collected in sealed containers and transported to decontamination areas. They will not be discharged into surface water courses.

- Before the start of the works, as well as throughout the execution period of the construction works, an expert botanist will be present to inspect and identify the presence of non-native invasive species. In order to reduce the risks of dissemination, mechanical removal actions of the identified species will be provided. Plant remains will be transported outside the protected areas, to be destroyed without risks for the propagation of the species (e.g. by incineration). Chemical control of invasive species is prohibited.

- It is forbidden to cross the riverbed with machines, in this sense it is necessary to provide temporary bridges. When carrying out the works in the river bed necessary for the construction of bridges and viaducts, the protection of the working front with guardrails will be carried out and the handling of the machinery on the banks will be ensured. All temporary works are carried out avoiding the interruption of the longitudinal connectivity of the watercourses, as well as respecting the other measures provided for in the present study.
- In order to limit the risk of water contamination of the rivers crossed by the highway and the expressway, before the start of construction and during construction and operation, a Prevention and Intervention Plan in case of accidental pollution will be developed, revised, and implemented, with clear provisions regarding to the management of rainwater (including runoff) and the maintenance of hydrocarbon separators. Both turbidity and river water quality parameters will have to be monitored at the beginning of the operating period (preferably at least 3 years).
- All areas affected during construction under structures (bridges and viaducts) will be rehabilitated. The rehabilitation works will also include the installation of vegetation cordons (native shrubs of various sizes, possibly trees whose height does not affect the built structures) that will guide the movement of as many species of fauna as possible under the structures, including some species of birds and bats. Native plant species will also be used for the arrangement of the highway and expressway facilities.

Measures for **habitat fragmentation:**

- For the species of small and medium mammals, it is proposed to make some underpasses in the right of km 11+150 and km 50+930. Small underpasses for fauna must be equipped with a mixed substrate consisting of stones, tree bark, sand and logs. It is recommended that for all these sub-crossings there is also a suspended step (a shelf) for small arboreal mammals to use. In order to guide individuals in the use of underpasses, it is necessary to implement in the entrance and exit areas some guide elements to the underpasses, made of native trees and shrubs, characteristic of the highway area.
- In order to improve the permeability of the highway an expressway, it is proposed to create an overpass for fauna at km 3+450. The overpass should have a minimum width (opening) of 80 meters, with a maximum slope of 15%. The entrance and exit areas from the overpass must be kept free of any constructions and revegetated with native plant species, similar to those existing in the implementation area. The edges of the overpass must be provided with sound-absorbing panels, in order to maintain their functionality.
- For the entire construction period of the project, areas of the construction site will be established by PMM to be maintained as corridor areas, to allow the movement of fauna between the areas of favorable habitat located east and west of the highway;

Measures - **disrupting the activity of the species:**

- Avoiding the handling of vehicles and machinery in the area of work lanes at night in the highway sector between km 8+000 and km 12+000, so that the activity of crepuscular and nocturnal species (bats) is minimally affected;
- Both in the construction phase and in the operational phase, it is necessary, for all project components, to implement one or more of the following solutions:

  1. Reduction of over-illumination (too strong lights);

  2. Orientation and screening of light sources (maintaining the light within the limits of the property or the area designated for lighting);

  3. Avoiding excessive grouping of light (lighting only the areas where it is really necessary);

  4. Reduction of lighting duration (use of timers, motion sensors, adaptive lighting that dims or turns off the lights when they are no longer needed, etc.);

  Provision of lighting sources with warm light, without blue color (color temperature not to exceed 3000 Kelvin). These lighting systems have a low degree of attractiveness for flying invertebrates (having consequently effects on chiropterans and avifauna) and should ensure the direction of light exclusively to the activity areas of the highway and the limitation of light dispersion in natural habitats.

  - For construction activities, mobile sound-absorbing panels are installed and maintained near the work fronts. The panels must have a height of at least 3 m, a noise reduction efficiency of at least 10 dB(A) and be mounted as close as possible to the noise sources. The effectiveness of the panels will be assessed through noise measurements.
  - The installation of permanent sound-absorbing panels with a height of 3 m is necessary in the following locations along the highway and the expressway, for the protection of Natura 2000 sites:

    - km 0+675 - 1+400 on the left side
    - km 0+975 - 1+600 on the right side
    - km 3+475 - 3+650 on the left side
    - km 3+475 + 3+650 on the right side
    - km 3+850 - 4+750 on the left side
    - km 3+850 - 3+950 on the right side
    - km 3+950 - 4+575 on the right side
    - km 5+450 - 6+075 on the right side
    - km 5+425 - 7+325 on the left side
    - km 7+050 - 8+025 on the right side
    - km 7+325 - 7+550 on the left side
    - km 7+550 - 8+250 on the left side
    - km 9+025 - 9+825 on the left side
    - km 11+725 - 12+375 on the right side
    - km 12+850 - 13+875 on the right side
    - km 14+075 - 15+000 on the right side
    - km 15+000 - 17+175 on the right side

- km 17+800 - 18+700 on the right side
– km 21+450 - 23+600 on the right side
- km 20+850 - 20+200 on the right side (SS type S1)
- km 24+175 -24+975 on the right side
- km 24+975 -26+350 on the left side
- km 26+425 - 27+900 on the right side
- km 26+350 - 27+450 on the left side
- km 30+800 - 31+350 on the left side
- km 38+625 - 39+075 on the left side
- km 38+625 - 39+075 on the right side
- km 39+575 - 40+075 on the left side
- km 39+575 - 40+075 on the right side
- km 40+625 - 40+975 on the left side
- km 43+050 - 43+275 on the right side
- km 43+550 - 44+075 on the left side
- km 49+900 - 50+125 on the right side
- km 49+900 - 50+125 on the left side
- km 54+975 - 55+425 on the right side
- km 55+450 - 55+700 on the right side

- Measures - **reducing effective population size**
- Before starting the construction works, a specific inventory will be made to analyze the presence of the *Neottia nidus-avis* species within the project boundary. The individuals identified in the expropriation corridor will be moved to an area that fits the characteristics of favorable habitats for this species. The inventory will be carried out by accredited experts. The relocation activities will be carried out in accordance with the requirements of the legislation in force.
- Before the start of the construction works, an updated inventory of the fauna species of community interest and of the bird species inside and in the vicinity of the project area (20 m left - right of the project boundary) will be made. The inventory will represent the reference situation to which the results of the monitoring program during construction and operation will be reported. Any additional information provided by the inventory will be reflected in the PMM from the point of view of the applicability of measures to avoid and reduce impacts.
- The opening of any work front front must be done after previously accredited persons for biodiversity monitoring have assessed the presence of species of community interest in the area to be affected and can guarantee that all measures have been taken to avoid/reduce the impact on these species, including operations of relocation, where applicable, in compliance with the legal requirements in force.
- The work fronts will be periodically checked by accredited biodiversity monitoring persons to ensure that all measures have been taken to avoid the establishment of fauna species in temporarily inactive areas where the resumption of work could lead to the destruction of nests

and shelters and/or the emergence of victims. Solutions to avoid the establishment of species can consist of: the installation of nets/tarpaulins, temporary fences, etc.

- In order to avoid the penetration of the *Lutra lutra* species, but also of other species in the area where the works are carried out and implicitly the site traffic, the work fronts will be surrounded by a temporary fence, for the duration of the construction works. The fencing system must not fragment the habitats of the species, in this sense it must be taken into account that the fences do not block the wetlands, and in the areas with intense activity for these species, small under-crossings of the technological/access roads can be provided.
- Avoiding the handling of vehicles and machinery in the area of work lanes at night in the highway sector between km 8+000 and km 12+000, so that the activity of crepuscular and nocturnal species (bats) is minimally affected.
- In order to avoid the destruction of birds' nests, the opening of the work fronts (cleaning the vegetation / uncovering the soil) on the surfaces within the expropriation limit will not be carried out between March and July;
- During the construction period, it will be avoided to keep open any pools, trenches, excavations for foundations, etc., in which specimens of fauna can remain captive. These potential traps must be inventoried and inspected periodically to avoid the production of victims. The areas where work will be carried out will be fenced off with temporary fences to prevent individuals from entering these areas.
- In order to avoid the penetration of amphibians and reptiles into the decanters or separators of petroleum products, solutions (ex: gratings) will be implemented in the connection areas between the rainwater ditches and the pre-treatment installations.
- In order to reduce the risk of collision of avifauna species, mammals (especially bat species), with car traffic on the highway, it is necessary to place some anti-collision panels. The anti-collision panels will be implemented in the areas frequently used by the species for movement, between the following kilometer intervals:

  - km 1+400 - km 1+550 on the left side
  - km 6+075 - km 7+050 on the right side
  - km 11+100 - km 11+700 on the left side
  - km 14+075 - km 17+550 on the left side
  - km 22+125 - km 23+625 on the left side
  - km 24+075 - km 24+975 on the left side
  - km 25+000 - km 25+900 on the right side
  - km 28+500 - km 28+700 on the left side
  - km 28+500 - km 28+700 on the right side
  - km 29+000 - km 29+875 on the right side
  - km 29+000 - km 29+875 on the left side
  - km 30+900 -km 31+050 on the right side
  - km 32+450 - km 32+700 on the left side
  - km 32+450 - km 32+700 on the right side

- km 33+425 - km 33+625 on the left side
- km 33+425 - km 33+625 on the right side
- km 34+950 - km 35+300 on the left side
- km 34+900 - km 35+300 on the right side
- km 35+875 - km 36+175 on the left side
- km 35+875 - km 36+175 on the right side
- km 42+000 - km 42+225 on the left side
- km 42+000 - km 42+225 on the right side

- In addition to the highway fence, it is necessary to install a mesh fence with very small meshes and the upper part bent outwards, which prevents amphibians and reptiles from entering the roadway area. The fence will have a minimum height of 60 cm and will have the secondary role of guiding small fauna towards underpasses (including bridges and viaducts). The fence for amphibians and reptiles is installed along the entire length of the highway fence, glued to it.

  The role of this additional fence is to avoid accidental victims (amphibians, reptiles, small mammals) on the highway road. Their appearance could attract species of birds of prey to areas at risk of collision with car traffic.

- In order to reduce the risk of wildlife entering the freeway area through road junctions, animal fences will be installed (at the level of the roadway) on their shoulders. Depending on the position of the installation, the width of the grating must be established in such a way as not to allow animals (e.g. red deer, roe deer, otter) to jump over the structure.

- The retention basins will be surrounded by a fence of at least 80 cm high, with thick mesh and with the upper part bent outward. This will have a role in preventing the entry of fauna individuals into these basins and the occurrence of accidental victims.

- All the storm drains of the highway are made with an angle of 90° towards the roadway and a height of this slope of at least 40 cm, so as to prevent the access of amphibians and reptiles to the roadway area as well as to ensure their guidance to the underpasses, and with an angle on the side opposite the roadway to allow the exit of individuals from inside the storm drains in the direction opposite the road.

- During the construction works, the speed of movement of machinery in the site area will be limited to a maximum of 30 km/h, to avoid the occurrence of accidental victims

Operational phase

⚙ Measures for **habitat loss:**

- For the operation stage of the project, a fire prevention plan will be provided and operationalized. CIC will be equipped with necessary materials and technologies for fire management and ensuring the maintenance of road traffic safety on the highway. The purpose of the measure is to avoid the occurrence of additional victims as a result of fires on the highway and expressway.

⚙ Measures for **habitat alteration:**

- During the operating period, an invasive species control program will be implemented, which will include activities to identify the presence of non-native invasive plant species along the entire length of the highway and expressway and in the areas adjacent to it (CIC, service areas, road junctions, etc. .). The program will also contain specific procedures for the elimination of invasive species by means that do not present risks of contaminating water and soil, affecting the existing natural vegetation or favoring the expansion of invasive species. The measure will correlate with the activities that must be implemented by CNAIR according to the requirements of Law 62/2018 regarding the combating of ragweed.
- In order to limit the risk of water contamination of the rivers crossed by the highway and the expressway, before the start of construction and during construction and operation, a Prevention and Intervention Plan in case of accidental pollution will be developed, revised, and implemented, with clear provisions regarding to the management of rainwater (including runoff) and the maintenance of hydrocarbon separators. Both turbidity and river water quality parameters will have to be monitored at the beginning of the operating period (preferably at least 3 years).

⚙ Measures - **disruptting the activity of the species:**

- Both in the construction stage and in the operation stage, it is necessary, for all project components, to implement one or more of the following solutions:

  1. Reduction of over-illumination (too strong lights);

  2. Orientation and screening of light sources (maintaining the light within the limits of the property or the area designated for lighting);

  3. Avoiding excessive grouping of light (lighting only the areas where it is really necessary);

  4. Reduction of lighting duration (use of timers, motion sensors, adaptive lighting that dims or turns off the lights when they are no longer needed, etc.);

  Provision of lighting sources with warm light, without blue color (color temperature not to exceed 3000 Kelvin). These lighting systems have a low degree of attractiveness for flying invertebrates (having consequently effects on chiropterans and avifauna) and should ensure the direction of light exclusively to the activity areas of the highway and the limitation of light dispersion in natural habitats.

- Measures - **reducing effective population size**
- A system for the identification and collection of potential animal victims on the highway must be implemented in the vicinity of the ROSPA0110 site, in the interval km 49+900 - km-55+700. The role of this system is to reduce the risk of collision for birds that could be attracted by the existence of carcasses to risk areas;

- During the operation stage, in the event of an accidental victim on National Road 2H, between the DN2H connection and the highway and the town of Rădăuţi, warning signs will be installed and speed restrictions will be provided (maximum 60 km/h). The area presents a risk of accidents as a result of the collision with wild fauna, the present measure having the role of reducing this risk as much as possible.

7.7 The landscape

7.7.1 Sensitivity classes and magnitude classes for assessing the impact on the landscape

The assessment of the significance of the impact was based on two criteria: the sensitivity of the study area and the magnitude of the changes proposed through the implementation of the project.

7.7.1.1 Sensitivity classes

The areas susceptible to impact from the landscape point of view were delimited in 5 classes of sensitivity, presented in the following table. Areas with very valuable landscape characteristics from the point of view of natural elements were considered with the maximum degree of sensitivity ("very high") and with the minimum degree of sensitivity ("very low") heavily anthropized and damaged areas, without frequent access of the human population.

Table no.7-29 Sensitivity assessment matrix for the Landscape component

The sensitivity of the area	Description
Very high	**Features of the landscape:** Areas of landscape importance designated at international level (UNESCO heritage, natural sites of universal heritage); Landscape areas in an excellent state of conservation (traditional landscapes) with a high level of aesthetic and cultural value; Areas that present exceptional characteristics from an aesthetic and perceptual point of view (high level of wilderness, high degree of "naturalness", silence, isolation, lack of man-made elements); **Visual receptors:** Homes and accommodation spaces positioned so as to benefit from visibility to the landscape with great sensitivity.
High	**Features of the landscape:** Areas appreciated or designated for the importance of the landscape at national level Areas with a high degree of naturalness and/or dominated by landscape elements with traditional characteristics, which preserve the distinctive character of an area from a historical and cultural point of view, characterized by the absence of modern man-made structures. **Visual receptors:** Residents of the area; Users of outdoor recreation facilities where the value of the landscape is important or integrated into that activity (e.g. users of trails designed to allow landscape sightseeing); Landscapes that the communities in the area can see, being highly appreciated

The sensitivity of the area	Description
Moderate	**Features of the landscape:** Landscape with few intact or distinctive natural or historical features, but which is valued by the local community; Anthropogenic landscape dominated by large, numerous and/or noisy constructions/structures; Natural landscape degraded or modified as a result of the agricultural use of the land - arable or pasture; **Visual receptors:** People at work, industrial facilities.
Low	**Features of the landscape:** Landscape with few intact or distinctive natural or historical features, but which is valued by the local community; Anthropogenic landscape dominated by large, numerous and/or noisy constructions/structures; Natural landscape degraded or modified as a result of the agricultural use of the land - arable or grazing. **Visual receptors:** People at work, industrial facilities.
Very low/ Insensitive	**Features of the landscape:** Landscape dominated by abandoned/degraded built elements that are not considered valuable by the local community; **Visual receptors:** With visual access or with limited visual access

On the entire project area, a low sensitivity is appreciated, as no valuable elements from the point of view of the landscape or important touristic objectives have been identified.

7.7.1.2 Magnitude classes

The second criterion for evaluating the significance of the impact, the magnitude of the changes, is presented for the Landscape component in the following table. The matrix for assessing the magnitude of the changes is structured in five classes, both for changes of a negative nature and for positive changes, depending on the extent of the changes and their temporality.

Table no.7-30 Magnitude assessment matrix for the Landscape component

The magnitude of the change		Description
Negative	Very high	The investment will dominate the landscape or generate significant changes in the quality or character of the landscape. Definitive changes on an extended area and/or the introduction of elements that will fundamentally change the character of the landscape. Temporary changes where restoring the landscape to its original state could take more than 10 years.
	High	The investment will generate an obvious change in the current landscape and/or will cause obvious changes in the quality and/or character of the landscape. Definitive changes over an extended area and/or new developments that will generate significant negative changes to the character of the existing landscape. Temporary changes where restoring the landscape to its original state could take 5-10 years.
	Moderate	The investment will generate visible changes in the current landscape and/or will cause visible changes in the quality and/or character of the landscape.

The magnitude of the change		**Description**
		Definitive changes to the landscape in a certain area. The new elements may be prominent, but not significantly unusual. Temporary changes where restoring the landscape to its original state could take 2-5 years.
	Low	The investment will generate minor changes to the landscape without affecting its general quality. Minor definitive changes. The new elements are slightly different from the existing ones, the existing landscape being preserved. Temporary changes where restoring the landscape to its original state could take 1-2 years.
	Very low	Small changes to the landscape components or the introduction of new elements that are consistent with the surroundings or do not generate appreciable changes to them.
No detectable change		Imperceptible changes in landscape components.
Positive	Very low	The size, scale and/or geographical extent of the improvements is very small in relation to the area of the key landscape components; The effects of the benefits are recorded on a very small spatial scale. The changes are short-term (< 1 year).
Positive	Low	Minor but notable changes that improve the elements and characteristics of the landscape type; The size, scale and/or geographic extent of the improvements is small relative to the area of the key landscape components; The effects of the benefits are recorded on a small spatial scale. The changes are short-term (1-2 years).
Positive	Moderate	Changes that considerably improve the elements and characteristics of the landscape type; The size, scale and/or geographic extent of the improvements is moderate in relation to the area of the key landscape components; The changes are in the medium term (2-5 years).
Positive	High	Major changes that improve the elements and characteristics of the landscape type. The size, scale and/or geographic extent of the improvements is large relative to the area of key landscape components; The effects of the benefits are registered on a large spatial scale; The changes are in the medium-long term (5-10 years).
Positive	Very high	Major changes that improve the elements and characteristics of the landscape type. The size, scale and/or geographic extent of the improvements is very large in relation to the area of the key landscape components; The effects of the benefits are registered on a very large spatial scale; The changes are long-term (>10 years).

During the **execution phase,** the project will bring temporary changes to the current landscape, especially due to the presence of machinery in the area, but especially the prominent elements associated with the construction site (earth deposits, material deposits, concrete stations, asphalt stations, etc.). In the process of evaluating the impact of the execution stage, 2 classes of magnitude were considered:

- **Moderate magnitude** - in the locations where earth deposits with large volumes will be set up, as a result of the construction of embankments with maximum heights of 20 m;
- **Low magnitude:**
    - in the work fronts where earth deposits with smaller volumes will be set up, as a result of the construction of embankments with a height of <10 m;
    - in the case of construction site organization interventions;
    - in the work fronts for the execution of road embankment and structures.

In the **operational stage**, 3 classes of the magnitude of the changes were also considered, as follows:

- Large magnitude - in the case of the consolidation works of the large excavation cuting arranged in the West Suceava Node;
- Moderate size – prominent construction elements, respectively: large-sized bridges and viaducts (length >100 m) and high embankment and embankment areas (>10 m in size);
- Small magnitude – areas with small dimensions of cut and fiil excavation (<8 m), bridges with small dimensions (length <100 m), bridges, road embankments.

7.7.2 Impact prediction

During the execution stage, the works provided for in the project will have a temporary impact on the landscape. The main elements with an impact on the landscape at this stage are represented by the presence of work fronts, constructions related to site organizations, machinery and heavy goods transport vehicles, employees' cars and employee transport buses. These elements can generate a negative visual impact due to the change in the perception of the landscape by the human population and the highlighting of some built elements.

The site organizations are proposed to be carried out in areas with agricultural land, with little sensitivity from the point of view of the landscape, located at distances of more than 1 km from the nearest visual receptors. Considering the relatively small size of the constructions within the site organizations (staff barracks, fences, material storage areas, etc.) but also that they will be temporarily present in the area, the impact on the landscape during the execution stage will be insignificant.

At the same time, in the work fronts, the most visible elements in the current landscape will be the temporary warehouses of the excavated material that will be set up in the areas where the larger dimensions will be executed, identified in the western area of the project, respectively:

- On the interval km 1+500 - 3+500 - a work will be carried out to consolidate a excavation cut that will extend to a distance of approx. 70 m from the road earthwork. The work will have a height difference of 10 m from the road embankment of the road to the edge of arrangement,
- On the interval km 9+500 - 11+200 - a work will be carried out to consolidate the road inside the Suceava West road junction, which will extend to a distance of approx. 900 m from the road embankment. The work will have an elevation difference of 80 m from the road embankment of the road to the edge of the arrangement;
- On the interval km 18+700 - 20+800 - a work will be carried out to consolidate an excavation cutt that will extend to a distance of approx. 260 m from the road embankment;
- On the interval km 50+100 - 50+800 - a consolidation work will be carried out on a road that will extend to a distance of approx. 60 m from the road earthwork. The work will have a

height difference of 10 m from the road embankment of the road to the edge of the arrangement,

- On the interval km 51+600 - 53+100 - a work will be carried out to consolidate an excavation cut that will extend to a distance of approx. 80 m from the road earthwork. The work will have a height difference of 12 m from the road embankment of the highway to the edge of the arrangement;

In the above locations, deposits with large volumes of excavated material will result, which means that during the entire period of their execution, until their removal from the site, the soil deposits will represent prominent elements that will be introduced into the current landscape of the area. These will be arranged in areas with reduced sensitivity from the point of view of the value of the landscape but also from the point of view of the receivers, thus estimating an insignificant negative impact, manifested over a short period of time.

At the same time, as can be seen in the following figure, the project foresees in other locations also the construction of some smaller sized deblees (<10 m) which will not result in deposits with large volumes of earth, in their case the estimated impact is also insignificant negative.

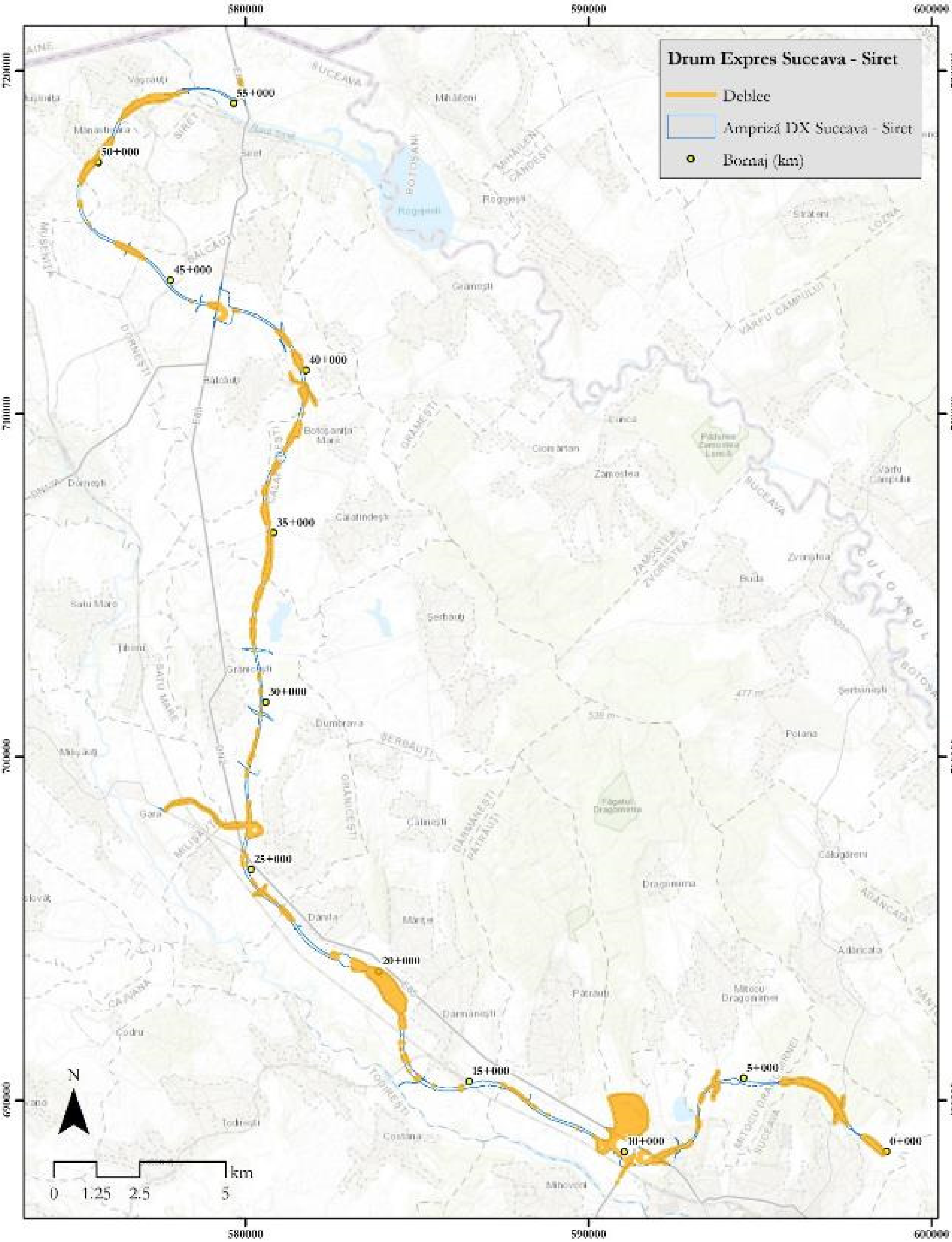


Figure no.7-6 The areas where temporary earth deposits will be set up as a result of the execution of the excavation cuts

During the operation stage, the constructive elements of the highway, especially the prominent ones (bridges, viaducts, excavation cuts and embankment) will generate definitive changes in the landscape that will be perceived by the visual receptors represented by the residents in the vicinity of the project. It is specified that all the above locations where large-scale buildings will be set up will also represent a permanent pressure on the landscape in the area during the operation stage. In addition to these, there is also the 960 m long structure consisting of access viaducts and a bridge over the Siret river, located between km 53+490 - km 54+570.

The analysis of the impact in the operation stage consisted in the first phase in the identification of the large constructive elements proposed in the project, capable of bringing significant changes in the current landscape. In the second phase, the visibility of the identified structures was analyzed in relation to the locations of sensitive visual receptors (localities or areas of tourist interest). The analysis was carried out with the ArcMap program using the Observer Point tool, which takes into account the digital model of the land and the position of the analyzed observation points (areas of tourist importance in the vicinity of the project). The graphic representations of the areas visible from the points of tourist importance identified in the project area are presented for each tourist objective, in the following figures.

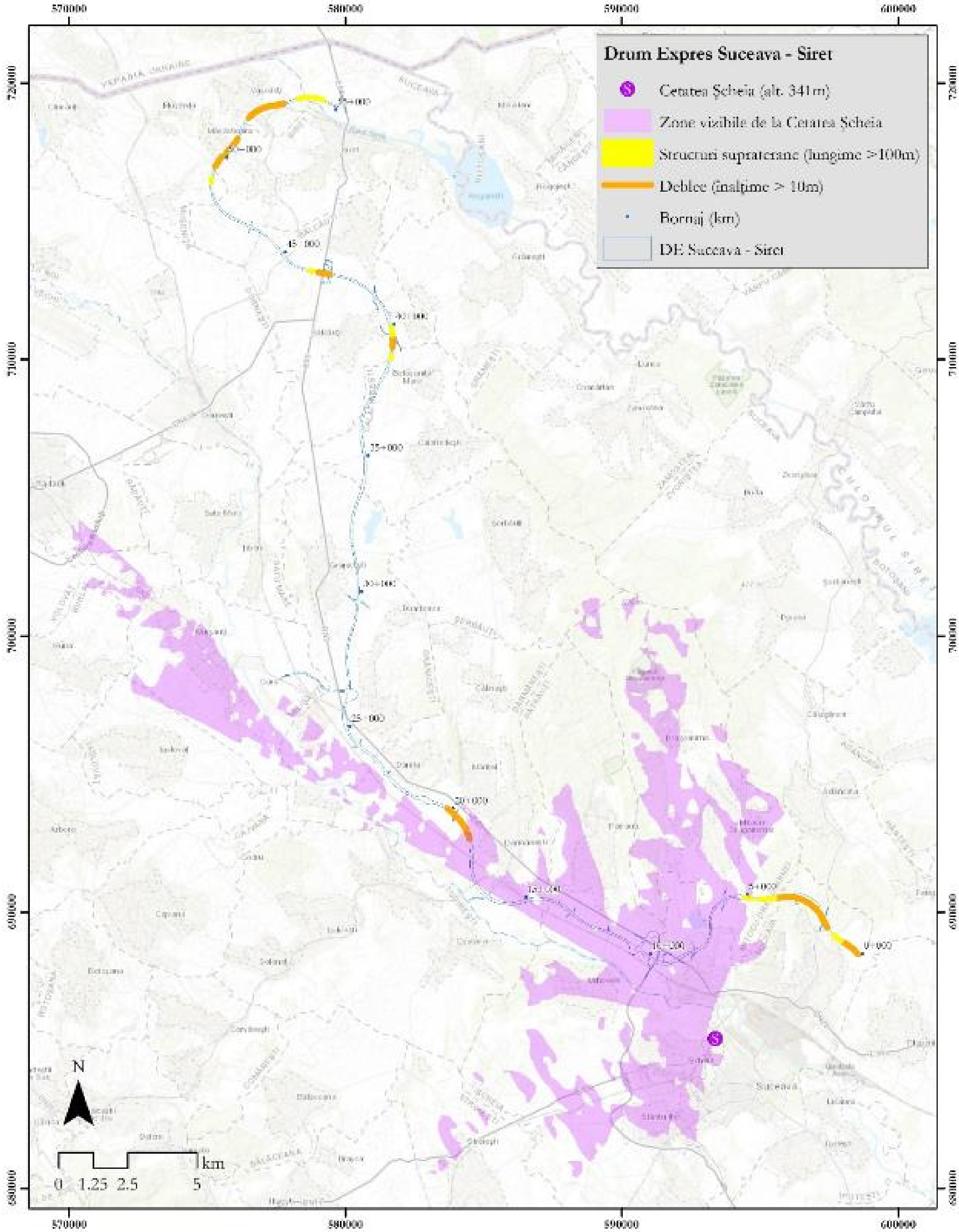


Figure no.7-7The visible areas within the Cetatea Şcheia viewpoint

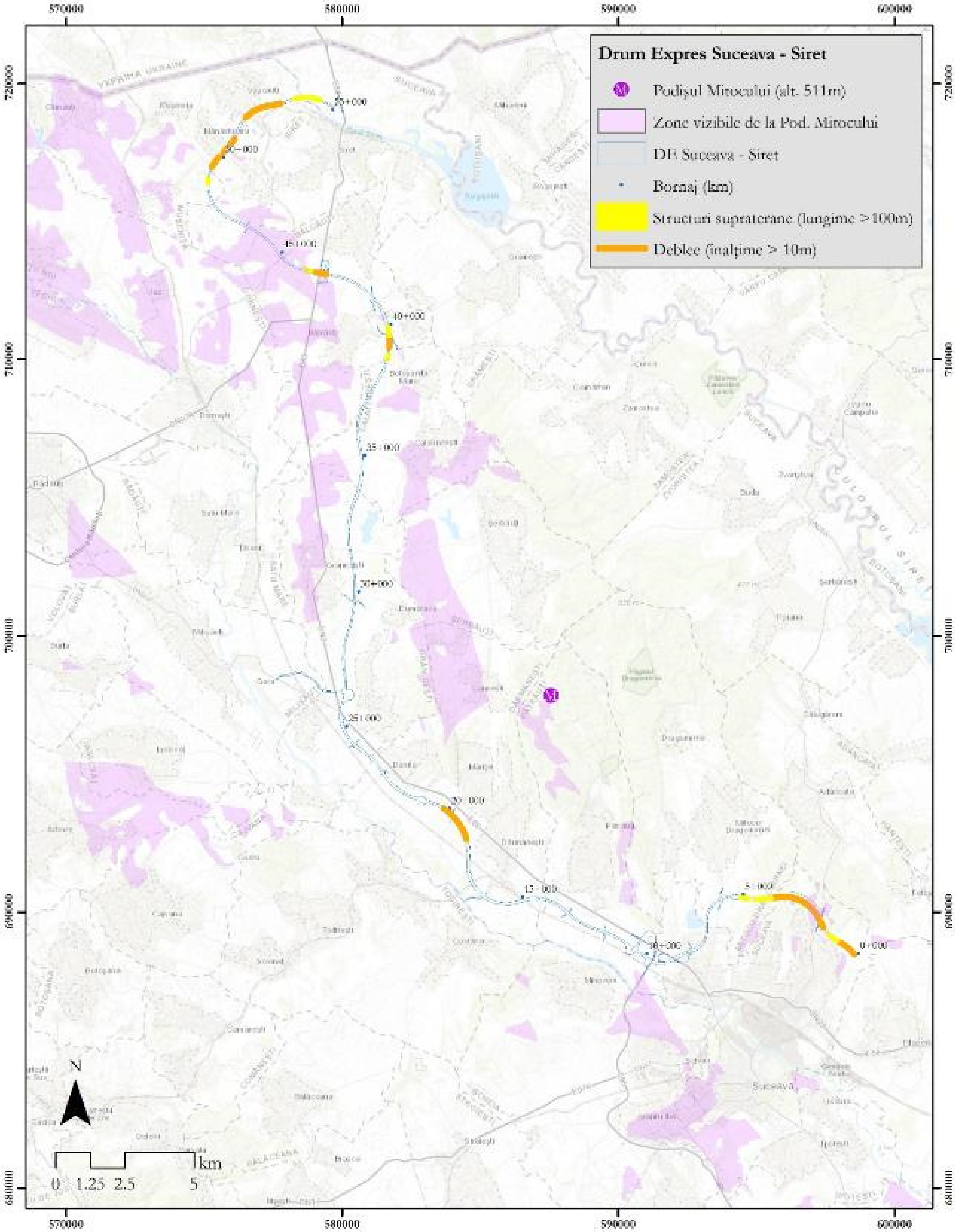


Figure no.7-8The visible areas within the Mitocului Plateau viewpoint

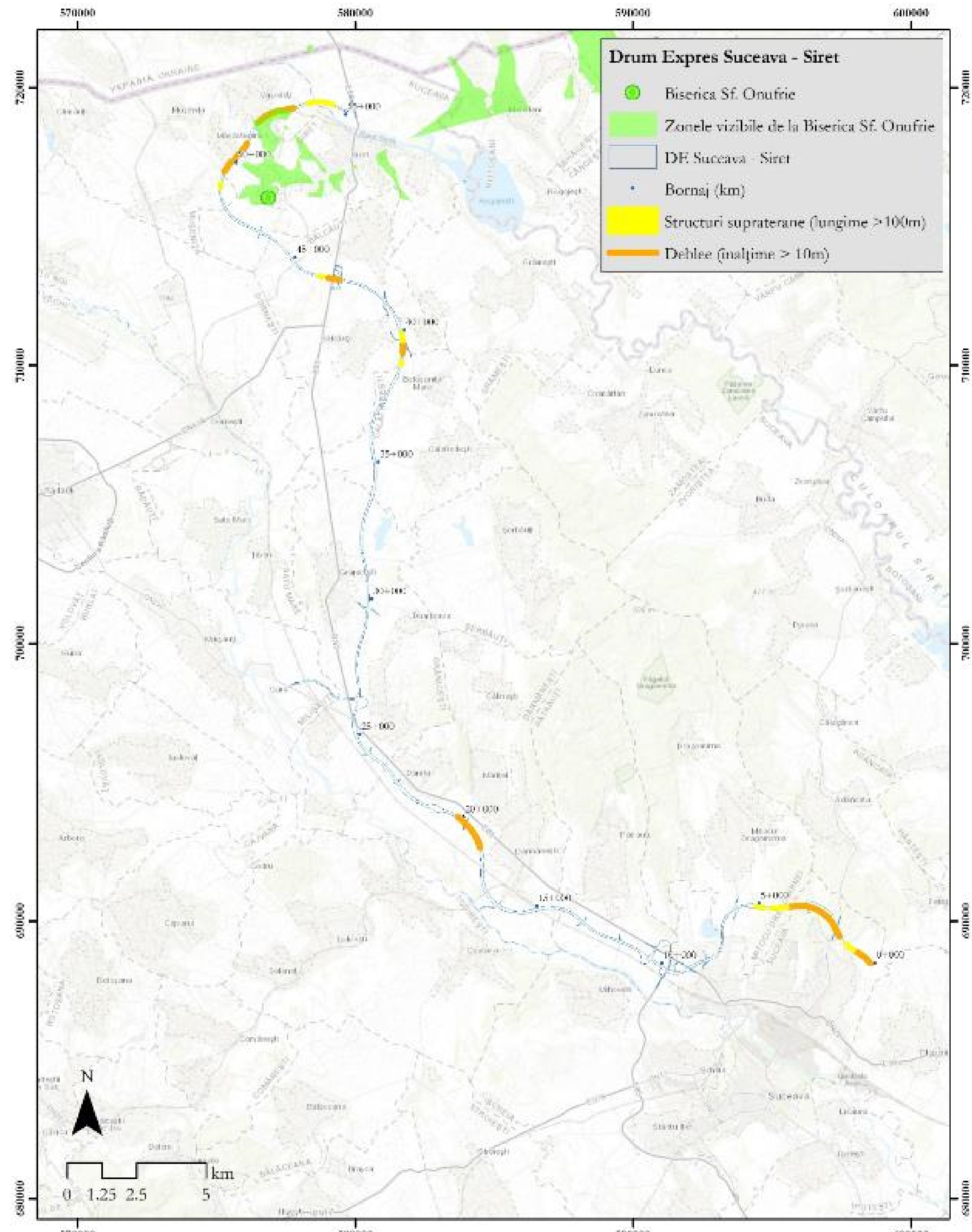


Figure no.7-9Visible areas within the object of worship St. Onufrie Church

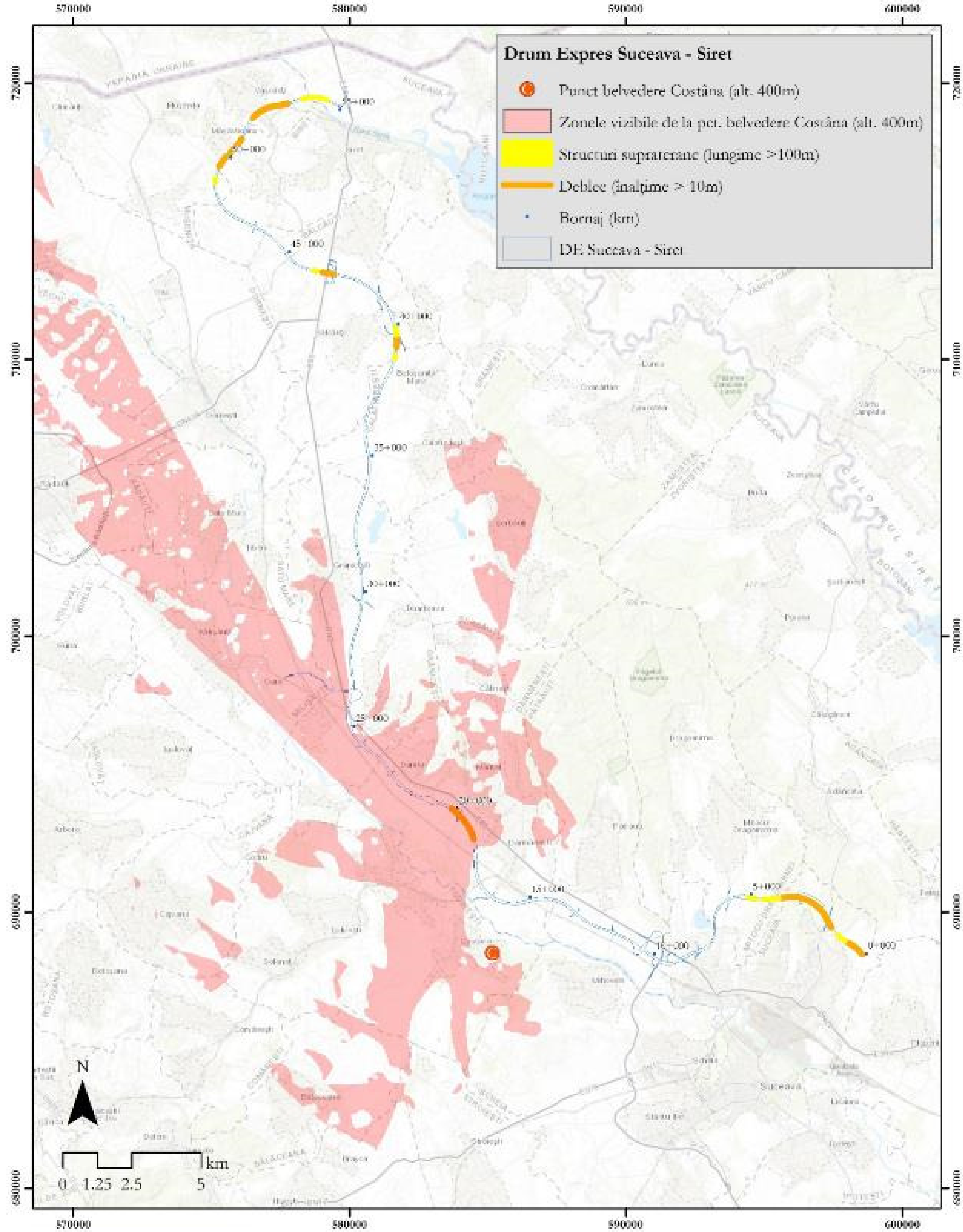


Figure no.7-10The visible areas within the Costâna viewpoint

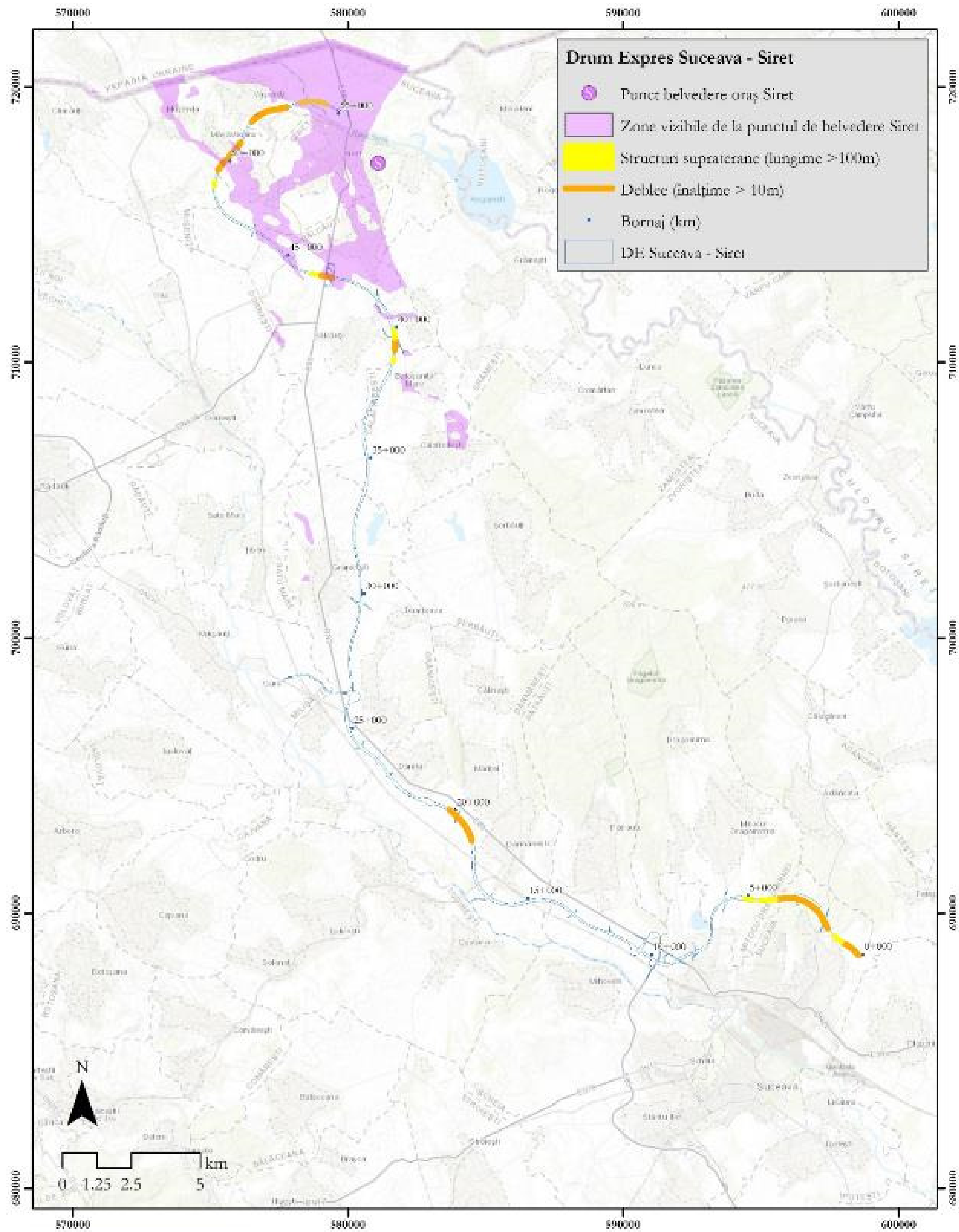


Figure no.7-11The visible areas within the Siret city view point

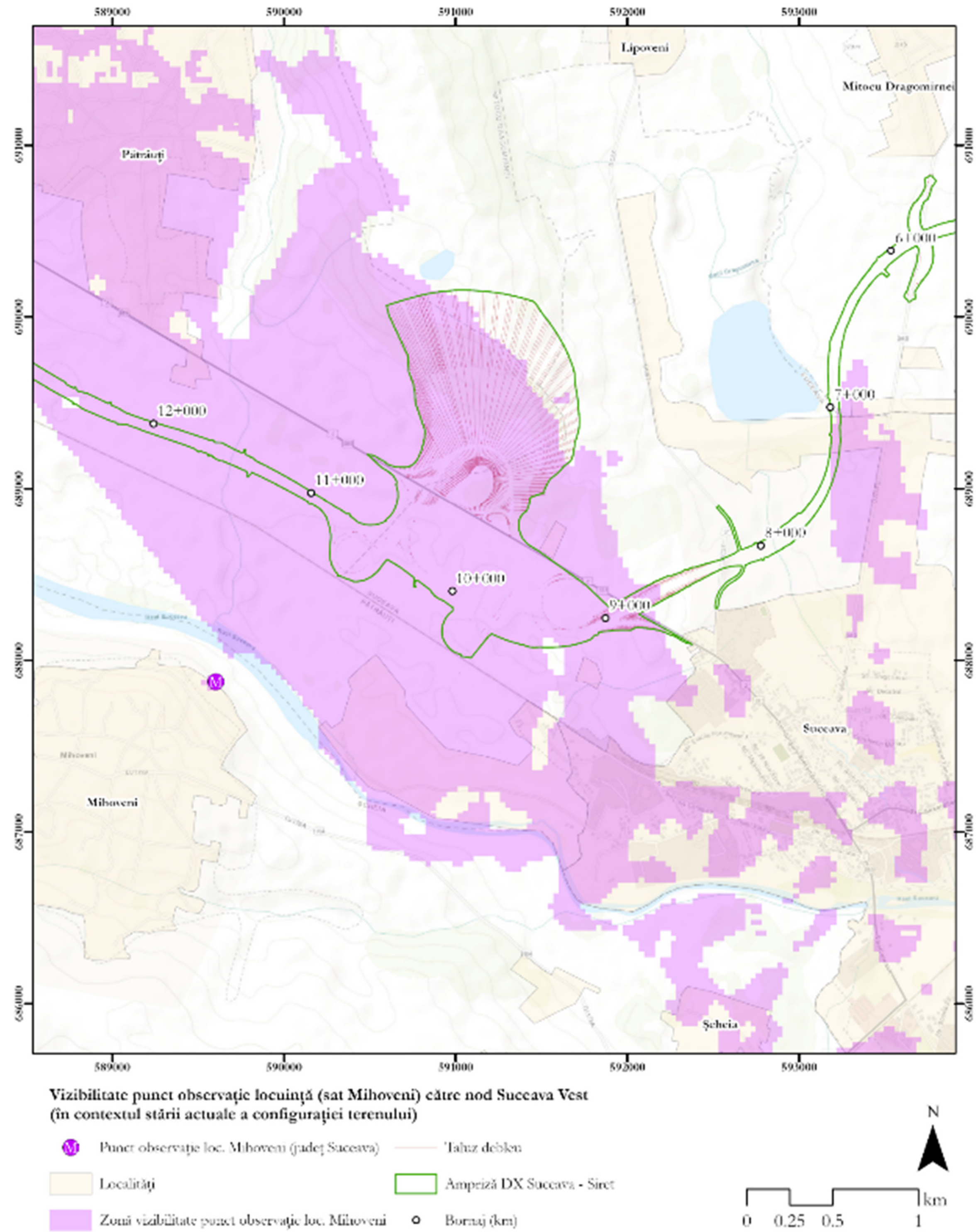


Figure no.7-12 The visible areas of the excavation cut from Suceava West Road Node - view from the houses in the village of Mihoveni

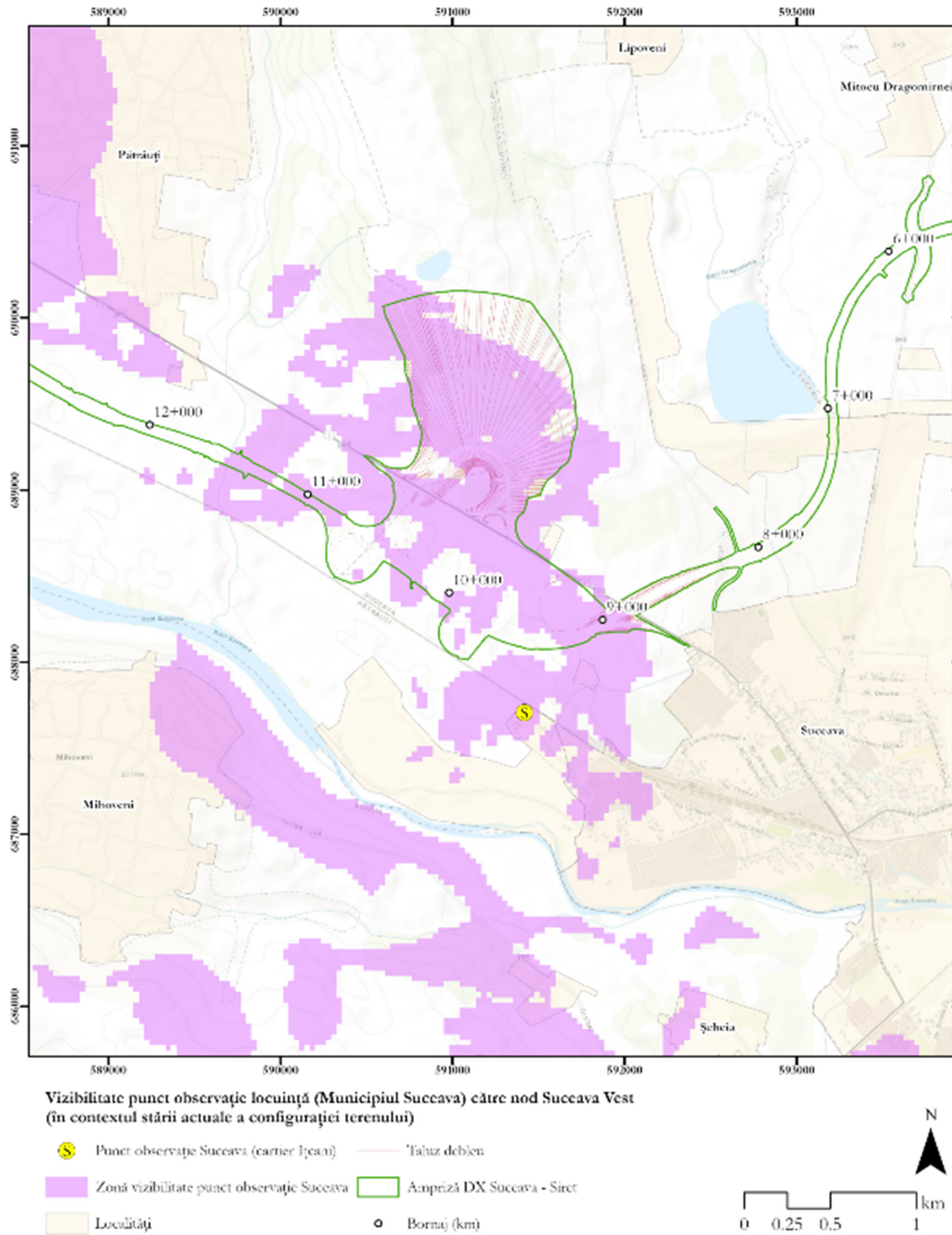


Figure no.7-13 The visible areas of the development of the road in the Suceava West Node - view from the houses in Suceava Municipality + Iţcani neighborhood

From the results of the spatial analysis, it was found that there are several belvedere points at the local level from where the prominent layouts of the future project could be observed, but the only objective of tourist interest, of cult-religious type, within which it is possible to see certain constructive elements of the highway is the Church of St. Onufrie in the town of Mănăstioara (Suceava county). Likewise, in the case of the work to consolidate the road in the Suceava West road junction, it is noted that they will be visible from the inhabited areas on the south side of the project. The following table presents the characteristics of the massive constructive elements provided for in the project, in relation to the sensitive areas from the point of view of the landscape where changes are expected according to the GIS analysis.

Table no.7-31 Prominent constructive objectives provided in the project in relation to sensitive areas from the point of view of the landscape

Structure type	Position km		Length (m)	Height (m)	The sensitivity of the area	The sensitive areas where the built objectives are visible[15]
	km start	end km				
Excavation cut	9+500	11+200	1700	80	Low	Iţcani district (Suceava Municipality) and Mihoveni town
Excavation cut	18+700	20+800	2100	20	Low	Şcheia Citadel, Costâna belvedere point
Excavation cut	51+600	53+100	1500	12	Low	Church of St. Onufrie
Bridge over the Siret River	53+490	54+570	960	12	Low	Lookout point Siret city (a hillside immediately east of the city)

It should be noted, however, that the spatial analysis performed in ArcMap with the Observer Point model only takes into account the digital model of the terrain, ignoring the other elements that may constitute visual barriers for the receivers (eg: buildings or areas with forest vegetation). Considering this aspect, the analysis of the distances and the presence of visual barriers between the sensitive areas and the built elements of the project is necessary to identify the significance of the impact. In the following, information is presented regarding these aspects, for the only locations for which the preliminary analysis carried out in ArcMap indicated a potential visual impact.

1. **Suceava Municipality (Iţcani District)**– it is positioned in the southern part of the future road, in the area of km 9+000, at a minimum distance of approx. 700 m from the expropriation corridor. The northern limit of the neighborhood is free of obstacles (tree vegetation or tall buildings), thus being an area with increased visibility towards the highway, respectively towards the prominent layout of the road junction Suceava West. The image below extracted from Google Earth represents a 3D capture from a point in the northwestern periphery of the Iţcani district towards the area that will be developed inside the Suceava West road junction. The red line in the capture represents the slope of the excavation cut that will be arranged.

[15] According to the spatial analysis made with the ArcMap - Observer Point model

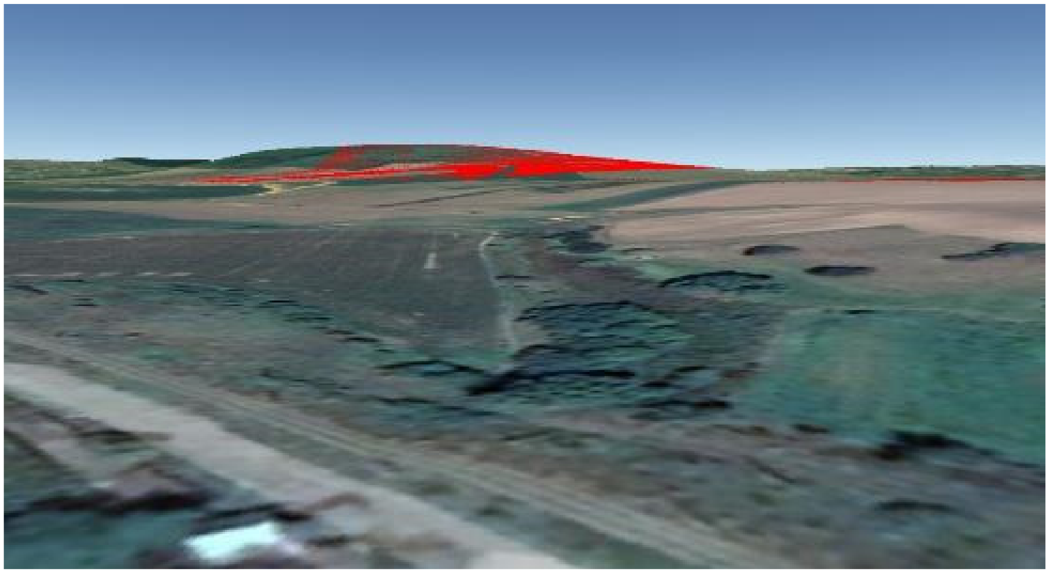


Figure no.7-14 Visibility from the northwestern periphery of the Ițcani neighborhood towards the development in the West Suceava Node

2. **The town of Mihoveni**– it is positioned in the southern part of the future road, in the range of km 10+000 – km 12+700, at a minimum distance of approx. 1,300 m from the expropriation corridor. The northern limit of the locality is flanked by a curtain of tree vegetation that reduces the visibility to the future highway, respectively to the prominent landscaping in the Suceava West road junction (node). The image below extracted from Google Earth represents a 3D capture from a point on the northern outskirts of the town towards the area that will be developed inside the Suceava West road junction. The red line in the capture represents the slope of the excavation cut that will be arranged.

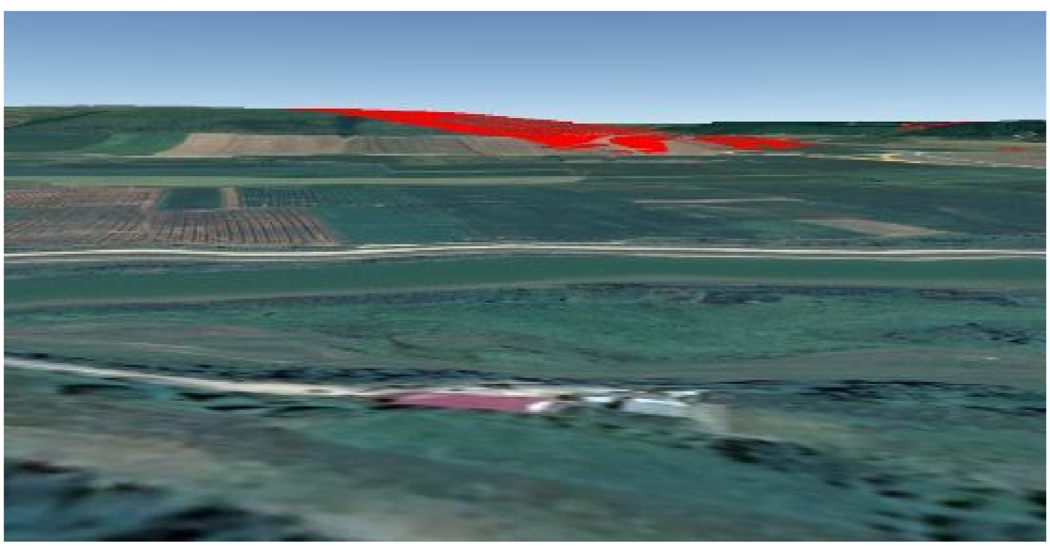


Figure no.7-15Visibility from the northern side of the Mihoveni village towards the development in the Suceava West Node

3. **Church of St. Onufrie**- the southern extremity of the town of Mănăstioara (Suceava county) is located at an approximate distance of 1 km. The church was founded by ruler Ştefan Petriceicu and built between 1672-1684.

   The entire site (church, annexes and inner courtyard) is almost entirely surrounded by trees (approximately 10-15 m high). It is also surrounded by residential buildings on the northeast side. The southern part in the direction towards the future Suceava – Siret project is not obstructed by any agglomeration of buildings or trees. Considering these aspects, especially the relatively significant distance from the project and the fact that the more prominent constructions (bridge and excavation cut) are located, the impact of the project on the visual receptors within this tourist objective is insignificant.

Figure no.7-16St. Onufrie Church - visibility towards the direction of the future highway and expressway Suceava - Siret (source: Wikipedia - Cezar Suceveanu)

Considering the low sensitivity of the study area, it is estimated that during the operation stage of the project, the impact on the landscape and implicitly on the visual receptors is insignificantly negative, manifested locally, in the long term and irreversible.

In the **decommissioning stage**, the impact is similar to the construction stage, which is also characterized by the presence of construction site organizations, work fronts, construction and transport machinery, which causes a negative visual impact. When the works are completed, however, the land rehabilitation will have a positive effect on the landscape.

Thus, in the event of some road decommissioning activities, it is predicted that there will be a temporary insignificant negative impact on the landscape manifested throughout the period of the works and a permanent significant positive impact as a result of the land rehabilitation works to a form as close as possible to the initial one.

7.7.3 Measures to avoid and reduce the impact

The main measures to reduce the impact on the landscape during the construction period are represented by:

- minimization as much as possible of the surfaces affected by constructions, excavations, temporary arrangements;
- the storage of the excavated material should be carried out in piles of a maximum height of 5 m;
- restoration of temporarily affected surfaces as a result of construction works (including borrow pits if they exclusively serve the proposed project) and fitting them into the landscape;
- on all surfaces temporarily affected during construction (eg: site organization, work fronts, soil storage areas) as well as on embankments and embankments, vegetation installation works will be carried out upon completion of the construction works. In the case of debles, the minimization of the surfaces that are not covered with vegetation will be taken into account;
- restoration of the areas included in the construction limit, which are not occupied by the constructions related to the highway, including the areas related to the relocation of utilities;
- the areas affected by the construction works will be brought to a state that represents as faithfully as possible the natural state of the affected areas and ensure the landscape integration of the elements subject to the restoration works;
- the sound-absorbing panels as well as those with the role of reducing the collision of insects and birds with car traffic will be made with materials, textures and colors that ensure a high degree of aesthetic integration with the natural landscape elements in the area where they are installed;
- for tree plantations, shrubs and grassy vegetation exclusively native, non-invasive plant species will be used;
- compliance with development rules (building techniques, materials, location, height of buildings) in accordance with the local traditional architecture of the landscape for works involving new constructions;
- the design of the service spaces, the maintenance and coordination center (CIC), intersections and road junctions in such a way as to comply with the rules of landscape design and respect the setting in the natural environment.

The main measures to reduce the impact on the landscape during the operation period are represented by:

- ensuring the maintenance works of the planted vegetation as part of the restoration works and carrying out additional planting works in case the drying of the vegetation is found;

- maintenance of sound-absorbing panels and anti-collision panels;
- maintenance of the built elements of the highway.

The main measures to reduce the impact on the landscape during the decommissioning period are represented by:

- minimization as much as possible of the surfaces affected by the decommissioning works and the temporary arrangements necessary to carry out the works (site organizations, temporary storage areas, temporary access roads);r
- rehabilitating the land to a form as close as possible to the original one and carrying out restoration works by implementing revegetation works (planting trees, shrubs, grassy vegetation), so that they can be structurally and functionally reintegrated into the previous category of land use;
- for the realization of the rehabilitation works of the affected surfaces and their arrangement with vegetation, only the species from the local phytocenotic composition (corresponding to the habitats that have been intervened on or located near the affected areas) will be used. The use of any foreign (non-native) and/or invasive plant species will be prohibited.

7.8 THE SOCIAL AND ECONOMIC ENVIRONMENT

7.8.1 Sensitivity classes and magnitude classes for assessing the impact on the population, human health and material assets

The impact on the social and economic environment was analyzed from the perspective of three components: population, human health and material goods.

Sensitivity classes

The sensitivity of the areas from the point of view of the population was delimited in five classes, presented in the following table. The areas where the human population is directly linked to the resources that the project uses and has no other alternatives were considered with a maximum degree of sensitivity ("very high"), and with a minimum degree of sensitivity ("very low") the areas where the human population is highly qualified and is not strictly dependent on a natural resource.

Table no. 7-29 Sensitivity assessment matrix for the Population component

The sensitivity of the area	Description
Very high	Several communities dependent on the affected resource/resources and for which there are no alternatives Lack of qualified and experienced workforce Changes generated by development induce risks for the community/communities that are not understood by most adults Many homeowners and business owners perceive that this change will affect their ability to

The sensitivity of the area	Description
	maintain their livelihood or quality of life at an acceptable level and may be forced to leave the area/community An extremely high level of concern is expressed by NGOs and/or stakeholders regarding the impact of proposed developments Communities that consist predominantly of indigenous ethnic minorities in decline may be affected by the proposed development
High	A community dependent on the affected resource(s) and for which there are no nearby alternatives Many business owners and owners perceive that this change will affect their ability to maintain their livelihood or quality of life at an acceptable level Changes generated by development induce risks for the community/communities that are understood only by some of the adults A high level of concern is expressed by NGOs and/or stakeholders regarding the impact of proposed developments Communities that include declining indigenous ethnic minorities that may be affected by the proposed development
Moderate	Some households depend on affected resources for which there are no nearby alternatives Limited qualifications and limited work experience in the available workforce Some business owners and owners perceive that this change will affect their ability to maintain their livelihood or quality of life on a significant period of time (>1 year) The changes generated by the development induce risks for the community/communities that are understood by all adults but without having the experience of living and working under the conditions proposed by the project Some of the stakeholders express concerns about some forms of impact on some of the communities Communities that consist predominantly of indigenous ethnic minorities that may be affected by the proposed development
Low	Households or communities using affected resources have access to nearby alternatives, the use of which may indirectly cause reduced negative impacts Skilled workforce but lacking relevant experience Some stakeholders express concerns about some forms of impact on a small number of communities Communities that include indigenous ethnic minorities that may be affected by the proposed development
Very low/ Insensitive	Households or communities using the affected resources have access to nearby alternatives, the use of which cannot cause negative impacts The workforce is qualified and has relevant experience The changes generated by the development induce risks for the community/communities that are understood by all adults and who have the experience of living and working under the conditions proposed by the project The interested parties do not express concerns about possible forms of impact on the communities Communities that do not include indigenous ethnic minorities or that include but may not be affected by the proposed development

In assessing the impact on the population component, taking into account the fact that most of the project is carried out in areas that could be significantly affected, in terms of the resources used by the communities in the area (eg: agricultural lands, pastures), a was considered a class of moderate sensitivity, at the level of all localities in the vicinity of the project. The choice is also supported by the fact that the population will no longer be able to use different agricultural lands partially or completely.

The sensitivity of the area from the point of view of human health was delimited in five classes, presented in the following table. Areas where the density of the human population is high and include sensitive objectives were considered to have a maximum degree of sensitivity ("very high"), and sparsely populated and heavily anthropized (industrial) areas to have a minimum degree of sensitivity ("very low").

Table no. 7-30 The sensitivity assessment matrix of the Human Health component

The sensitivity of the area	Description
Very high	Residential areas with high density of houses, parks, schools and hospitals
High	Rural/urban residential areas where there are no significant sources of air pollution and noise Rural/urban residential areas where the air quality is very low
Moderate	Urban residential areas
Low	Mixed urban residential areas where various industrial activities take place that can constitute existing sources of air pollution and noise
Very low/ Insensitive	Residential areas inhabited temporarily/seasonally Heavily anthropized (industrial) areas

According to the analyzes of the current situation in terms of background noise and air quality (by consulting the strategic noise maps available on the CNAIR and CFR website as well as the air quality maps available on the European Environment Agency website) it can be appreciated that at the level of the entire project, the sensitivity class is high, in the study area no exceedances of the maximum admissible concentrations for the air quality indicators have been reported, but there are exceedances of the current noise values. It is specified that in the localities of interest there are in some places (in the localities of Suceava, Şcheia, Mereni and Siret) various types of industrial activities and road arteries that constitute existing sources of atmospheric pollution and noise.

The sensitivity of the area in terms of Material Assets has been delimited into five classes, shown in the following table. The areas where the economic activity is dependent on a high quality of ecosystem goods and services were considered with the maximum degree of sensitivity, and with the minimum degree of sensitivity the areas where the ecosystem goods and services have a low importance in relation to the development of the economic activity.

Table no. 7-31 Matrix for assessing the sensitivity of the Material goods component

The sensitivity of the area	Description
Very high	Ecosystem goods and services: Ecosystem services of high importance with/witha very few spatial alternatives ; services of essential importance with a low-moderate degree of replacement; Socio-economic goods and services: Critical infrastructures (including safety areas of energy capacities); Buildings of cultural-historical importance with a high risk of collapse due to vibrations/seismic activity; Economic activities that require a high quality of ecosystem services (air quality, water quality, etc.)
High	Ecosystem goods and services: Ecosystem services of high importance without some spatial replacement alternatives; services of medium importance with very few (or no) alternative spatial alternatives; or essential services but which have numerous spatial replacement

The sensitivity of the area	Description
	alternatives; Socio-economic goods and services: Important infrastructures at county level; Constructions where the probability of collapse is high as a result of vibrations / seismic activity;
Moderate	Ecosystem goods and services: Ecosystem services of medium importance with some spatial replacement alternatives; services of high importance with numerous spatial alternatives for replacement; or services of low importance and with few (or no) alternative spatial alternatives; Socio-economic goods and services: Important local infrastructures; Constructions in which the probability of collapse is reduced but in which major structural degradation may occur as a result of vibrations / seismic activity;
Low	Ecosystem goods and services: Ecosystem services of low or moderate importance with spatial replacement alternatives; Socio-economic goods and services: Buildings and infrastructures of minor importance at the local level; Constructions where major structural degradation does not occur as a result of vibrations / seismic activity but where the degradation of non-structural elements can be important;
Very low/ Insensitive	Ecosystem goods and services: Ecosystem services have low importance or do not have importanche in terms of goods and services; Socio-economic goods and services: Buildings and infrastructures of no importance; Buildings whose response to vibrations / seismic activity does not differ from that of new buildings.

In the assessment of the impact on this component, considering that the project is carried out in areas that involve affecting ecosystem services or socio-economic services (agricultural lands and pastures) of the communities, a moderate sensitivity was considered for the entire development area of the project.

Magnitude classes

The magnitude classes of the changes for the three considered components (population, human health, material assets) are presented in the following tables. The matrix for assessing the magnitude of the changes is structured for each component in five classes, both for changes of a negative nature and for positive changes, depending on the extent of the interventions and their duration.

The following matrix was used to assess the magnitude from the point of view of the population.

Table no. 7-32 The matrix for assessing the magnitude of changes for the Population component

The magnitude of the change		Description
Negative	Very High	Displacement or abandonment of the households of ≥20% of the number of inhabitants of the locality. The loss of a significant number of jobs (≥20% of the number of existing jobs at the community level), without alternative opportunities during one year after the loss of the job (other than those involving a change of residence). Widespread perception of the negative impact and/or loss of opportunities to improve quality of life, resulting in frustration and disappointment, which can lead to increased migration and threats to community integrity and viability.
	High	Displacement or abandonment of households of 5-20% of the number of inhabitants of

The magnitude of the change		Description
		the locality. The loss of 5-20% of the number of existing jobs at the community level. Changes that have different adverse effects on the quality of life and employment opportunities for vulnerable groups (eg people with disabilities, the elderly, refugees, people living below the poverty line).
	Moderate	Displacement or abandonment of the households of <5% of the number of inhabitants of the locality. The loss of 2.5-5% of the number of existing jobs at the community level.
	Low	Temporary reduction (<1 year) of the incomes of some households and/or temporary damage to the quality of life and local businesses, including opportunities to improve them. Loss of <2.5% of existing jobs in the community.
	Very low	Short-term changes that disrupt/reduce viability/business opportunities, household activities, jobs and incomes.
No detectable change		Changes that do not influence the local population.
Positive	Very low	Measures that ensure in the short term the maintenance/increase of the number of jobs and/or the improvement of the quality of life for local communities.
	low	Measures that ensure the increase in the number of jobs and/or the improvement of the quality of life for up to 2.5% of the population of the locality.
	Moderate	Measures that ensure the increase in the number of jobs and/or the significant improvement of the quality of life for 2.5-5% of the population of the locality.
	High	Measures that ensure the increase in the number of jobs and/or the significant improvement of the quality of life for 5-20% of the population of the locality. Measures that have the effect of significantly improving the conditions of vulnerable groups.
	Very big	Activities that lead to the creation of a significant number of jobs, to new business opportunities for local communities, as well as to a significant increase in the quality of life in these localities (at least 20% of the inhabitants must benefit from these changes).

In the execution phase, for the population component, a low negative magnitude was considered because all the interventions associated with this stage will constitute sources of disruption to household activities (eg: interruption of the supply of utilities as a result of the relocation works, interruption of access to agricultural land, etc.) but they will appear for short periods.

In the operation phasee, a moderate negative magnitude of the changes is estimated in the situation where certain owners of agricultural lands or pastures will be affected by the project both from the point of view of accessibility and from the point of view of the reduction of land surfaces on which they can carry out their activities. At the same time, a high positive magnitude is appreciated in the operation stage, the project representing an investment that brings benefits to the quality of life by increasing the degree of mobility, lower times spent in traffic and, last but not least, this represents an opportunity for business development.

The matrix below was used to assess the magnitude from the point of view of human health.

Table no. 7-33 Magnitude assessment matrix for the Human Health component

The magnitude of the change	Description

The magnitude of the change		Description
Negative	Very high	The occurrence of significant risk factors (e.g. explosions, fires, radioactivity, cloud of chemical pollutants, contamination of water supply sources, biological risk factors) for human health (illnesses and/or deaths)
	Big	Exceeding the maximum permissible values in the environment (project + initial situation) for risk factors that can lead to an increase in morbidity
	Moderate	Exceeding the alert thresholds (project + initial situation) for risk factors that can lead to increased morbidity
	High	The appearance of medium and long-term risk factors, which create discomfort but do not lead to an increase in morbidity
	Very small	The appearance of short-term complaints (related to noise, smells, headaches, coughs), without the existence of a risk to human health
No detectable change		Changes that do not influence human health
Positive	Very low	Reducing risk factors that create short-term discomfort
	Low	Elimination of risk factors that create discomfort in the medium and long term
	Moderate	Activities that lead to the reduction of risk factors for human health below alert thresholds
	Big	Activities that lead to the reduction of risk factors for human health below the maximum allowed values
	Very big	Activities leading to the elimination of a significant risk factor for human health

In the execution stage, for the human health component, a low negative magnitude was considered for all the interventions, which have the potential for short-term disruption (traffic on the construction site, machinery in operation, higher concentrations of atmospheric and noise emissions, etc.), which can lead to complaints from residents.

In the operation stage, as a result of the increase in the noise level and atmospheric emissions associated with road traffic, the magnitude of the changes was considered negatively moderate, in the mathematical modeling carried out within the RIM being estimated to exceed the CMA of the project area. At the same time, through the operation of the project, the number of road accidents in the area will be significantly reduced, the magnitude of the changes in this case being assessed as positively moderate.

The matrix below was used to assess the magnitude from the point of view of Material Goods.

Table no. 7-34 Magnitude assessment matrix for the Material goods component

The magnitude of the change		Description
Negative	Very high	Affecting ≥20% of ecosystem and socio-economic goods and services
	Big	Affecting 10-20% of ecosystem and socio-economic goods and services
	Moderate	Affecting 5-10% of ecosystem and socio-economic goods and services
	Low	Affecting 2.5-5% of ecosystem and socio-economic goods and services
	Very small	Affecting <2.5% of ecosystem and socio-economic goods and services
No detectable change		Changes that do not influence material goods
Positive	Very low	Changes that improve <2.5% of ecosystem and socio-economic goods and services
	Low	Changes that improve 2.5-5% of ecosystem and socio-economic goods and services
	Moderate	Changes that improve 5-10% of ecosystem and socio-economic goods and services
	High	Changes that improve 10-20% of ecosystem and socio-economic goods and services
	Very high	Changes that improve ≥20% of ecosystem and socio-economic goods and services

In the execution phase, for the assessment of the material goods component, a very low magnitude of negative changes was assessed in the case of all interventions, as they have the potential to temporarily affect the use of land, the productive capacity of the soil, as well as the fragmentation of properties.

In the operation phase, the magnitude of the changes was considered positive as a small result of the reduction of road traffic on the roads in the study area and implicitly the risk of damage to the buildings exposed to the vibrations associated with road traffic, these roads passing through the inhabited areas in the current situation. At the same time, the possibility of reducing the times in traffic, as a result of the realization of the project, was appreciated as a moderate positive change.

7.8.2 Impact prediction

The evaluation of the "Social and economic environment" component integrates the evaluation of three distinct but related components: population, human health and material assets. The evaluation was carried out based on the analysis of the project's interventions, the effects and the potential impacts generated by them on the elements of the social and economic environment.

Construction phase

Population

During the entire execution period, the project will favor the phenomenon of temporary residences in the area of the personnel involved in the works, a phenomenon that can generate direct impacts regarding the change in the population structure. No significant negative impacts are expected in this respect as the staff, which is estimated to be around 1,000 employees in all stages of execution, will have accommodation provided both within the site organizations and in the accommodation units available in the project area. However, these changes also have a positive aspect, bringing financial gains to local businesses.

Human health

An important aspect at this stage is the potential of the project to increase the current level of atmospheric emissions and noise, with direct effects on the health of the residents in the vicinity. In this sense, a mathematical modeling of the dispersions of atmospheric pollutants was carried out (presented in chapter 2.8.4 and 7.3.2) and mathematical modeling of noise based on which the areas where exceeding the maximum permissible values may occur, with consequences on people health.

In order to evaluate the level of noise generated by the execution of the project, a situation as unfavorable as possible was considered. In this context, the scenario was developed in the area near the expressway to the townSuceava(km 8+700 – km 11+500), where they wereidentified elements (the existence of aconstruction sites, construction of a road junction) that could affect the receivers located in their immediate vicinity. The scenario assumes functionthe simultaneous ionization of all the equipment and machines involved in the construction activities on the work front and in the site organization. The modeling was carried out exclusively during the day, the execution of the works being carried out only during the day.

The noise sources considered in the modeling for this scenario are shown in the following table.

Table no.7-32Noise sources considered in the execution stage in the closest points to the sensitive receivers

The type of noise source	Number of sources	Emission level (dB)
Bulldozer	5	107
Excavator	5	103
Compactor	1	102
Mobile crane 20T	1	108
Generator 330 kVA	1	97
Transport dump trucks	24	Software Generated (Linear Source)

The chosen scenario presents five groups of machines (1 excavator and 1 bulldozer) intended for construction works. Three of these were assigned to the embankment works related to the express road, two groups being intended for the earthworks related to the Suceava West road junction (DN2/DN2P).

A number of 24 dump trucks/day transporting the fill material or the material resulting from the excavations was considered. A compactor, a truck crane (for handling materials in the site organization) and a 330 kVA generator that provides electricity in the site organization were also considered in the modeling. The working schedule for the operation of the equipment is 10 hours/day. In order to capture the cumulative effects, the modeling also took into account road traffic on the neighboring roads, respectively, DN2 and the Suceava Ring.

In order to evaluate the level of noise generated in the scenario presented above, a modeling of the noise sources was carried out with the help of the software application CadnaA Version 2023. The input data used were represented by:

- The digital terrain model – .asc format in Stereo 70 projection;
- Suceava – Siret highway/expressway axis – .shp format in Stereo 70 projection;
- Road traffic data for the DN2 and Suceava Belt roads - according to the Traffic Study;
- Average vehicle speed – default settings in CadnaA;
- Road infrastructure characteristics – road type (default settings in CadnaA);
- The position of the machinery – point sources of noise (coordinates in the STEREO 70 projection);
- The noise level generated by each type of equipment and machinery that represent noise sources.

The modeling results in the worst case scenario are illustrated in the following figures. In order to be able to capture the dynamic nature of the effects produced as a result of the works in the execution stage, the current state of the existing roads (DN2 and the Suceava Ring in the present case) and the cumulative impact of road traffic on them together with the machines present were analyzed in parallel in the expropriation corridor.

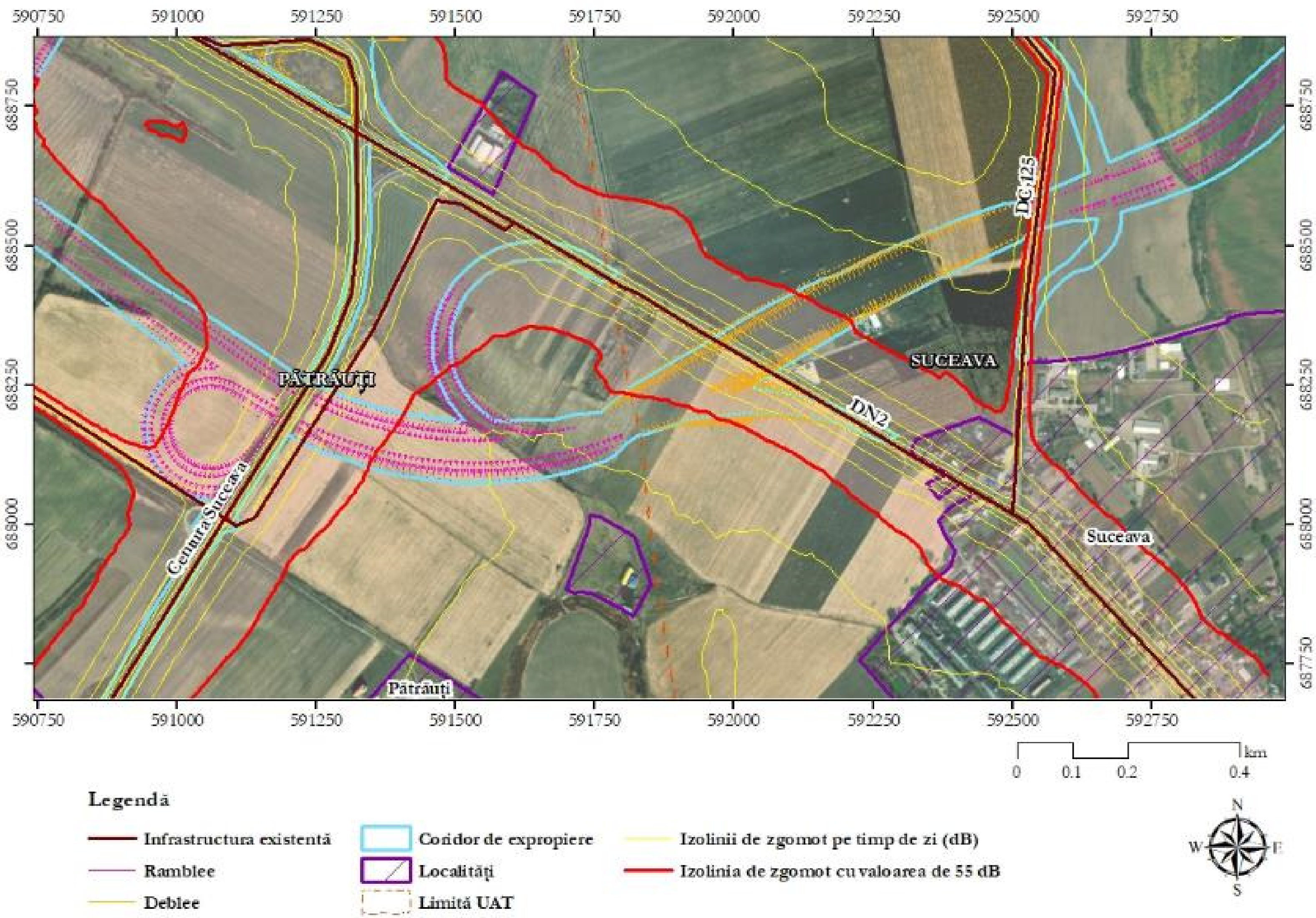


Figure no.7-17 The results of modeling the noise level (without machinery) in Suceava area

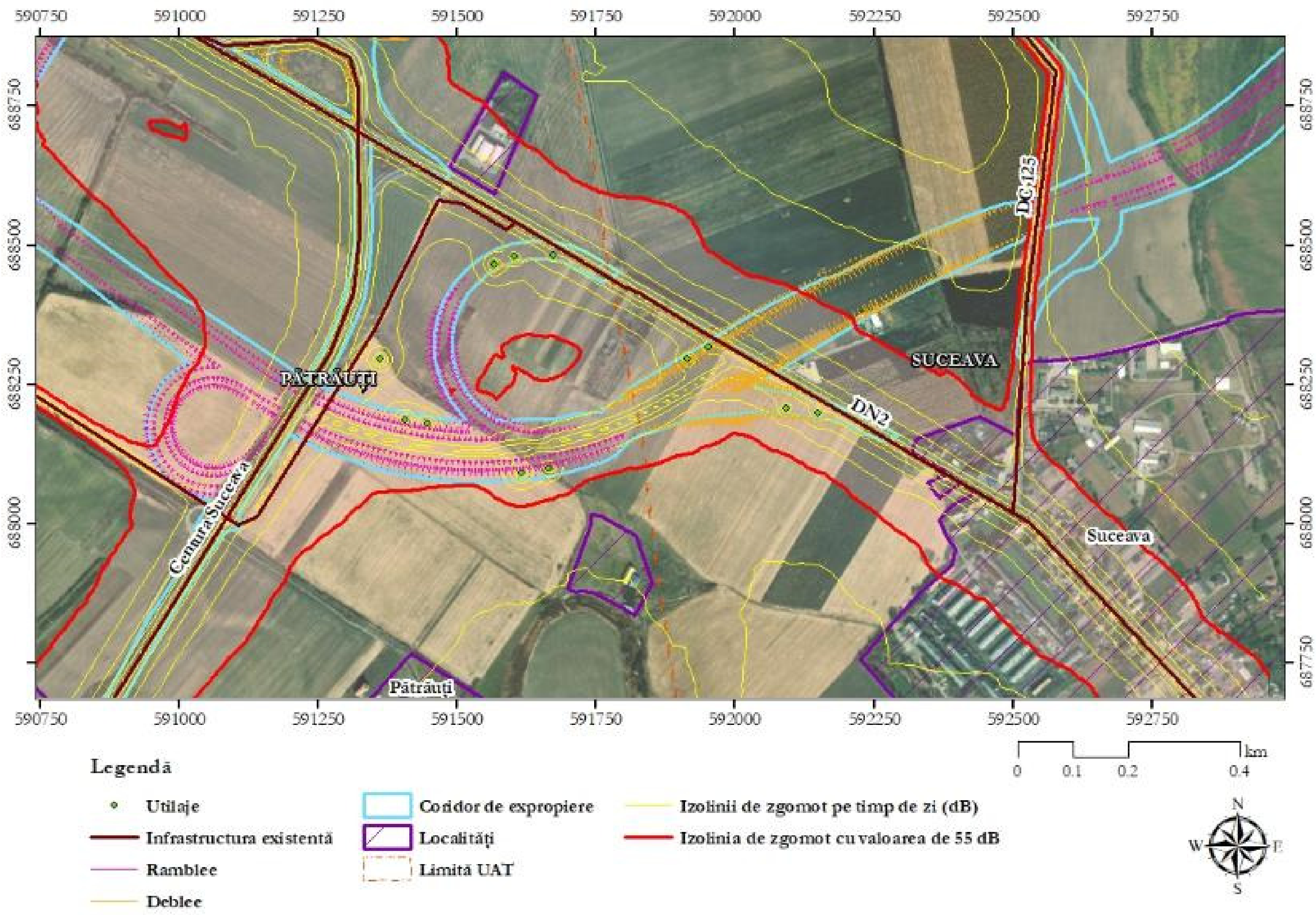


Figure no.7-18 The results of modeling the noise level (with machines) in Suceava area

The results of the modeling highlighted the fact that the impact zone in which the daytime limit values of 55 dB may be exceeded (the works taking place exclusively during the day), will manifest up to a distance of approx. 60 m from the work front, this area being assessed as having a significant temporary, short-term and reversible impact. In order to quantify the impact on human health due to the noise produced during the execution stage, a spatial analysis was carried out considering the zone of influence at a distance of 60 m from the expropriation limit in relation to the urban limits of the localities in the study area.

In the following table, the affected urban areas were extracted, expressed in % of the total area of each locality.

Table no.7-33 Surfaces in the inner city of localities potentially affected by the noise produced during the project execution stage

No. crt.	Potentially affected inner city	Potentially affected surface	
		m²	% of the urban area of the locality
1.	Suceava	94,134	0.32
2.	Pătrăuţi	10,742	0.20
3.	Dărmăneşti	26,895	0.42
4.	Iacobeşti	6,730	0.60
5.	Gara	32,341	2.13
6.	Grănicești	2,323	0.08
7.	Bălcăuţi	117	0.01
8.	Gropeni	23,625	4.50
9.	Negostina	329	0.02
10.	Bănceşti	76,576	4.39
11.	Văşcăuţi	74,926	1.87
12.	Mănăstioara	50,559	3.26
13.	Siret	158,626	2.12

From the analysis of the previously presented data, it can be observed that the inner city areas potentially affected by the noise level during the execution stage are reduced, the most affected being the locality of Gropeni on an area of 4.5% of the total area of the inner city. At the same time, it must be specified that not the entire urban area resulting from the spatial analysis represents a sensitive area, in many cases within it there are areas where there are no sensitive receptors: gardens, vacant land free of construction, commercial/industrial spaces, etc.

Table no.7-34 The areas of manifestation of the impact on the human population in the vicinity of the project due to the noise during the execution period

Areas of manifestation of the impact		Interventions	Sensitive receptors (localities)	The sensitivity of the area	Extension	Duration	Frequency	Probability	Reversibility	Magnitude
from km	to km									
1+850	2+275	IE 1, IE 2, IE 3, IE 4, IE 5, IE 6, IE 7, IE 8, IE 9, IE 10,	Suceava	High	Local	Short	Periodic	Very likely	Reversible	Low negative
2+400	2+500									
7+050	7+275									
8+325	8+475									

Areas of manifestation of the impact		Interventions	Sensitive receptors (localities)	The sensitivity of the area	Extension	Duration	Frequency	Probability	Reversibility	Magnitude
from km	to km									
8+350	8+600									
9+650	9+750		Pătrăuţi							
16+400	16+750		Dărmăneşti							
24+275	24+425		Iacobeşti							
25+600	26+000		Gara							
26+250	26+475									
29+800	29+950		Grănicesti							
40+650	40+700		Bălcăuţi							
40+325	40+575		Gropeni							
43+300	43+350		Negostina							
49+450	50+625		Bănceşti							
51+500	52+100		Văşcăuţi							
52+350	53+075									
53+450	53+575									
49+825	50+675		Manastioara							
55+100	55+700		Siret							

In the areas presented above, measures to reduce the impact are recommended by installing mobile sound-absorbing panels throughout the execution period in which important noise sources are present.

As a result of the mathematical modeling of the dispersion of pollutants presented in section 7.3, there were no values of atmospheric pollutant emissions that indicate significant changes in the current air quality in inhabited areas. The resulting concentrations, even if they exceed the maximum admissible values, are located at the level of the roadway, without effects on human health.

Considering the reduced time of exposure of the human population to air pollution and noise pollution associated with the project in the execution stage and implicitly the generation of a very low risk of the occurrence of diseases associated with these pressures, it is estimated that the impact on human health in the construction stage execution is insignificant, reversible, manifested on a local scale.

Material assets (Goods)

The interventions associated with the relocation works of utility networks and roads will generate the temporary stoppage of the supply of utilities and the increase in the level of traffic on public roads as a result of some restrictions that will be established in the areas of road relocation. These effects will generate financial losses, but taking into account the short duration of their manifestation, an insignificant negative impact was assessed.

The buildings in the immediate vicinity of the project site may be affected by vibrations during the execution of the works, especially where excavation or soil compaction works are carried out, but also as a result of the intensification of heavy traffic on the access roads inside the site. There are no fragile buildings (monuments, buildings with special conservation status) in the poroximity of the project.

At the European level, there are the following standards that establish limits for vibrations in the context of affecting buildings: the Dutch standard SBR-A (2017), the German standard DIN 4150-3 (2016), the British standard BS 7385-2 (1993) and the Swiss SN 640 312: (1989). These are shown in the following table.

Table no.7-35 Vibration limit values for constructions

The type of building	SBR-A limits depending on the type of vibration manifestation (mm/s)			DIN 4140-3 limits depending on the type of vibration manifestation (mm/s)		BS 7385-2 limits depending on the type of vibration manifestation (mm/s)		Limits SN 640 312: 1989 depending on the type of vibration manifestation (mm/s)
	Short term	Repetitive – short duration	Continuously	Repetitive – short duration	Continuously	Repetitive – short duration	Continuously	Generally valid
Fragile buildings - monuments	2.9	3.0	2.5	8	2.5	-	-	3
Residential buildings - masonry	5.0	5.0	5.0	15	5.0	15	7.5	5
Concrete buildings	20	20	10	40	10	50	25	12

In construction activities that will take place within the analyzed project, the vibrations will be manifested repetitively, for a short period of time.

Any PPV vibration value estimated to be ≥5 mm/s at any frequency was considered potentially damaging. According to the information from the specialized literature[16], the distances up to which the PPV value of the vibrations reaches 5 mm/s, specific for different types of machines are presented in the following table.

Table no.7-36 Specific influence area for each type of machine

Type of equipment	The distance (m) at which the PPV value is 5 mm/s
Dump truck	4
Bulldozer	4.5
Backhoe	0.6
Excavator	4.5
Compactor	4.5
Mobile crane	4

As can be seen from the previous table, the distances up to which the vibrations can reach values with effects on the resistance structures of the buildings are small, from the spatial analysis no situations were identified in which certain buildings could be at distances smaller than or equal to

[16]Spotlight Development Inc. "Construction Vibration Assessment, Ajax." (2020)

these values against the work fronts. In conclusion, significant negative impacts on material assets are not expected as a result of the vibrations generated during the execution stage.

Operation stage

Population

The realization of the project will have a positive impact on the population, thanks to the provision of optimal transport conditions between rural localities and urban centers. Also, the investment will contribute to the development of the area, along the entire route of the highway and expressway.

Human health

In the operational stage, on the human health component, the construction of the highway and expressway will have a significant positive impact due to the reduction in the number of road accidents and atmospheric emissions, as a result of the streamlining of traffic and the elimination of transit traffic within the localities.

For the analysis of the impact on human health as a result of the atmospheric emissions and the noise generated during the operation stage, mathematical modeling was carried out.

According to the results of modeling the dispersion of atmospheric pollutants in the operation stage (presented in Section 7.3.2), the contribution of the project to the air quality at the level of inhabited areas was estimated to be low and will not lead to exceeding the CMA established for human health according to the legislation in force.

The modeling of the noise level generated by the traffic was done with the help of the softwareCadnaA Version 2023. The input data used were:

- The digital terrain model – .asc format in Stereo 70 projection;
- Suceava – Siret highway/expressway axis – .shp format in Stereo 70 projection;
- Road traffic data for DN, DJ, A roads within a radius of 2 km from the axis of the Suceava - Siret highway/expressway - according to the Traffic Study and the CESTRIN 2015 traffic census;
- Average vehicle speed – default settings in CadnaA;
- Road infrastructure characteristics – road type (default settings in CadnaA);
- Wooded areas - which represent obstacles in the propagation of noise;
- Sound-absorbing and anti-collision panels with a height of 3 m - .shp format in Stereo 70 projection;
- Exavation cuts – .shp format in Stereo 70 projection;
- Sensitive receivers - coordinates in Stereo 70 projection.

The noise modeling was carried out taking into account the values estimated in the traffic study for DX Suceva – Siret for the year 2050. The traffic values for the roads in the existing network corresponding to this segment of the expressway were taken from the CESTRIN 2015 traffic census. From the surface of the total number of intersected forests, those segments intended for deforestation, which correspond to the expropriation corridor, were cut out.

Modeling resultsthe noise levelduring the operation stage, they were reported to the sensitive receivers in the project area (residential areas), taking into account the limit values during the day and at night according to Order 119/2014, specific for each locality classified according to the current level of noise . In the analysis, the official limits of intravillages publicly available on the ANCPI geoportal were used. In order to highlight the level of acoustic pressure due to the operation of the project on the inhabited areas, the potentially affected surfaces inside the urban areas were extracted, determined on the basis of the noise isolines corresponding to the limit values during the day and at night and related to the total urban areas of each locality .
The quantification of the urban areas affected by the noise produced during the operation stage is presentedin the following table.

Table no.7-37 The results of the noise modeling for the 2050 scenario reported at the inner city limits of the localities in the project area

CITY	UAT	The surface of the affected area during the day		The surface of the affected area during the day - with panels		The surface of the affected area at night		The surface of the affected area at night - with panels	
		m²	% of the inner city	m²	% of the inner city	m2	% of the intravilan	m²	% of the intravilan
Suceava	Suceava	196,855	1	99,080	0	1,166,362	4	884,924	3
Mihoveni	Şcheia	0	0.00	0	0.00	167,936	6	93,580	3
Mitocu Dragomirna	Mitocu Dragomirna	6,187	0.14	0	0.00	134,785	3	88,044	2
Pătrăuţi	Pătrăuţi	82,590	2	70,905	1	752,622	14	673,926	12
Dărmăneşti	Dărmăneşti	81,376	1	22,895	0	796,386	12	434,971	7
Măriţeia Mică		27,847	4	22,109	3	142,328	21	127,006	18
Dănilă		92,381	6	72,535	5	300,807	21	280,406	20
Iacobești	Graniceşti	80,174	7	61,739	5	175,467	16	172,453	15
Româneşti		52,908	6	37,427	4	576,611	60	404,241	42
Slobozia Sucevei		0	0.00	0	0.00	333,741	2. 3	217,847	15
Grăniceşti		0	0.00	0	0.00	6,824	0.23	3,703	0.13
Gara	Milisăuţi	65,944	4	60,226	4	321,889	21	317,845	21
Bălcăuţi	Bălcăuţi	0	0.00	0	0.00	485	0.03	431	0.02
Gropeni		12,757	2	12,747	2	55,796	11	45,322	9
Bănceşti	Muşeniţa	6,744	0.39	3,406	0.20	29,727	2	17,020	1
Văşcăuţi		1,918	0.05	857	0.02	38,735	1	6,675	0.17
Mănăstioara	Siret	877	0.06	781	0.05	7,774	1	7,733	1
Siret		97,611	1	85,355	1	158,584	2	153,476	2

The data presented in the previous table indicate that at night, 9 localities out of 18 analyzed will be affected by noise on an area greater than 10% of the total area of the inner city. The most affected locality from the point of view of noise discomfort compared to the total urban area is the locality of Româneşti, with approx. 60% of the inner city area in the area where legal limit values are expected to be exceeded at night. In most affected localities, the fluthe expresswayon inner-city areas is exercised marginally. In the case of the Româneşti locality, it presents small inner-city sections, being positioned longitudinally, parallel tothe express way, next to the DN2H road node.

The other localities where significant exceedances were estimated (over 10% of the inner city) are also under the influence of multiple pressures from road traffic. The town of Pătrăuţi (14 %) is located in the vicinity of the road junction DN2/DN2P, next to the area where DN2 intersectshighway/express road Suceava – Siret. Similarly, the localities of Slobozia Sucevei (23%) and Gara (21%) are located next to the DN2H junction, at the intersection of the expressway with DN2. The localities of Dărmăneşti (12 %), Măriţea Mică (21 %), Dănila (21 %), Iacobeşti (16 %) are affected by the cumulative effect of the DN2 national road that runs parallel tohighway/ express road Suceava – Siret. The percentage of 11% of the area affected by the increased level of decibels in the Gropeni locality is due to the small area of the locality and its short distance fromfreeway/express road.

After analyzing the graphic results, which can be **seen in Annex C of the Report**, it can be found that an important contribution to the noise level inside the localities identified as potentially affected is given by the accumulation of road traffic fromhighway/expressway, especially of the road junctions, with the national and county roads located in its immediate vicinity.

The areas where the limit values for noise are estimated to be exceeded were considered as areas where a significant negative impact on human health is manifested. The following table shows the areas of manifestation of the significant impact from the operation stage, being considered exclusively those inner-city areas where residential houses were identified, through the analysis of satellite images.

For all localities for which a significant negative impact in terms of noise was estimated, sound-absorbing panels sized to reduce the acoustic pressure due to road traffic below the maximum admissible levels were proposed and included in the project.

To reduce the noise discomfort in the localities affected by the noise generated by highway traffic/express road, it is proposed to place sound-absorbing panels in the areas facing the houses. The measure adopted in the project will reduce the level of noise generated by the highway/express road, but the noise produced on the other roads in the project area will continue to represent a pressure on the sensitive receivers, but at a lower level due to the decrease in the volume of traffic of these roads.

Table no.7-38 The areas of manifestation of the significant impact on the human population in the vicinity of the project due to the noise during the operation period

<table>
<tr><th colspan="3">Areas of manifestation of the impact</th><th rowspan="2">Interventions</th><th rowspan="2">Sensitive receptors</th><th rowspan="2">Sensitivity</th><th rowspan="2">Extension</th><th rowspan="2">Duration</th><th rowspan="2">Frequency</th><th rowspan="2">Probability</th><th rowspan="2">Reversibility</th><th rowspan="2">Magnitude</th></tr>
<tr><th>from km</th><th>to km</th><th>Side</th></tr>
<tr><td>0+680</td><td>1+405</td><td>Left</td><td rowspan="7">IO1</td><td rowspan="2">Suceava</td><td rowspan="7">High</td><td rowspan="7">Local</td><td rowspan="7">Long</td><td rowspan="7">Periodic</td><td rowspan="7">Very likely</td><td rowspan="7">Reversible</td><td rowspan="7">Moderate</td></tr>
<tr><td>3+940</td><td>4+585</td><td>right</td></tr>
<tr><td>5+425</td><td>7+325</td><td>Left</td><td>Suceava + Mitocu Dragomirnei</td></tr>
<tr><td>5+440</td><td>6+070</td><td>right</td><td>Mitocu Dragomirna</td></tr>
<tr><td>7+550</td><td>8+250</td><td>Left</td><td>Suceava</td></tr>
<tr><td>9+025</td><td>9+825</td><td>Left</td><td>Suceava+ Patrăuţi</td></tr>
<tr><td>11+710</td><td>12+370</td><td>right</td><td>Pătrăuţi</td></tr>
</table>

Areas of manifestation of the impact			Interventions	Sensitive receptors	Sensitivity	Extension	Duration	Frequency	Probability	Reversibility	Magnitude
from km	to km	Side									
12+865	13+880	right									
14+985	17+170	right		Dărmăneşti							
17+805	18+690	right									
20+840	21+205	right		Măreţia Mică							
21+450	23+605	right		Măreţiaa Mică + Dănila							
24+175	24+990	right		Iacobeşti							
26+975	26+330	left (node belt)		Gara							
26+340	27+450	left (node belt)									
26+430	27+895	right		Româneşti							
30+790	31+345	Left		Grăniceşti							
40+630	40+970	Left		Balcăuţi+Gropeni							
43+025	43+300	right (node belt)		Negostina							
49+900	50+125	right		Mănăstioara							
49+900	50+135	Left		Bănceşti							
54+960	55+420	right		Siret							
55+440	55+700	right									

Goods

Regarding the impact on material assets, the project involves expropriation of some agricultural lands and pastures belonging to private owners in the vicinity of the highway, this leads to the fragmentation or relocation of properties, but also to the difficulty of access (circumvention) to agricultural lands during the entire period of operation of highways. It is estimated that the impact due to the loss of some areas of agricultural land permanently occupied by the highway is insignificantly negative, because the areas lost are reduced compared to the area of agricultural land available at the level of UATs. In addition, right from the execution phase, the project included measures to restore the access road connections on all the lands obstructed by the highway.

According to the estimates made in Chapter 2.8.5. Noise and vibrations, the vibrations associated with road traffic during the operation stage will not reach values that could affect the resistance elements of the neighboring buildings, thus being considered an insignificant negative impact in this context.

In the operation stage, the project will also generate positive effects on material goods by reducing the duration of the transport of goods on this section and increasing the quantities of goods or other goods transported. All this will lead to an economic growth, both locally and nationally.

Decommissioning phase

For the decommissioning phase, the level of generated effects are similar to those presented for the construction stage. The same measures, stated for the construction stage, must also be observed in the event of the decommissioning of the structure or some of its sections.

7.8.3 Measures to avoid and reduce the impact

In order to minimize the impact on the social environment, the following measures will be taken during the execution stage:

- informing the citizens of the area about the work schedule and especially the periods when the supply networks of building utilities (electricity, water, gas, etc.) will be temporarily interrupted;
- the works will not be carried out at night, between 22:00 and 07:00;
- encouraging the hiring of qualified and unqualified personnel from the project implementation area;
- daily cleaning of access roads in the vicinity of work areas and maintenance of these roads;
- protection and signaling of work areas, with clear markings regarding the safety limit in the work perimeter;
- prohibiting access to work areas for unauthorized persons;

- the use of new vehicles, equipment and machinery, technically compliant with the best existing technologies;
- for construction activities carried out in the vicinity of inhabited areas, less than 600 m from them, mobile sound-absorbing panels will be used near the work fronts.
- limiting the routes in inhabited areas by machines and vehicles with large masses;
- the movement of vehicles in the construction site will be done at a reduced speed of a maximum of 30 km/h;
- restoring all road access links to the fragmented properties of the project.

In order to reduce the impact on inhabited areas during the operation stage, the following measures will be taken:

- installation of sound-absorbing panels in the following kilometer intervals:
  - km 0+675 - km 1+400 on the left side
  - km 3+950 - km 4+575 on the right side
  - km 5+450 - km 6+075 on the right side
  - km 5+425 - km 7+325 on the left side
  - km 7+550 - km 8+250 on the left side
  - km 9+025 - km 9+825 on the left side
  - km 11+725 - km 12+375 on the right side
  - km 12+850 - km 13+875 on the right side
  - km 15+000 - km 17+175 on the right side
  - km 17+800 - km 18+700 on the right side
  - km 21+450 - km 23+600 on the right side
  - km 20+850 - km 20+200 on the right side (SS type S1)
  - km 24+175 - km 24+975 on the right side
  - km 24+975 - km 26+350 on the Left side
  - km 26+425 - km 27+900 on the right side
  - km 26+350 - km 27+450 on the left side
  - km 30+800 - km 31+350 on the left side
  - km 40+625 - km 40+975 on the left side
  - km 43+050 - km 43+275 on the right side
  - km 49+900 - km 50+125 on the right side
  - km 49+900 - km 50+125 on the left side
  - km 54+975 - km 55+425 on the right side
  - km 55+450 - km 55+700 on the right side;
- checking and maintaining the panels that shield traffic noise;
- monitoring and control of atmospheric pollutant emissions;

- restoring road connections to ensure access to fragmented agricultural lands;
- adequate maintenance of the road infrastructure.

The implementation of the project will be carried out in such a way as to ensure the continuation of community life and economic activities. The roads and utility networks intersected by the project will be relocated, continuing to be functional during the operation of the highway/express road. In this sense, by implementing the project, the economic activities in the neighboring areas can be encouraged, the project having a positive impact on the local economy.

In the decommissioning stage, the same measures will be implemented as in the execution stage.

7.9 CULTURAL AND ETHNIC CONDITIONS, CULTURAL HERITAGE

7.9.1 Sensitivity classes and magnitude classes for assessing the impact on cultural heritage

7.9.1.1 Sensitivity classes

From the point of view of cultural heritage, five classes of sensitivity were delimited, presented in the following table. The areas with cultural, historical or archaeological value of international relevance were considered to have the maximum degree of sensitivity ("very high") and the areas with no cultural, historical or archaeological importance to the minimum degree of sensitivity ("very low").

Table no.7-39Sensitivity assessment matrix for the Cultural Heritage component

The sensitivity of the area	Description
Very High	UNESCO sites designated for cultural, historical or archaeological value.
High	Sites of archaeological, historical or cultural importance designated at national level Protected historical, archaeological, cultural monuments.
Moderate	Sites of archaeological, historical or cultural importance designated at county level.
Low	Sites of archaeological, historical or cultural importance designated at the local level or used by the local community to maintain traditions.
Very low/ Insensitive	Sites that are not of archaeological, historical or cultural interest and are not considered important by the local community for maintaining traditions

In the case of this location of this project, from the point of view of cultural heritage, the sensitivity is estimated to be high in the case of the localities of Suceava and Siret, where there are several churches located at a smaller distance from the project (approx. 400 - 600 m). The archaeological sites in the area are located at a distance of more than 1 km from the project limit, in their case a low sensitivity is estimated.

7.9.1.2 Magnitude classes

The second criterion for assessing the significance of the impact, the magnitude of the changes, is presented for the Cultural Heritage component in the table below. The matrix for assessing the magnitude of the changes is structured in five classes, both for changes of a negative nature and for positive changes, depending on the extent of the interventions and their timing.

Table no.7-40 Magnitude assessment matrix for the Cultural Heritage component

The magnitude of the change		Description
Negative	Very high	Activities that lead to the total alteration of the cultural resource
	High	Activities that lead to the alteration of 50-75% of the cultural resource
	Moderate	Activities that lead to the alteration of 25-50% of the cultural resource
	Low	Activities that lead to the alteration of 10-25% of the cultural resource
	Very low	Activities that lead to the alteration of <10% of the cultural resource
No detectable		Activities that do not influence the cultural heritage

The magnitude of the change		Description
change		
Positive	Very low	Activities that lead to a very small appreciation of the cultural resource
	Low	Activities that lead to a small appreciation of the cultural resource
	Moderate	Activities that lead to a moderate appreciation of the cultural resource
	High	Activities that lead to a greater appreciation of the cultural resource
	Very high	Activities that lead to the valuing of the cultural resource to a great extent

In the case of the Suceava – DN2H highway project and the DN2H – Siret border expressway project, the magnitude is estimated to be very high, strictly in the area where the works are carried out. Considering the location of the cultural heritage objectives identified in the area and the distance from them to the project area, it is estimated that the magnitude that the project can have on them is either very small or undetectable.

7.9.2 Impact predicition

In the context of the potential impacts on historical monuments, it is important to mention that in the area of the highway and expressway route, no archaeological sites of international interest, designated by UNESCO World Heritage as world cultural heritage sites, have been identified.

According to the List of Historical Monuments (2015), approved by Order no. 2314/2004 with the subsequent amendments and additions, there are no historical monuments (architectural monuments, public forum monuments, memorial and funeral monuments) having the protection zone intersected with the route of the highway and the expressway. The objectives located closer to the project are located in inner-city areas, at distances of about 400 meters from the project (Orthodox Church of St. Peter and Pavel Ițcani and Adormirea Maicii Domnului Church, Văşcăuți).

According to the archaeological report prepared for the project, no potential archaeological sites were identified in the area of the route.

Construction phase

The interventions associated with earthworks (which involve excavation, filling and handling of earth masses) have the greatest impact on the objectives of historical interest. Following the analysis of the project implementation area (analysis based on spatial data), no cultural/historical/religious objectives were identified within the scope of the project, in the urban areas of the localities. A potential impact can occur strictly in relation to the transport activities during construction, which take place in localities. Considering the sensitivity and magnitude, a potential insignificant impact was estimated for the archaeological objectives in the area during the construction phase.

Operation stage

During the operation stage, the only effects that could have the potential to affect the archaeological monuments are vibrations and atmospheric emissions. Considering the fact that the closest historical monuments were identified more than 200 m from the highway, an insignificant negative impact on the objectives of historical and cultural interest is appreciated.

Decommissioning phase

In the decommissioning phase, is considered that there is no probability of the appearance of effects on the elements of cultural heritage.

7.9.3 Measures to avoid and reduce the impact

In order to avoid and reduce impacts on cultural heritage during the construction phase, the following measures are recommended:

- Preventive archaeological surveillance of the archaeological sites identified as a result of the research carried out for the preparation of the in-depth archaeological evaluation report of the field (perieghese).
- Prior to the execution phase of the project, the intrusive archaeological diagnosis at road junctions, parking lots, construction site organization, additional lands, as well as in the perimeter of all additional surfaces arising after the finalization of the project;
- The resumption of the in-depth evaluation through intrusive diagnosis in the phase prior to the start of site development and construction works, after the expropriation of these lots, in the areas where surveys could not be carried out as part of the intrusive archaeological study;
- In the event that new archaeological sites are identified during the construction phase, the works will be stopped, and the competent authorities will be contacted for expertise and establishing the necessary solutions. Any unloading of archaeological load will be carried out in accordance with the legislation in force and the requirements of the National Commission of Archaeology.

In the operation stage, no specific measures are required to reduce the impact on the cultural heritage.

In the decommissioning stage, the same sets of measures established for the execution period will be adopted.

7.10 IMPACT ON NATURAL RESOURCES

7.10.1 Impact prediction

The main natural resources used in the execution stage for the implementation of the project are represented by: water, natural aggregates stabilized with cement, ballast, raw stone, wood, land and vegetation (ruderal) existing in the areas temporarily or permanently affected by works.

The project includes the realization of borrow pit. The amount of material required for the execution of embankments excavation cuts /embankment was identified, the volumes required for filling works to be taken from borrow pits, in case the excavated material will not be of good quality to be used for the works of filling. The possible locations of the borrow pits are presented in the section 2.3.6.2 of the Report.

Also, for the construction of the highway, clearing works of some areas located in the forest background are necessary. The total area that needs to be deforested, from the forest fund, is about 37.57 ha. Details on deforestation are presented in chapter 2 of the Report.

For the assessment of the impact on the natural resources related to the project, in this phase of the project, there are limitations in the quantification and management of the use of natural resources due to the fact that the suppliers of raw materials are not yet known, these being established by the builder before the start of the works. From economic considerations, the builder will most likely establish his suppliers of raw materials in the project area in order to reduce the costs associated with logistics (transport, handling and storage), the possibilities in the area being multiple.

According to the National Agency for Mineral Resources, there are a variety of suppliers of natural aggregates (sand and gravel) in the Suceava county level, both in the process of exploitation and in the process of approval. It is estimated that during the execution period, at the local level, the exploitation of natural resources will be accelerated in the existing authorized installations (ballasts) that will be contracted to ensure the needs of the project. Their degree of exploitation will be within the limits of the exploitation parameters, the requirements of the project not exceeding the maximum available capacities authorized within these installations. Taking into account the distance over which the project is carried out and depending on the availability of ballasts, there is the possibility of choosing a larger number of suppliers, in order not to put pressure on a single area, and so that the distance covered is as short as possible.

Compared to the size of the project, the amount of water required for the entire execution period (approx. 30 months), of 244,918 m^3, does not represent a significant pressure on water resources. The project does not provide for the capture of surface water.

In the operation stage, for the maintenance works, the need to use some quantities of natural resources, such as those used in the execution stage, may occasionally appear, but these quantities will be reduced. The only exceptions are water and electricity, which will be needed throughout the operating period in short-term parking lots, service spaces and CIC.

7.10.2 Measures to avoid and reduce the impact on natural resources

For the **execution phase**, the following measures are recommended:

- Prohibition of exploitation of natural resources inside protected natural areas;
- The use in the filling works of the surplus material resulting from the excavation cuts areas of the project;
- The supply of raw materials will be made exclusively from authorized sources, through suppliers;
- In the selection of suppliers, the distance from the project to their location will also be taken into account;
- Checking the stock of raw materials of the suppliers, in order not to put pressure on the exploitation perimeters, in case of overlapping with other projects;
- Occupancy of land areas in addition to those provided by the project will be avoided;
- The temporarily occupied lands will be rehabilitated at the end of the works;
- The areas that were affected by the removal of vegetation will be properly stabilized, and in the areas left free after the completion of the constructions, the re-establishment of the vegetation will be ensured;
- There will be no underground or surface water intakes to ensure the water supply during construction.

In the **operation phase**, it is necessary to implement the following measures:

- Ensuring the maintenance of sanitary installations in such a way as to ensure the reduction of water losses;
- Avoiding the occupation of additional land surfaces during maintenance and repair works, other than the land related to the road infrastructure resulting from the implementation of the project.

In the decommissioning stage, the measures will be similar to those in the execution period.

7.11 CUMULATIVE IMPACT OF THE PROJECT

7.11.1 Level of current pressures

The main current pressures that could have the potential to generate cumulative effects as a result of the implementation of the project are the road and railway infrastructure, the economic operators that carry out activities in installations falling under the scope of the Industrial Emissions Directive (IED) and ballast sorting/extraction facilities. Current pressures that can generate cumulative effects with the pressures associated with the project are presented below.

1. Road and railway infrastructures that may have cumulative effects with the analyzed project in terms of noise, atmospheric emissions and behavioral barriers for fauna:
   - DN2 (E85) - to run parallel to the project along its entire length, intersecting the project at several points
   - DN2H – intersects the project at km 27+000
   - DN29A – intersects the project at km 2+000
   - DJ178B – intersects the project between km 31+000 and 32+000
   - DJ208D – intersects the project at km 6+000
   - DJ208T – intersects the project at km 1+000
   - DJ209D – intersects the project between km 39+000 and 40+000 and at km 41+000
   - DJ 291A – intersects the project at km 50+000
   - Railway – intersects the project at km 15+000 and km 18+000, following that from that km it runs parallel to the project up to km 25+000.
2. Installations falling under the scope of IED that may have cumulative effects with the analyzed project in terms of atmospheric emissions:
   - SC Bulrom Gas impex SRL – at a distance of 2.6 km;
   - SC EGGER Technologia SRL – at a distance of 8 km;
   - SC FLAGA LPG Vereştii – at a distance of 11 km.
3. At the level of the study area, ballast extraction and sorting facilities operate, which can lead to cumulative effects with the analyzed project with regard to atmospheric emissions (dust in suspension), in all stages of the project:
   - Florconst44uct Balastiera – at a distance of 4 km from the project
   - Expert Evia – at a distance of 2.8 km from the project
   - Bucovplast - at a distance of 1 km from the project
   - S.U.C.T.S.A - at a distance of 0.8 km from the project

7.11.2 Existing/planned projects in the analyzed area

In order to identify existing or planned investments in the project area that could generate cumulative effects on the environment, publicly available information was studied in:

- The list of projects from the UATs of interest subject to regulation from the point of view of environmental protection available on the websites of the Suceava Environmental Protection Agencies
- List of planned projects in the UATs intersected by the project on the website https://recorder.ro/investitii/.

The analysis of these projects focused in particular on investments to modernize/build roads, railways in the study area and investments in water and wastewater infrastructure that propose the collection of flows or the return of wastewater treatment in the water bodies intersected by project. The table below presents the projects identified in the area as well as the potential cause-effect mechanisms identified in the context of the cumulative impact.

Table no.7-41 Existing or planned investments in the project area

failed	Name of existing objective/proposed project	Potenttial affected component	Possible cumulative cause-effect mechanism
Suceava Municipality	Paşcani - Suceava highway	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	YES The project represents a continuation of the investment analyzed in the present study and most likely the execution works will be carried out simultaneously, thus having the potential to accumulate the effects generated by the project interventions.
	Extension of household sewerage networks on the street Dobrilă Eugen, Molidului, Făgetului	Water, Air, Soil	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	CF modernization: Ilva Mica - Suceava	Air, Soil, Biodiversity, SOCIO-ECONOMIC	YES It can contribute to intensifying the estimated impacts for Natura 2000 sites, especially by increasing the level of fragmentation.
	CF modernization: Paşcani - Dărmăneşti	Air, Soil, Biodiversity, SOCIO-ECONOMIC	YES It can contribute to intensifying the estimated impacts for Natura 2000 sites, especially by increasing the level of fragmentation.
Mitocul Dragomirnei	Extension of sewerage and water supply networks in the Mitocu Dragomirnei, Suceava County	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
Pătrăuţi	Establishment of waste water infrastructure and treatment plant in Pătrăuţi, Suceava County	Water, Air, Soil, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
Dărmăneşti	Establishment of waste water infrastructure and treatment plant in the commune Dărmăneşti	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	Modernization of communal roads in Darmăneşti	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	Modernization of a road of local interest through measure 4/6b in the commune of Dărmăneşti	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	CF electrification: Dărmăneşti - Vicsani	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	YES It can contribute to intensifying the estimated impacts for Natura 2000 sites, especially by increasing the level of fragmentation.
Grăniceşti	System establishment of sewage with station of purification in the Grăniceşti commune,	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NOT The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant

failed	Name of existing objective/proposed project	Potenttial affected component	Possible cumulative cause-effect mechanism
	Suceava County		
	Extension of water supply networks in the commune Grăniceşti, Judeţul Suceava	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
Calafindeşti	Expansion of the sewerage network and expansion of the water supply in Calafindeşti locality, Calafindeşti commune	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	Rehabilitation of communal roads in Calafindeşti commune, Suceava county	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
	Rehabilitation of communal road DC 39 km 0+000-5+672 in Calafindeşti commune, Suceava county	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant
Bălcăuţi	Infrastructure modernization road in Bălcăuţi commune	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	NO The area does not show great sensitivity from the point of view of biodiversity. The effects on water, air and soil are not significant.
Siret	Extension of sewerage networks in the town of Siret-Vama Siret, Suceava county	Water, Air, Soil, Biodiversity, SOCIO-ECONOMIC	YES It can contribute to intensifying the impacts on the Natura 2000 site ROSPA0110 Accumulations Rogojeşti - Bucecea

As can be seen from the analysis presented in the table above, most of the projects proposed in the area have a point-like character and are reduced in size. The estimated impact as a result of these projects is also low, not having the potential to generate, together with the highway and expresswy, a significant cumulative impact on environmental factors.

In the figure Figure no.7-19the existing or planned investments in the project area that could generate cumulative effects on the environment are represented.

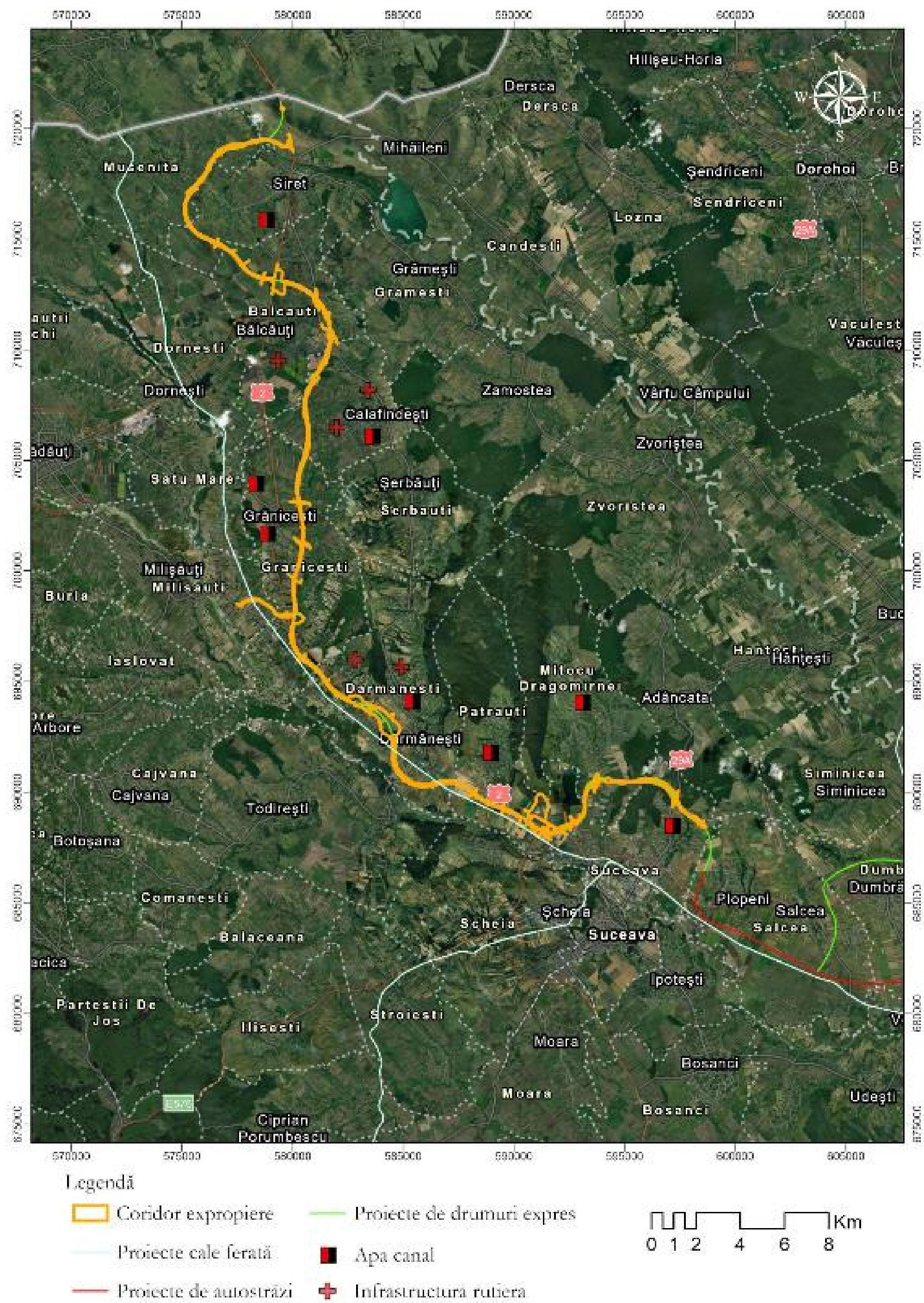


Figure no.7-19The projects in the area of the Suceava - DN2H highway and the DN2H expressway - Siret border, analyzed from the point of view of cumulative impact

The cumulative impact analysis was carried out as follows:

- Current pressures and projects in the area of influence of the project were included (as additional sources) in quantifying the effects. Therefore, both during the execution period of the highway project and during the operation period, the impact assessment was carried out by considering the cumulative effects in the area of influence. For example, see section 2.8 of the RIM;
- The projects that generate remote and long-term impact, such as those on water bodies and on habitats and species of community interest, were analyzed within SEICA and the EA Study and the conclusions were integrated into the RIM. We make it clear that in this case, in addition to the existing pressures and the proposed projects, both the direct and indirect impacts generated by the highway were taken into account.

Summary of forms of significant cumulative impact:

1. On human settlements: The significant cumulative impact may occur in the case of noise, at the level of some of the localities located in the area of influence of the project. Because the noise emissions were analyzed cumulatively (project + existing sources + sources related to other projects), the results presented in chapter 7.8 practically reflect the cumulative impact. There is a differentiation regarding the noise of the affected areas within the localities. During the construction of the highway, the main sources of noise remain inside the localities (mainly car traffic), the sources related to the construction activities of the highway contributing to the expansion of the current level of noise inside the locality. In the operation stage, the main source of noise becomes the highway and the areas affected by noise move from the interior of the localities to the side close to the highway. Reducing the level of noise generated as a result of the cumulative contribution of the sources can be effectively achieved by controlling noise emissions at the highway level (see the measures proposed in chapter 9);
2. **Biodiversity**:

   The impact on **Natura 2000 sites** was analyzed in the EA Study. The impact analysis, carried out at the level of each possible parameter of the conservation objectives, took into account the contribution of the existing pressures and the proposed projects. Significant impacts on habitats and species of community interest were identified in several analyzed sites. Thus, in the framework of the EA study, it was found that it is possible for the project to have a significant cumulative impact in both the construction and operation stages with other road or railway infrastructure projects as follows:

   - Transport infrastructure projects, especially the Paşcani - Dărmăneşti and Dărmăneşti - Vicşani railway projects may contribute to increasing the risk of mortality for bat species in the Natura 2000 site ROSCI0075.
   - The risk of mortality for the *Myotis myotis* and *Lutra lutra* species from the ROSCI0380 site may be increased as a result of the cumulation of the impacts of the analyzed project with the "Paşcani - Suceava Highway", "Suceava - Botoşani Expressway" and the "Paşcani - Dărmăneşti" railway projects and "Ilva Mica - Suceava".
   - In the case of bird species, a potential cumulative impact may occur as a result of the implementation of the project to expand the sewerage network in the city of Siret - Vama

Siret, in the case of the ROSPA0110 site, taking into account the proposed crossing of the Siret River and the potential impact on water quality in site.

Outside of Natura 2000 sites, significant cumulative impacts may occur in particular as a result of the spread of invasive plant species and as a result of the intensification of the risk of mortality for fauna. An important risk exists in the area of the Siret river, a river where the presence of the Castor fiber species has been reported.

The analysis of the cumulative impacts also involved the investigation of the expected changes in the level of traffic on the roads adjacent to the new highway, at the level of 2050 (scenario with project and scenario without project). Following the analysis, the following were observed:

- In general, the level of traffic on the adjacent roads is lower in the scenario with the highway and expressway, compared to the scenario without highway and expressway, but it will not decrease to a level considered permeable;
- No roads have been identified that will become waterproof strictly as a result of the construction of the Suceava - DN2H highway and the DN2H - Siret expressway;
- The DN2H road sector will remain impermeable in the area between the junction with the highway and the town of Rădăuţi;
- In the area, there were no ecological corridors that could be fragmented by changes in the traffic level on the roads adjacent to the highway and the expressway;
- National Road 2 will remain a barrier for the movement of fauna in the context of the project.

In the following figure is the spatial representation of the way in which the variability of the permeability of the adjacent roads is estimated as a result of the construction of the highway.

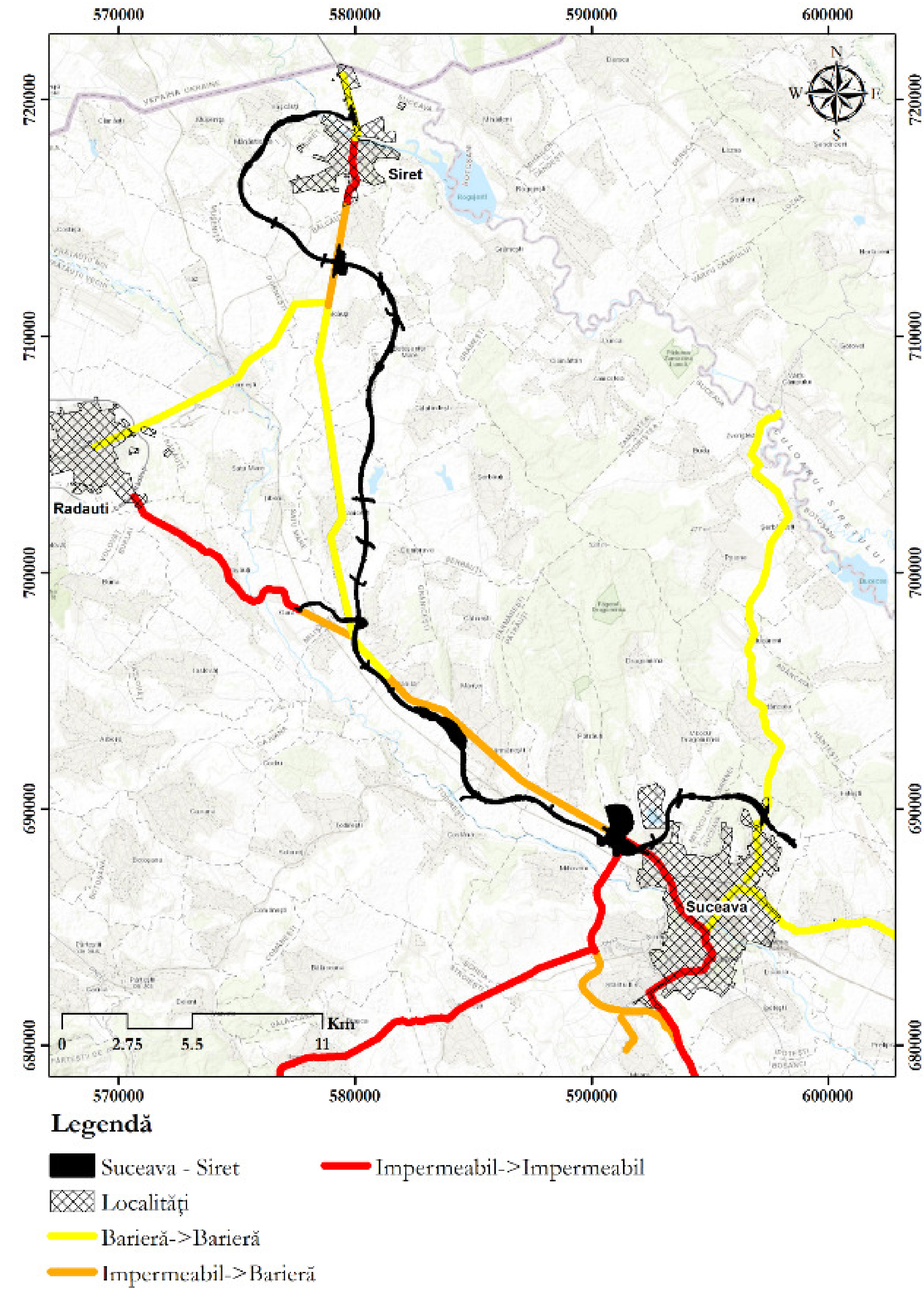


Figure no.7-20 Changing the permeability of the roads adjacent to the highway in 2050, as a result of the construction of the Suceava - DN2H highway and the DN2H - Siret expressway

According to the results of the permeability analysis (presented in the Appropriate assessment report), without the implementation of measures to improve permeability, it indicates a good level of permeability at the level of the highway and the expressway. However, structures were provided to cross the proposed infrastructure, in the forest area north of Suceava (a highway overpass) and in other sensitive areas on the route.

Following the analysis carried out within SEICA, regarding the cumulative impact on surface water bodies, the following were found:

- Cause-effect mechanisms were identified for a potential cumulative impact in the case of the water bodies Podul Vătafului (RORW12-1-17-30B_B1), Mitoc (RORW12-1-17-30A_B1), Dragomirna (lake Dragomirna – cf Suceava) (RORW12 -1-17-30_B3), Patrăuţeanca (RORW12-1-17-28_B1), Hatnuţa + Bocancea (RORW12-1-17-27_B1) and Horaiţ (RORW12-1-17-24A_B1). The impact can be generated by cumulating the effects of the railway projects "Rehabilitation of the Paşcani - Dărmăneşti railway line" and "Rehabilitation of the Dărmăneşti-Vicşani railway line". The main quality element potentially affected is the structure of the riparian zone (in the case of all water bodies). In the case of the Podul Vătafului water body, there is also a risk for the other analyzed quality elements.
- Regarding the designated protected areas on the water bodies intersected by the project, it is considered that the impact is minimal because the works carried out within the project do not affect the habitats in the Natura 2000 sites dependent on the intersected water bodies. However, the project is taking place near the underground catchment front of the city of Siret, proposing the construction of a bridge located at approx. 570 m upstream from it (measured along the route of the minor bed), avoiding the related sanitary protection zone. And in this case, no significant negative impacts were assessed on the protection area of the catchment front, the works provided in the project for the construction of the bridge avoiding the minor bed of the water body. At the same time, during the operation stage, the project does not provide for the evacuation of rainwater collected from the road embankment directly into the river, but is directed to other canals in the area that flow into Siret downstream of the catchment front.

7.12 THE POTENTIAL IMPACT IN A CROSS-BORDER CONTEXT

The Suceava - DN2H highway and the DN2H - Siret border expressway will run in the north of the country. The minimum distance between the project site and the country's borders is approximately 1.6 km in the northern direction, up to the border with Ukraine.

The project is located at a distance of 15 km from the Emerald UA0000085 Chernivetskyi Regional Landscape Park site in Ukraine, not far from the capital of the Chernivtsi region. This site contributes substantially to the survival of threatened species, endemic species, presents unique forest communities composed of *Fagus sylvatica L., Carpinus betulus L., Quercus robur L., Acer. Communities in the Green Data Book of Ukraine: Fageta (sylvaticae) taxosa (baccatae), Fagetum (sylvaticae) vincosum (minoris), Fagetum (sylvaticae) lunarietosum (redivivae), Fagetum (sylvaticae) scopoliosum (carniolicae), Querceto (petraeae)*. It is located in two biogeographic regions, respectively continental (30%) and alpine (70%).

According to the Environmental Notice no. 33 of 11.12.2015 for the short-, medium- and long-term General Transport Master Plan of Romania for the period 2014-2030 promoted by the Ministry of Transport, for construction projects involving the construction of new road transport corridors (express roads, highways) that will allow the considerable improvement of transport conditions and safety, facilitating active links between communities located on either side of the border, contributing directly to the modernization/expansion of the trans-European network (TEN-T) and pan-European corridors as well as the connection between Romania and the neighboring states, no significant negative impact is identified in a cross-border context.

8 DESCRIPTION OF FORECASTING METHODS

The main difficulties encountered during the creation of the Environmental Impact Assessment Report were related to the availability of detailed information on the existing environmental conditions in the project area.

The description of the relevant aspects of the current state of the environment in the project implementation area and its probable evolution in the event that the project is not implemented, was carried out both on the basis of publicly available data and on the basis of data collected from the field. Among the data sources used, we mention:

- Annual reports on the state of environmental factors in Suceava county
- The updated management plan of the Siret Hydrographic Area 2022-2027
- The Flood Risk Management Plan made by ABA Siret
- Air quality maintenance plan;
- The values of atmospheric pollutant concentrations monitored within the RNMCA;
- Air quality maps at European level available on the website of the European Environmental Protection Agency;
- The strategic noise maps made on the road sections in the study area.
- The reports on the state of health of the population developed by the National Institute of Public Health;
- Statistical data available on the website of the National Institute of Statistics;
- Management plans of protected natural areas, etc.

The collection of data from the field was carried out at the level of the entire implementation area, with special attention being paid to the observations of biodiversity elements, especially in the areas of the works located near and/or inside protected natural areas.

Different methods were used to identify and quantify the effects and/or forms of impact associated with the project, including the modeling of noise sources and the modeling of the dispersion of atmospheric emissions.

The assessment of the impact on the air component was carried out by modeling the quantities of pollutants emitted, with the help of the software application CadnaA Version 2023.

The estimation of pollutant loads in rainwater collected from the highway platform was made based on the SETRA methodology.

The analysis of the potential changes in the noise level was carried out by modeling with the help of the software application CadnaA Version 2023, using the traffic projections related to the project, for the level of the year 2050.

9 MEASURES TO AVOID AND REDUCE THE IMPACT AND MONITORING

9.1 MEASURES TO AVOID AND REDUCE THE SIGNIFICANT IMPACT ON THE ENVIRONMENT

In this report, the analysis of the environmental components was carried out for each component on which the implementation of the project could generate a potential impact. The effects generated both in the construction stage and in the operation and decommissioning stage were considered, effects on which it is necessary to apply the recommended measures to avoid and reduce the impact. To the extent that they will be applied, the proposed measures (preconditions) attract the expected results of a nature to reduce the values of the initially assessed impacts.

The effects that remain after the implementation of avoidance and reduction measures are expressed in the form of residual impact. At the time of this report, this type of impact can only be estimated. The evaluation of the efficiency of the proposed measures, as well as the residual impact corresponding to the realization of the project, constitute important recommendations, for this it is necessary to implement an adequate monitoring system, carried out both during the construction and post-construction periods (depending on the analyzed component).

The estimated residual impact for the analyzed project is presented in the following table. In this case, only those components were evaluated where the possibility of significant negative impacts was identified, respectively for the components:

- Biodiversity and the social environment - in the construction phase;
- Biodiversity and the social environment - in the operational phase.

The complete list of measures proposed for the project can be found in chapter 7, in the subsections related to each environmental component.

No significant negative impacts were identified during the decommissioning stage.

Table no.9-1 The measures to reduce the significant negative impact and the estimation of the residual impact as a result of the implementation of the measures

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
Biodiversity	Execution	IE1, IE4, IE5, IE6, IE7, IE8	**Loss of habitats:- can occur in the case of bird and mammal species, through the occupation of meadows, pastures or agricultural land.**	M_RIM_1	Construction activities will be strictly limited to the project limit included in the Environmental Agreement. During the execution stage, additional surfaces will not be occupied to this limit, especially in natural areas, meadows, pastures or forests.	-	Insignificant impact
	Execution and operation	IE1., IE3., IE4., IE5., IE6, IE7, IE8., IE9., IO1.	**Alteration of habitats: - can occur during construction and operation periods as a result of the spread of invasive plant species in the project area. - can occur in aquatic habitats, as a result of changes in their physical-chemical parameters.**	M_RIM_2	In the case of equipment and personnel that were involved in areas where the presence of invasive non-native species was indicated, the equipment of the work personnel (shoes) and the equipment will be passed through a cleaning ramp where all traces of soil and debris will be removed vegetables. The resulting waters will be collected in sealed containers and transported to decontamination areas. They will not be discharged into surface water courses.	-	Insignificant impact
				M_RIM_3	Before the start of the works, as well as throughout the execution period of the construction works, an expert botanist will be present to inspect and identify the presence of non-native invasive species. In order to reduce the risks of dissemination, mechanical removal actions of the identified species will be provided. Plant remains will be transported outside the protected areas, to be destroyed without risks for the propagation of the species (eg by incineration). Chemical control of invasive species is prohibited.	**€48,000.00**	
				M_RIM_4	During the operating period, an invasive species control program will be implemented, which will include activities to identify the presence of non-native invasive plant species along the entire length of the highway and expressway and in the areas adjacent to it (CIC, service areas, road junctions, etc. .). The program will also contain specific procedures for the elimination of invasive species by means that do not present risks of contaminating water and soil, affecting the existing natural vegetation or favoring the expansion of invasive species. The measure will correlate with the activities that must be implemented by CNAIR according to the requirements of Law 62/2018 regarding the combating of ragweed.	**€54,000.00**	
				M_RIM_5	It is forbidden to cross the riverbed with machines, in this sense it is necessary to provide temporary bridges. When carrying out the works in the river bed necessary for the construction of bridges and viaducts, the protection of the working front with guardrails will be carried out and the handling of the machinery on the banks will be ensured. All temporary works	-	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					are carried out avoiding the interruption of the longitudinal connectivity of the watercourses, as well as respecting the other measures provided in the RIM.		
				M4	In order to limit the risk of water contamination of the rivers crossed by the highway and the expressway, before the start of construction and during construction and operation, a Prevention and Intervention Plan in case of accidental pollution will be developed, revised, and implemented, with clear provisions regarding to the management of rainwater (including runoff) and the maintenance of hydrocarbon separators. Both turbidity and river water quality parameters will have to be monitored at the beginning of the operating period (preferably at least 3 years).	***Value included in EA***	
				M18	All areas affected during construction under structures (bridges and viaducts) will be rehabilitated. The rehabilitation works will also include the installation of vegetation cordons (native shrubs of various sizes, possibly trees whose height does not affect the built structures) that will guide the movement of as many species of fauna as possible under the structures, including some species of birds and bats. Native plant species will also be used for the arrangement of the highway and expressway facilities.	-	
		IE7, IE8. IO1.	**Fragmentation of habitats: - can occur in the forest area north of Suceava; - can occur in the case of water courses, mainly during the construction stage.**	M_RIM_8	For the species of small and medium mammals, it is proposed to make some underpasses in the right of km 11+150 and km 50+930. Small underpasses for fauna should be equipped with a mixed substrate consisting of stones, tree bark, sand and logs. It is recommended that for all these sub-crossings there is also a suspended step (a shelf) for small arboreal mammals to use. In order to be able to guide individuals in the use of underpasses, it is necessary to implement in the entrance and exit areas some guide elements to the underpasses, made up of native trees and shrubs, characteristic of the highway area	**€160,000.00**	Insignificant impact
				M_RIM_9	In order to improve the permeability of the highway/express road, it is proposed to build an overpass for fauna at km 3+450. The overpass should have a minimum width (opening) of 80 meters, with a maximum slope of 15%. The entrance and exit areas from the overpass must be kept free of any constructions and revegetated with native plant species, similar to those existing in the implementation area. The edges of the overpass must be provided with sound-absorbing panels, in order to maintain their functionality	**€3,000,000.00**	
				M_RIM_10	For the entire construction period of the project, areas of the construction	-	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					site will be established by PMM to be maintained as corridor areas, to allow the movement of fauna between the areas of favorable habitat located east and west of the highway and expressway		
		IE1, IE2, IE3, IE4, IE5, IE6, IE7, IE8., IO1	**Disturbance of species activity: - increase in noise level and artificial lighting in highly sensitive areas crossed by the highway.**	M10	Avoiding the handling of vehicles and machinery in the area of work lanes at night in the highway sector between km 8+000 and km 12+000, so that the activity of crepuscular and nocturnal species (bats) is minimally affected.	-	Insignificant impact
				M11	Both in the construction stage and in the operation stage, it is necessary, for all project components, to implement one or more of the following solutions: 1. Reduction of over-illumination (too strong lights); 2. Orientation and screening of light sources (keeping the light within the limit of the property or the area designated for lighting); 3. Avoiding excessive grouping of light (lighting only the areas where it is really necessary); 4. Reducing the duration of lighting (use of timers, motion sensors, lighting adaptive that dims or turns off the lights when they are no longer needed, etc.); Provision of lighting sources with warm light, without blue color (color temperature not to exceed 3000 Kelvin). These lighting systems have a low degree of attractiveness for flying invertebrates (with consequent effects on chiroptera and avifauna) and should ensure that light is directed exclusively to the highway activity areas and that light dispersion is limited in natural habitats	-	
				M19	For construction activities, mobile sound-absorbing panels are installed and maintained near the work fronts. The panels must have a height of at least 3 m, a noise reduction efficiency of at least 10 dB(A) and be mounted as close as possible to the noise sources. The effectiveness of the panels will be assessed through noise measurements.	***Value included in EA***	
				M20	The installation of permanent sound-absorbing panels with a height of 3 m is necessary in the following kilometer intervals, for the protection of Natura 2000 sites: - km 0+675 - 1+400 on the left side - km 0+975 - 1+600 on the right side - km 3+475 - 3+650 on the left side - km 3+475 + 3+650 on the right side - km 3+850 - 4+750 on the left side km 3+850 - 3+950 on the right side	***Value included in EA***	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					- km 3+950 - 4+575 on the right side - km 5+450 - 6+075 on the right side - km 5+425 - 7+325 on the left side - km 7+050 - 8+025 on the right side - km 7+325 - 7+550 on the left side - km 7+550 - 8+250 on the left side - km 9+025 - 9+825 on the left side - km 11+725 - 12+375 on the right side - km 12+850 - 13+875 on the right side - km 14+075 - 15+000 on the right side - km 15+000 - 17+175 on the right side - km 17+800 - 18+700 on the right side – km 21+450 - 23+600 on the right side - km 20+850 - 20+200 on the right side (SS tip S1) - km 24+175 -24+975 on the right side - km 24+975 -26+350 on the left side - km 26+425 - 27+900 on the right side - km 26+350 - 27+450 on the left side - km 30+800 - 31+350 on the left side - km 38+625 - 39+075 on the left side - km 38+625 - 39+075 on the right side - km 39+575 - 40+075 on the left side - km 39+575 - 40+075 on the right side - km 40+625 - 40+975 on the left side - km 43+050 - 43+275 on the right side - km 43+550 - 44+075 on the left side - km 49+900 - 50+125 on the right side - km 49+900 - 50+125 on the left side - km 54+975 - 55+425 on the right side - km 55+450 - 55+700 on the right side		
		IE1, IE2, IE3, IE4, IE5, IE6, IE7, IE8., IO1, IO4	**Reduction of population numbers: - mortality during the execution stage as a result of the construction works;** **- the destruction of individuals of plant species; - the**	M_RIM_11	Before starting the construction works, a specific inventory will be made to analyze the presence of the Neottia nidus-avis species within the project boundary. The individuals identified in the expropriation corridor will be moved to an area that fits the characteristics of favorable habitats for this species. The inventory will be carried out by accredited experts. The relocation activities will be carried out in accordance with the requirements of the legislation in force.	**€12,000.00**	Insignificant impact

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
			occurrence of victims of collisions with car traffic on construction sites (under construction) or on the highway (in operation); - the occurrence of victims as a result of works in riverbeds or accidental pollution.	M5	Before the start of the construction works, an updated inventory of the fauna species of community interest and of the bird species inside and in the vicinity of the project area (20 m left - right of the project boundary) will be made. The inventory will represent the reference situation to which the results of the monitoring program during construction and operation will be reported. Any additional information provided by the inventory will be reflected in the PMM from the point of view of the applicability of measures to avoid and reduce impacts.	***Value included in EA***	
				M6	The opening of any work front must be done after previously accredited persons for biodiversity monitoring have assessed the presence of species of community interest in the area to be affected and can guarantee that all measures have been taken to avoid/reduce the impact on these species, including operations of relocation, where applicable, in compliance with the legal requirements in force.	***Value included in EA***	
				M7	The work fronts will be periodically checked by accredited biodiversity monitoring persons to ensure that all measures have been taken to avoid the establishment of fauna species in temporarily inactive areas where the resumption of work could lead to the destruction of nests and shelters and/or the emergence of victims. Solutions to avoid the establishment of species can consist of: the installation of nets/tarpaulins, temporary fences, etc.	***Value included in EA***	
				M10	Avoiding the handling of vehicles and machinery in the area of work lanes at night in the highway sector between km 8+000 and km 12+000, so that the activity of crepuscular and nocturnal species (bats) is minimally affected.	-	
				M13	In order to avoid the penetration of the Lutra lutra species, but also of other species in the area where the works are carried out and implicitly the site traffic, the work fronts will be surrounded by a temporary fence, for the duration of the construction works. The fencing system must not fragment the habitats of the species, in this sense it must be taken into account that the fences do not block the wetlands, and in the areas with intense activity for these species, small under-crossings of the technological/access roads can be provided	***Value included in EA***	
				M8	In order to avoid the destruction of birds' nests, the opening of the work fronts (cleaning the vegetation / uncovering the soil) on the surfaces within the expropriation limit will not be carried out between March and July	-	
				M14	During the construction period, it will be avoided to keep open any pools,	-	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					trenches, excavations for foundations, etc., in which specimens of fauna can remain captive. These potential traps must be inventoried and inspected periodically to avoid the production of victims. The areas where work will be carried out will be fenced off with temporary fences to prevent individuals from entering these areas.		
				M_RIM_12	In order to avoid the penetration of amphibians and reptiles into the decanters or separators of petroleum products, solutions (ex: gratings) will be implemented in the connection areas between the rainwater ditches and the pre-treatment installations.	**€5,940.00**	
				M_RIM_13	The retention basins will be surrounded by a fence of at least 80 cm high, with thick mesh and with the upper part bent outward. This will have a role in preventing the entry of fauna individuals into these basins and the occurrence of accidental victims.	**€96,000.00**	
				M_RIM_14	All the storm drains of the highway are made with an angle of 90° towards the roadway and a height of this slope of at least 40 cm, so as to prevent the access of amphibians and reptiles to the roadway area as well as to ensure their guidance to the underpasses, and with an angle on the side opposite the roadway to allow the exit of individuals from inside the storm drains in the direction opposite the road.	-	
				M_RIM_15	During the construction works, the speed of movement of machinery in the site area will be limited to a maximum of 30 km/h, to avoid the occurrence of accidental victims	-	
				M15	In order to reduce the risk of collision of avifauna species, mammals (especially bat species), with car traffic on the highway, it is necessary to place some anti-collision panels. The anti-collision panels will be implemented in the areas frequently used by the species for movement, between the following kilometer intervals: - km 1+400 - km 1+550 on the left side - km 6+075 - km 7+050 on the right side - km 11+100 - km 11+700 on the left side - km 14+075 - km 17+550 on left side - km 22+125 - km 23+625 on the left side - km 24+075 - km 24+975 on the left side - km 25+000 - km 25+900 on the right side - km 28+500 - km 28+ 700 on the left side	***Value included in EA***	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					- km 28+500 - km 28+700 on the right side - km 29+000 - km 29+875 on the right side - km 29+000 - km 29+875 on the left side - km 30+900 -km 31+050 on the right side - km 32+450 - km 32+700 on the left side – km 32+450 - km 32+700 on the right side - km 33+425 - km 33+625 on the left side - km 33+425 - km 33+625 on the right side - km 34+950 - km 35+300 on the left side - km 34+900 - km 35+300 on the right side - km 35+875 - km 36+175 on the left side - km 35 +875 - km 36+175 on the right side - km 42+000 - km 42+225 on the left side - km 42+000 - km 42+225 on the right side		
				M16	In addition to the highway fence, it is necessary to install a mesh fence with very small meshes and the upper part bent outwards, which prevents amphibians and reptiles from entering the roadway area. The fence will have a minimum height of 60 cm and will have the secondary role of guiding small fauna towards underpasses (including bridges and viaducts). The fence for amphibians and reptiles is installed along the entire length of the highway fence, glued to it. The role of this additional fence is to avoid accidental victims (amphibians, reptiles, small mammals) on the highway road. Their appearance could attract species of birds of prey to areas at risk of collision with cars.	***Value included in EA***	
				M17	In order to reduce the risk of wildlife entering the freeway area through road junctions, animal fences will be installed (at the level of the roadway) on their shoulders. Depending on the position of the installation, the width of the grating must be established in such a way as not to allow animals (e.g. red deer, roe deer, otter) to jump over the structure	***Value included in EA***	
				M9	A system for the identification and collection of potential animal victims on the highway and expressway must be implemented in the vicinity of the ROSPA0110 site, in the interval km 49+900 - km-55+700. The role of this system is to reduce the risk of collision for birds that could be attracted by the existence of carcasses to risk areas (measure applicable in operation).	***Value included in EA***	
				M_RIM_16	During the operation stage, in the event of an accidental victim on National Road 2H, between the DN2H connection and the highway and the town of	-	

Environmental component significantly affected	Stage	Type of intervention	Estimated significant impact	Measure code	Impact reduction measure	Budget (EUR)	Residual impact
					Rădăuți, warning signs will be installed and speed restrictions will be provided (maximum 60 km/h). The area presents a risk of accidents as a result of the collision with wild fauna, this measure has the role of reducing this risk as much as possible		
The social environment	Execution	All the I.E.	Exceeding the noise limit values at the sensitive receivers in the vicinity of the work fronts, found in the localities: Mitocu, Dragomirnei, Vicsani, Negostina, Gropeni, Gara, Suceava, Siret, Românesti, Iacobesti, Slobozia Sucevei, Botosanita Mare, Vascauti, Bancesti, Danila, Mariteia Mica, Darmanesti, Granicesti, Milisauti, Patrauti, Balcauti, Manastioara	M_RIM_17	For construction activities carried out in the vicinity of inhabited areas, less than 600 m away from them, mobile sound-absorbing panels will be used near the work fronts	*See measure M19*	Insignificant impact
The social environment	operating	I.O.1	Exceeding the noise limit values at sensitive receivers in the vicinity of the motorway and express road in the localities: Mitocu Dragomirnei, Vicsani, Negostina, Gropeni, Gara, Suceava, Siret, Dumbrava, Românesti, Iacobesti, Slobozia Sucevei, Botosanita Mare, Vascauti, Bancesti, Danila, Mariteia Mica, Darmanesti, Granicesti, Milisauti, Patrauti, Balcauti, Manastioara	M20	*See measure M20 (above).*	-	Insignificant impact

Measures labeled M are taken from the Adequate Assessment Study.

Measures with the indicator M_RIM were added following the impact assessment carried out in RIM.

In addition to the measures above, SEICA proposed the following measures aimed at minimizing the impact on quality indicators such as the structure of the riparian zone, the depth and width of the river, ichthyofauna. The estimated costs for the measures proposed under SEICA are around €97,310.

Table no.9-2The measures provided for avoiding and reducing the impacts associated with the project on water bodies

Quality element/quality indicator (parameter).	Measure code	Proposed additional measure	Implementation location	Estimated cost (EUR)
The vegetation structure of the riparian zone	M_SEICA_1	At the end of the construction works, rehabilitation works will be carried out in the riparian area, which consists in the planting of some native tree or shrub plant associations.	In the area where diversion and bed protection works are proposed: • Dragomirna water body (Dragomirna lake - cf Suceava) (RORW12-1-17-30_B3) – km 7+950 - 8+050; • Pătrăuţeanca water body (RORW12-1-17-28_B1) – km 11+550 - 11+650; • Horaiţ water body (RORW12-1-17-24A_B1) – km 36+400 - 36+800; • Negostina water body (RORW12-1-3_B1) – km 41+950 - 42+250. In the area where the construction of a footbridge is proposed - the Vătafului Bridge water body (RORW12-1-17-30B_B1).	85610
	M_SEICA_2	Site organizations must be located as far as possible from surface water bodies, in no case less than 50 m from their banks.	In all locations.	-
	M_SEICA_3	Temporary access roads will be located at distances as large as possible from bodies of water surface and damage to the specific vegetation will be avoided the riparian zone, the banks and the substrate of the bed	In all locations.	-
	M_SEICA_4	In the case of temporary arrangements for crossing watercourses, bridges will be provided in such a way as to ensure the flow section and avoid the interruption of longitudinal connectivity, including during periods with low flows. Solutions will be adopted that do not lead to the alteration of the banks and the substrate of	In all locations.	5000

Quality element/quality indicator (parameter).	Measure code	Proposed additional measure	Implementation location	Estimated cost (EUR)
		the water course.		
The depth and width of the river	M_SEICA_5	A mixed transverse profile will be created on the axis of the protected bed with the gabion mat, which will allow a reduction of the flow section and an optimal water level in the minor bed during periods with low flows.	In the area where diversion and bed protection works are proposed: • Dragomirna water body (Dragomirna lake - cf Suceava) (RORW12-1-17-30_B3) – km 7+950 - 8+050; • Pătrăuțeanca water body (RORW12-1-17-28_B1) – km 11+550 - 11+650; • Horaiț water body (RORW12-1-17-24A_B1) – km 36+400 - 36+800; • Negostina water body (RORW12-1-3_B1) – km 41+950 - 42+250.	-
ichtyofauna	M_SEICA_6	The works in the bed will be carried out only after isolating the working front with temporary dikes, which must be executed in such a way as not to affect the longitudinal connectivity of the water body. The works in the bed will be carried out by maneuvering the machines on the bank.	In the area where diversion and bed protection works are proposed: • Dragomirna water body (Dragomirna lake - cf Suceava) (RORW12-1-17-30_B3) – km 7+950 - 8+050; • Pătrăuțeanca water body (RORW12-1-17-28_B1) – km 11+550 - 11+650; • Horaiț water body (RORW12-1-17-24A_B1) – km 36+400 - 36+800; • Negostina water body (RORW12-1-3_B1) – km 41+950 - 42+250.	-
	M_SEICA_7	During the execution period of the works in the bed, in the case in which there are species of ichthyofauna, will be set up on water sheen, temporary barriers with filters that they will have role of water turbidity control, respectively al sediments carried into the water during the works	In the area where diversion and bed protection works are proposed: • Dragomirna water body (Dragomirna lake - cf Suceava) (RORW12-1-17-30_B3) – km 7+950 - 8+050; • Pătrăuțeanca water body (RORW12-1-17-28_B1) – km 11+550 - 11+650; • Horaiț water body (RORW12-1-17-24A_B1) – km 36+400 - 36+800; • Negostina water body (RORW12-1-3_B1) – km 41+950 - 42+250.	5500
Sanitary protection zones	M_SEICA_8	During the execution period of the works in the bed, in the case in which there are areas of sanitary protection for drinking water catchment, will be arranged on the body of water, temporary barriers with filters that will have the role of control of pollutants and water turbidity, respectively of sediments carried into the water during the works	In the area where piles and pulleys are proposed (bridge km 53+490 – km 54+570): • Siret (border - Lake Rogojesti) (RORW12-1_B0) – km 53+490 – 54+570;	1200
	M_SEICA_9	During the execution period, in all		-

Quality element/quality indicator (parameter).	Measure code	Proposed additional measure	Implementation location	Estimated cost (EUR)
		points/intersection areas of the project with the adduction, transport, water supply, gravity sewerage and pressure sewerage pipes existing on the proposed sites, the underground building networks will be diverted or relocated on a another route that will not be affected by the proposed construction works, according to the provisions of SR 8591/97 [17]which establishes the minimum distances between underground building networks, based on documentation at the level of PT-DDE technical execution project approved by ACET SA Suceava.		
	M_SEICA_10	During the execution period, for all the materials/components that will be assembled/put into operation, "FAM" material approval sheets will be presented, which will be confirmed by ACET SA Suceava before the preparation of the necessary documentation.		-
	M_SEICA_11	Before the execution of the diversion/replacement works of the water supply and sewerage pipes, the beneficiary will obtain all the authorizations and approvals necessary for the execution of the works, in accordance with the legislation in force.		-
	M_SEICA_12	At the end of the works of diverting/replacing the water supply and sewage pipes (gravity/under pressure), the beneficiary will start handover-acceptance procedures of the new resulting installations in compliance with all the conditions imposed by the owners.		-

[17]Romanian Institute of Standardization, 1997, Underground building networks - Location conditions. SR 8591/97, Bucharest, Romania;

9.2 Monitoring

Monitoring the impact that the construction and operation of the analyzed project will have on the environmental components has the role, on the one hand, to confirm or deny the residual impact quantifications made before the implementation of the project, to quantify the efficiency of the measures already implemented and to identify, as the case may be, the need for additional measures or new locations where it is necessary to implement measures to reduce the impact.

The monitoring program contains requirements for the pre-construction period, the construction period, the operation period and the decommissioning period. The requirements related to the construction period are also valid for possible stages of rehabilitation, modernization or decommissioning of the infrastructure. The implementation of the monitoring program implies the existence of a dedicated team of specialists, which includes at least one expert for each Natura 2000 component (habitats/plants, invertebrates, fish, herpetofauna, birds, mammals).

The results of the monitoring will feed a database and information with the help of which the need for any additional measures or additional implementation locations will be highlighted and which will indicate the real situation existing at that time.

The team/teams designated to carry out the monitoring have/have the following obligations:

- Carrying out monitoring activities in accordance with best practices and with the requirements of the monitoring guidelines (see below);
- Elaboration of monitoring reports: quarterly in the construction phase and annually in the operation phase;
- Elaboration of residual impact assessment reports (for biodiversity): annually and upon completion of construction (in the construction stage), respectively annually and in the first three years of operation (in the operation stage).

The monitoring reports will be drawn up by the team/teams designated to carry out the monitoring and will be made available to the Beneficiary and upon request to the interested public and the competent Authority for environmental protection.

Regardless of the monitoring program, the holder has the obligation to report, according to the legal requirements in force, any accidental killing of bird species, as well as strictly protected species provided in annexes no. 4A and 4B of GEO no. 57/2007 (both during the construction period and during the operation period).

For community interest habitats and species monitoring, the methodological requirements of the guidelines for monitoring the conservation status of species and habitats in Romania will be applied, based on article 17 of the Habitats Directive, published on the website of the Bucharest Biology Institute of the Academy Romanian (http://www.ibiol.ro/posmediu/rezultate.htm), respectively:

- Synthetic monitoring guide for habitats of community interest (salt flats, continental dunes, meadows, fresh water) in Romania;
- The synthetic monitoring guide for habitats of community interest: thickets, peatlands and marshes, rocky outcrops, forests;

- The synthetic guide for monitoring invertebrate species of community interest in Romania;
- Synthetic guide for monitoring community species of reptiles and amphibians in Romania;
- The synthetic guide for monitoring community fish species in Romania;
- The synthetic monitoring guide for mammal species of community interest in Romania;
- Guide for monitoring the state of conservation of caves and bat species of community interest in Romania; as well as of:
- The standard guide for monitoring bird species of community interest in Romania, developed by the Romanian Ornithological Society and the Milvus Group in 2014, http://monitorizareapasarilor.cndd.ro/documents/Ghid-standard-de-monitorizare-pasari-2014.pdf .

The selected study methods will have to cover all the particularities related to the identity of the analyzed species, phenology and the particularities/limitations of the different study areas.

The amount of effort made for any of the monitoring activities must be sized so that the data and information collected are representative, from the point of view of the methods applied, for the entire studied territory.

In order to monitor the impact that the construction and operation of the highway will have on the environmental components, a monitoring plan is proposed that includes monitoring components and sub-components, indicators, the minimum duration, the minimum frequency of field campaigns and the frequency of reports, both for the period of construction as well as for the operating period (presented in the following table). The monitoring program is accompanied by the proposed monitoring locations for each component and subcomponent. All these elements are also presented for the pre-construction phase.

In the meaning of this report, a "field campaign" represents a field trip that ensures the complete coverage of all locations to be monitored, within the entire study territory and with the application of all appropriate study methods.

The responsibility for implementing the monitoring program belongs as follows:

During the execution period:

- The designers/builders, who will contract the teams of experts in biodiversity;
- To the project owner (CNAIR), who will ensure the integration of data received from different teams/contracts, etc., for the purpose of unitary reporting to the competent environmental authority;

During the operating period:

- To the project owner (CNAIR)/ Contractor, who will ensure the contracting of the team/teams of experts in biodiversity, data integration and unitary reporting to the competent environmental authority.

The responsibility for the quality of the data collected and reported rests with the experts involved in the monitoring activities and the authors of the monitoring reports. In order to ensure a high level of quality of the monitoring activities, the project owner must ensure that the terms of reference for the execution of these services include the requirements expressed in this report.

All the data and information collected within the monitoring program must be expressed quantitatively, with a clear specification of the measurement units, the size of the investigated surfaces, the applied method and the time periods (including timetables) in which the field activities were carried out. The information must be presented both in the form of raw data (tabular) and in graphic form (representation on maps of all collected data). Each set of data must be accompanied by an interpretation of the results, as well as qualitative and quantitative assessments regarding the trends recorded and the prospects for value changes of the monitored indicators.

The responsibility for monitoring the quality of the environmental components, including the habitats and species of conservation interest, which constitute the conservation objectives of the Natura 2000 sites crossed by the highway, is the responsibility of the project beneficiary, Compania Nationala de Administrare a Infrastructurii Rutiere SA and the contractor under the contract concluded for the execution of the works.

Next, the program for monitoring the impact on biodiversity proposed for the pre-construction period, the construction period, the operation period and the decommissioning period is presented, which also contains the requirements regarding the monitoring of the impact on the Natura 2000 sites included in the EA study.

Table no.9-3 Biodiversity impact monitoring program

Natura 2000 site	Conservation objective / Species / Affected habitat / parameter	Form of impact	Reduction measure	The period of implementation of the measure	The location of the measure	Monitoring indicators	Measurement units	Monitoring frequency	Monitoring locations	Duration of monitoring	Degree of effectiveness of the measure	Budget (EUR)	Responsible for monitoring
-	All natural habitats	pH	M_RIM_1	Construction	Along the entire length of the highway and the expressway (in the working lane)	Spatial expansion of construction activities	Ha	Monthly	On the corridor of the highway and the expressway	The entire construction phase	No extensions outside the project boundary according to the Environmental Agreement	€150,000.00	CNAIR, Contractor
		AH	M_RIM_2, M_RIM_3, M_RIM_4	Construction	Along the entire length of the highway and the expressway (in the working lane)	The dynamics of invasive species in the execution stage: Updating the list of species + updating the locations of presence + updating the level of dispersion of the species + updating the propagation paths.	No. species, no. locations of presence, density	semester	In the areas of the work fronts and along the entire route between the site organizations and the work fronts.	The entire construction phase	No changes compared to the pre-construction situation.	€25,000.00	CNAIR, Contractor
			M18	Construction	The areas of the proposed structures on the highway and the expressway	The degree of vegetation rehabilitation with native species	% rehabilitation, types of species installed	semester	In the areas of the proposed structures on the highway and the expressway.	The entire construction phase	100% rehabilitation without non-native species	€6,250.00	CNAIR, Contractor
		FH	M_RIM_8, M_RIM_9, M_RIM_10	Construction	Locations of undercrossings and overcrossings, work fronts.	The technical characteristics of the structures.	Width, height, kilometer position, degree of development.	Quarterly	In the areas of undercrossings, overcrossings and work fronts	The entire construction phase	No changes to the technical characteristics of the Environmental Agreement. At least one site area kept free every 5 km of the work front.	€5,000.00	CNAIR, Contractor
	Neottia nidus-avis	REP	M_RIM_11	Construction	Along the entire length of the highway and the expressway (in the working lane)	Flora species inventory: By reference to the pre-construction situation: Changes in the presence of the species + locations of presence of the species.	No. individuals, density, spatial location	Quarterly	In the work fronts from km 1+100 - km 4+000	The entire construction phase	No changes compared to the pre-construction situation.	€5,000.00	CNAIR, Contractor
	All species of fauna	REP	M_RIM_12, M_RIM_13, M_RIM_14, M_RIM_15	Construction	Along the entire length of the highway and the expressway (in the working lane)	Accidental victims: Species, cause of death, date, location.	No. accidental victims, esp	If appropriate	In the areas of the work fronts and along the entire route between the site organizations and the work fronts.	The entire construction phase	0 accidental casualties	€15,000.00	CNAIR, Contractor
			M15, M20	Operating	Along the entire length of the highway and the expressway (in the working lane)	Accidental victims: Species, cause of death, density of individuals (no. of individuals / area) identified.	No. accidental victims, esp	Quarterly	Along the entire route of the highway and the expressway	The first 3 years after the completion of construction	0 accidental casualties	€165,000.00	CNAIR
		REP	M_RIM_16	Operating	DN2H, between the DN2H				DN2H, between the DN2H			€72,000.00	CNAIR

Natura 2000 site	Conservation objective / Species / Affected habitat / parameter	Form of impact	Reduction measure	The period of implementation of the measure	The location of the measure	Monitoring indicators	Measurement units	Monitoring frequency	Monitoring locations	Duration of monitoring	Degree of effectiveness of the measure	Budget (EUR)	Responsible for monitoring
					connection and the highway and the town of Rădăuți				connection and the highway and the town of Rădăuți				
ROSCI0075 Pătrăuți Forest	*Carabus variolosusLucanus cervus Myotis myotis Myotis dasycneme Barbastella barbastellus*	REP	M5, M6, M7	Construction	Along the entire length of the highway and the expressway	Fauna species inventory: By reference to the pre-construction situation: Changes in the list of habitats and species + presence locations of habitats and species + changes in breeding habitats + changes in the main transit areas.	No. species, no. locations of presence, no. breeding habitats, no. individuals, density	Monthly	In the work fronts	The entire construction phase	No changes compared to the pre-constructor situation.	€75,000.00	CNAIR, Contractor
			M3, M10, M11, M15, M16, M18, M19, M20, M21	Construction	Along the entire length of the highway and the expressway	Accidental victims: Species, cause of death, date, location.	No. accidental victims, esp	If appropriate	In the areas of the work fronts and along the entire route between the site organizations and the work fronts.	The entire construction phase	0 accidental casualties	€7,500.00	CNAIR, Contractor
			M21	Operating	On the whole route	Accidental victims: Species, cause of death, density of individuals (no. of individuals / area) identified.	No. accidental victims, esp	Quarterly	Along the entire route (relevant for ROSCI0075: Between km 4+000 - km 28+000)	The first 3 years after the completion of construction	0 accidental casualties	€36,000.00	CNAIR
ROSCI0380 Suceava Liteni River	*Lutra lutraMyotis myotis*	REP	M3, M10, M11, M15, M16, M18, M19, M20, M21	Construction	Along the entire length of the highway and the expressway	Accidental victims: Species, cause of death, date, location.	No. accidental victims, esp	If appropriate	In the areas of the work fronts and along the entire route between the site organizations and the work fronts.	The entire construction phase	0 accidental casualties	€7,500.00	CNAIR, Contractor
			M21	Operating	On the whole route	Accidental victims: Species, cause of death, density of individuals (no. of individuals / area) identified.	No. accidental victims, esp	Quarterly	On the entire route (relevant for ROSCI0380 between km 0+000 - km 4+000).	The first 3 years after the completion of construction	0 accidental casualties	€12,000.00	CNAIR
ROSPA0110 Accumulations Rogojesti - Bucecea	All species subject to conservation in ROSPA0110	REP	M5, M6, M7	Construction	Along the entire length of the highway and the expressway	Fauna species inventory: By reference to the pre-construction situation: Changes in the list of habitats and species + presence locations of habitats and species + changes in breeding habitats + changes in the main transit areas.	No. species, no. locations of presence, no. breeding habitats, no. individuals, density	Monthly	In the work fronts	The entire construction phase	No changes compared to the pre-construction situation.	€15,000.00	CNAIR, Contractor
			M3, M10, M11, M15,	Construction	Along the entire length of the	Accidental victims: Species, cause of	No. accidental victims, esp	If appropriate	In the areas of the work fronts and	The entire construction	0 accidental casualties	€7,500.00	CNAIR, Contractor

Natura 2000 site	Conservation objective / Species / Affected habitat / parameter	Form of impact	Reduction measure	The period of implementation of the measure	The location of the measure	Monitoring indicators	Measurement units	Monitoring frequency	Monitoring locations	Duration of monitoring	Degree of effectiveness of the measure	Budget (EUR)	Responsible for monitoring
			M16, M18, M19, M20, M21		highway and the expressway	death, date, location.			along the entire route between the site organizations and the work fronts.	phase			
			M21	Operating	On the whole route	Accidental victims: Species, cause of death, density of individuals (no. of individuals / area) identified.	No. accidental victims, esp	Quarterly	Along the entire route (relevant for ROSPA0110 between km 53+000 - km 55+700)	The first 3 years after the completion of construction	0 accidental casualties	**€9,000.00**	CNAIR
	Alcedo atthis, Ardea purpurea, Aythya nyroca, Botaurus stellaris, Chlidonias hydribus, Chlidonias niger, Cygnus cygnus, Egretta alba, Egretta garzetta, Gavia arctica, Gavia stellata, Haliaeetus albicilla, Ixobrychus minutus, Mergus albellus, Phalacrocorax pygmeus, Sterna hirundo, Anas acuta , Anas crecca, Anas penelope, Anas platyrhynchos, Anas querquerdula, Anas strepera, Aythya ferina, Aythya fuligula, Aythya marila, Cygnus olor, Fulica atra, Larus cachinnans, Larus ridibundus, Phalacrocorax carbo, Ardea cinerea	AH	M1, M4, M_RIM_5	Construction	The intersection of the highway and the expressway with the rivers	Water quality: At least pH, conductivity, dissolved oxygen, turbidity (preferably also petroleum product).	pH, concentrations	Monthly (during the periods when works are carried out in the river area)	At least 2 monitoring points upstream and downstream of the intersection with the Siret river	The entire construction phase	No exceeding pre-construction values	**€25,000.00**	CNAIR, Contractor
				Operating				Quarterly		The first 3 years after the completion of construction		**€27,500.00**	CNAIR

For the monitoring of the abiotic components in all stages of the project, the following monitoring program is proposed.

In the execution stage and, as the case may be, in the decommissioning stage, measurements will be made regarding the inclusion of the emissions generated by the activities on the work fronts and from the site organizations within the permitted limits regarding the concentrations of polluting substances in the air, water, soil, and noise levels. The monitoring of environmental factors will be carried out according to the monitoring program in the work fronts as the works progress. Following the monitoring, the necessary measures will be taken to protect the environmental factors.

During the operation stage, noise level measurements and air quality measurements will be carried out mainly in the area of houses in the localities crossed in the vicinity of the highway, as well as soil and water quality analyses.

The responsibility for monitoring environmental factors and reporting belongs to the project owner.

Table no.9-4 Monitoring plan for abiotic components

The environmental factor	Location of monitoring points	Monitoring points	Monitored parameters	Monitoring frequency	Estimated cost (€)
CONSTRUCTION STAGE					
Air	• Active work fronts near populated areas • Site organizations	**km 1+600**- working front in Suceava area **km 9+400**- work front in the Suceava area (eastern area) **km 10+000**- site organization **km 19+450**- working front in the Măriței area **km 22+675**- working front in the Dănilă area **km 26+450**- working front in Româneşti area **km 27+500**- construction site organization **km 29+950**- working front in the area of Grănicesti **km 39+475**- working front in the area of Bălcăuţi **km 40+400**- working front in Gropeni area **km 43+000**- construction site organization **km 43+300**- working front in the Negostina area **km 49+875**- work front in Mănăstioara **km 51+900**- working front in the area of Văscăuţi **km 54+900**- construction site organization **km 55+225**- working front in the Siret area	• NO2; • SO2; • powders in suspension; • settleable powders.	Monthly throughout the active period of site organizations and work fronts	**€105,600.00**
Water	Water bodies will be monitored according to the Water Bodies Impact Assessment Study (SEICA)				
	The quality of	**km 10+000**- construction site	• pH;	Annual	**€1,200.00**

The environmental factor	Location of monitoring points	Monitoring points	Monitored parameters	Monitoring frequency	Estimated cost (€)
	waste water discharged from construction sites	organization **km 27+500**- construction site organization **km 43+000**- construction site organization **km 54+900**- construction site organization	• suspended matter; • CCO-Cr; • CBO5; • petroleum products; • heavy metals.		
Soil	Site organizations	**km 10+000**- construction site organization **km 27+500**- construction site organization **km 43+000**- construction site organization **km 54+900**- construction site organization	• pH; • Total hydrocarbons from petroleum products; • Heavy metals. Sampling will be done from at least 2 sampling points located at different distances from the site organizations (eg: 25 m and 50 m), from a single depth (shallow depth, 5-10 cm).	Annually and in case of accidental pollution	**€4,000.00**
Noise	• Active work fronts near populated areas • Site organizations	**km 1+600**- work front in the Suceava area **km 9+400**- work front in the Suceava area (eastern area) **km 10+000**- construction site organization **km 19+450**- work front in the area of the town of Marîţei **km 22+675**- work front in the Dănilă area **km 26+450**- work front in the Româneşti area **km 27+500**- site organization **km 29+950**- work front in the area of Grănicesti **km 39+475**- working front in the area of Bălcăuţi **km 40+400**- work front in the Gropeni area **km 43+000**- site organization **km 43+300**- working front in the Negostina area **km 49+875**- work front in the area of Mănăstioara **km 51+900**- working front in the area of	Noise level dB (A)	Monthly throughout the active period of site organizations and work fronts	**€38,400.00**

The environmental factor	Location of monitoring points	Monitoring points	Monitored parameters	Monitoring frequency	Estimated cost (€)
		Văşcăuţi **km 54+900**- site organization **km 55+225**- working front in the Siret area			
OPERATION STAGE					
Air	At the houses closest to the highway	**km 1+600**- work front in the Suceava area **km 9+400**- work front in the Suceava area (eastern area) **km 19+450**- work front in the area of the town of Marîţei **km 22+675**- working front in the Dănilă area **km 26+450**- work front in the Româneşti area **km 29+950**- work front in the area of Grănicesti **km 39+475**- work front in the area of Bălcăuţi **km 40+400**- work front in the Gropeni area **km 43+300**- work front in the Negostina area **km 49+875**- work front in the area of Mănăstioara **km 51+900**- work front in the area of Văscăuţi **km 55+225**- work front in the Siret area	• NO2; • SO2; • powders in suspension; • settleable powders.	Annually during the first 3 years of operation	**€8,580.00**
Water	According to the Impact Assessment Study on Water Bodies (SEICA) and the Water Management Notice				
Noise	At the houses closest to the highway	**km 1+600**- working front in the Suceava area **km 9+400**- work front in the Suceava area (eastern area) **km 19+450**- work front in the area of the of Măriţei **km 22+675**- work front in the Dănilă area **km 26+450**- working front in the Româneşti area **km 29+950**- work front in the area of Grănicesti **km 39+475**- working front in the area of Bălcăuţi **km 40+400**- work front in the Gropeni area **km 43+300**- working front in the Negostina area **km 49+875**- work front in the area of Mănăstioara **km 51+900**- working front in the area of Văşcăuţi **km 55+225**- working front in the Siret	Noise level dB(A)	Annually during the first 3 years of operation	**€2,880.00**

The environmental factor	Location of monitoring points	Monitoring points	Monitored parameters	Monitoring frequency	Estimated cost (€)
		area			
Soil	Inside the Maintenance and Coordination Centers (CIC)	**km 43+400 –**ClC	• pH; • Total hydrocarbons from petroleum products; • Heavy metals.	Annually during the first 3 years of operation	**€600.00**
DECOMMISSIONING PHASE					
For the decommissioning phase, the monitoring program will be similar to that of the execution phase					

The monitoring program for the water component (according to SEICA) is presented in the following table.

Table no.9-5Program for monitoring the impact on water bodies

No. crt.	Body of water	Monitoring points			Quality elements	Argumentation	Minimum duration	Monitoring frequency	Estimated cost (EUR)
		Bornaj km	Stereo 70 coordinates						
			X	Y					
1.	Vătafului Bridge (RORW12-1-17-30B_B1)	km 3+575	595899.815	690396,000	Phytobenthos; Macrophytes; Benthic invertebrate fauna; Fish fauna.	Bed diversion works.	During the execution period	Once a year	500
2.	Dragomirna (lake Dragomirna - cf Suceava) (RORW12-1-17-30_B3)	km 3+800	592831.622	688530.039	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500
		km 3+800	592831.622	688530.039	Phytobenthos; Macrophytes; Benthic invertebrate fauna; Fish fauna.	Bed diversion works.	During the execution period	Once a year	500
3.	Pătrăuţanca (RORW12-1-17-28_B1)	km 11+650	589579.170	689097.791	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500
		km 11+650	589579.170	689097.791	Phytobenthos; Macrophytes; Benthic invertebrate fauna; Fish fauna.	Bed diversion works.	During the execution period	Once a year	500
4.	Horaiţ (RORW12-1-17-24A_B1)	km 25+275	579846.091	696785.199	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500
		km 25+950	580222,412	697559.410	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500
		km	580276,380	697858.731	At discharge points from	Hydrocarbon separators	The first 2	Once a year	3500

No. crt.	Body of water	Monitoring points			Quality elements	Argumentation	Minimum duration	Monitoring frequency	Estimated cost (EUR)
		Bornaj km	Stereo 70 coordinates						
			X	Y					
		26+250			hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	are located that evacuate the pre-purified water into the water body.	years of operation		
		km 36+500	580736.229	707937.612	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500
		km 36+425	580749.976	707880.589	Phytobenthos; Macrophytes; Benthic invertebrate fauna; Fish fauna.	Bed diversion works.	During the execution period	Once a year	500
5.	Negostina (RORW12-1-3_B1)	km 42+200	580257,505	712957,767	Phytobenthos; Macrophytes; Benthic invertebrate fauna; Fish fauna.	Bed diversion works.	During the execution period	Once a year	500
		km 42+225	580272,783	712936.499	At discharge points from hydrocarbon separators (pH; suspended matter; CCO-Cr; CBO5; petroleum products; heavy metals).	Hydrocarbon separators are located that evacuate the pre-purified water into the water body.	The first 2 years of operation	Once a year	3500

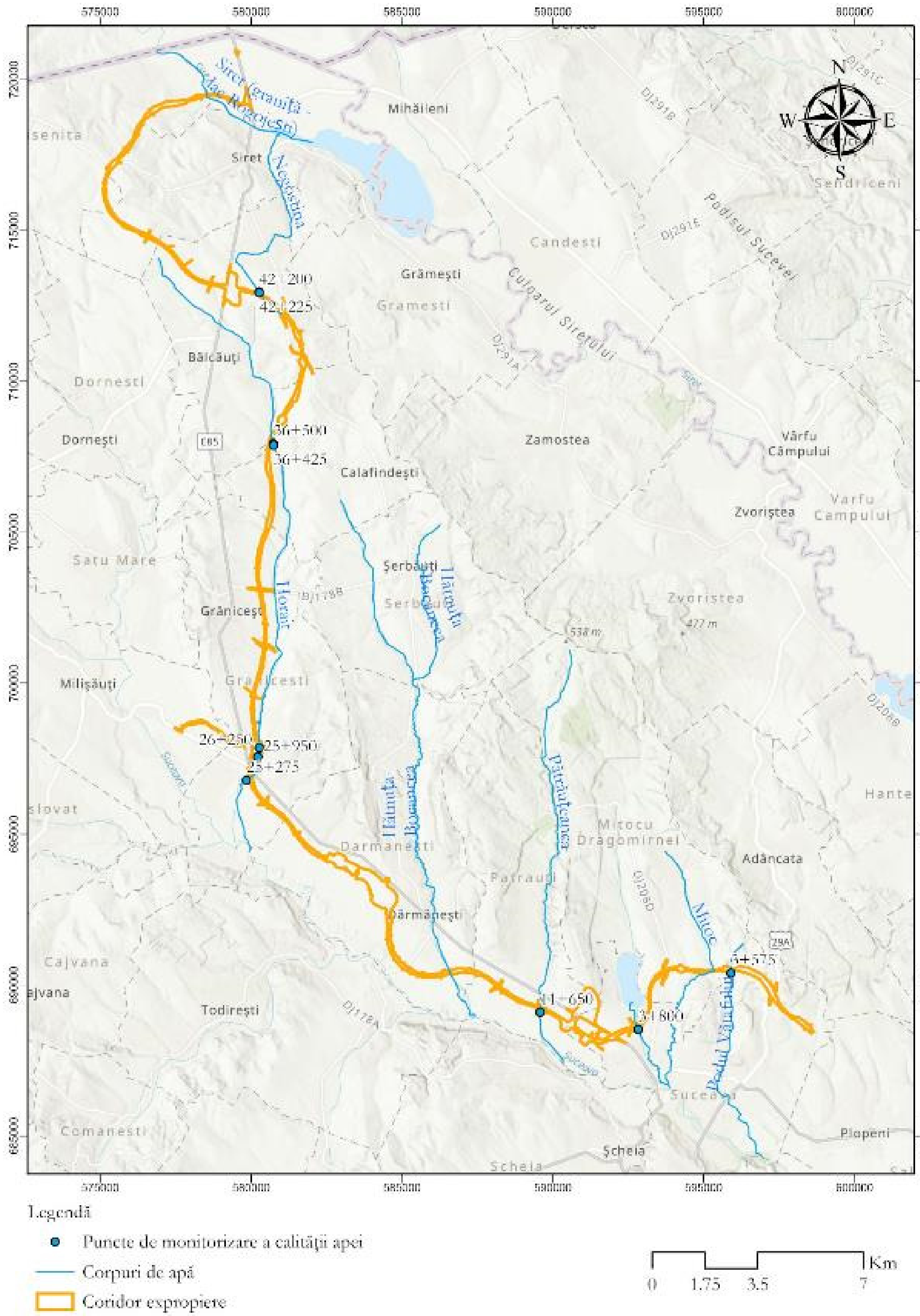


Figure no.9-1 Monitoring locations for water component

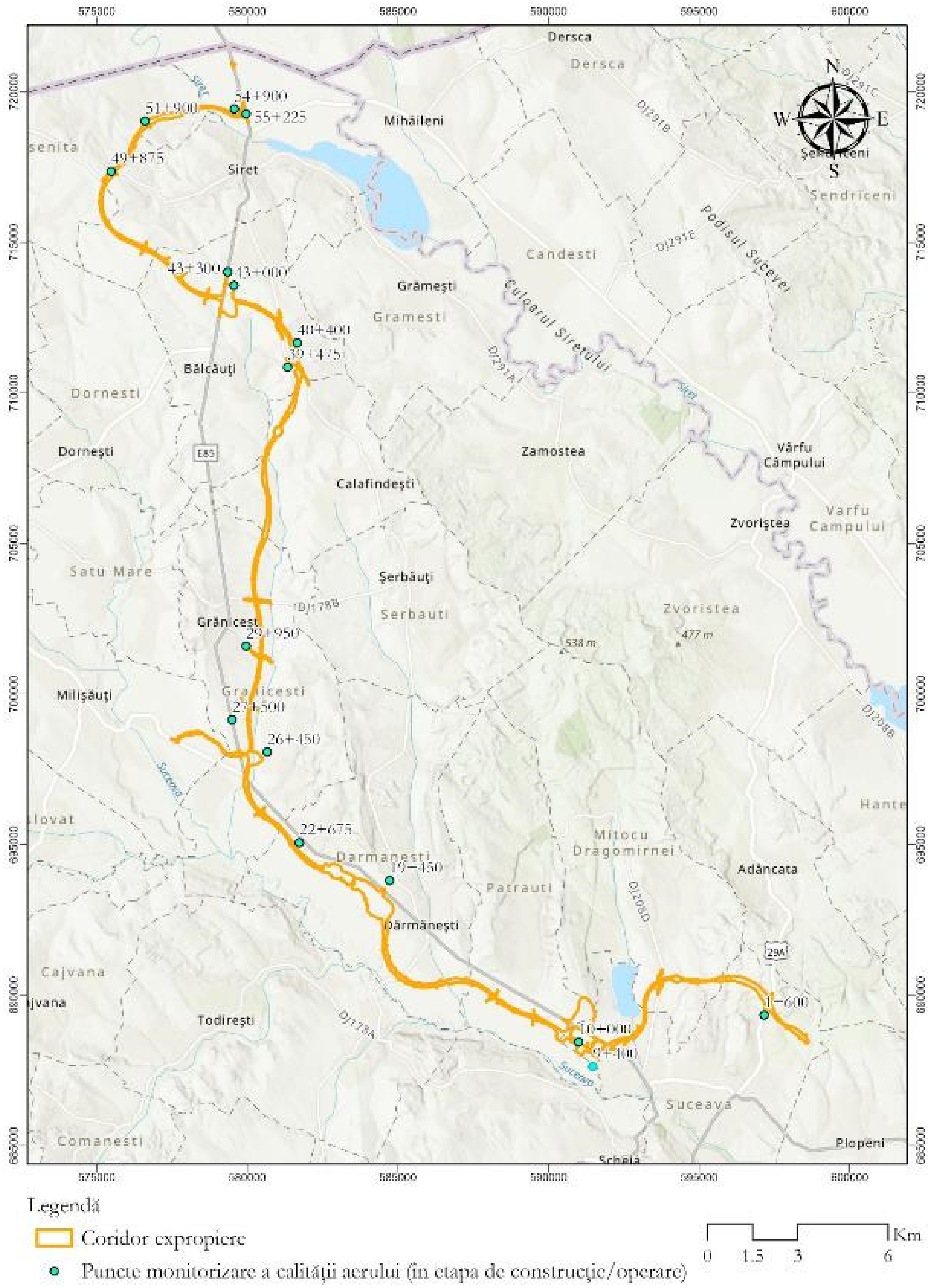


Figure no.9-1 Monitoring locations for the air component

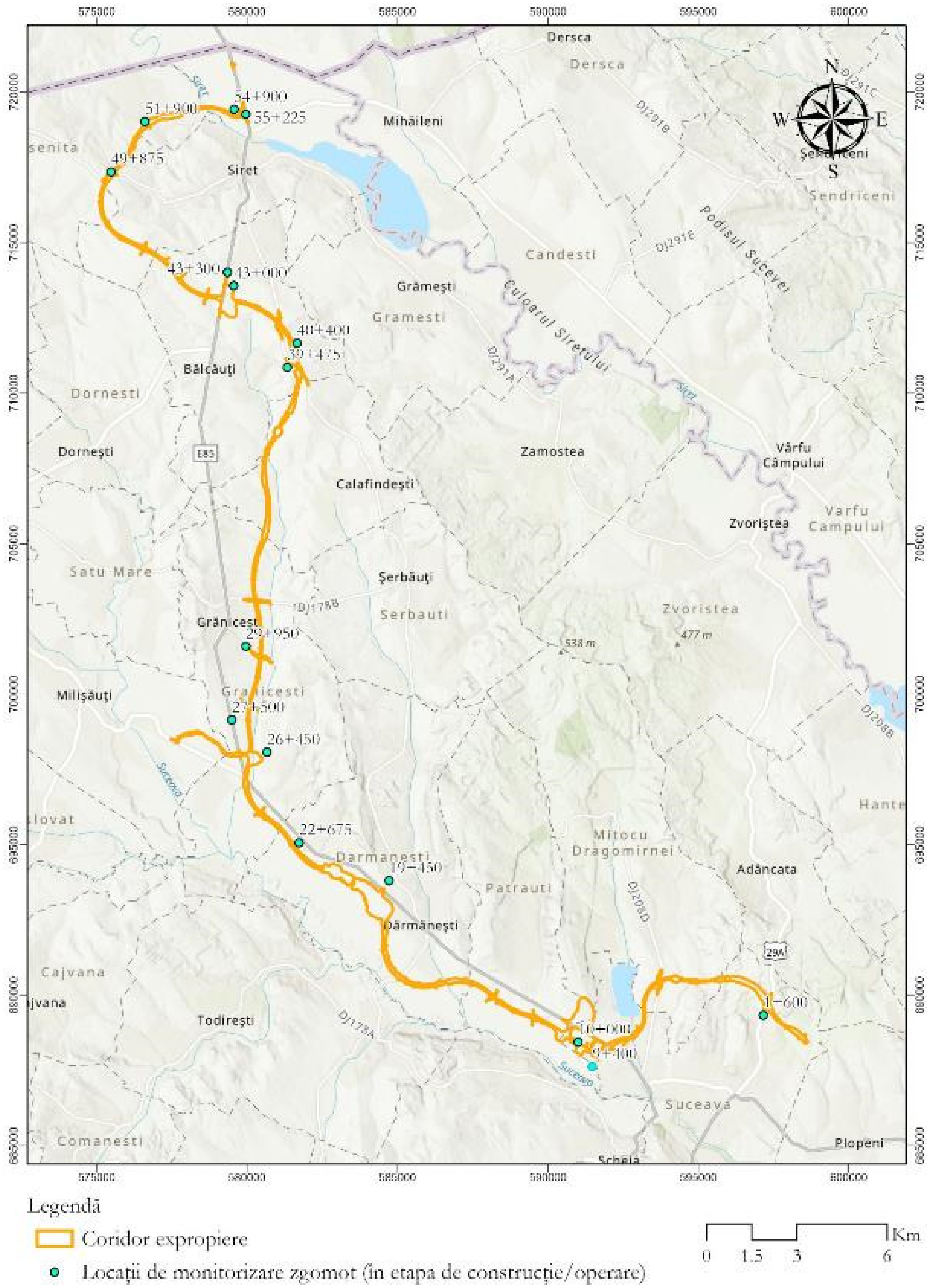


Figure no.9-2 Monitoring locations for noise

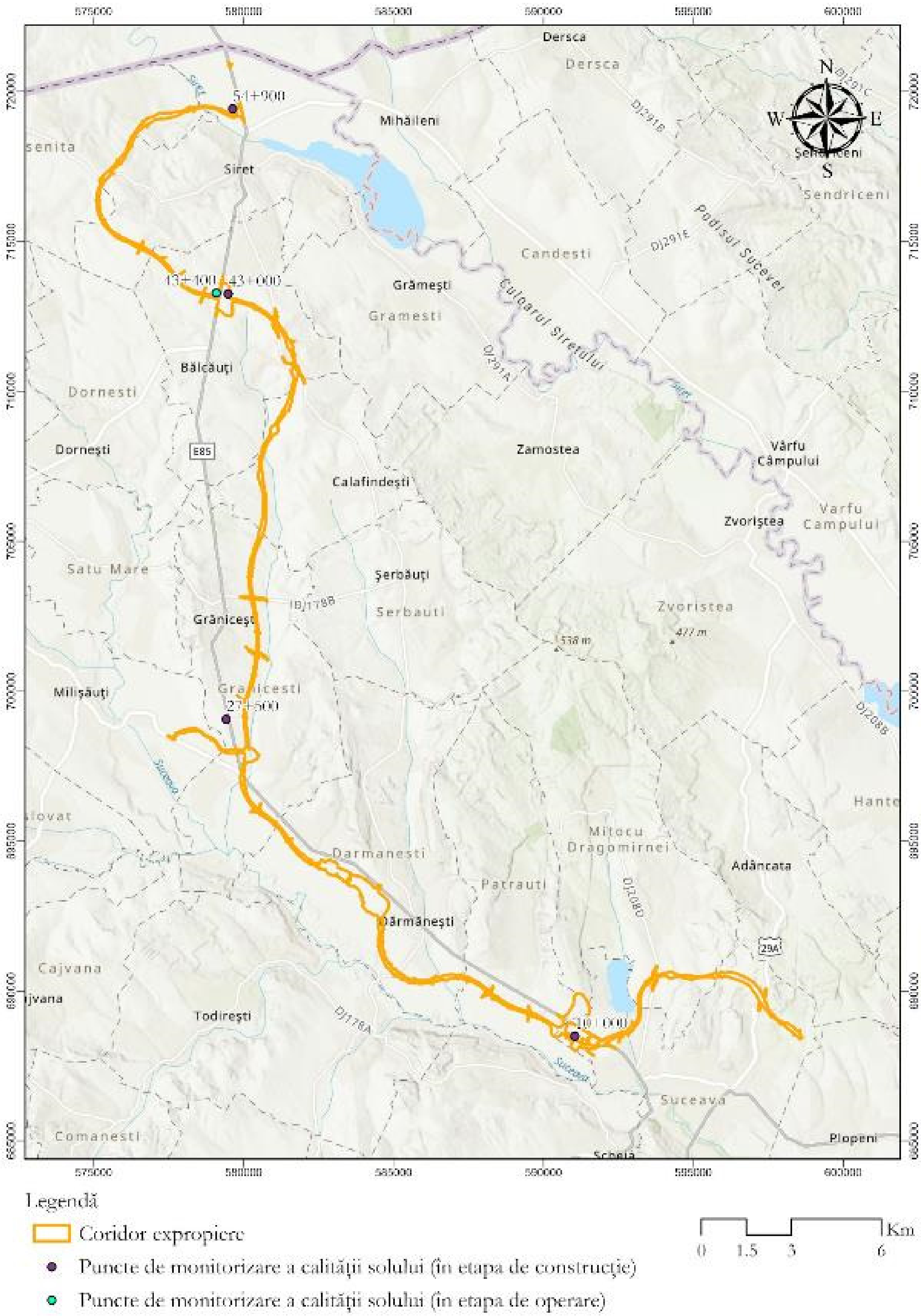


Figure no.9-3 Monitoring locations for soil component

10 RISK SITUATIONS

The risks that can be generated following the realization of the project both in the execution stage and in the operation stage are presented in section 7.1.4 of this Report. Also, the risks associated with climate change were detailed in the Study on the vulnerability of the project to climate change, developed for the "Suceava - DN2H Motorway and DN2H Expressway - Siret Border" project.

Risks associated with natural disasters

1. Floods

Floods cause far more widespread damage than any other natural hazard (IPCC, 2007) and are the main cause of weather-related disruptions in transport systems (Pregnolato et al., 2017, in Wang et. al, 2020).

According to the ABA Siret Flood Risk Management Plan - updated and flood risk maps available online[18], near the project, there are 5 areas with potential significant flood risk (APSFR- Areas with Potential Significant Flood Risk). They are presented in the following table:

Table no.10-1 Flood risk areas near the project

Identification code	Name of potentially significant risk area at floods	Length / total area (km / km2)	The cycle of Report	Source	Mechanism	Characteristics	Consequences
RO10-12.01.01 7.30...-01A	Dragomirna r. - av. place. Mitocu Dragomirna	12.62	Cycle I	river	Exceeding the transport capacity of the bed	Flood with medium growth time	Consequences on human health Consequences on pollution sources
RO10-12.01.01 7.28...-01A	Patrăuţanca r. - av. place. Squares	7.87	Cycle I	river	Exceeding the transport capacity of the bed, A2	Medium rise time flood,	Consequences on human health Consequences on pollution sources
RO10-12.01.01 7.27...-01A	r. Hătnuţa - av. conf. The boot	14,18	Cycle I	river	Exceeding the transport capacity of the bed,	Medium rise time flood,	Consequences on human health Consequences on pollution sources,
RO10-12.01.01 7.24a...-01A	r. Horaiţ av. place. Balcauti	19.13	Cycle I	river	Exceeding the transport capacity of the bed,	Medium rise time flood,	Consequences on human health Consequences on pollution sources,
RO10-12.01.....-02A	r. Siret - av. place. mounds, sect. embankment	122.21	Cycle I	river	Exceeding the transport capacity of the bed, Overcoming the defense infrastructure, Destruction of defense infrastructure	Spring flood due to snowmelt Flood with little growth time Flood with remarkable levels	Consequences on human health Consequences on the community, Consequences for cultural objectives

Details regarding the effects of floods, possible impacts / consequences on the transport infrastructure and respectively on areas at risk of flooding are presented in chapter 7.1.6 of this Report.

The hazard zones for flooding are shown in the following figure. As can be seen, the project is located near several flood hazard zones.

[18] https://harticiclul2.inundatii.ro/ map@45.9891990 ,23.4491860,7z

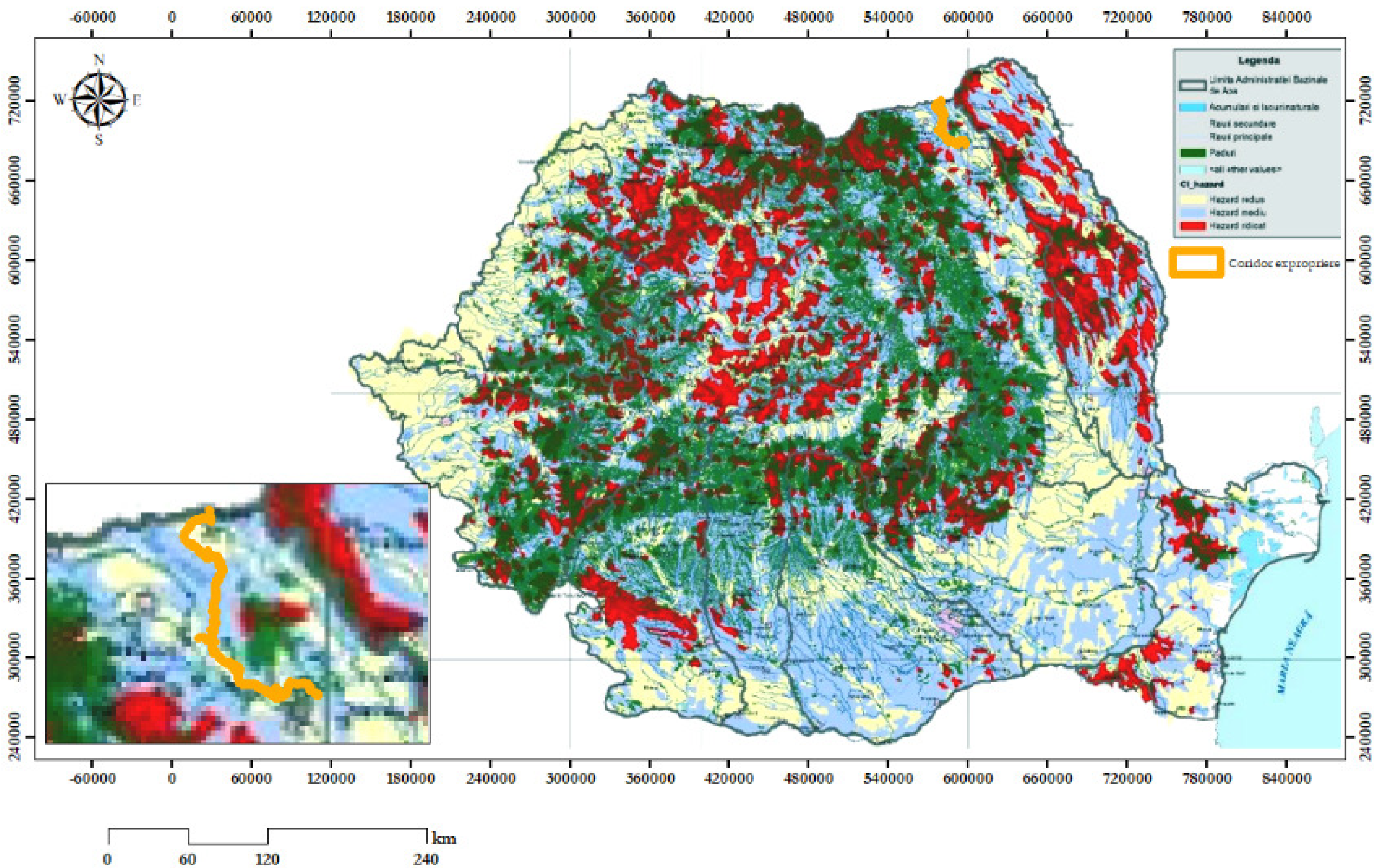


Figure no.10-1 Flood hazard map (according to the Synthesis on Disaster Risk Management, map developed within the RO-RISK project)

2. Landslides

In general, landslides can occur due to: deforestation (this plays an important role in soil fixation), earthquakes and heavy rains. In the following figure, the risk of landslides due to extreme seasonal precipitation is represented at the national level, as well as in the project area (represented in green), according to the Synthesis on Disaster Risk Management (2020). As can be seen, the project is located in low risk areas.

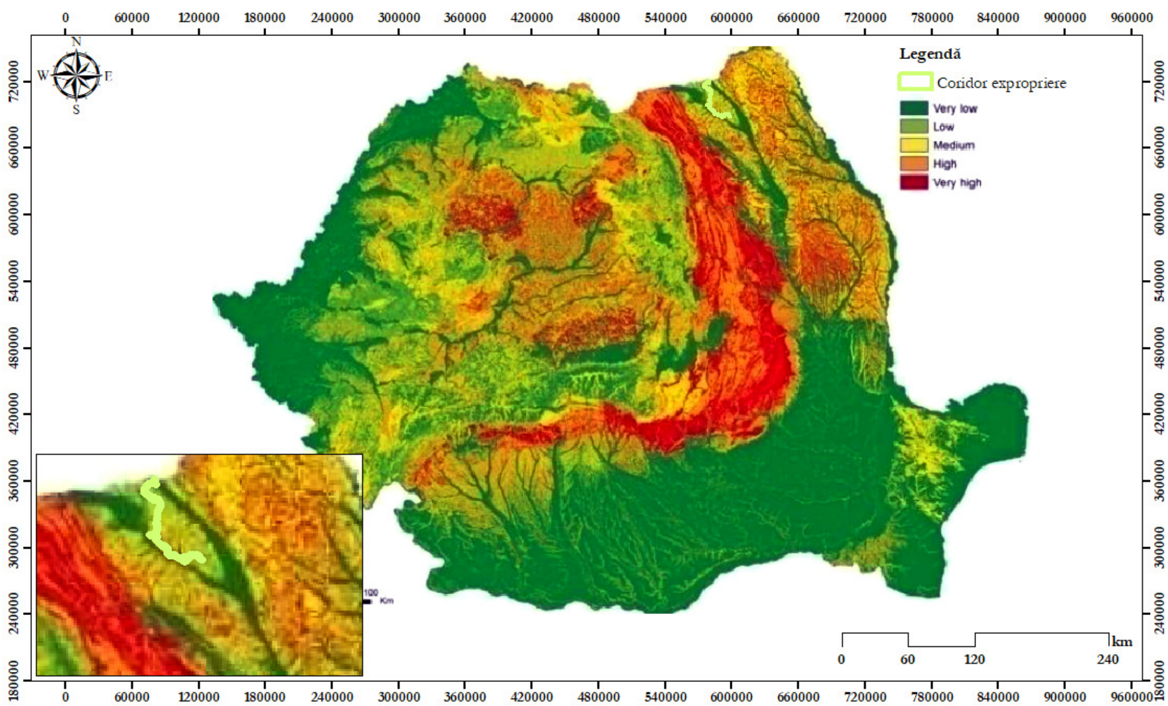


Figure no.10-2 The risk of landslides due to extreme seasonal precipitation (according to the Synthesis on Disaster Risk Management, map developed within the RO-RISK project)

The following figure shows the average exposure to landslides of built-up areas at the level of municipalities in Romania. As can be seen in the figure, the location of the express road is proposed in areas with very low risk, and low risk of landslides.

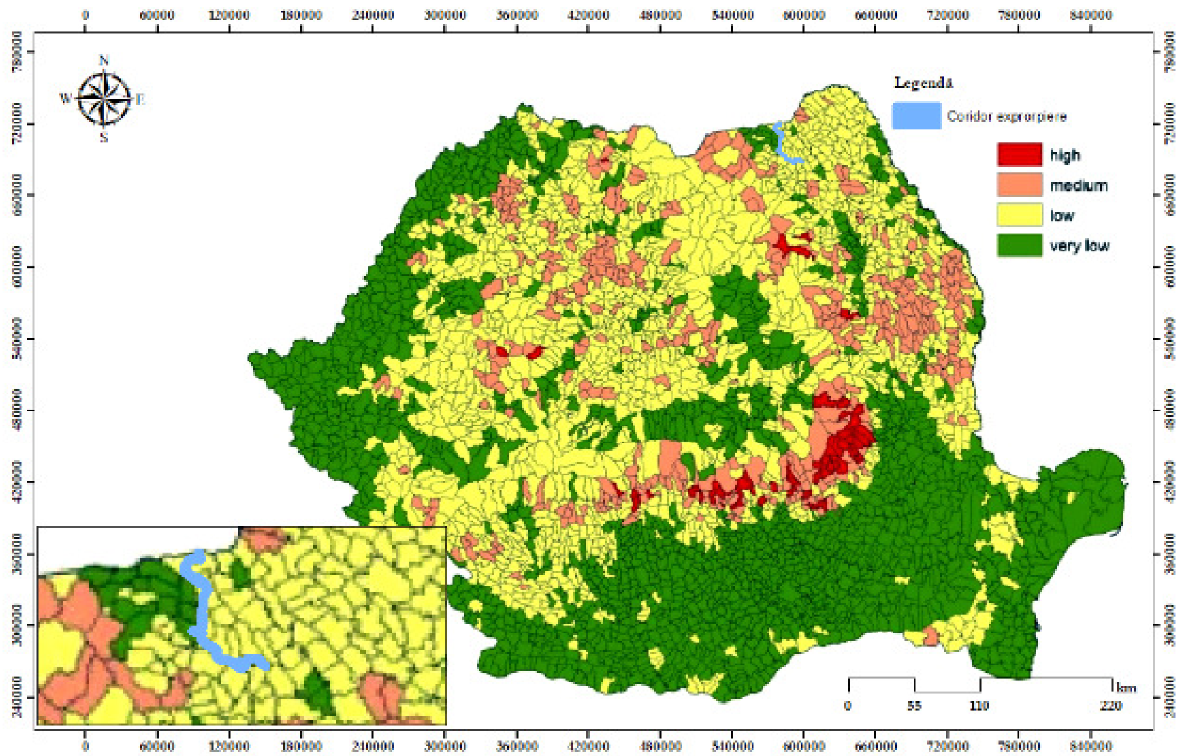


Figure no.10-3 The average exposure to landslides of built-up areas at the municipal level (according to the Synthesis on Disaster Risk Management, map developed within the RO-RISK project)

3. Earthquakes

According to the map of earthquakes in Romania, made by Toma, 2014 within the MOBEE project, for the period 1900-2014, no earthquake epicenters were identified in the project area. The closest epicenter to the project is in Botoşani county.

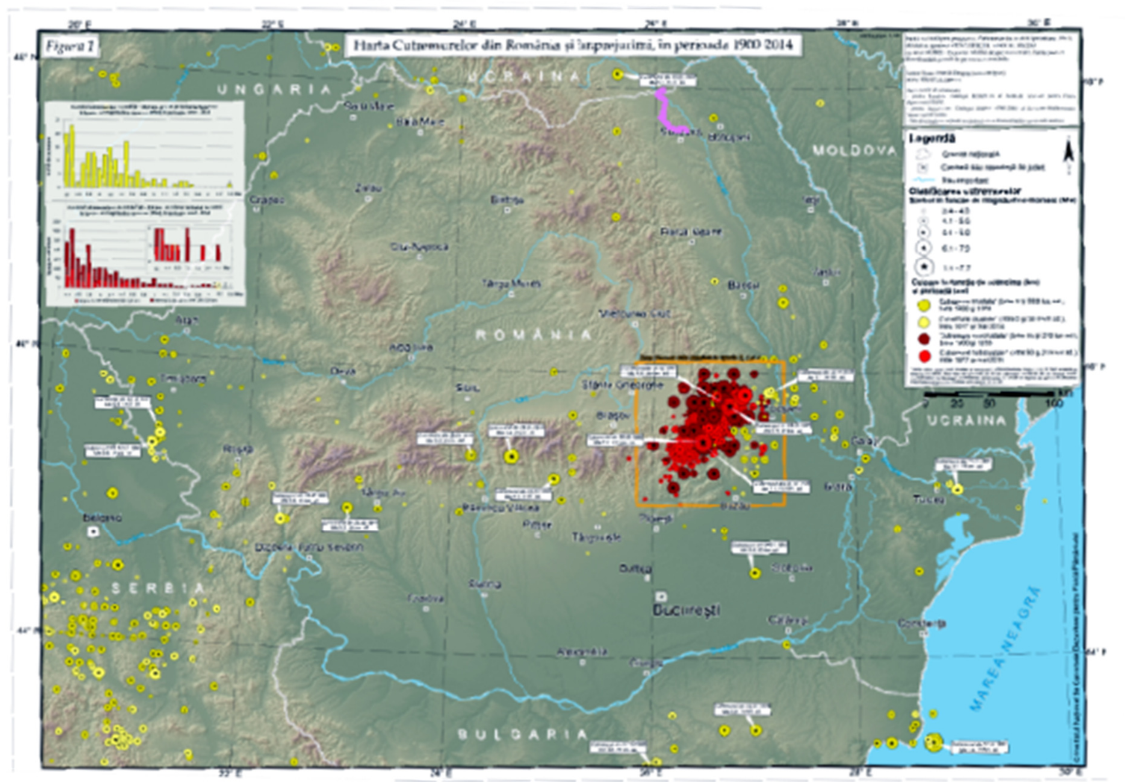


Figure no.10-4Map of earthquakes in Romania (according to Toma, 2014)

4. Wildfire

In the project area, the forest fire risk is considered low, according to the assessment carried out by the IGSU and presented in the Synthesis on the management of disaster risks in Romania, published in 2020 (IGSU, 2020). The following figure shows the project area in relation to the information provided by IGSU on fire risk.

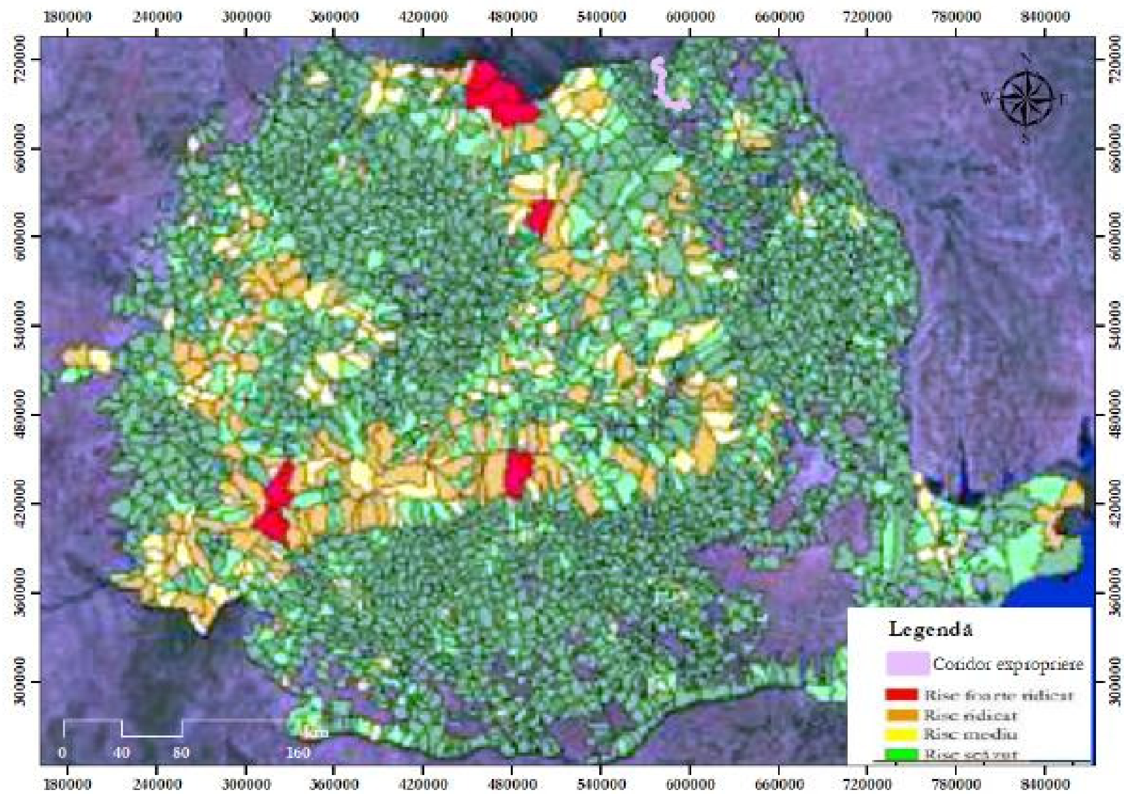


Figure no.10-5The potential risk of fire in the highway area, according to IGSU information

Risks associated with human activities

1. **Fiers** due to the anthropogenic factor: non-compliance with safety and security regulations at work, malfunctions of machinery or electrical installations, intentional stubble burning by local residents (the project is mostly located on or near agricultural land), etc.
2. **Explosions –**the explosion of gas pipelines, gas stations, etc., due to non-compliance with safety rules

11 NON-TECHNICAL SUMMARY

GENERAL PRESENTATION OF THE PROJECT

This summary was prepared to present in a non-technical language the conclusions of the Environmental Impact Assessment Report for the project "Suceava Motorway - DN2H and expressway DN2H - Siret Frontier" project proposed by the National Road Infrastructure Administration Company SA (CNAIR) .

CNAIR S.A is a company of national strategic interest that operates under the authority of the Ministry of Transport and Infrastructure and is responsible for the administration, operation, maintenance, modernization and development of the network of national roads and highways on the territory of Romania.

For any question related to the activity of CNAIR as well as the project of the Suceava - DN2H Highway and DN2H Expressway - Siret border, please use the contact details below:

CNAIR SA

Address:Dinicu Golescu Boulevard, no. 38, sector 1, Bucharest

Landline :**021.264.32.00**, fax:**021.312.09.84**

E-mail: office@andnet.ro , Internet page: www.cnadnr.ro

Contact persons: Cristian PISTOL – General Manager,

Responsible for environmental protection: Eng. Ecaterina MUSCALU - Head of the Environment Department.

The project involves the construction of a highway between Suceava and DN2H and an express road between DN2H and Frontiera Siret, this being part of the road project with the generic name "Drumul Siretului", indicator DX5 included in the MPGT (Paşcani - Suceava - Siret) and will be part of the Bucharest - Ukraine corridor, which will ensure a fast connection between the south of the country via the A7 highway (Ploiesti - Buzău - Focşani - Bacău - Paşcani) to the north in the Moldoveni region and to the neighboring country in the north, Ukraine.

PROJECT LOCATION

The project of the Suceava - DN2H highway and the DN2H - Frontiera Siret expressway will have a total length of approx. 56 km and will cross the route of 10 UATs: Suceava, Mitocul Dragomirnei, Patrăuţi, Darmăneşti, Grăniceşti, Calafindeşti, Bălcăuţi, Siret, Musenita.

CHARACTERISTICS OF THE PROJECT

The land area definitively occupied by the highway was estimated at 601.78 ha (based on the construction limit of the highway (expropriation limit), which belongs both to the Romanian state and to private owners. The period of execution works is estimated at 30 months.

For the execution period, it is estimated that a temporarily occupied area of about 36 ha will be needed for the construction site organizations.

Deforestation is planned within the project (the total area required to be removed from the forest fund is 37.57 ha).

CONSTRUCTION WORKS

The project involves the realization of the following categories of works:

- Road embankment;
- Road structure;
- Road junctions;
- Bridges;
- Viaducts;
- Passages
- Bridges;
- Boxed structures;
- Highway and expressway facilities (short-term parking lots, maintenance and coordination center, service areas (type S1);
- Hydrotechnical works;
- Rainwater collection and evacuation works;
- Consolidation works;
- Relocation and protected works of utility networks, relocation of transport routes and demolitions;
- Works for traffic safety;
- Works for environmental protection;
- Works necessary for site organization.

RAW MATERIALS AND NATURAL RESOURCES

Fuel

The project will require fuel (diesel) for transportation and the operation of the equipment necessary to fulfill the objectives proposed in the execution phase. Fuel supply will be provided from outside the construction site, their transport being carried out with the help of car tanks to the fueling points within the construction site organization.

Estimation of the type and quantities of emissions and waste

Emissions in surface and underground waters

During the execution period, the main sources of water pollutants are represented by:

- Soil manipulation works, generating soil particles that can reach surface waters. In the case of large quantities of powders, they can accumulate in watercourses, generating changes in water turbidity and affecting aquatic flora and fauna;
- Site traffic to and from the work fronts or the areas from which construction materials are brought (quarries, ballast);
- Accidental spills of chemicals, fuels and oils from the operation of machinery involved in construction works or due to faulty handling of transport vehicles;
- Improper handling and putting into operation or storage of the materials used in the execution of the works (bitumen, concrete, aggregates, etc.), which can reach the surface waters by entrainment by rainwater;
- Improper extraction of mineral aggregates (sand, ballast, gravel);
- Inadequate storage and management of domestic waste water resulting in the sanitary groups within the construction site organizations, the management being properly ensured by means of authorized operators;
- Washing machines and means of transport at the site organization level.

The waste water generated during the execution stage of the project will be at the level of the site organizations. They will be collected and discharged periodically by emptying, based on contracts concluded with authorized companies, and where possible by discharge into the local sewer networks or discharge into the emissary following appropriate pre-treatment/purification.

During the operating period, the main source of water pollutants is represented by the washing and entrainment by precipitation of solid particles and other soluble compounds deposited on the surface of the road as a result of road traffic, such as heavy metals, hydrocarbons, snow removal substances. Potential sources of pollutants can be represented by:

- Deposition of atmospheric emissions from vehicle thermal engines – heavy metals (Fe, Cr, Zn, Ni, Cd, Cu, Pb), hydrocarbons (PAH, PCB);
- Residues from the wear of vehicle tires and braking elements - suspended particles (PM10, PM2.5);
- Maintenance works - sodium (derived from the substances applied in winter for snow removal); heavy metals and hydrocarbons (from repair works at the level of road surface - asphalting);
- Metallic residues from vehicle corrosion - Fe, Cr, Ni, Cd, Cu and from galvanized parapets - Zn, oils and mineral fats;
- Residues from the wear of the road surface - solid materials.
- The risks of surface water or groundwater contamination are greater in the following situations:
- Direct deposition in surface waters of pollutants generated by vehicles involved in car traffic;
- Improper operation of settling basins and hydrocarbon separators;
- Accidental discharge of liquid or solid pollutants into surface waters (mainly due to massive spills of substances as a result of a traffic accident in the area of a water course).

Domestic wastewater from CIC, SS and PSD can be a source of water pollutants, but these waters will be collected in drainable watertight basins and periodically evacuated by authorized operators.

Rainwater potentially contaminated with hydrocarbons, collected from the road surface and from the CIC premises, service spaces and short-term parking lots will be pre-purified by means of decanters and hydrocarbon separators provided in the project before being discharged into the outfalls.

Atmospheric emissions

During the execution period of the works necessary for the realization of the project, the main sources of atmospheric emissions will be represented by:

- The activities of handling earth masses (excavation of fertile soil, excavations, fillings, leveling, loading, unloading, transport), some construction materials (sand, gravel, ballast) and waste from demolitions - undirected stationary sources. Pollutants: suspended dust and sedimentable dust;
- Temporary storage of powdery materials (sand, earth) that can be carried away by the wind. Pollutants: suspended dust and sedimentable dust;
- Wind erosion on disturbed or unvegetated land surfaces – undirected stationary sources. Pollutants: suspended dust and sedimentable dust;
- Generator sets to ensure energy supply in site organizations and work fronts - directed stationary source. Pollutants: NO2, SO2, CO, dust;
- Diesel storage. Pollutants: volatile organic compounds;
- The operation of asphalt and concrete stations - stationary point sources, located at the site organizations level;
- Welding/cutting activities of metal elements – non-directed stationary sources. Pollutants: metal particles, combustion gases corresponding to the use of welding / cutting devices;
- Mobile emission sources (vehicles and machines that participate in land preparation and the transport of materials and equipment, as well as in the supply of substances and materials during the execution of construction works. Pollutants: NOx, SOx, CO, suspended dust, particles with metals heavy.

Atmospheric pollutant emissions will be generated by works necessary to carry out the entire construction process, starting with digging and excavations and continuing with filling works, the construction of the embankment of the expressway and the construction of artworks. The area of the work fronts will constitute the most important source of emissions as it accumulates the activity of several polluting factors.

The construction works also include numerous mobile sources represented by the machines necessary for the development of the land and the construction of the objectives, by the vehicles that will ensure the supply of construction materials, but also by the vehicles necessary to evacuate the waste from the site. Their operation will be intermittent, depending on the work schedule and the work schedule.The works related to the project will be carried out with modern equipment (excavator, bulldozer, loader, mobile crane, pile drilling installations, etc.).

For the most part, the emission sources of atmospheric pollutants are ground sources (except for works of art located at high heights from the ground level), free, open and mobile or stationary diffuse/directed.

During the operation period of the objective, the sources of atmospheric pollutants will be mobile, represented mainly by the vehicles that will transit the expressway. According to the EMEP/EEA air pollutant emission inventory guidebook 2019, the main pollutants emitted by road traffic are:

- ozone precursors (CO, NOx, NMVOC);
- greenhouse gases (CO2, CH4, N2O);
- acidifying substances (NH3, SO2);
- particulate matter (PM);
- carcinogenic substances (PAHs and POPs);
- toxic substances (dioxins and furans);
- heavy metals.

Emissions - soil

In the construction stage, the potential sources of contamination/degradation for soil, subsoil and groundwater will be represented by:

- Improper storage of machinery and construction materials;
- Improper management and storage of the waste resulting from the works, as well as household waste resulting from the personnel involved in the execution of the works;
- The traffic of vehicles and machines involved in achieving the objective. Along with the impurity of the air, there is the possibility that a certain amount of atmospheric pollutants (SO2, NOx, heavy metals) reach the soil, which can lead to the modification of its characteristics;
- Accidental leaks of fuels, lubricants and other chemical substances from the vehicles and machinery involved in the construction works or from their improper storage;
- Degradation of soil quality through improper handling/storage of uncovered/excavated material, implicitly the occurrence of erosion and/or spreading phenomena;
- Contamination of the soil with germinal material belonging to ruderal and/or non-native invasive and potentially invasive species, as a result of soil manipulation activities, as well as the traffic of machinery and work personnel;
- Deposition of the dust resulting from excavation, loading, transport and unloading of construction materials;
- Inadequate management of domestic and technological waste water resulting from the site of the construction site organizations and in the work fronts.

In the operation phase, the potential sources of pollution will consist of the following:

- Road traffic, which represents a continuous source of pollutants from the exhaust gases resulting from the burning of fuels. This represents a continuous source of pollution through which elements such as NOX, SO2, PM10 and heavy metals generated by exhaust gases, road wear, tire wear, etc. they can deposit and accumulate on the soil level, affecting both its quality and the abiotic and biotic elements that depend on it;

- Accidental leaks of fuels, lubricants from waste transport vehicles and personnel involved in maintenance activities;
- Accidental leaks of toxic substances or hydrocarbons as a result of road accidents in which vehicles transporting dangerous substances are involved;
- Substances used in the cold season for snow removal (basic solutions of calcium/sodium chloride) as a result of road maintenance activities, which causes an input of chlorides in the soil and surface waters by entrainment of particles by rainwater, as well as affecting the vegetation on the side of the road.
- The project may generate a potential impact on the geology during the construction period, as a result of the construction of piles and bridges. In the case of the other elements of the project, the works will be carried out with the superficial damage to the soil layers so that they will not have an impact on the geological environment.

Light pollution

The Suceava – Siret highway and expressway will contribute to increasing the level of light pollution in the area where it will be built. The project proposes the lighting of several areas of the expressway, including road junctions and other structures. The most light-polluted area in the area of the highway/express road is located in the municipality of Suceava, approximately 0.3 km from its axis. Among the UATs crossed by it, most localities are characterized by a moderate level of light pollution. Only the towns of Bălcăuți and Calafindești predominantly show a low level of light pollution, oriented on the right side of the highway/expressway axis.

DESCRIPTION OF THE SIGNIFICANT EFFECTS ON THE ENVIRONMENT DUE TO THE PROJECT

The analysis in the Report of the environmental components was carried out for each component on which the implementation of the project could generate a potential impact. The effects generated both in the construction and in the operation stage were considered, effects on which it is necessary to apply the recommended measures to avoid and reduce the impact.

During the assessment, the possibility of significant negative impacts for the components was identified:

- Biodiversity and the social environment - in the construction stage;
- Biodiversity and the social environment - in the operating stage.

For all situations in which significant negative impacts were identified, measures to reduce the impact were proposed in the Report (presented in Chapter 9.1).

MAIN CONCLUSIONS OF THE IMPACT ASSESSMENT STUDY ON WATER BODIES (SEICA)

Within the "Suceava Higway - DN2H and DN2H Expressway - Siret border" project, potential cause-effect mechanisms were identified for all 8 bodies of surface water intersected by the project.

For the surface water bodies, cause-effect mechanisms were identified, as a result of the works that will take place both in the major water bodies and in the minor water bodies (only in the case of the Horaiţ water bodies - RORW12-1-17- 24A_B1 and Negostina RORW12-1-3_B1).

In the case of water bodies Mitoc - RORW12-1-17-30A_B1, Dragomirna (lake Dragomirna - cf Suceava) - RORW12-1-17-30_B3, Pătrăuţeanca - RORW12-1-17-28_B1, *Hâtnuţa +Bocancea - RORW12-1-17-27_B1* and Siret (border – Rogojeşti lake) - RORW12-1_B0 the effects can be recorded on the Structure of the riparian zone due to the location in the major riverbed of the support structures (piles and culverts) related to bridges and viaducts.

The works designed in the minor bed, respectively the diversions and bed protections designed on the water bodies Horaiţ - RORW12-1-17-24A_B1 and Negostina - RORW12-1-3_B1 and the foundation elements of the footbridge designed on the water body Podul Vătafului - RORW12- 1-17-30B_B1, can generate potential cause-effect mechanisms on the following quality elements: River depth and width, Bed bed structure and substrate, Riparian zone structure, Phytobenthos, Macrophytes, Benthic Invertebrate Fauna and Fish Fauna.

Although 5 of the water bodies studied, namely Podul Vătafului – RORW2-1-17-30B_B1, Pătrăuţeanca – RORW12-1-17-28_B1, Hătnuţa +Bocancea - RORW12-1-17-27_B1, Negostina - RORW12-1-3_B1 and Siret (border - lake Rogojeşti) - RORW12-1_B0, crosses protected areas for habitats and species where water is an important factor, no cause-effect mechanisms induced by the project on these protected areas were identified, the limits of the protected areas being located at considerable distances in relation to the intersection area of the project with water bodies.

In the case of the planned projects in the study area, cumulative cause-effect mechanisms were identified in the case of 6 surface water bodies: Podul Vătafului - RORW12-1-17-30B_B1, Mitoc - RORW12-1-17-30A_B1, Dragomirna (lake Dragomirna - cf Suceava) - RORW12-1-17-30_B3, Pătrăuţeanca - RORW12-1-17-28_B1, Hătnuţa + Bocancea - RORW12-1-17-27_B1 and Horaiţ - RORW12-1-17-24A_B.

Regarding groundwater bodies, potential cause-effect mechanisms were identified only on the ground water body ROSI03 Lunca and the terraces of the Siret River and its tributaries. They appear on the Underground water level indicator, as a result of the construction of the drilled piles for the foundations of piles and piles.

In the area related to the project, hydrogeological protection zones were identified designated for drinking water intakes for the city of Siret, consisting of a drain and a borehole that captures the infiltrated water from the left bank of the Siret river. The project does not cross the hydrogeological protection zone and the sanitary protection zone with a severe regime related to this catchment front. The bridge designed over the Siret river is located approx. 570 m upstream from the catchment front (measured along the route of the minor bed).

No cause-effect mechanisms have been identified on the qualitative state of underground water bodies.

No projects that could generate cumulative effects were identified on any of the intersected underground water bodies.

CONCLUSIONS OF THE APPROPRIATE ASSESSMEN REPORT

The assessment of the impact of the project on the Natura 2000 sites that may be affected by the project was carried out on the basis of the Specific Conservation Objectives established by ANANP in the period 2021-2022 for all sites considered in the assessment.

The Suceava DN2H highway and the DN2H expressway border Siret and do not cross any Natura 2000 site, but are adjacent to 4 Natura 2000 sites that have the potential to be influenced by its construction: ROSCI0075 Pădurea Pătrăuţi, ROSAC0391 Siretul Mijlociu – Bucecea, ROSPA0110 Accumulations Rogojeşti – Bucecea, ROSCI0380 Suceava Liteni River. These sites were analyzed in the study, from the point of view of the impact of the project on their integrity. The project does not cross ecological corridors.

The assessment of the impact of the project on the potentially affected Natura 2000 sites was carried out on the basis of the Specific Conservation Objectives established by ANANP in 2022 for all sites considered in the assessment. The assessment took into account the potential cumulative impact with other large infrastructure projects proposed in the area (DX5B Suceava – Botoşani, Paşcani – Suceava highway, CF modernization: Ilva Mica – Suceava, CF modernization: Paşcani – Dărmăneşti, DX5B Suceava – Botoşani, CF Paşcani - Darmanesti, CF electrification: Darmanesti – Vicşani, etc.).

Following the evaluation, it was concluded that the Suceava DN2H Highway and the Siret border DN2H Expressway (in some cases cumulatively with the other projects included in the analysis) are able to generate significant impacts and affect the integrity of the Natura 2000 sites ROSCI0075, ROSCI0380, ROSPA0110 .

Considering the fact that the highway does not intersect Natura 2000 sites, the project will not lead to losses of the surface of the habitats of community interest within the sites or of the favorable habitats of the species of community interest in the sites. A potential risk of altering aquatic habitats may occur in the event of accidental pollution, but the impact was considered insignificant, taking into account its accidental nature and the large distance between the intersection of the highway with the river and the Natura 2000 site area.

From habitat fragmentation point of view, the main impacts are related to the interruption of some ecological corridor areas by the highway. These were addressed by improving the permeability of the highway, resulting in a project that ensures, in the current configuration, the permeability necessary for the movement of fauna.

A potential disturbance to the activity of bird species may occur in the adjacent area between the project and ROSPA0110, as a result of the increase in the noise level during the construction period and during the operation period. In order to reduce this potential impact, the implementation of sound-absorbing panels was proposed, which will also have a role in reducing the noise level in the area of the localities in the vicinity of the highway and reducing the risk of collision of flying fauna species (invertebrates, bats, birds).

The most important potential form of impact associated with the project is represented by the reduction of fauna populations, which may occur during the construction and operation stages, as a result of the works, the collision with construction site traffic or car traffic. This form of impact can mainly affect mammal species in Natura 2000 sites (including remote sites) and birds. The reduction of population numbers is able to have a significant level on the populations of fauna species and affect the parameters related to the population size of the specific conservation objectives established for the species.

The measures proposed in this study to avoid and reduce the impact cover all the identified forms of impact.

Among the most important measures proposed are a series of sound-absorbing and anti-collision panels, proposed along the highway, in sensitive areas from the point of view of fauna, such as areas adjacent to SPAs or areas where it is possible for fauna species to move for feeding . The sound-absorbing panels have the role of reducing the noise level in these sensitive areas for fauna, and the anti-collision panels will reduce the level of impact caused by the collision of birds and chiroptera with road traffic, during the operation period of the project. Measures were also proposed to avoid some traps during the construction of the highway and to enclose it with an additional small fence, aimed at small fauna.

The measures to avoid and reduce the impact have been dimensioned in such a way as to ensure either avoiding the occurrence of impacts or reducing them to an insignificant level. It is estimated that the residual impact will be insignificant for all habitats and species in the analyzed sites. This also assumes that the implementation of the measures will ensure the avoidance of affecting the integrity of the Natura 2000 sites.

The appropriate evaluation study identified the need to implement some measures that can ensure the maintenance of an insignificant residual impact. To validate the effectiveness of the avoidance and reduction measures, a monitoring program was proposed that includes provisions for both the construction period and the operation period. The implementation of the monitoring program is essential to be able to ensure the correct implementation and functionality of the measures to avoid and reduce the impact.

ANALYSIS OF REASONABLE ALTERNATIVES

At the time of the Feasibility Study in 2020, an analysis of the alternatives was carried out for the Suceava - Siret section. 7 route variants were analyzed (within AMC1). The analysis was carried out jointly with the analysis of alternatives for the Paşcani - Suceava highway. In the case of Suceava – Siret, 7 route variants were analyzed, shown in the following figure (SVS V1, SVS V2, SVS V3, SVS V3.1, SVS V4, SVS V5, SVS V8)

For the Suceava – Siret project, the AMC1 results indicated the SVS V8 and SVS V2 alternatives as the most advantageous alternatives.

Following the analysis carried out in AMC 2, Alternative 8 was chosen as the optimal alternative for the Suceava - Siret sector. This alternative avoids the intersection with Natura 2000 sites, although it borders several sites. The alternative also presents advantages in terms of noise, land use, permeability, the risk of fauna colliding with road traffic and the need to demolish some buildings. The following figure shows the intersection areas of the alternatives analyzed in AMC 2 with the Natura 2000 sites.

WHY WAS AN ENVIRONMENTAL IMPACT ASSESSMENT REPORT PERFORMED?

RIM role is to identify the existing limitations in terms of environmental protection in the construction and operation of the Suceava - DN2H highway and the DN2H - Frontieră Siret expressway. The report identifies all the effects and impacts generated by the project and proposes appropriate measures to avoid or reduce the forms of impact. The measures are subsequently incorporated into the project ensuring that the final form of the project takes into account all relevant environmental aspects. The purpose of RIM is to provide the project with the essential elements to avoid significant impacts on the population and the environment.

WHAT OTHER STEPS HAVE BEEN CARRIED OUT SO FAR IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE?

A Project Presentation Memorandum was created and submitted. It contains a description of the proposed works and a preliminary identification of the impacts on the environment. Simultaneously with the EIA, the Appropriate assessment report (which assesses the project's impact on Natura 2000 sites) and the Impact Assessment Study on Water Bodies were developed.

WHAT IS THE PROJECT IN?

The project consists in the construction of the Suceava - DN2H highway and the DN2H - Frontieră Siret expressway. It involves the construction of the road itself, which includes road junctions, bridges, passageways, box structures, bridges, viaducts, hydrotechnical works, consolidation works, relocation and protection of utility networks, relocation of transport routes, works for traffic safety, works for the protection of the environment, works necessary for the organization of the construction site as well as works for the equipment of the highway/express road.

The project will be part of the Bucharest-Ukraine corridor, which will ensure a fast connection between the south of the country via the A7 Highway to the north in the Moldoveni region and to the neighboring country in the north, Ukraine.

From an administrative point of view, the project route crosses Suceava county.

HOW WILL THE PROJECT BE IMPLEMENTED?

The construction of the highway involves several stages, among which the most important are:

- Realization of the technical project and execution details;
- Location of site organizations (builders' headquarters during the construction phase);
- Expropriation of the lands on the highway route and the demolition of the existing buildings on these lands. The expropriation is carried out under the conditions of the law with the payment of the consideration of the land and the buildings;
- Relocation of utility networks. This operation involves moving cables, pipes, poles and any other existing elements on the route that are owned by the service operators (water supply, sewerage, telephone network, gas network, etc.);
- Relocation of existing roads, only where they intersect the highway and it is not possible to bypass or cross them;
- The execution of earthworks that involve excavations or filling with earth, necessary to reach the projected height of the land;

- Execution of works of art that include: bridges, viaducts, passages, etc.;
- The execution of hydrotechnical works, necessary to avoid the road being affected by running water, especially during periods of flooding;
- Works carried out on the highway, consisting of the actual execution of the road, including asphalting works, making markings and installing traffic signs, installing fences, making passages for wildlife, etc.;
- The execution of the rehabilitation works which consist primarily in leveling the land and restoring the vegetation in the areas covered with earth.

WHAT ACTIVITIES WILL TAKE PLACE DURING THE OPERATING PERIOD OF THE INVESTMENTS?

During the operating period, the main activity consists in the development of car traffic. Other activities consist of:

- Precipitation management - Water from the highway platform will be collected through the drainage system provided along the entire highway route. All rainwater collected from the highway platform will be directed to oil product decanters and separators for pre-treatment and then discharged into the outfalls. Also, in the cold season, interventions are needed to: prevent / combat the formation of ice on the road surface, as well as for snow removal;
- Maintenance and maintenance works - These consist of asphalt carpet maintenance works, interventions on bridges, passages and viaducts, but also the replacement of elements whose lifespan has expired or which have been damaged for various reasons;
- Activities at the level of service spaces and the maintenance and coordination center. At the level of service spaces, it is necessary to maintain parking lots and collect household waste

WHAT IS THE LIFETIME OF THE PROPOSED INVESTMENTS?

The life of the project is considered to be, conventionally, 30 years. As with most roads, it is highly unlikely that the highway will no longer be useful after 30 years. From the point of view of environmental protection, it should be considered that these constructions are permanent.The different components of the constructions have limited lifetimes (from a few years to decades) and as such require replacement. The replacements are made as part of the maintenance works or can be the subject of dedicated rehabilitation projects.

WHAT IS PRODUCTION AND WITH WHAT RESOURCES IS IT MADE?

The project does not propose the realization of any productive activities.

ARE THESE INVESTMENTS INCLUDED IN THE PLANS ELABORATED AT THE LOCAL, COUNTY OR REGIONAL LEVEL?

The route of the Suceava - DN2H highway and the DN2H - Frontieră Siret expressway is provided for in Romania's General Transport Master Plan, a plan that was subjected to a strategic environmental assessment and for which Environmental Notice no. 33 / 11.12.2015. The project is also included in the Transport Program 2021 - 2027, for which Environmental Approval no. 116 / 22.11.2022.

WHAT POLLUTANTS WILL BE EVACUATED IN THE AIR AS A FOLLOWING OF THE IMPLEMENTATION OF THE PROJECT?

During the construction period, activities are carried out that involve the release of dust and other atmospheric pollutants such as exhaust gases related to the machines involved in the execution of the works or combustion gases generated by the use of welding and cutting machines.

During the operating period, the main atmospheric pollutants are those generated by the exhaust gases of motor vehicles.

In the report (RIM), the quantities of atmospheric pollutants generated using agreed calculation methodologies (mainly the European methodology EMEP/EEA air pollutant emission inventory guidebook 2019) were calculated and were reported to the limits provided by the legislation in force (for pollutants and the situations for which the legislation provides such limits). Road traffic, mainly during operation, represents an important source of atmospheric pollutants.

The implementation of the project allows for better road traffic (fewer traffic jams, higher travel speed) which implicitly leads to the reduction of pollutant emissions. At the same time, following the construction of the highway, road traffic moves from inside the localities to outside them. There are still areas where concentrations of atmospheric pollutants can be high, but the situation after the construction of the highway will be significantly better than the current one.

WHAT POLLUTANTS WILL BE EVACUATED INTO THE WATER AS A FOLLOWING OF THE IMPLEMENTATION OF THE PROJECT?

During the execution period of the works, there will be no direct discharges of waste water into underground waters or surface water courses. During this period, however, accidental spills may occur as a result of improper handling of hazardous substances, waste or wastewater generated during construction, as well as accidental spills of petroleum products from machinery involved in construction activities. In order to avoid accidental pollution situations, measures were proposed in the report (RIM).

In the operating stage, at the level of the road itself, the only waters loaded with pollutants are rainwater, collected from the road surface. These waters are collected by means of ditches and drains provided in the project and discharged into the outfalls in the area. At all water discharge points from the drainage system, hydrocarbon separators with decanters were provided for the pre-purification of potentially contaminated rainwater. Thus, the possibility of the discharge of pollutants into the waters is reduced. At the level of the service spaces and the maintenance and coordination center, including the monitoring and information center, household wastewater resulting from the activity of the sanitary groups will also be generated. For the management of domestic wastewater generated within the above-mentioned objectives, own solutions will be provided within the premises of each location, either by connecting to existing networks, or by implementing local solutions.

WHAT POLLUTANTS CAN REACH THE SOIL?

All the pollutants emitted into the atmosphere (particles from the execution works, exhaust gases) can reach the soil, as well as as a result of accidental spills (both during the execution period and during the operation period).

The soils in the immediate vicinity of the highway are more exposed to the process of accumulation of pollutants in the soil. Within the RIM, measures were proposed for soil quality monitoring and interventions in case of exceeding the limits provided by the legislation in force.

WILL IMPLEMENTATION OF THE PROJECT LEAD TO INCREASE NOISE LEVELS?

Both construction activities and car traffic during the operating period represent important sources of noise. In order to limit the effects of noise, measures to avoid and reduce the impact have been provided. The main measure adopted is the provision of sound-absorbing panels, both during construction (mobile panels) and during operation (fixed panels).Taking over traffic on the highway, outside the urban areas, will lead to a more favorable situation in terms of noise level.

DOES THE PROJECT GENERATE THERMAL (HEAT) OR RADIOACTIVE POLLUTION?

The project will not generate radioactive or thermal pollution. The project does not foresee the use of radioactive materials.

WHAT WASTE IS PRODUCED AND HOW WILL IT BE MANAGED?

The main wastes generated during the execution period will be those resulting from construction activities. The largest amount is estimated for soil and stone waste, the only type of waste that will be partially reused in the filling works and for the restoration of sites.

Concrete waste, construction materials, plastic, packaging, asphalt, metal waste, filtering materials, sludge and municipal waste will be disposed of by specialized companies.

During the operation period, household and recyclable waste will be generated by the personnel who ensure the operation of the service spaces and the maintenance and coordination center. Household waste will be collected by sorting, according to the legislative provisions, and handed over to authorized operators for disposal or recycling.

In all stages of the project, contracts will be concluded with authorized companies that will ensure the elimination/utilization of all types of generated waste. All waste generated as a result of the project, in all its stages, will be temporarily stored only on surfaces specially arranged for this purpose.

In all stages of the project, records of waste management will be maintained. All the employees on the construction site will be trained on the handling of waste as well as how to sort it by category, in the containers specially provided for each category of waste.

In the case of hazardous waste, special measures will be taken to manage it (by separate storage only on impermeable surfaces), so as not to contaminate the rest of the waste or the soil. Within the premises of the construction site, the contractor will set up platforms specially designed for the collection and management of all types of waste that will result from the execution of the works, provided with bins, containers and containers specially designed for the temporary storage of waste. The platforms will be set up in such a way as to allow the handling of waste by the contracted authorized companies, in safe conditions. The temporary storage of waste will be done separately, for each type of waste, each container or container intended for storage being labeled with the corresponding waste code, according to HG 856/2002 with subsequent amendments and additions.

WHAT IS THE METHODOLOGY USED FOR ENVIRONMENTAL IMPACT ASSESSMENT? The methodology used for environmental impact assessment involved the following steps:

a) Study of the initial conditions;
b) Study of project alternatives and contributions to their selection;
c) Identification of the sensitivity of the areas where the project is proposed;
d) Identification of the effects of the project (physical changes, generated emissions, waste);
e) Quantification of effects (calculations, modeling, estimates);
f) Identification of forms of impact – changes at the level of sensitive components (eg: biodiversity, social environment, etc.);
g) Prediction and quantification of the identified forms of impact;
h) Evaluation of the significance of the impacts based on the significance thresholds established for each component;
i) Analysis of the accumulation of impacts as a result of the implementation of other projects in the same area;
j) Establishing measures to avoid and reduce significant impacts;
k) Evaluation of the residual impact, estimated after the implementation of the measures;
l) Establishing a program to monitor the significant impacts and the effectiveness of the measures.

The identification of the effects was based on the analysis of the possible changes generated by the project on the physical environment as a direct consequence of its realization. The identification of the effects involved the following steps:

- Analysis of all interventions proposed within the project;
- Identification of all activities resulting from the construction and operation of investments;
- Identification of all the changes (effects) that occur in the physical and socio-economic environment as a result of the implementation and operation of the interventions.

To quantify the effects, the following were used:

- information provided by the designer (affected surfaces, location, quantities, etc.);
- calculations and modeling (eg: in the case of the noise level);
- estimates based on the experience of other similar projects or provided in profile guides.

The identification of the forms of impact was carried out based on the list of effects and on the identification of the changes that may occur at the level of sensitive elements (eg: air, water, biodiversity, social environment, etc.) as a result of these effects.

Making the impact prediction involved the analysis of several specific parameters, both qualitatively and quantitatively, where this was possible. Among the analyzed variables were: the stage of the project, the type and nature of the impact, the cumulative potential of the impact, the spatial extension, the duration, the frequency, the probability and the reversibility. In the case of the appearance of the same form of impact as a result of several effects, its level was analyzed only once to eliminate redundancies.

The evaluation of the significance of the impacts was based on the analysis of the sensitivity of the project implementation areas and the magnitude of the changes proposed by the project.

For each potentially affected component (eg: water, air, soil, geology, biodiversity, etc.) sensitivity classes were established. Similarly, the changes proposed by the project were divided into classes of magnitude.

Based on the analysis of the sensitivity of the environmental components, in relation to the magnitude of the changes generated by the project, the level of impact can be divided into the following classes:

- Significant impact (negative/positive);
- Insignificant impact (negative/positive);
- No impact (where it is estimated that no changes will occur at the level of the environmental factor or their level is undetectable).

The analysis of potential cumulative impacts was carried out by:

- Identification of important existing and/or proposed projects in the project implementation areas;
- Analyzing the probability that these projects contribute with additional effects and/or cumulative effects with the analyzed project;
- Evaluation of the significance of the cumulative impact.

The measures to avoid and reduce the impact were proposed mainly for situations where the possibility of a significant impact on an environmental component was identified. Other measures necessary to avoid certain impacts or to maintain all identified impacts at an insignificant level were considered.

Based on the measures established for the management of significant impacts, the level of the residual impact was analyzed, the level estimated to have remained after the implementation of the avoidance and reduction measures.

The monitoring program was developed with the aim of evaluating the effectiveness of the measures to avoid and reduce the impact and to ensure that the predicted level of the impact is not exceeded. It was made taking into account the proposed measures and adapted to ensure the evaluation of their efficiency.

WHAT IS THE IMPACT OF THE PROJECT?

During the assessment, the possibility of significant negative impacts for the components was identified:

- Biodiversity and the social environment - in the construction phase;
- Biodiversity and the social environment - in the operating phase.

For all forms of impact, avoidance and reduction measures were proposed so as to ensure an insignificant residual impact after the implementation of the measures proposed in the Report.

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