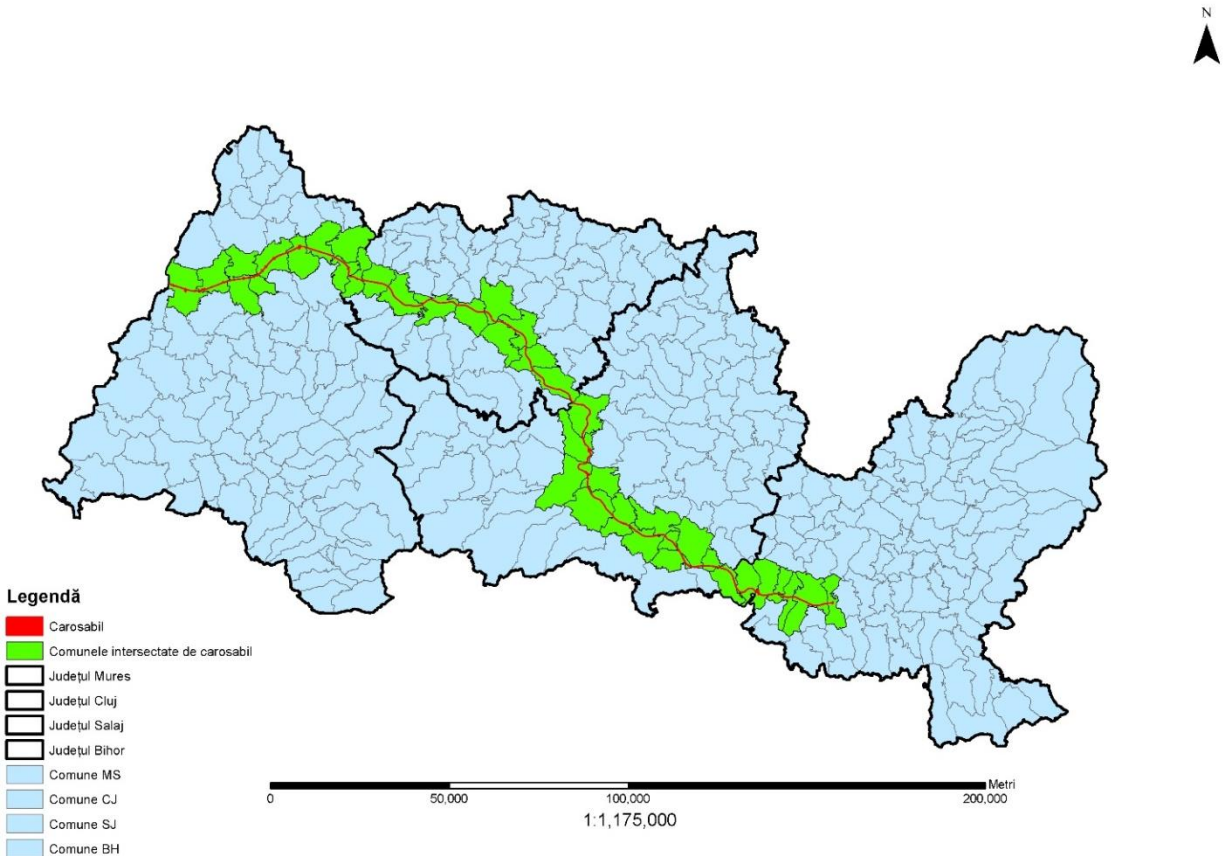
NATIONAL COMPANY FOR ROAD INFRASTRUCTURE ADMINISTRATION

BRAȘOV – ORADEA MOTORWAY
OGRA – BORȘ SECTOR
GILĂU – BORȘ SECTION



DOCUMENTATION FOR ENVIRONMENTAL IMPACT ASSESSMENT IN THE TRANSFRONTIER CONTEXT

Contents

List of figures

List of tables

1. Description of the proposed activity and its purpose

1.1. Purpose of the project

One of the major problems facing Romania remains related to socio-economic limitations caused by deficiencies due to transport networks. Thus, the need to develop a road transport network become a naturally justified desideratum, which, in the national context, takes the dimension of a stringent priority to support the desiderata of developing and ensuring common standards as set out in sectoral policies .

The need for a modern and safe road network to respond to the increasing demand for transport is a natural justification for the economic growth aspirations, but also for increasing social, living standards (by shortening travel times and increasing traffic safety), also with a certain component related to environmental protection, as a result of the increase in transport efficiency, the reduction of pollutant emissions.

The objective of the project is construction of Sector Ogra - Brasov, part of Brașov – Oradea Motorway, with a total length of 255,39 km.

Brasov - Oradea Motorway, which will be connected with the Bucharest - Brasov Motorway, and with the Nadlac - Sibiu Motorway, through the Sebeş - Turda Motorway, is one of the national transport highways that will ensure the interconnectivity between Romania and the Center and Western Europe, by ensuring connection with the Budapest - Miskolc Motorway, from which the Miskolc - Debrecen Section departs.

The motorway will have its starting point in the southern part of Ogra, it will cross the administrative territory of Mureş, Cluj, Sălaj and Bihor counties and will have the final point in Bors village, in the area of Santăul Mare village, continuing in Hungary with the M4 motorway to Miskolc and Budapest.

This motorway will provide an increased flow of traffic by creating a modern communication link with implications for regional development of the area, fluidizing traffic, deviating transit traffic, increasing user safety, reducing journey times, facilitating future maintenance of the roadway and the reduction of pollution in the areas currently in transit.

In addition to international valence, this motorway will lead to a significant improvement in traffic conditions in Romania. Through the network of national roads rehabilitated or under rehabilitation with which the motorway will be connected, the motorway can receive and distribute traffic more efficiently through its junctions.

The Braşov - Oradea Motorway will absorb a substantial part of the traffic on the adjacent national road network, reliveing them significantly and contributing greatly to a decongestion of the traffic from the transited localities.

1.2. Project description

The Brasov - Oradea Motorway, Ogra - Borş Sector, has a length of 255.39 km and crosses the counties of Mureş, Cluj, Salaj and Bihor, according to the map in figure 1.

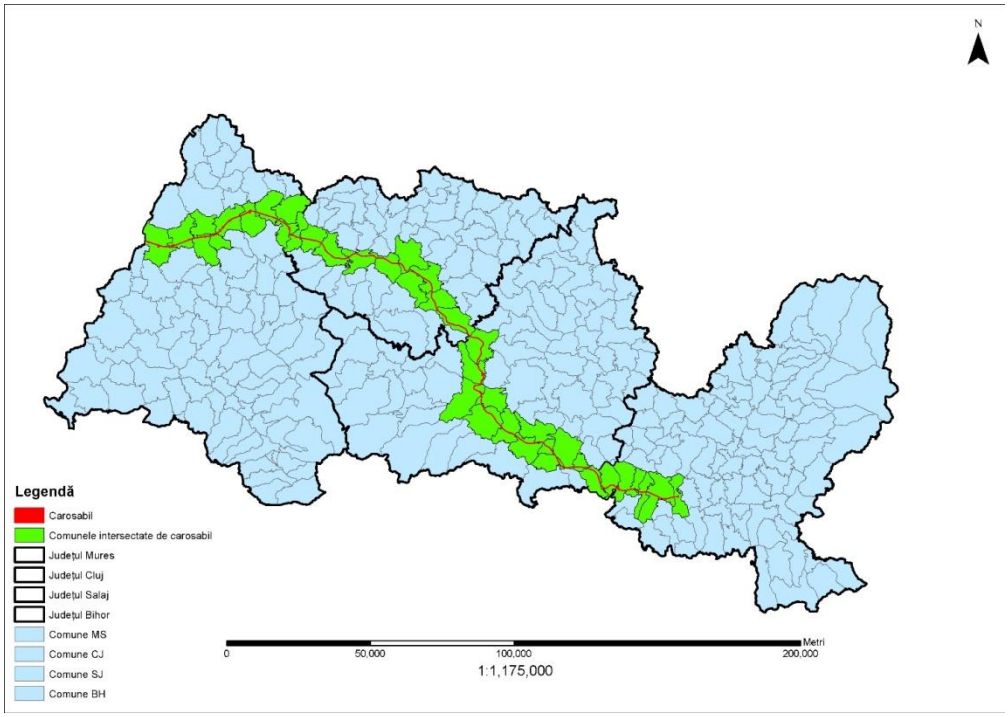


Figure 1. Braşov – Oradea Motorway, Ogra – Borş Sector and crossed counties

From a geographic point of view, the Brasov - Oradea motorway, Ogra - Bors Sector, crosses the central and western parts of the Transylvanian Plateau, then crossing the Meseş Mountains, following the Piedmont of the Plopis Mountains (Ses) and the central area of the Western Plain to the border with Hungary.

The following works will be carried out for the implementation of the project:

- **Road works:**
  - construction of a 255,39 km long motorway, of which the length of the Gilau - Borş sector is 166,754 km;
  - the total width of the transversal profile will be 27.5 m / 28.5 m and includes the space for the sill to be placed on each side of the platform;
  - width of the platform:
    - a two-lane carigeway on each direction;
    - guide lanes, two on each direction;
    - median lane (waterproof);
    - one emergency lane on each direction;
    - two shoulders.
- In the area of road junctions, the width of the motorway platform is 29,50 m, by adding a meter to the width of each emergency lane, which turns into acceleration-deceleration lanes;;

- in the case of junction arms with two lane, the road platform width is 9.00 m, and in the case of junction arms with a single lane width of the platform is 6.00 m;

➢ **Works of art:**

- bridges, passages, viaducts;
- hidrotechnical works:
  - protection of concrete pillars;
  - protection with concrete pillar and gabion mattress;
  - wall of gabions;
  - recalibration and deviations of the river bed;
  - river bed thresholds;
  - river bed corrections;
  - concrete tiles wall;
  - masonary dry wall;
  - gabion support walls, monolithic concrete foundation on cassettes;
  - concrete culverts or gabion;
  - threshold buried anti-erosion;
  - docks;
  - thresholds for torrents;

➢ **Consolidation works:**

- protection works for cut-and-fill embankments with geocells filled with soil;
- protection works for embankments with Geosynthetics;
- protection works for embankments with geocells / biodegradable mats ;
- backfill base reinforcement;
- deburring support structure from drilled columns;
- support structure of anchored prefabricated plates;
- mattress reinforced with geogrids;
- reinforcement of landfill with reinforced earth;
- reinforced earth support walls;
- deck support walls in drilled pilots;
- green terramesh system;
- consolidation pilots;
- grids
- dray walls;
- longitudinal drainage;
- Sowing and creating a vegetal layer;

- planting bushes;

- **Tunnel**: in the area of the Meses Mountains a tunnel with a total length of 2.4 km was designed, realized in a two-lane bitub system;
- **Drainage works:**
  - pluvial waters acting directly on the motorway body will be collected and removed from the body of the motorway through gullies, ditches, guard ditches, drains, cassettes;
  - the rainwater on the adjacent land of the motorway will be collected in the ditches at the base of the slope;
  - pluvial water sewerage shall be separated on the left and right sides of the motorway;
  - before discharging into the emissary, all the drained rainwater will be passed through a sludge separator and by-pass hydrocarbons that ensure efficient rainwater treatment;
  - where necessary, decanters, desiccants, grease separators, retention basins were provided;
  - in areas where there are no emissaries, the treated rainwater will be discharged into the environment by means of dispersion basins;
  - culverts and bridges with 2,00 m and 5,00 m bridge span, were provided;
  - Designed culverts operate in free-drain mode;
- **Roadwork rehabilitation works:** Over and undertracking has been provided to ensure the continuity of the national, county, communal and local road network on the motorway area;
- **Maintenance and Support Centers;**
- **Maintenance works:** On both sides of the motorway, roads specifically designed for maintenance work have been provided. These roads will have a 2.50 m roadway and access will be restricted to maintenance personnel only;
- **Traffic safety works: Lucrări pentru siguranţa circulaţiei:** road signs and horizontal marking;

Below will be presented in detail the works proposed in the Gilau - Borş sector.

1.2.1. Longitudinal profille

The longitudinal profile was designed based on technical criteria and norms and taking into account the characteristics of the land and has the following characteristics:

- Minimum radius of concave connections: 6.000 m / 10.000 m / 18.000, depending on the characteristics of the field;
- minimum radius of convex connections: 6,000 m;
- minimum length of vertical connection: 240 m;
- maximum gradient: 5% and 6% respectively;
- minimum gradient: 0.3% and 1.0% respectively;

Since the maximum gradient exceeds 3% in some sectors, were considered lanes for slow vehicles.

Slow vehicle lanes have been designed at following kilometer positions:

- km 5+360 - km 6+330 and km 7+230 - km 7+830, on the left side of motorway;
- km 14+800 - km 16+025, on the right side;
- km 13+260 – km 15+265, on the right side;
- km 16+645 – km 18+085, on the left side;
- km 23+265 – km 24+475, on the left side;
- km 15+500 – km 16+450, on the right side;
- km 16+450 – km 18+250, on the left side;
- km 23+135 – km 24+575, on the left side;
- km 28+075 – km 30+700, on the right side;
- km 30+067 – km 31+255, on the left side;
- km 37+850 – km 38+450, on the left side;
- km 66+500 - km 80+054, on the left side;

For junction arms, the maximum gradient was chosen based on the design speed and the radius of connection in plan, assuming a maximum gradient of 6.7% at a speed of 30 km / h and 6.2% for at a speed of 40 km / h. Both values correspond to a radius of 100 m.

A longitudinal slope of up to 15% was adopted for the service roads.

For sector 3C, km 4+200 - km 64+450 Suplacu de Barcău – Borș

The red line optimizations were made between: km 29 + 440 + km 43 + 140; Km 43 + 540 + km 54 + 120; Km 55 + 800 + km 56 + 200 and km 58 + 000 + km 62 + 460.

In the case of the junction arms, the maximum declivity was chosen according to the design speed and the radius of connection in the plane, adopting for the Chiribis junction a maximum gradient of 4% for a speed of 30 km / h, and for the Biharia junction a declivity 4.5% for a speed of 40 km / h.

A longitudinal slope of up to 20% has been adopted for the relocated operating roads.

1.2.2. Transversal profile

The cross-sectional profile comprises the following elements:

- the width of the platform consisting of:
  - a two-lane carigeway on each direction;
  - guide lanes, two on each direction;
  - middle lane (waterproof);
  - one emergency lane on each direction;
  - two shoulders.
- space for guardrails (outside the platform) on each side of the platform.

Thus the overall width of the transversal profile will be 27.5 m / 28.0 m.

1.2.3. The route

On section Gilau – Bors, the route of Brasov – Oradea motorway has the following particularities:

The motorway route on section 3A Gilau – Mihailesti starts from section 2B immediately after crossing Somesul Mic River and the “runway” close to the river. The kilometer 0 of the route is located approximately 600 m southeast of the DN 1 route, at the entrance in Gilau. The length of this highway sector is 25.45 km.

The Motorway Section 3A does not passing through the proximity of protected natural areas.

The route of 3B Topa Mica (Mihailesti) – Suplacu de Barcau section is carried out on the following line: Topa Mică – Zimbor – Poarta Sălajului – Zalău - Nușfalău – Suplacu de Barcău.

The length of this motorway section is 80.054 km. At km 80 + 054, Section 3B connects with Section 3C, whose starting mileage is 4 + 200.

Section 3C Suplacu de Barcau - Bors has a length of 60.25 km, and overlaps tangential with a small portion to the northern limit of the site ROSCI0322 Mount Ses.

The route passes through hills of Barcau and most in the Plain of Barcău (part of Western Plain).

The motorway route runs across the county Salaj and Bihor, near the localities IP, Marca, Suplacu de Barcau, Balc, Abram, Tauteu, Chislaz, Spinus, Sirbi, Ciuhoiu, Sălard, Bihar ia and Tămăşeu.

The route is relatively parallel to DN 19B (Şimleul Silvaniei - Marghita), starting from a temporary road junction (until the end of Section 3B) at km 4 + 200, that connects the motorway and DN 19B, then passes through the water storage from Suplacu the Barcau.

In the village Marca, at km 4+349 the motorway intersects with DC 95, that it crosses with a motorway overpass, and in the area of km 6+655 - km 8+453.60 crosses the water storage Suplacu de Barcau with a bridge, then enters in the oil field wells and crossing with a motorway overpass the street Zarandului from Suplacu de Barcau at km 8+587.

The motorway is crossed by a passage at km 9+004, county road DJ 191 B (Surplacu de Barcau - Foglas).

After crossing the field of wells, the motorway section is moving to the west along the national road DN 19B (Surplacu de Barcau - Marghita), to the south of localities Dolea and Margine, in a hilly area.

In the area of km 9+825 a passage is provided on the local road over the motorway, then the motorway route continues with the crossing of the Frumoasa creek, and the road link at km 10+686, with a bridge on the motorway.

The motorway route is still parallel with DN 19B, and in area of km 12+163 crosses a valley and a road link with a bridge, then it is crossed the valley Saldabagiului, in the area of km 14+386 with a viaduct.

The highway route enters a curve up to km 16 + 225 where a valley crosses through a viaduct, and then the motorway continues to km 17 + 041 where it crosses the Ungat valley with a bridge.

The motorway crosses the village Margine to the north, until the valley Hontiu, km 17+835, which is crossed by a viaduct.

The motorway is crossing the valley Tania with a bridge, in the area of km 19+473 and with another bridge is crossing the valley and local road from km 20+656.

At km 22+503 to the South of Abram, the motorway is crossing with a passage the railway Tauteu - Marghita, and in the area of km 23+145 is crossing with an overpass the DC 122. In the vicinity, the motorway is crossing with a bridge the Bistra creek, at km 23+495 reaching in the area of km 24+175, where with a passage is crossing the DJ 191A.

The road junction Chiribis from km 24+525 connects to Marghita.

Inside the road junction from Chiribis it is expected to achieve a Maintenance and Coordination Center, at km 24+525, with an area of approximately 29,000 m2. After exiting the road junction the motorway route is in alignment until the area of km 25+940, where is provided a short-term parking.

The motorway route crosses the Chiraleu town at north, until the Valley Ciuba area, at km 28+319, where there is a bridge to cross it.

The motorvay is heading for Sânlazar, where it approaches DN 19E deviated but parallel to the motorway, close to Misca and Chişlaz, which are linked by a passage at km 32 + 115 on DJ 190E, in this area being provided a road link between DJ 190E. Then the motorway has a parallel DN 19 E route deviated to km 34 + 500, and at km 35 + 491 the highway is overrun by a passage on DC 115.

The motorway route passes north of Pocluşa de Barcău, crosses a bridge over the Tria brook at km 36 + 228, after which in the km 36 + 872 area the motorway intersects an exploitation road that is crossed by a passage over the highway.

Further, the motorway passes between Sarsig and Hăuceşti, to the south of Ciuleşti, where a bridge over the Ghepesu brook is located at km 38 + 504.

In order to ensure the connection between the towns of Ciuleşti and Sarsig, there is a passage on DC 118A over the motorway at km 38 + 745

The route continues parallel to DN 19 E and in km 39 + 945 the highway is overloaded with a passage on DN 1P.

In the km 40 + 884- km 40 + 986 area crosses a portion of the Natura 2000 ROSCI0347 Pajiştea Fegernic site, which was declared according to Order no. 2387 / 29.09.2011 for the amendment of the WMO no.1964 / 2004.

The motorway continues its route to the south of Nadar, and a passage on DC 42 at km 41 + 335 is foreseen near Sarcau.

The motorway route then passes north of Ciuhoi and south of Fegernic, and to secure the link between these two localities, the DJ 767A passage is provided over the motorway at km 42 + 748.

The motorway runs parallel to DN 19 E, up to km 44 + 735, where via a motorway bridge crosses a valley and a local road, and later in the km 46 + 540 area with a bridge on the motorway crosses a valley and a Local road.

At km 48 + 394 with a passage over the motorway there is crossed an exploitation road that will be deflected so that the passage is perpendicular to the axis of the motorway.

The route of the motorway continues in line to the north of Salard, and at km 49 + 916 there is a motorway bridge over the valley and the creek, followed by km 50 + 313 (km 50 + 302,55 ÷ km 50 + 320,65) to provide a bridge over the DC 25 and the Valea Uscata.

From here the highway route is heading to the Romanian-Hungarian border intersecting DN 19E with a passage at km 55 + 233, and then the route enters a long-range curve, following to intersect DC 22 at km 56 + 960 with a passage over the motorway.

At km 58 + 615 there is a bridge on the motorway over the Cosmo brook and the local road after which the highway intersects DN 19 where the "double trumpet" Biharia road junction ensures the exit / entry of the motorway traffic in the Biharia - Oradea area , As well as the following structures:

- bridge over the motorway over the canal km 58 + 974;
- passage on the cross over the DN 19 at km 59 + 615 which ensures crossing DN 19 Satu-Mare;
- Passage on the motorway km 59 + 877 that crosses the bridle at the road junction;
- Passage on the motorway over CF km 60 + 067.

At the exit from the road junction, the motorway is aligned, and in the km 61 + 300 it will be provided S3 type of service space that will be left-right to the motorway and will offer users outside of specific resting and recreation spaces Short-term parking, fueling services, accommodation and catering services, auto repair services, trade, etc. The area occupied by the S3 service space is approximately 33,000 m2 on each side of the motorway.

Also in front of the service space (km 61 + 300) there will also be a maintenance support point with access beside the S3 Service Area.

Upon leaving the service area, the motoway is still in alignment, with a passage over km 63 + 246 overpassing at km 63 + 246 where it meets an explotation road.

The motorway route and Section 3C respectively end at the Romanian-Hungarian border at km 64 + 450, north of Sânpaul Mare, from where it will connect to Hungary's motorway road network.

The total length of the motorway in the Bihor County is 58.5 km.

1.2.4. Works necessary to provide the rainwater drainage

In order to maintain the constructional elements of the motorway in good condition (especially the earthworks and road structures) it is necessary to make some elements for the removal of water. The rainwater acting directly on the motorway body will be collected and removed as quickly as possible from the motorway body and road structure through gutters, ditches, guard ditches, drains, caves. The rainwater on the adjacent land of the motorway will be collected in the ditches at the base of the slope.

In the longitudinal profile, the red line is correlated, both with the configuration of the natural land crossed and with certain points of gravity, the gauge imposed on the lower passages at the crossing of the local and exploitation roads, the 1% insurance rates, including the guard height for bridges at the crossing the watercourses. The minimal adoptions ensure proper discharge of surface water, preventing water from standing on the road or its slow leakage that can lead to loss of tire adhesion, at high speeds, until the aquaplaning phenomenon.

By the geometry of the platform is provided a diffuse drainage of the rainwater to the external extremity, from where they are taken over by gutters systems that run along the sideroads, from where they will be collected in the

gutters network deployed on the sideroads, from where they will be unloaded on the slopes through caves to the ditches provided along the motorway.

The useful sections of rainwater management pitches have been designed taking into account the calculated flows for platform and slope surfaces.

The waterrain drainage duct will be separated for the left and separately for the right side. Before downloading the emissary all channeled rainwater will be passed through separator sludge and hydrocarbons bypass that provides the quality of the discharged water according to norm TN001 / 2002. The download envoy rainwater will be treated in discharge mouths located in the emissary, for the protection of shores against erosion.

The ditches system converges to gradually decanting decanters located along the motorway, able to take most of the rainwater volumes. These decanters operate similar to a mechanical treatment water step, retaining most of the suspended particulates washed by rainwater at the level of the motorway platforms and also retaining any leakage of hydrocarbons or any other products with potential for pollution, for example, accidents, responding to the principle of withholding pollutants at source.

Decanters (desiccants), grease separators, retention basins were also provided where it was considered necessary to place such structures.

The ditches will generally have a trapezoidal section with variable dimensions depending on the water flow to be collected and discharged and it will be protected. On ramps, the waters will be collected in the gutters and discharged on the slopes through the caves at the ditches provided along the motorway. Specific calculations were made to determine precipitation flows and converge to ditches from the motorway platform or from the adjacent slopes of the area, ultimately determining the useful sections of the ditches on homogeneous sectors. Side ditches on the slope and ditches at the base of the slope are made of concrete

Prior to discharge into the emissaries, rainwaters on the carriageway will pass through decanters and oil separators. The required capacity of these separators is determined by the flows collected by the motorway ditches. In the absence of emissaries, the water will be discharged into the environment by means of dispersion basins.

For the passage of water under the motorway there were provided culverts with light of 2,00 and 5,00 m and bridges that ensure transit of permanent or meteoric waters from one side of the road, and on the local roads there were provided tubular corrugated culverts with the diameter of 1,00 m or 0,8 m.

The culverts were designed at a flow rate with the probability of exceeding 2% in the case of the valleys with water. In the case of unloading culverts, the hydraulic sizing was done for the rainfall rate of 1/10 (maximum rain number / number of years).

Bridges and floors have been hydraulically dimensioned at flow rates with 2% assurance. Where there is a potential to drive solid material, upstream and downstream arrangements have been made for projected bridges and culverts.

The location and sizing of bridges and culverts has taken into account the following considerations:

- is located in the vicinity of small water courses or canals;

- are located at the points where pluvial waters are collected on the adjacent surfaces;
- are placed near rivers for flood discharge and do not endanger the stability of the road earthworks.

During the construction period, all work platforms will be equipped with slopes to allow surface water to be discharged. Meteorological water will be collected and discharged into desiccant basins so that particle loading of downstream courses is minimized. Measures will be taken to avoid water stagnation in pits or any concavities, efforts being made to maintain the level of access ways and working fronts; foundation pits will not remain open until the minimum time required to re-fill them.

At the level of each site organization or more important work fronts involving a longer workforce presence, decanting basins with desiccant role will be created.

These structures are positioned and dimensioned so as to ensure the upstream storage of the volumes of water that they store temporarily from the washed work platforms. Discharging takes place gradually in downstream natural courses, ensuring a slurry settling.

At the site organization level, where fueling points, maintenance centers and mechanical workshops will be located, will be located also hydrocarbon separating basins that will take over the eventual leakage of hydrocarbons from the waterproof platforms.

During the operation of the highway the rainwater will be collected in the gutters system running along the motorway platform and will be unloaded on the slopes by caves at the highway ditches, and after passing through the treatment systems, the waters are discharged into the emissaries or in basins with gradual unloading.

The settling basins are usually carried out at the level of some soil concavities so that the environmental impact is minimized. Their position and size are optimized so as to ensure the collection of collected water from the upstream motorway platforms.

In addition to the decantation basins, hydrocarbon separator basins are also located, so that accidental spills at the level of the motorway platforms can be retained and treated.

A number of 603 decanting basins, fitoseparators ponds or oil separators designed to protect the water courses were provided on the motorway, operating as a mechanical and biological gear, of which 415 units are foreseen for the sector Gilau-Bors

2. Description of the analyzed alternatives

The alternative zero and several options for the project were analyzed:

- route alternatives;
- constructive alternatives.

Alternative zero (non-implementation of the project)

Transport networks are of particular importance in the socio-economic development of states. Regional development is dependent on the density and quality of transport ways.

Romania has one of the weakest represented high-speed road networks (motorways and express roads), their density being well below the European average (about 1% of the national territory in Romania versus 3% at European level). Romania currently has 747 km of motorway in operation.

The poor condition of the road infrastructure and the low density of the current public roads in Romania contribute to the maintenance of significant transport times, excessive fuel consumption, with harmful effects on the environment, making Romania the last place in Europe (EU28) In terms of traffic safety, with the highest number of mortality cases per million inhabitants: 93 cases (European average of 51 cases).

From the traffic analyzes carried out for the pre-feasibility study, the connection between the major localities of central and western Romania (Brasov, Târgu-Mureş, Cluj-Napoca, Zalău, Oradea) is ensured through a network of national roads which maintain an old technical structure and a low fluency generated by traffic intensity. These elements lead to a high number of accidents in the Mureş, Cluj, Salaj and Bihor counties.

Brasov - Oradea highway, Ogra – Bors sector will provide an increased flow of traffic by creating a modern communication way with implications for the regional development of the area, increased traffic flow, deviating transit traffic, increasing users safety, reducing travel times, facilitating on the future of a road maintenance system and the reduction of pollution in the areas currently in transit.

Besides the international valency, this motorway will lead to a significant improvement of the traffic conditions on the territory of Romania. Through the network of national roads rehabilitated or under rehabilitation with which the motorway will be connected, the motorway can receive and distribute traffic more efficiently through its nodes.

The development of a national highway network aims to achieve the objectives of ensuring the necessary capacity for freight and passenger traffic, secure and rapid connection of the western and central area to the south and south-east of the country, obtaining economic, environmental and social benefits.

Taking into account the above aspects, it is absolutely necessary to build the Brasov - Oradea motorway, the Ogra - Borş sector.

2.1. Route alternatives

To achieve this goal, several route alternatives were studied in the pre-feasibility study. For the Gilău - Borş sector two options were retained: South and North (Figure 2).

Later, an option for the connection between the two alternatives was analyzed, which departs from km 0 of the South alternative North of Gilau, crosses the hill of Viilor and Ciup, and after the intersection with the county road no. 108 C, the Nădaşu stream, national road no. 1F, the Cluj railway - Oradea and Nădăşelu Valley, then head North along national road no. 1F, joining the localities of Şardu and Sînpaul. This alternative opens in the North alternative, to the East of Mihăesti at km 20 + 000 (km 30 + 000 on the North variant). The length of this connection is 20 km.

Figure 2. Route alternative

During the elaboration of the feasibility study, following the consultation of the authorities, the route was modified to limit the negative impact on the environment, including the socio-economic environment.

2.2. Construction alternatives

The Meseş Tunnel

The Meseş Tunnel was studied as a constructive alternative for the penetration of the steep slopes in the Meseş area. The Meseş tunnel is a motorway tunnel with a length of 2.4 km, made in two-lane bitube system, takes into account the European rules for safety and comfort in tunnels, which provide emergency galleries, Tunnel interior monitoring and ventilation systems, specific lighting systems.

The gallery is provided with 2 strips on the sidewalk and the sidewalk, the water drainage system is below the sidewalk, from 500 to 500 m, there are emergency contact galleries with the opposite direction, used in case of emergency.

Pajistea Fegernic Viaduct

In the initial project for the 3C motorway sector ranging from km 40 + 884 - 40 + 986, for the crossing of the Fegernic valley there was proposed a backfill solution with the keeping of a footbridge. Because the Nature 2000 site of conservation interest ROSCI0347 Pajiştea Fegernic, whose perimeter overlaps with the motorway, was declared in 2011 and the construction of the motorway would have affected the priority habitat 40A0 * - peri-panonic subcontinental bushings for whose protection the site of Community importance was designated, there was proposed to make the Fegernic viaduct as an alternative to avoid the impact on the priority habitat.

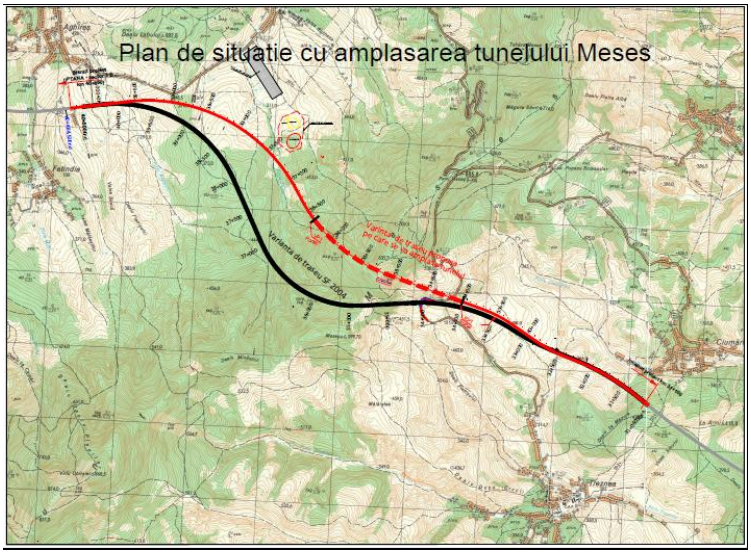


Figure 3. The route alternative proposed within the constructive option that includes the building of Meseş Tunnel

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The multi-criteria analysis was applied and the most feasible option from the technical-economical point of view and with the least impact on the environment was selected, as presented in Chapter 1.2. The potential impact of the construction and operation of the Braşov - Oradea motorway, Ogra - Borş sector, is detailed in Chapter 4. Description of the potential impact.

3. Description of the environment possibly affected by the proposed activity and suggested alternatives

All the proposed works for the construction of the Brasov - Oradea motorway, the Ogra - Borş sector, will be carried out on the territory of Romania, within the Mures, Cluj, Salaj and Bihor counties. On the territory of Hungary, no works will be done.

During the execution of the construction works, a higher level of sedimentary and noise dust could be recorded in the immediate vicinity of the border, but without affecting the environment in Hungary, subject to compliance with prevention and mitigation measures

During the exploitation period the motorway is not expected to have a significant impact on the environment from the Hungarian side, as the operation of the Brasov - Oradea motorway will not lead to significant traffic growth, keeping it at current traffic levels, but will decongest the usual routes (E60) . At present, there is a border crossing point in the south of the site (Borş customs located at approximately 7,285 km measured in a straight line). The Budapest - Miskolc motorway to which Brasov - Oradea motorway will be connected will go through a distinct national regulatory stage in Hungary.

3.1. Water

The Ogra - Borş motorway sector overlaps with the Mureş, Crişuri and Someş-Tisa hydrographic basins.

Figure 4. Overlapping of the Brasov-Oradea Highway route, Ogra-Borş sector with Romania's hydrographic basins

The main water bodies intersected by the Brasov-Oradea motorway route, Ogra - Borş are:

- the rivers: Grindeni, Arieş, Someş, Barcău, Frumoasa, Mureş;
- the rivers: Sarata, Saula, Luncilor, Usturiş, Almaş, Rastolt, Silivaş, Colitca, Grespei, Catrice, Crasna, Mărtăuţa, Nădăşu, Sardu, Borlacului, Silistea, Horsu, Rotişori, Bistra, Tria, Cosmo.

In the design phase of the motorway, a route was chosen to overlap with minimum flood risk areas. Most of the works will be carried out on superficial horizons of up to 2 - 2.5 m, and in the case of special consolidation works, they will not intercept groundwater, so that the project will not lead to damage to the hydrogeological environment.

The site organizations will be located at a distance from the existing minor alleys along the Brasov - Oradea motorway route.

According to the GIS analysis, the western edge of the Brasov - Oradea motorway section is bordered by following bodies of surface water in Hungary:

- Berettyó river, approximately 5,73 km to the North;
- Crişul Mic watercourse, approximately 2,97 km to the South East.

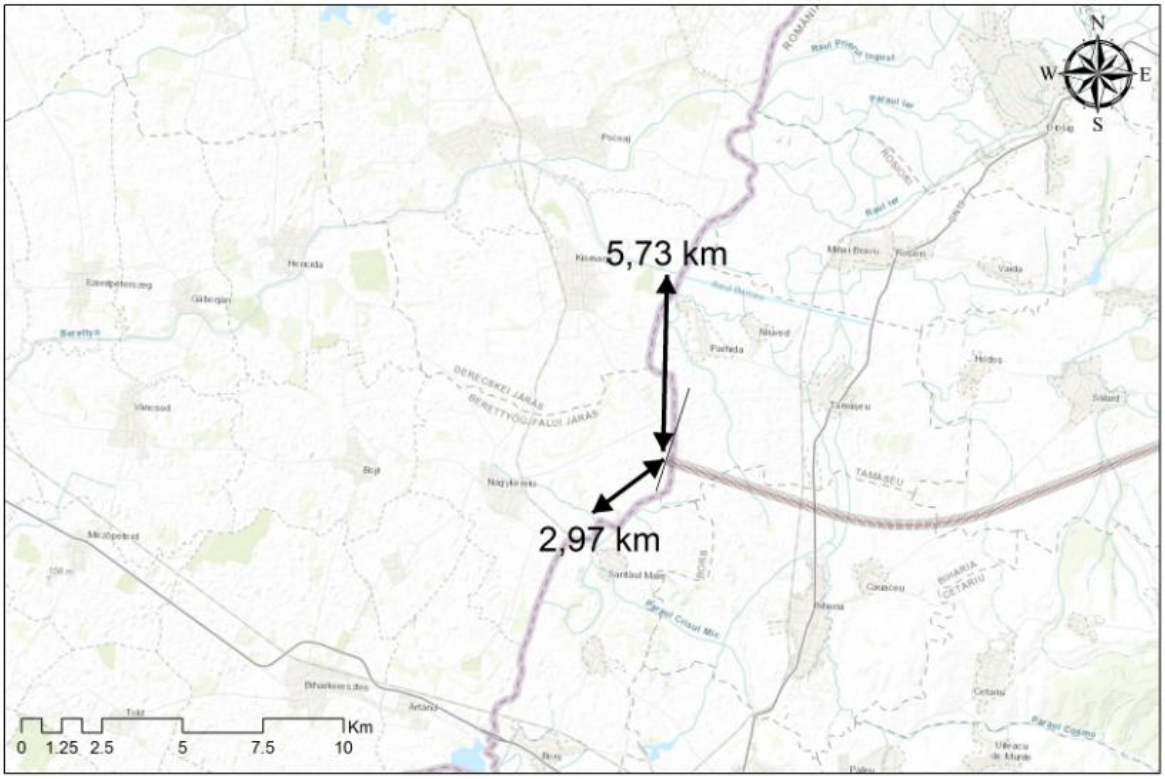

Figure 5. Location of the Brasov - Oradea motorway route in relation to the surface water bodies in Hungary

The works foreseen for protecting the water environment factor and ensuring the disposal of waste water are described in chapter 1.2.4. Water drainage works.

3.2. Air

From a climate point of view, Romania is placed in the transition continental climate, characteristic of Central Europe, defined by the presence of the four distinct seasons of spring, summer, autumn and winter.

Due to the extension of the Brasov - Oradea motorway project, which crosses the Transylvanian region, through a plain and hillside relief, as well as numerous microclimatic areas, the climatic and meteorological conditions of the site are varied. The average multiannual value of the temperature varies between 7,60C in Huedin and 10,30C in Oradea (very close to the county average of 10,50C). The most important lengths of motorway segments are located in the area defined by annual averages of temperatures between 6 and 10 ° C.

The analysis of the maximum average temperatures shows that at Huedin station there are lower values with about 10C compared to Cluj and with 2.50C compared to Oradea and the minimum average is at Huedin with 0.50C lower than in Cluj and about 30C front Of Oradea. The absolute maximum temperatures recorded were 36.50C at Huedin and 39.50C at Oradea, and the minus -31.50C at Huedin and -29.20C at Oradea.

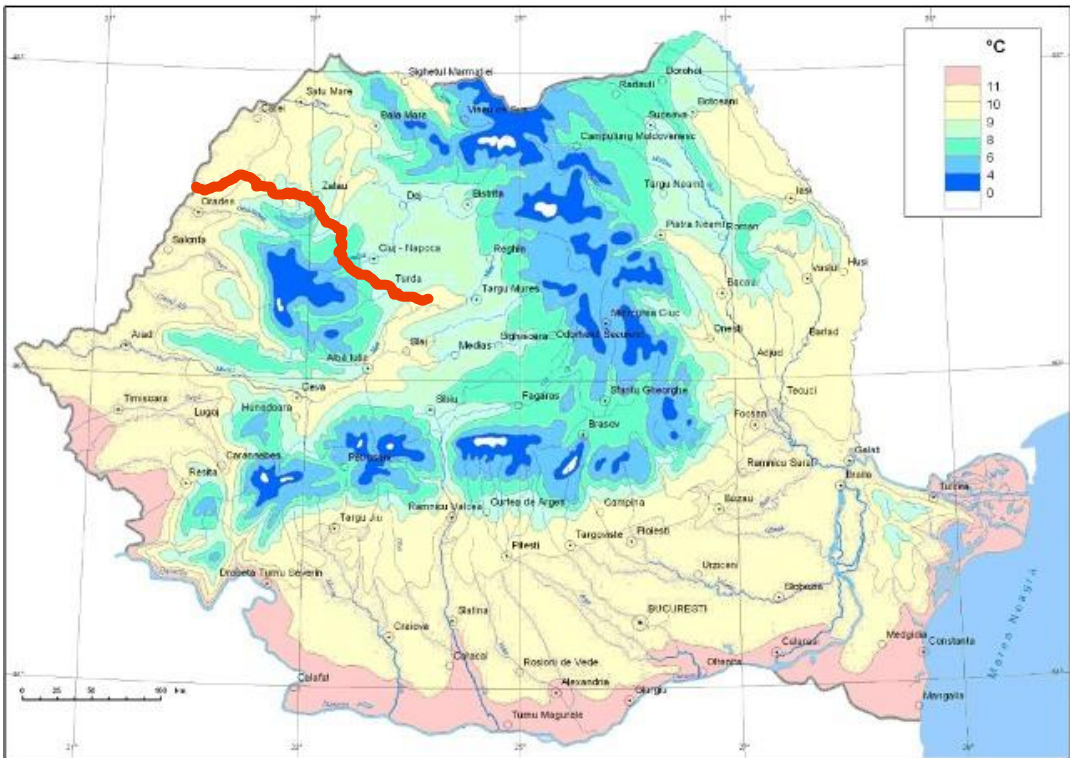

Figure 6. Overlap of the motorway route with the climate zones defined in Romania

The nearby area of the motorway route in Salaj County is characterized by a moderate continental climate, being subject to a predominantly western movement. During winter the North - West maritime - polar invasions predominate, while in summer the warm air from the South - West. The annual average air temperature in the mountain range is between 6 ° C on the heights of Meseş and Plopiş and 8 ° C at the periphery of the mountain range. In the Almaş, Agrij and Silvania depressions, annual averages exceed 8 ° C. The absolute minimum temperature in the county was -29.5 ° C, and the absolute maximum of 38 ° C. Multiannual average temperatures rise progressively from the eastern extremity of Bihor County (corresponding to the motorway route), where it is between 6 - 8 ° C, to the west (Oradea and Border) where it is between 10-11 ° C.

In the Bihor county, in the western sector of the motorway, the rainfall ranges between 800-1000 mm, the quantities falling westwards (700-800) to the Oradea area where they are between 600-700 mm. The wind regime is particularly varied due to fragmentation of the relief. The frequency on the propagation directions is predominantly western in Cluj Napoca 1.7% and Huedin 11.8% with periods of calm (46.8% and 54.3% respectively).

In Oradea there is a more uniform distribution in almost all directions, the 22.7% calm being less than half of the frequency registered at Huedin and Cluj. In Oradea, the prevailing wind speed (4.0 m / s in the south) is similar to the one in Cluj (4.3 m / s west) higher than the average wind speed in all directions.

3.3. Soil

From a pedological point of view, the Brasov - Oradea highway passes through the following types of soils:

- Cambrian chernozems;
- Pseudo
- black soils of meadows;
- ground clay clay soils;
- underground argilo-clay soil;
- red-brown podzolite brown clay soils;
- rendzinas;
- acidic brown soils;
- alluvial soils;
- brown soils;
- Cambrian chernozems;
- marshy.

3.4. Biodiversity

All the works foreseen in the project will be carried out on the territory of Romania. There are no works on the territory of Hungary.

The planned route of the Brasov - Oradea motorway, the Ogra - Bors sector, will cross eight categories of ecosystems: roads (access roads), anthropic and anthropized ecosystems, agroecosystems, natural meadows, forests (including forests outside the national forest fund), riparian biotopes, bushwoods.

The motorway will cross watercourses (natural) and artificial structures (irrigation / drainage channels) to which a large number of unclassified valleys are added. Of these, the most important are: Mureş, Arieş and Someş.

The motorway route has been designed so as to avoid wet areas. If areas with excess moisture are identified during the execution, drains will be created that will lead the waters to natural courses, field concavities or other favorable discharge areas.

The route of the Brasov-Oradea motorway in the forest area totals 10,010 m, representing approximately 3.96% of the total length.

On the territory of Romania, on the Brasov - Oradea motorway route or in its vicinity there are the following protected natural areas (according to the map in Figure 7):

- ROSCI0034 Cheile Turenilor;
- ROSCI0322 Muntele Șes;
- ROSCI0347 Pajiștea Fegernic;
- ROSPA0087 Munții Trascău;
- ROSCI0040 Coasta Lunii
- ROSCI0210 Râpa Lechința

- ROSCI0301 Bogata
- ROSCI0313 Confluenţa Mureş cu Arieș
- ROSCI0367 Râul Mureș între Moreşti și Ogra
- ROSCI0427 Pajişţile Liteni – Săvădisla
- ROSPA0041 Elești de la Iernut-Cipău;
- ROSPA0067 Lunca Barcăului

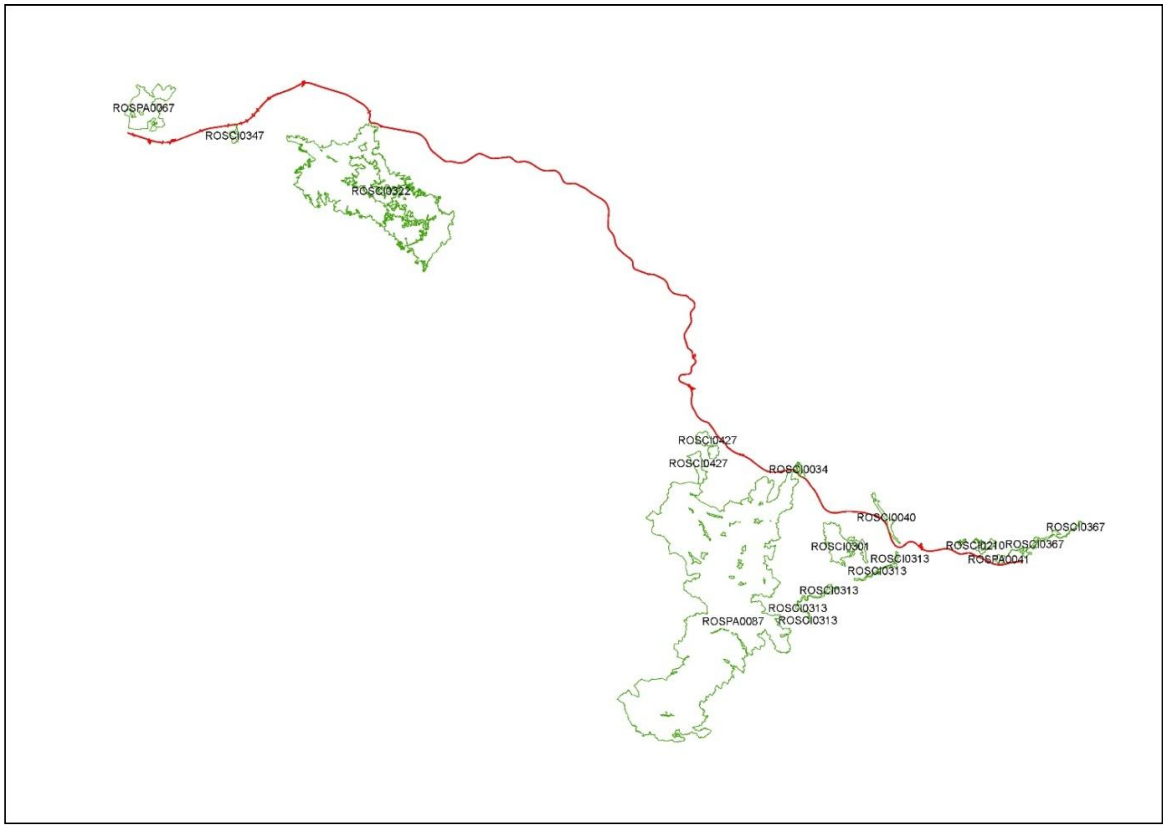

Figure 7. Location of the Brasov - Oradea motorway in relation to the protected natural areas

On the territory of Hungary, in the vicinity of the western sector of the Brasov-Oradea motorway there are three sites of Community importance (according to figure 8):

- HUHN20014 Kismarjai Nagy-szik – located in the NV at a distance of approximately 2.05 km from the motorway axis;
- HUHN20008 Kismarja - Pocsaj - Esztári-gyepek located in NNV at a distance of approximately 3,70 km;
- HUHN20010 Pocsaji-kapu – located in N at a distance of approximately 9.65 km.

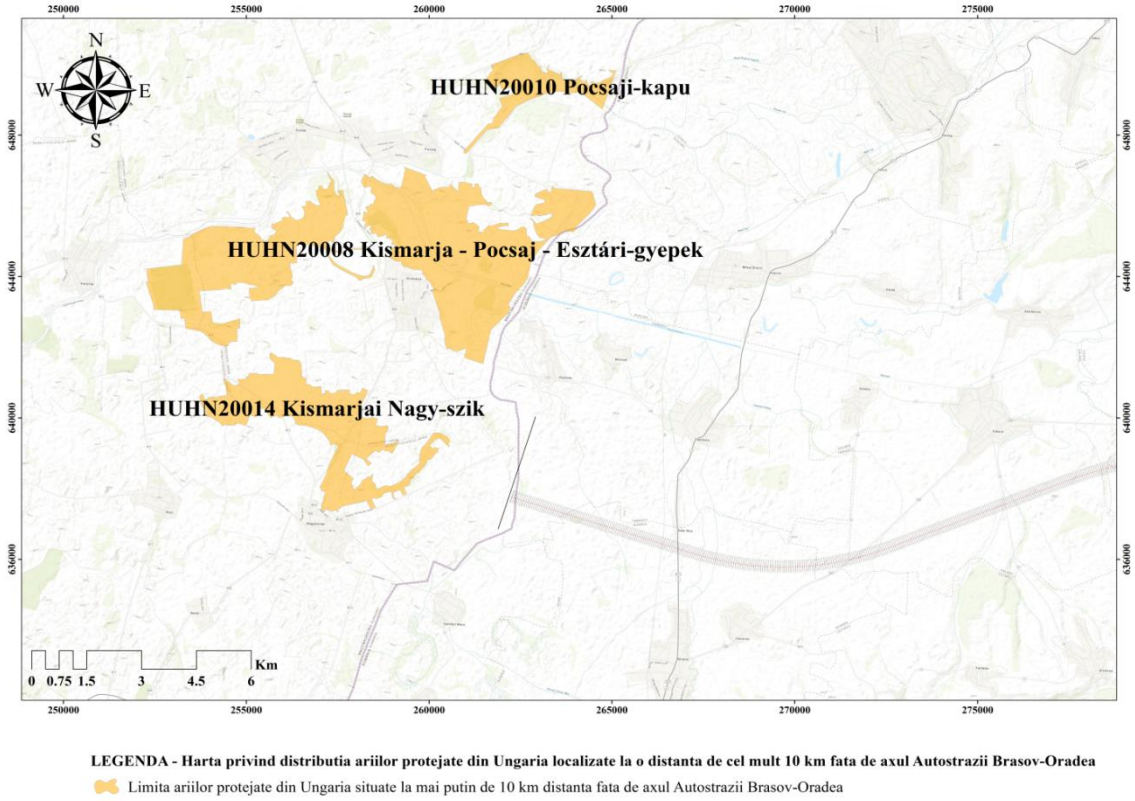

Figure 8. Map of the location of protected natural areas within the Natura 2000 network in Hungary located at a distance of no more than 10 km from the axis of the Brasov - Oradea Motorway

3.5. Human settlements

The Brasov - Oradea Highway, Ogra - Borş sector passes through 38 administrative - territorial units, most of which are rural localities. Population tendency in these localities is decreasing and the occupational spectrum is potentially agricultural. The route of the motorway passes through the outbuilding of these localities. The minimum distance between the motorway route and the Hungarian dwellings is 4.36 km, according to the map in Figure 9.

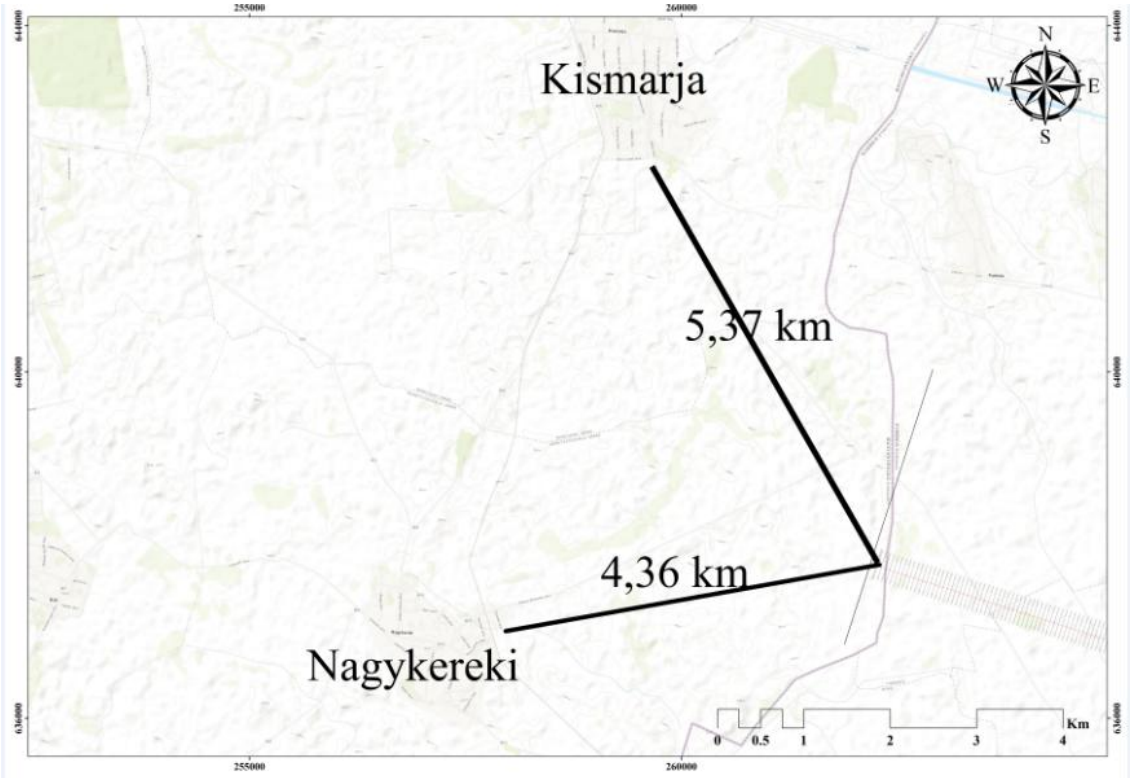

Figure 9. The location of the Brasov - Oradea motorway in relation to the residential areas of Hungary

3.6. Cultural patrimony

The route of the Brasov - Oradea motorway was designed so as to avoid elements of cultural, archaeological heritage and inhabited areas.

Within the communes whose administrative territory is crossed by the Brasov - Oradea motorway there are the following objectives belonging to the historical and cultural heritage: Haller Castle in Ogra, Kornis - Rákoczi - Bethlen Castle, Degenfeld Castle, Kemény Manor, Bethlen Manor; Tumuli from the "Izvorul Fizeş" point; Tumuli in the "Eleffalva Izvorul" point; Roman castles Potaissa; Turda Lapidarium; Prince's Palace in Turda, Count of Borş's Mansion, Mikes Castle, Ruins of the medieval church dedicated to St. Ladislau, Ghetto's Fortress, Roman Castles in Gilau; Gilau Castle; Wass-Banffy Castle; Gallus manor; Lake Tarniţa; Cariera Corabia Natural Reservation, Laszay Manor, Romita Roman Castrum, Roman Castrum from Românași, Bay Castle, Bozna Archaeological Site, Treznea Valley Dacic Defense Towers, County Museum of History and Art, The Art Gallery "Ioan Sima", the Association of Handicrafts Association, Roman Catholic Church "Sfatnta Treime", "Sfanta Vineri" Episcopal Cathedral, the archaeological site of Meseşenii de Sus, the Dacic guard and defense system at Meseşenii de Sus, the wooden bell tower of the Reformed church in Meseşenii de Jos, Banffy Castle in Nuşfalău, the Nuşfalău Tumulus Cave, the Nuşfalău Medieval Settlement, the Dacic Fortress of Marca, The Heroes Monument in Marca, the Wooden Church from Porţ village, Degenfeld-Schomburg Castle in Balc, Biharia Fortress.

4. Describe the potential impact of the proposed activity. Describe the potential impact of the proposed alternatives. Estimation of the importance of the impact

The overall impact analysis led to the conclusion that the environmental impact associated with the Brasov-Oradea motorway project, Ogra - Borş sector, remains within acceptable limits, the effects generated during the construction phase will disappear within a short time after the completion of the works (maximum 24 months). No potential effects of medium or long-term impacts, effects of direct or indirect significance on environmental factors have been identified and effects with cumulative potential remain within acceptable limits.

Also, the impact of the exploitation period is limited. The proposed measures to mitigate / eliminate the impacts of identified impacts have been dimensioned to outweigh the foreseeable impact level and comply with the principles underpinning environmental policies (precautionary principle, pollutant containment principle, biodiversity conservation principle).

4.1. The potential impact on the quality and quantity of water

The construction and operation of the Brasov - Oradea motorway will not generate a significant impact on the water environment factor.

An impact has been quantified on riparian environments associated with surface water courses, as a result of multiple crossings of cadastral (natural) water courses or artificial structures (irrigation / drainage channels). The crossings will be made using technologies that call for modular systems, applying complex ecological restoration measures to replicate natural systems (the location of gabions and gabion mattresses).

The construction of the motorway does not entail taking significant quantities of water from the environment, which limits the potential impact on the hydrological and hydrogeological conditions of sites overlapping the design footprint or of perimeters in immediate proximity.

At the level of the motorway platform, supporting points and service spaces, waterproofed surfaces (building footprint, concrete platforms, access ways, etc.) will appear, but green spaces of up to 50% of the areas will be maintained within the expropriation line.

The entire volume of rainwater will be retained at the level of the retention basins, being taken over by ditch, chute and drainage systems. This will maintain the permeability and functionality of the zones from the point of view of hydro-geological circuits.

Pre-treatment and purification systems or pollutant containment systems at the source have been provided for in the technical project so as not to affect the water quality of the receptors after discharge of pluvial and / or waste water.

The construction and operation of the motorway does not involve the generation of waste water volumes in some technological processes. Waste water will be discharged into natural water courses only after properly treated. For this purpose, retention basins (grass-roots) with gradual discharging at the level of the site organization, working fronts,

service spaces and support points, which serve as mechanical treatment steps (in order to retain the suspended particles , But also to neutralize potential pollutants). Where appropriate, SBR mini-treatment plants will be located.

Water resources will maintain their pre-project features, which are not influenced by the development of the motorway, and can be subject to unrealized returns (unpointed values).

The risk of spills of some polluting substances in water bodies occurs during the construction period. As a result of handling machines or fueling, accidental oil leakage may occur, but the amount of oil that may leak during such operations is reduced.

During the construction of the motorway, sewage leaks may occur at the level of waste water storage basins of the ecological toilets that will be located at the level of the site organization and work fronts. Also, domestic sewage leakages (loaded with faecal products) may also occur in the event of critical discharges at the level of treatment stations installed at supporting points and service spaces.

Activities carried out within site organizations at the construction stage may have an impact on groundwater or surface water.

The impact on water during the construction period can be summarized as follows:

- change of the water regime by deviating the watercourse;
- increasing the turbidity of the water in the area of the bridges;
- temporary change of the bed in the bridges;
- obstacles to the free flow of water as a result of the works in the bed;
- destruction of flood defense works in the event of their existence or damage to other works in the area;
- deterioration of the talveg and the shores of the watercourse;
- consequences of accidental pollution with hydrocarbons or other dangerous chemical substances or preparations;
- consequences of discharged wastewater which is not treated or insufficiently treated or contaminated by rainwater.

The impacts generated on water quality are temporary and reversible in terms of complying with proposed measures to prevent and mitigate impacts.

During the exploitation period there will be no impact on water quality because the waste and rainwater will be properly taken up and treated.

Cross-border impact

In no stage of the motorway construction project, a cross-border impact on the water environment factor is foreseen, all construction activities will be carried out within the national territory. Also, during the exploitation period, adequate drainage of rainwater and / or wastewater in sewage treatment systems will be carried out prior to unloading in the emissary, and rainwater management systems will be directed to drive volumes of waters to basins Retention /

dispersion located along the highway sector located on Romanian territory, so that there will be no impact on the Hungarian environment.

During the exploitation period, it will be considered to ensure a maximum efficiency of the systems provided for the uptake and purification of the waters through their regular cleaning and maintenance.

4.2. Potential impacts on air and climate quality

The main atmospheric pollutants contributing to the environmental factor related to the project for the construction of the Brasov - Oradea motorway are:

- sulfur dioxide (SO_2) released from the combustion of fuels, including the combustion of diesel;
- nitrogen oxides (NO / NO_2) released from combustion at high temperatures, also resulting from road traffic;
- carbon monoxide (CO) results from combustion (incomplete) of fuels;
- suspended powders (PM10 and PM2.5) result from combustion (fine ash), including internal combustion engines, excavation and land mobilization, road traffic;

Sources of atmospheric pollutants related to the objective

The sources of pollution identified in the construction phase of the motorway are the equipment and work equipment equipped with internal combustion engines. Generally, they use diesel as fuel.

At the operational stage, the potential sources responsible for the generation of air pollutants are road traffic, support points and sources in service areas. Pollution that will be recorded at the level of the motorway will be significantly lower than when traveling on the same route in current road conditions.

Characterization of sources of atmospheric pollutants related to the target

The most significant pollution, both during the construction period and during the operating period, remains related to the use of fuels, of which the largest share is that of diesel fuel.

The construction works will employ machines and equipment that will have a high working efficiency and low fuel consumption.

Amounts of exhaust emissions in the air vary depending on the type of equipment used and the operating time of the exhaust, the degree of wear and tear of the engine.

Throughout the construction phase of the motorway, the main pollutants present in the environment in the working area are dust particles and, in a lower amount, chemical pollutants such as: NOx, SO2, CO.

According to the literature, pollutant emmissions in road traffic have an insignificant effect on vegetation and fauna.

Due to the large expansion of the surface unit work with low concentration of machinery and relatively intense transport on extended stretches of road, the noxious damage will be greatly attenuated. It can be concluded that the noxes released into the atmosphere remain low, which can be taken over by the natural processes of transformation / degradation, so that they will not have a significant impact on the environment, even less on the Hungarian environment.

Aspects of dust pollution

In the construction of the highway, significant excavation and mobilization of volumes of land will be carried out, plus the activity of machinery in denuded areas, thus creating a significant risk of dust emissions, given the lack of specific prevention and reduction measures.

The sources related to the construction of the Brasov - Oradea motorway, Ogra - Borş sector, are free sources (dust release), the level of emissions is not normalized either in the national legislation or in the Community legislation.

These will be displayed in the working fronts without affecting the whole area of the area under consideration. Emissions of atmospheric pollutants act on the work fronts, their intensity decreases with increasing distance from the work site.

The local impact on air quality generated by the construction of the Brasov - Oradea motorway will be temporary, being limited to the construction period. Also, the change in the position of the emission sources (due to the shift of the working front) leads to a reduced local long-term impact and a decrease in the likelihood of large concentrations of short-term concentrations.

Airborne impacts are temporary and reversible and occur only at the project site without significant air quality impacts.

During the operation of the Brasov - Oradea motorway, the impact on air quality will not be significant due to traffic conditions.

Sound and vibration pollution

The technological processes underlying the construction phase of the motorway include various stages, ranging from grubbing up woodworking to specific excavation, construction, asphalting, moving and operating machinery, technology transport of equipment. These actions will lead to a wide variety of noise sources that can be grouped as follows:

- the operation of the construction equipment specific to the works, plus the supply of materials;
- circulation of dumpers, concrete mixers and trucks carrying materials necessary for the execution of the works.

The level of noise and vibration depends both on the nature of the equipment and its layout, as well as on external factors such as:

- meteorological phenomena: wind speed and direction, temperature and wind gradient;
- more or less significant absorption of acoustic waves by the soil, phenomenon called "soil effect";
- air absorption, dependent on pressure, temperature, relative humidity, spectral noise component
- land topography;
- vegetation.

The acoustic powers associated with the usual equipment used to carry out the construction work are:

- bulldozer - 80 dB (A);
- Dumper - 70 dB (A);

- excavator - 90 dB (A).

Construction machines with large masses produce through their movements or through work at vibration work points.

The second main source of noise and vibrations in the construction site is the circulation of the means of transport. For the transport of materials (earth, rock, ballast, crushed stone, concrete, building materials, etc.) we use heavy-duty dumpers / trucks with a load of several tons and not more than 40 tons.

For the assessment of site traffic values, the average vehicle capacity of 40 t has been assessed. The effects of the above noise and vibration sources overlap with the existing noise currently produced by traffic on nearby roads on the one hand, and Of the activity in the areas adjacent to the projected buildings, on the other hand.

At source of air pollution with noxes associated with the highway project add the sources of noise generation that will appear at the level of technological transports associated with the work fronts.

The main sources of noise and vibration are the machines in the front work area (loaders, transport trucks, excavators, etc.).

Noise produced by construction machinery is of a low frequency nature and does not affect the environment and on-site staff. If more than one machine will operate, the noise level will increase (up to 90 dB (A), and the noise level calculated at the worktop limit will be 64.4 dB (A), so it will not significantly affect environment.

According to the provisions of STAS 10009/88, the allowable noise level at the working frontier is 65 dB (A), higher than the noise level calculated at the enclosure limit of 64.4 dB (A).

The noise level at the limit of the first human settlements on the territory of Romania, located at a minimum distance of about 700 m from the working front, is 33,5 dB (A).

Noise produced in the building site - installation is not able to affect the human settlements, the noise produced being below the threshold for the inhabited areas, according to the provisions of the Order no. 119/2014 for the approval of the Public Hygiene and Public Health Standards regarding the living environment of the population. In perimeters outside the dwelling areas, the noise levels are not normalized.

Cross-border impact

Emissions of air pollutants generated by the construction of the motorway sector in the immediate vicinity of the border can have a small impact on the air quality in Hungary, but this form of impact is insignificant, temporary and reversible and will occur up to a maximum of 200 m from the border because The concentration of atmospheric pollutants decreases with increasing distance from the place of production.

The activities carried out within the site organization will have no impact on the Hungarian environment since the closest site organization (Salard) is located approximately 13 km from the border.

All loan holes are located away from the state border, which limits the emissions of sedimentary powders, thus rendering the effect meaningless in a cross-border context. In addition, measures will be taken to reduce emissions of air

pollutants: installation of a plant for spraying equipment at the exit of the pit, spraying of the landfills, discontinuation of dust-producing works during strong winds, coating of powdered materials during Transport, etc.

Also, during the exploitation period, there will be no significant environmental impact in Hungary, as the commissioning of the highway will not lead to significant traffic growth. At present, there is a border crossing point in the south of the site (Borş customs located at approximately 7,285 km measured in a straight line).

The execution of works near the border will generate a higher noise and vibration level, but as their intensity decreases as the distance from the work site increases, they will not have a significant impact on the Hungarian environment.

4.3. Potential impacts on flora and fauna

The construction and operation of the Brasov - Oradea motorway will have no significant impact on biodiversity.

At the construction stage, the impact will take place over a period of about 32 months, due to general disruption due to site organizations and work fronts.

The direct and indirect impact categories for infrastructure projects remain the categories with the highest responsibility for generating potentially negative effects and risks for the criteria criteria underlying the designation of Natura 2000 sites.

Following the analysis for each criterion element (species and habitats), the following conclusions were drawn:

- the habitats underlying the designation of Natura 2000 sites are not affected;
- the analysis of the 98 species resulted in the absence of a significant impact on them, with the exception of the species lupus (*Canis lupus*), whose area of dispersion and connection between the cantonal populations in the Western Carpathians (Apuseni) and those in the northern and eastern Carpathians Is crossed by Brasov - Oradea Highway, Ogra - Bors;
- for a large number of species (46 species = 46%), a potential impact associated with the construction or operation stages could not be highlighted;
- for a large number of species (48 species = 48%), the associated impact remains extremely limited, manifested mainly by indirect effects and only in case of certification of the species presence in the area of influence of the project;
- a small number of species (2 species = 2%) are directly affected by the implementation of the project, namely Bombina bombina and B. variegata, species with a very wide presence and characterized by high ecological plasticity and high tolerance To disturbance;
- for one species (lupus - Canis lupus) a potential impact associated with induced fragmentation has been identified since the construction phase;
- for a significant number of species (56 species = 56%), a potentially positive effect was identified as a result of the delimitation of the expropriation strip and the assumption of ecological restoration measures

Aspects related to the induced fragmentation effect

Transport infrastructure projects such as highways retain a significant impact on large species of hunting or conservative interest, as is the case with large carnivorous species.

The area crossed by the motorway project has not been identified as a sensitive area in terms of connectivity issues, according to the report on the connectivity of protected habitats and protected areas in the Romanian Carpathians under the BioRegiocarpathians project: Integrated Management of Biological Diversity and The landscape for sustainable regional development and ecological connectivity in the Carpathians.

The highway project involves the creation of 400 openings (bridges, bridges and viaducts) that can provide connectivity between habitats. The average distribution of openings is an opening of 0.63 km. The smallest distance between openings is about 20 m, and the largest is at 4.03 km, at 3 C Suplacu de Barcau-Bors.

In terms of the relevance of openings with potential for use by honeysuckle species, but particularly by wolf species, only openings larger than 5 m were considered. The number of these openings is 174, their average density being One at 1.46 km. The smallest distance between the openings is approximately 200 m, and the largest is about 8 km, at the level of 3 C, Suplacu de Barcau-Bors.

In order to evaluate the functionality of these openings and the possibility of exploitation by the wolf species, a field analysis was carried out on the state of the proximate habitats, which took into account the existing connectivity at the landscape level, the habitat conditions, etc. The analysis was carried out at the level of the Gilau-Bors sectors, where the motorway route overlaps with areas occupied by lax hats or isolated individuals that make up the population of the Western Carpathian (Apuseni) populations with the northern and eastern Carpathian populations.

Only those openings that remain usable (openings over 5 m), located in the vicinity of natural or semi-natural habitats (on both sides of the motorway route), have been retained at sufficiently distant distances (Settlements, other built elements or infrastructure, etc.)

Cross-border impact

The realization of the Brasov - Oradea motorway and its connection to the Budapest - Miskolc motorway will have no significant impact on the biodiversity in Hungary.

On the territory of Hungary, in the vicinity of the western sector of the Brasov - Oradea motorway there are three Sites of Community Importance (Figure 8). The minimum distance between the proposed site of the Brasov - Oradea motorway and the sites in Hungary is 2.05 km (up to the limit HUHN20014 Kismarjai Nagy-szik - located in the NV)

According to the Natura 2000 Standard Forms, the three protected natural areas in Hungary, located near the Brasov - Oradea highway, were declared on the basis of 7 habitat types, 2 species of amphibians, 2 plant species, one reptile species, 7 species Of invertebrates, 7 species of fish and 2 mammalian species (presented in Table 1).

Table 1. Species and habitats of Community interest based on which were declared Sites of Community Importance within the Natura 2000 network in Hungary located at a distance of no more than 10 km from the axis of the Brasov-Oradea Motorway

Nr. crt.	The biotic component	Code and habitat / species designation	HUHN20014	HUHN20008	HUHN20010
1	Habitats	1530 Steppes and panonic salty marshes	x	x	x
2		3160 Dystrophic lakes and ponds		x	x
3		6250* Pajişti stepice panonice pe loess	x	x	x
4		6440 Pajişti aluviale ale văilor de râuri cu *Cnidion dubii*			x
5		7230 Alkaline marsh		x	x
6		91E0* Păduri aluviale cu *Alnus glutinosa* şi *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Silicion albae*)			x
7		91I0 Vegetaţie de silvostepă eurosiberiană cu *Quercus* spp.		x	
1	Amphibians	1188 *Bombina bombina*	x	x	x
2		1993 *Triturus dobrogicus*		x	x
1	Plants	1516 *Aldrovanda vesiculosa*		x	
2		4081 *Cirsium brachycephalum*	x	x	x
1	Reptiles	1220 *Emys orbicularis*	x	x	x
1	Invertebrates	1060 *Lycaena dispar*	x	x	x
2		1074 *Eriogaster catax*			x
3		1083 *Lucanus cervus*			x
4		1086 *Cucujus cinnaberinus*		x	x
5		1088 *Cerambyx cerdo*			x
6		4032 *Dioszeghyana schmidtii*		x	
7		4035 *Gortyna borelii lunata*	x	x	x
1	Fish	1124 *Gobio albipinnatus*		x	x
2		1130 *Aspius aspius*		x	
3		1134 *Rhodeus sericeus amarus*		x	x
4		1145 *Misgurnus fossilis*			x
5		1146 *Sabanejewia aurata*		x	
6		1149 *Cobitis taenia*		x	x
7		2011 *Umbra krameri*			x
1	Mammals	1335 *Spermophilus citellus*	x	x	
2		1355 *Lutra lutra*		x	x
Surface, ha			**848,18**	**2427,05**	**284,24**

Due to the large distance between the alignment of the motorway and the boundaries of these sites of local importance, these natural protected areas will not be affected by the construction and operation of the motorway.

There will be no impact on the flora species and protected natural areas habitats whose protection these have been designated, according to table 2.

Species of reptiles and amphibians have low mobility and their presence in the vicinity of the motorway is unlikely.

According to the data in the standard forms, there are no large carnivores in the three sites of local importance, so the connection of the Brasov - Oradea motorway with the Budapest - Miskolc motorway will not be a barrier to the movement of large carnivores.

The species of mammals for whose protection the three sites were designated will not be affected by the construction and operation of the Brasov-Oradea motorway.

Table 2. The evaluation of the impact on the species and habitats from protected areas from Hungary

Biotic component	Code and habitat name/ species	
Habitat	1530* Steppes and panonic salty marshes	The construction works or the operation phase of the motorway are not likely to lead to habitats being affected, lacking: - a direct impact (overlap) with them; - a direct damage to the edifying species involved in their definition; - an indirect impact to the extent that it leads to changes in the ecological conditions involved in the support of the habitats or to the alteration of the attributes to which the species (edifiers / characteristics / components) exhibit particular requirements. The presence of habitats of conservation interest remains strictly limited to the sites designated for their express purpose of protection.
	3160 Dystrophic lakes and ponds	
	6250* Paxonic steppe grasslands on the loess	
	6440 Alluvial meadows of river valleys with Cnidion dubii	
	7230 Alkaline marsh	
	91E0* Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Slicion albae)	
	91I0 Vegetaţie de silvostepă eurosiberiană cu Quercus spp.	
In the absence of an overlapping of the motorway route (Romanian sector) with Natura 2000 sites, it is admitted that only aspects related to a potential indirect impact on the criterion species underlying the designation of Natura 2000 sites on the territory Hungary (HUHN20014; HUHN 20008; HUHN20010).		
Amphibians	1188 *Bombina bombina*	As a measure to protect species associated with aquatic environments, sloped retention basins with hydrocarbon separators have been provided along the motorway route so that rainwater (flushing) does not affect downstream water courses.
	1993 *Triturus dobrogicus*	
Plants	1516 *Aldrovanda vesiculosa*	For many plant species including this species, a potentially positive impact is foreseen, grasshopper slides, which are to go through a set of management prescriptions aimed at meeting the ecological requirements of the target species, and will promote colonization and spread.
	4081 *Cirsium brachycephalum*	
Reptiles	1220 *Emys orbicularis*	As a measure to protect species associated with aquatic environments, sloping retention basins with hydrocarbon separators have been provided along the motorway route so that rainwater (flushing) does not affect downstream water courses.
Invertebrates	1060 *Lycaena dispar*	For invertebrate species, grasshopper slides in which a set of management prescriptions to meet the ecological requirements of the target species will be able to function as refuge and dispersion areas. In this respect, for the Lycaena species and Gortyna
	1074 *Eriogaster catax*	
	1083 *Lucanus cervus*	

Biotic component	Code and habitat name/ species	
		Borelii, which formed the basis of the designation of Natura 2000 sites on the territory of Romania, dedicated measures for their conservative management were laid down. The Eriogaster catax species, due to the obvious ecological preferences, can also benefit from ecological conditions at the level of the tillage, allowing them to be successfully used as a refuge and dispersion area. The populations of Lucanus cervus, Cucujus cinnaberinus, Cerambyx cerdo, and Dioszeghyana schmidtii, associated with forest habitats, are unable to be affected by the construction and operation stages of the Romanian motorway sector on the proximity sites that could be used by them Connecting areas (communication), thus missing affected habitats. Grubbing works that could not be avoided in the design of the highway are located far away from the State border.
	1086 *Cucujus cinnaberinus*	
	1088 *Cerambyx cerdo*	
	4032 *Dioszeghyana schmidtii*	
	4035 *Gortyna borelii lunata*	
Fish	1124 *Gobio albipinnatus*	As a measure to protect species associated with aquatic environments, sloping retention basins with hydrocarbon separators have been provided along the motorway, so that rainwater (scrubbing) does not affect downstream water courses.
	1130 *Aspius aspius*	
	1134 *Rhodeus sericeus amarus*	
	1145 *Misgurnus fossilis*	
	1146 *Sabanejewia aurata*	
	1149 *Cobitis taenia*	
	2011 *Umbra krameri*	
Mammals	1335 *Spermophilus citellus*	The species appears in isolated, localized populations, including outside protected perimeters (Natura 2000 sites), occupying both natural, semi-natural and agro-ecosystem habitats, also present in the border area, with populations in Hungary being connected With those from Romania without significant obstacles. The highway, by its associated specificity, as a major transport structure, is capable of leading to fragmentation of populations, but the phenomenon is manifested in the N-S direction and not in the E-V direction, thus expressing a cross-border impact. However, the permeability of the N-S structure is high, with a large number of subtractions that can be used by this species. Moreover, grasshoppers can function as refuge and dispersion areas for this species, for which, in order to prevent a potential impact, they have been provided in the palisade risk areas of deflection so that individuals of this species do not reach the carriage platforms. It is noticed that phenomena of fragmentation of diffuse populations of this species, located outside the sites, are eliminated by the constructive solutions

Biotic component	Code and habitat name/ species	
		but also by the assumed management prescriptions.
	1355 *Lutra lutra*	As a measure to protect species associated with aquatic environments, sloped retention basins with hydrocarbon separators have been provided along the motorway route so that rainwater (flushing) does not affect downstream water courses. Thus, resident populations located at sites in Hungary (HUHN20008; HUHN20010) are not likely to be affected.

Based on these considerations, it can be concluded that the construction and operation of the Brasov - Oradea motorway will not lead to the integrity of the three sites of regional importance existing on the territory of Hungary, in the vicinity of the motorway site.

4.4. Potential impacts on soil, subsoil and land use

The physical (mechanical) impact on the soil is present in the construction phase, along with the scraping, excavation and transport activities and during the transport of materials, when temporary transport routes to the work fronts will be used. The affected areas overlaps with the work strip. At its level, the texture will be affected, as well as phenomena of compaction and mixing of horizons.

Compaction of soils occurs as a result of the pressure caused by the circulation of heavy machinery, especially along technological roadways. Compacted soils become more exposed to erosive and wash phenomena, but phenomena such as increasing surface impermeability and decreasing the availability of water that penetrates harder into the soil, lowering the nitrogen and potassium uptake potential by plants.

These phenomena will occur during construction only along the expropriated strip. In the site organization area, the compaction phenomena will be more pronounced due to the longer period of the triggering factors of these phenomena.

To achieve the project, the layer of surface soil (up to 30 cm) will be uncovered, it will be stored separately from the non-fertile material and will be used for restoration of temporarily affected areas. Plant soil will be temporarily stored along the work strip. The storage period of the soil will not exceed 3 - 5 months, but will usually not exceed 20 - 30 days.

Due to the short storage period of the measures taken to preserve the physico-chemical and biological properties of the vegetal soils, it is not expected to have a significant impact on the soil environmental factor.

Grounding of the soil is a measure of soil protection, designed to avoid its pollution by the activities carried out in the working fronts. There will be no significant changes in soil biological activity, retaining its properties during demolition and temporary storage in stacks. The proposed activities will not lead to a change in the chemical composition of soils.

The direct local impact on the soil will occur as a result of excavation work and only in the short term. Medium and long-term effects are not expected at local or regional level.

The residual impact will be present mainly as a consequence of the permanent occupation of some land areas, respectively occupying an area of 2,477,837 ha.

No cumulative effects on the soil environmental factor are expected, as there are no other projects with special significance for the soil environmental factor to be summed up with those associated with the Braşov - Oradea motorway project.

During the construction stages of the highway, no significant elements of soil pollution risk were identified, because classical technologies and established methodologies will be used for construction works, so as to avoid soil pollution. Also, no significant impact from soil pollution is expected during the operational period, and appropriate risk mitigation measures are taken.

During the execution of construction works accidental pollution may occur with petroleum products (hydrocarbons), resulting in long-term compromising of small areas. As a rule, such phenomena appear on small squares at the level of the site organization, work fronts, etc., wherever maneuvers occur with equipment that involves fueling or unauthorized troubleshooting.

During the exploitation period, soil impact may be recorded as a result of the use of anti-slip materials (salt mixtures or calcium chloride with sand) in winter. A consumption of about 1 m3 of anti-skidding material has been calculated for each kilometer of the highway.

The anti-skid and surface cleaning materials used mostly during winter are sand, sand mixed with salt (NaCl), pure salt (crystallized), and less calcium (CaCl2).

To reduce the impact on the soil, anti-slip materials have to be stored in areas with permanently waterproofed surfaces (asphalt / concrete in the parking area) or in waterproof containers.

The washed water from the road surfaces will be taken over by the gully systems and transported to the retention network with gradual discharge where the mechanical separation (coarse sand / sand deposition) and salt dilution will be carried out, thus avoiding the impact on the soil And affecting the natural water courses downstream.

Cross-border impact

The construction and operation of the Brasov - Oradea motorway will have no cross-border impact on the soil environmental factor. All the works will be carried out on the territory of Romania. No areas will be occupied in Hungary. There will also be no emissions that will lead to soil damage in Hungary.

4.5. The potential impact on the landscape and the visual environment

At the construction stage, the impact will take place over a period of approximately 32 months, due to general disruption due to site organizations and work fronts.

For working fronts the period of disturbance will be considerably lower, the activity at their level being limited in time, but will be taken over by the transport structures put into operation.

The impact will be manifested by inducing at the landscape level some contrasting, aggressive elements that will lead to fragmentation of the perspective. However, given the characteristics of the project, the technological solutions

adopted, the vertical intervention remains limited, occasionally appearing landmarks exceeding 4-6 m height (cranes, etc.)

The visual impact remains moderate by the size and deployment of work fronts along the expropriation line. These bands will be preserved as elements of impact on the landscape for a longer period of time, along which will be the technological roads that support the work fronts.

The impact due to fragmentation of the landscape is intensifying in areas where the highway crosses tree stands and forest formations.

Types of landscape, land use, land use change; The impact of these changes on the stability of the landscape

The route overlaps with various relief facilities, each with different landscape features.

Figure 10. Landscapes in the plain area: agroecosystems (left), mosaic of agroecosystems (right)

Figure 11. Landscapes in the hill area: agro-ecosystems mosaic, semi-natural habitats and habitat areas (right) and landscapes dominated by natural formations (meadows, forests, riparian-lying areas)

The construction of the motorway will have a particular impact on the forest landscapes at which deforestation will be carried out.

The landscape, treated as an ecosystem, has a horizontal structure that is related to surface units and is associated with vertically-developed interrelated attributes (Zonneveld, The land unit - a fundamental concept in landscape ecology and its applications).

Thus, the impact generated by the project will lead to the creation of a fragmented landscape, lacking contrasting elements, but with an artificial character given by the rectilinear geometry of the aisle.

Impact of the project on the natural environment, biotope fragmentation, aesthetic value of the landscape, including the cross-border

During the construction period, an impact on the landscape in the work area and site organization will be generated, but will be short-lived (up to 32 months) but will be prolonged in the long-term exploitation phase, As a result of the deployment of the transport platform.

Taking into account the level of visibility of the 300 m perspective and the modest vertical development of the motorway structures, the impact level remains relatively low.

Cross-border impact

The construction of the Brasov - Oradea motorway, especially the border area, will have an insignificant impact on the Hungarian landscape, due to the presence of work fronts, machinery and workers. The activities carried out within the site organization will have no impact on the Hungarian environment as the closest site organization (OS Salard) is located at approximately 13,068 km of the border. All other site organizations are located more than 35 km from the border. All the works will take place within the national territory.

Exploiting landfills will have an insignificant impact on the landscape in Hungary. Impact will only occur during the construction period, in particular through the existence of derelict areas and the presence of machinery and means of transport. Upon completion of the works, loan holes will be closed in accordance with the standards in force, thus eliminating the impact on the landscape.

It should be kept in mind that the Brasov - Oradea motorway connects to the Budapest - Miskolc motorway in Hungary, and the cross - border impact is mutual. The construction of the Budapest - Miskolc motorway will have an impact on the landscape in Romania, but this form of impact will not be significant.

During the exploitation of the Brasov-Oradea motorway there will be no impact on the landscape, the new structure being integrated into the landscape.

4.6. Impact on human settlements and other objectives

As regards the impact on the socio-economic factor, a number of generic or associated effects categories have been differentiated as follows:

- **Moving the population in search of jobs;**

For the construction of the Brasov - Oradea motorway, Ogra - Borş sector, 15 site organizations will be set up along the route, attracting the interest of local workers. These are the points with the highest dynamic level at the project level.

Thus, of the approximately 4,000 full-time jobs generated during the construction of the Brasov-Oradea motorway, some 3,000 will be occupied by local labor force.

For the construction of the Brasov - Oradea motorway, a skilled and highly qualified work force is needed in the field of construction. Thus, approximately 1,000 jobs will be created for specialists, which will lead to a limitation of the emigration interest and the keeping of the labor force at the level of the national territory.

- **Relocation of the population**

The route of the Brasov-Oradea motorway was chosen in such a way as to avoid as much as possible the relocation measures of the population.

For sectors crossing certain risk areas or sensitive areas, special technical solutions have been called for, which have involved the installation of sound absorbing panels capable of mitigating the impact caused by noise.

- **Impact on local labor force**

The construction of the motorway will directly generate a minimum of 4,000 jobs, of which 3,000 will be occupied by the local labor force. In addition to the 4,000 directly created jobs, a large number of indirectly generated jobs are added, ie drivers transporting materials, equipment and machinery, but also service workers (especially food, machinery and vehicle maintenance) .

In the operational phase, the use of the motorway will lead to boosting the economy at regional level, but as a result of the development of a vital pan-European transport artery, it is expected to boost all socio-economic spectrum.

- **Impact on the local business environment**

The project is able to generate and propagate where the socio-economic environments will influence both at the national / regional level, especially at the transnational level. At local level will be a revival of the business environment in the field of services, in support of the project being necessary solutions for providing food services, repairs, logistic services, mechanical services (repairs, oil exchanges, consumables etc. .). Given the urgency and the impossibility of programming these elements, all will appeal to local business networks generating consistent profits, even if the time of action will be limited.

Cross-border impact

The construction and operation of the Brasov - Oradea motorway will have no significant impact on the Hungarian settlements, taking into account that the minimum distance between the designed axis of the motorway and the dwellings is 4.36 km.

4.7. Impact of noise and vibration

The noise level produced during the construction work depends mainly on the nature of the equipment and its layout and the specificity of the site.

The construction of the Brasov - Oradea motorway construction in Ogra - Borş sector will increase the noise level, but at the limit of the residential areas these will be integrated within the limits stipulated in STAS 10009 - 88 "Urban Acoustics - Permissible Limits of Noise".

In order not to have an impact on the construction workers, they will be provided with personal protective equipment.

The discomfort created for the local population will occur only during the construction works. Upon completion, traffic conditions will improve.

4.8. Impact on historical and cultural heritage

As early as the design phase, the Braşov - Oradea highway route was designed to avoid cultural, archaeological, or residential heritage elements that could have a potential impact on historical or architectural monuments.

Cross-border impact

All works provided for the construction of the highway will be carried out on the territory of Romania, without affecting the land areas on the territory of Hungary, which means that there will be no impact on the historical and cultural heritage of the neighboring country.

The realization of the Brasov - Oradea motorway and its connection to the Budapest - Miskolc highway, from which the Miskolc - Debrecen section will be deployed, will lead to a decrease in the level of emissions of air pollutants associated with road traffic.

Also, the use of motorways will lead to the decongestion of traffic in the transited localities, to the reduction of the transit time, thus contributing to the improvement of the traffic conditions and having an indirect positive effect on the socio-economic environment on both sides of the border.

5. Description of the proposed improvement measures in order to reduce as far as possible the impact on the environment

In order to prevent, reduce and offset the adverse effects on the environmental factors during the construction works and during the operation of the Brasov - Oradea motorway, the Ogra - Borş sector, the measures described below will be adopted. The measures are applicable to all variants studied.

All works will be carried out within the territory of Romania.

5.1 Proposed measures to prevent, reduce and compensate adverse effects on the water environment factor

The most important measure proposed to reduce the impact on the water environment factor is the creation of retention basins that replicate natural wetland systems.

In the area of site organizations and work fronts, temporary retention basins with gradual discharging will be constructed, connected to the gully networks to be designed for the management of rainwater run along technological (temporary) access ways. The dimensions of these polders will be made in correspondence with the surfaces drained by the gullies.

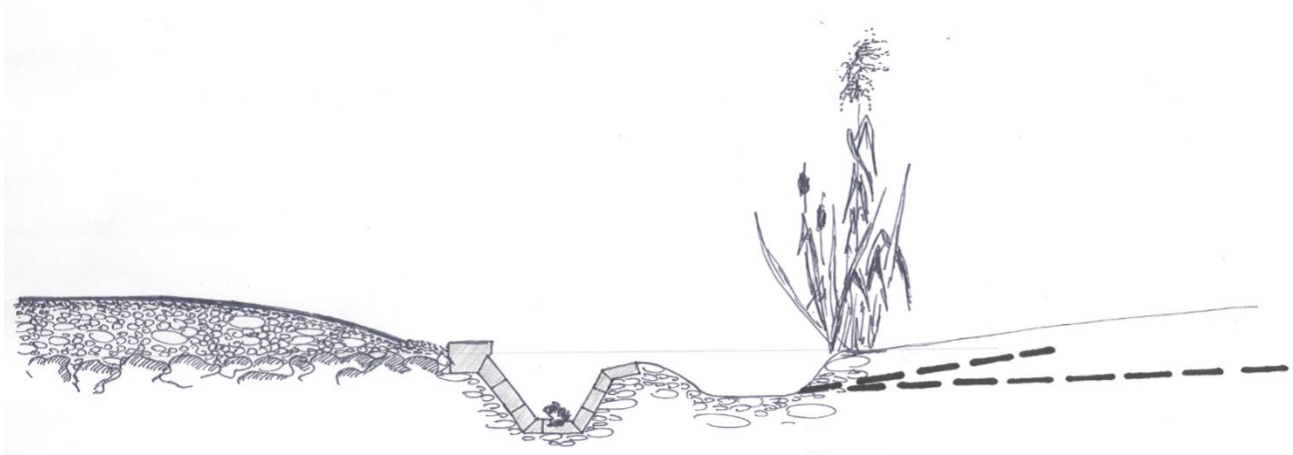

Figure 12. Structure of gutters to be made along the paths of temporary technological roads

From Figure 12, it is possible to see their gradual discharge zones, additional accumulation areas, flow rate limiting structures disposed in the structure of the drains

For service points and service spaces, the containment ponds are of a permanent character and are dimensioned so as to be able to take rainwater from drainage perimeters. For both retention basins and perimeter gutters, as much as possible, a rock structure is used and where appropriate natural stone is used to increase stability and limit erosion (Figure 13), facilitating the penetration of water to deep horizons, Losses of surfaces that have been waterproofed.

Gradually unfolded landfills are not rainwater accumulation areas, but rather water-infiltration surfaces to the deep horizons of the soil.

Figure 13. A model of a giant and reinforced stone gutter that ensures the drainage of rainwater in a manner that replicates natural structures

- **Measures to reduce the impact on the quantitative characteristics of water bodies**

In order to reduce the impact on the quantitative characteristics of water bodies, measures have been taken to reduce consumption in the construction and operation stages.

For the operational phase, engineering solutions for reducing consumption have been considered, through the provision of efficient (no losses) specific endowments, but also by the application of a monitoring program able to identify potential losses at the network level in time.

- **Other measures to reduce impacts on water bodies and their shores**

In shore and talveg areas, where the solution for the placement of casted elements is chosen, the anti-erosion protection shall be carried out on a minimum of 10 m upstream and 10 m downstream. Anti-erosion protection systems will be made by placing overcrowded gabions and rocket mats.

An extremely effective solution is to protect the shores of the trees. Thus, in carrying out the excavation work, any root systems to be deployed will be repositioned in the shore area, mixed with rockfill and integrated into the gabion systems, so that the erosion force is diminished and bank stability secured.

In order to stabilize the bank areas at which works were carried out, but also along the gullies (at least a part of them), respectively the banks of the retention basins with gradual discharge, structures will be made able to eliminate erosive phenomena, The type of mattresses and gabions with rocking or climbing (Figure 14). Such structures also maintain a high ecological function, with a limited impact on the landscape.

Figure 14. Bank Stabilization Solutions: Left: Model of a gabion mattress prepared to receive rockfalls (Arrigo Gabioni Inc); Right: the use of rockfalls for the protection of some banks

Smaller animals can cross the highway and beneath the water drainage floor, and it is recommended that vegetation is planted to create an attractive environment.

It is very important that bridges with forest vegetation (submarines) are arranged under bridges and viaducts so that the animals have a natural camouflage area to reduce their stress from the moment they pass.

Since subtractions are usually made of cubic reinforced concrete cubicles, suitable solutions have been proposed for these boxes to be accepted by fauna species.

Because it is known to have a particular role in the fragmentation of habitats, especially for small fauna species (amphibians, reptiles, micromammaries, etc.), the access routes are associated with the fact that the gullies are provided with escalator ramps Made to the outside, so as to avoid as far as possible their entry into the carriageway.

Where necessary (for example, in areas where the amphibian crossing areas between wet areas separated from the highway) will be installed along the drains and detuning rails and fencing to restrict access to the microfouled species.

- **Measures to prevent accidental water pollution**

To reduce the risk of accidental water pollution, a number of preventive measures have been proposed:

- measures to avoid leakage of oil products:

  - the machines will be thoroughly checked before being used, thoroughly washed under pressure jet for removal of stains or areas with grease leaks, within the site organization, on appropriately arranged, waterproofed platforms and provided with basins with separation compartments Hydrocarbons and decantation;
  - Fueling equipment will only be provided in waterproofed areas provided with bucket-type retention systems. The amount of fuel to be used will not exceed the normal daily allowance for workload, thus avoiding the spillage of fuel quantities in the event of accident or unforeseen circumstances;

- Any leakage of oil products on the ground will be isolated, the respective perimeters being dismantled and then treated to neutralize the pollutant, avoiding the possibility of pollution of watercourses or phreatic streams with petroleum products;

- At the construction stage, at each level of the site organization and each working front will be organized beside the PSI picket and an intervention pigeon in the case of accidental pollution, in which will be minimal: 5 straw bales, 1 bag of shavings or sawdust, 5 kg of product for treatment of hydrocarbons, solvents and derivatives, type Petrolsynth (as a product of rapid intervention in case of accidental pollution), a metallic container, anticorrosive treatment, sealing which will be used for storing some Volumes of pollutants or contaminated materials (taken from the environment after accidental pollution);

The risks due to the accidental spillage of fuel residues, lubricants and their residues can be eliminated through the measures established when organizing work sites by:

- phased attack of objectives with minimum concentration of machinery, materials and labor force;
- arrangement of waterproofing platforms for the temporary storage of fuels and storage in barrels of any materials with potential for water pollution;
- the arrangement of toilets with water-repellent, chemically water-repellent toilets for collection of faecal products;

The foreseeable impact on the water environment factor may be reduced if the following aspects are respected during the activities:

- vehicle routes will be limited and reduced to the strict minimum, requiring the use of the existing access network to avoid additional loads of water courses with suspended particles that can be washed from sites affected by erosion and compaction; Strict crossing through whites will be strictly avoided;
- the environmentally friendly reconstruction of the affected areas by covering (covering) with vegetal, grassy carpet in all free areas and where possible planting of tree species from the local spontaneous flora to avoid soil erosion and loading the courses Water with suspended material;
- planting of tree species from local spontaneous flora (especially¬ alder alnus glutinosa, but also species of willow, walnut, poplar or ash) to stabilize the banks both upstream and downstream;
- construction of small retention basins with gradual filling (in¬ stages) for taking over the maximum flows for diminishing the effects of some flow increases;
- ensuring the longitudinal continuity of the rivers, avoiding the location of some types of thresholds;
- correct dimensioning of the protection solutions for the motorway related elements in order to preserve the morphology and the water flow dynamics at the level of the whites; Immediate correction of potential shore or retrographic erosion by appropriate solutions;
- making detours during the works in the riverbeds, to prevent the increase of the turbidity of the water;

All staff will receive training to enable them to correctly identify the risks of water pollution, take preventive and remedial measures, as appropriate, and initiate appropriate alert and informative sequences of responsible authorities.

5.2 Proposed measures to prevent, reduce and compensate for adverse effects on the air environment factor

Measures to reduce pollution and dust

Measures to mitigate the impact on the air environment factor specifically aimed at limiting dust emissions. Thus, the areas affected by the eventual deposition of dust particles remain only those located in the immediate vicinity of the work fronts, without affecting the localities in the project area, which are at appreciable distances, in most cases being separated by forms of relief or forest curtains To the source point.

Powders trapped during machine operation in the work area dissipate in the atmosphere, not involving intense traffic or machine concentration (the working fronts will be small). Also, the road conditions in the working fronts area will not allow for high-speed driving and thus the raising of significant amounts of dust that will affect the environmental factors.

To reduce emissions of dust and dust, the following measures will be followed:

- the use of periodically technically-controlled, recent-generation equipment (corresponding to the minimum EURO3 standard) equipped with catalytic pollutant reduction systems;
- the use of modern facilities / stations for the preparation of concretes and modern astral mixtures with pollutant retention systems;
- optimal routes for vehicles transporting construction materials will be chosen;
- exploitation roads will be watered during periods of dryness;
- pulverulent materials will be transported using trucks with roof rails;
- The production of unpleasant odors will be avoided by:
  - arrangement of waste storage facilities;
  - organization of regular collection and transport to ecological landfills for final disposal;
  - maintenance of the rainwater collecting and evacuation system in the site organization areas;
- Work fronts will be watered periodically to avoid dust emissions into the atmosphere;
- Machine motors will be switched off in the waiting times;
- The generation of dust-generating technological processes in strong wind conditions will be avoided.

The emissions generated by the mobile means (means of transport and equipment) must be within the limits provided by the legal provisions in force.

Asphalt and concrete plants will be provided with pollutant retention systems as follows:

- cement and lime silos will have sack filters - 99% efficiency;
- asphalt mixing plant installations: - local air-polluted air capture system from aggregate drying tray provided with bag filters - 99% efficiency;
- filing hopper - local air-entrapping plant with a cyclone - minimum 75% efficiency; During the operation, the motorway is associated with the impact due to traffic, capable of generating noxes, dust and noise. For detention and detoxification of pollutants, it was envisaged the introduction into the natural

functional circuits of the slopes left free (unoccupied) by objectives related to the transport infrastructure and which will be subjected to an elaborate ecological restoration program.

5.3. Proposed measures to prevent, reduce and compensate for adverse effects on the soil-subsoil environmental factor

For the protection of the soil - groundwater factor, control, prevention, limitation and mitigation measures will be applied throughout the construction. The proposed measures consist of:

- the use of appropriate equipment and machinery without failures, traces of fluids, etc .;
- optimizing, minimizing the number and increasing the efficiency of work equipment in order to minimize the consumption;
- during the execution of the works for the construction of the terraces, measures will be taken to support and consolidate the areas that are susceptible to collapse or slip;
- If groundwater levels are intercepted, adequate drainage and correction measures will be taken;
- Excavation works will be carried out in optimum weather conditions without precipitation, or with the application of protective measures in order to avoid flooding of the working areas;
- Undertake a worker information and awareness program so that any kind of incidents are avoided and, when they occur, the correct alarm and intervention procedures are activated;
- provision of air for vegetal soil piles which will be stored for more than 30 days;
- measures to mitigate the impact of the construction phase will be prolonged in the ecological reconstruction stage of the site.

The sources associated with the construction work can not be equipped with a pollutant capture system. Measures to control particulate emissions are operational.

Specific steps for the construction stage:

- regular wetting of aggregate deposits;
- restraining or covering inactive pads;
- regular checking of the equipment;
- the use of state-of-the-art transport equipment and means of transport;
- choosing optimal routes for vehicles serving the yard;
- covering the means of transporting powdered materials;
- periodic watering of used roads;
- elaboration of work charts correlating the work schedule of the production base with the equipment on the fronts;
- the weather forecast will be taken into account;
- technological processes that produce a lot of dust will be reduced in times of strong wind;

- construction site roads will be permanently maintained by leveling and wetting;
- at the end of the working week the work fronts will be cleaned;
- access roads and temporary service roads will be cobbled;
- traffic speed will be restricted.

Ecological restoration of the soil environmental factor

The ecological rehabilitation of the soil will be done with particular attention. This measure will aim at eliminating all the negative effects generated during the construction phase with the objective of effectively restoring the affected perimeters and fully deploying their functions. The following steps will be taken:

a. Restoring the physical structure of affected soil strata:

- the morphologically affected areas will be flooded and brought to a state closest to the natural one;
- after the geometric rehabilitation of the sites, they will be prepared for a quick re-revelation;
- In areas where soil layers are unstable, a layer of straw of several centimeters will be deposited to ensure a better cohesion of the vegetal soil;
- the layer of vegetal soil will be deposited as uniformly as possible;

b. Ensuring the stability of the soil layer:

- a cut hayed blanket will be laid in order to ensure the stability of the soil layers at the level of the expropriation strip;
- a shallow layer of soil should be placed over the mowing hay and a shallow compaction;
- where necessary (steep slopes, areas exposed to erosion, etc.), it will proceed to the production of cleavings from vegetal material and the placement of geogrids.

c. re-establishing the micro-hatchet network;

d. sowing**;**

e. completion of works through plantations**;**

f. repeated measures aimed at ecological restoration of the soil environmental factor**;**

g. assessing the success of ecological restoration of the soil environmental factor**.**

The entire volume of loose soil will be used in the environmental recovery phase as a cover material that will be uniformly distributed continuously over the last layer of ground excavated and rolled up at the level of the strip.

Measures to reduce pollution:

- the contractor's staff will be trained to avoid maneuvers involving pollution risks (eg fueling equipment, etc.) and to take appropriate measures to limit accidental pollution and the elimination of pollutants;
- materials and raw materials will be stored only in the strictly necessary quantities;
- measures will be taken to recycle materials and reduce the amount of waste generated;
- waste will be stored in specially designed areas outside sensitive areas;

- selective waste collection points will be organized at the level of the main objectives of the project, both at the construction stage (site organization, work fronts, etc.) and in the operational phase (support points, service spaces, parking facilities).

Measures to mitigate the physical impact on the soil

To mitigate the physical impact on the soil, the following measures will be taken:

- measures will be taken to limit the pressure exerted by the most commonly used equipment, by using wider treadings (balloon tires, wagon tracks), plateau layout (especially in the support points of some machines or long-term operation areas);
- traffic on non-organized technological roads should be avoided during periods of excess humidity when the physical impact is amplified;
- technological roads will be demarcated by guide strips to prevent machinery from entering the roadside;
- technological roads will be properly maintained to ensure their flatness and to avoid the occurrence of pits;
- alternate routes will be organized where possible, so that there will be no phenomena of increased compression.

5.4. Proposed measures to prevent, reduce or offset adverse effects on biodiversity

During the Brasov - Oradea motorway construction will be adopted a series of measures to minimize and avoid impacts on biodiversity production that will involve:

- enhancing access roads; will be achieved through the installation of a road convex profile. This structure will facilitate drainage of rainwater from the side surface access roads and thus avoid their erosion and ponding that can lead to accumulation of amphibians exposed incidents caused by traffic;
- making polders small role desanding that calming force rainwater drainage, to be along the access roads at distances of about 30-50 m. The development polders will be done on surfaces up 10 m2 and a maximum depth of 30 cm being provided with the areas of the drain diffused, the steps facing upstream, to avoid the occurrence of phenomena erosive at distances of 2-3 m above the doorways, operating the accumulation zone (aggregation) of the amphibian, and not only outside the areas of negative potential (roadways);
- careful maintenance of the access routes so as to avoid puddles;
- use of low intensity light sources, with sodium vapor in order to avoid attracting insects of the species of bats and therefore the follow-up of their coming. Also to be avoided strong light sources that can disrupt or erratic night migration of species.
- foundation trenches and pits will be provided with ramps from the ground to facilitate their escalation by any species microvertebrate falling into them;
- run at low speed on the access roads in order to avoid incidents, raising dust, noise, etc.
- during periods of heavy traffic (transport materials, etc.) access roads will be sprayed to limit emissions of sediment particles;

- during the closing works stages, appropriate measures will be taken to restore the original state of the land morphology and restoration of the fertile soil.

For ecological restoration of the site will be used the following elements which constitutes valuable microhabitats systems:

- **Concave and water storage areas**
  - such a structure contributes to maintaining the water in the habitat and provide water to the survival of a large number of species in periods of dryness;
  - functioning as a temporary storage systems stormwater drainage and thus makes surface erosion is much reduced, contributing to the restoration of freshly restored; (see figure 15);
  - expropriation in the strip will proceed to the realization of such structures at a density of about 3-5 / km.

Figure 15. Temporary water storage areas provide significant local biodiversity indices contributing to enhanced fluid balance

- Stack and clumps of boulders
  - such structures provide refuge areas (niches shelter), but also points sunshine, watch local landmarks, etc. for a large number of animal species;
  - their arrangement along the steep slopes that often occur leaking water will significantly reduce the corrosive effect and ravines, increasing soil stability;
  - such structures will be carried out to strip the expropriation a density of about 3 to 5 stacks / km, a total of 3-5 m^3 material (see figure 16).

Figure 16. The use of microhabitats boulders that is able to provide additional environmental niches (left) and acting as a water drain zones of the washer which substantially contribute to stabilizing slopes (Right)

- ❖ Other measures:
- ➢ in the skirts emerging will be made plantations woody species belonging to the floor of the vegetation and the composition object of the stands, a width of 4 m, and in the area of the strip compulsory purchases to be made plantations woody shrubs characteristic floors vegetation, the local spontaneous flora;
- ➢ be planted species with oaks (*Quercus cerris, Q. petraea, Q robur*), ash (*Fraxinus exc*elsior*),* poplar (*Populus alba, P. tremula, P. nigra* – in areas with high humidity), linden tree (*Tilia cordata*), and other species of ecological value level: *Acer sp., Salix sp.*, hazelnut tree (*Corylus avellana*), and shrubs, hornbeam (*Carpinus betulus*), arinul (*Alnus sp.*), hawthorn (*Crataegus monogyna*), pubescent oak (*Quercus pubescens*), rosehip (*Rosa canina, Rosa sp.*) and blackthorn (*Prunus spinosa*).
- ➢ the bank and the valley floor areas, the areas crossed by the highway bridges and culverts in the erosion protection will be achieved on deployment of at least 10 m to 10 m upstream and downstream of outsize cargo by placing the embankment and gabion mattresses;
- ➢ culverts will be provided with structures to enable their function ecoducte;
- ➢ constructive solutions have been proposed for the grass discharge gutters and functions bio retention phase (fito cleanser). The structure of rill will allow the gradual discharge of rainwater to the grass slopes, further accumulation of water and slow the rate of leakage.

- ❖ **Ecological corridors associated assembly**

- ➢ use of hedges, additional structures such as cliffs, stone fences, some pools or gutters, even artificial structures (shelters, nesting boxes, hibernacule, watering, etc.);
- ➢ habitat hedges maintained in a number of species of flora and fauna;
- ➢ installing hedges will take into account the morphology of the land and aim primarily " filling of goals ", helping to increase connectivity;

❖ **Specific mitigation solutions**

To mitigate the impacts on the environment have been proposed a number of specific measures:

- **solution of rainwater drainage segments by providing the riprap**: their use will help to reduce the water flow velocity, erosive phenomena are eliminated; These structures have the ability to retain particles;
- **green alignments:** planting trees indigenous species rain gutters achieve the response rates hygrophile rich natural vegetation;
- **walls of boulders that reply natural habitats** and ensure good drainage of rainwater;
- **made of gabion retaining walls** arranged in terraces of stone blocks joined imperfect (providing colonization by species parietal)
- **interleaving systems with sectors rock gabions** (parietal) to ensure environmental integration high;
- **steep slope reinforcement solution** with geo grid and supported on the walls of gabions;
- **natural grass slopes**: allowing natural water leaking into the system and their management through a grassy ditch. The adoption of this solution will reduce the risk of death in accidents significantly reduce speed;
- **partial concreting gutters ensures** a good penetration of the water into the soil and slow water flow rate and water retention capacity of the particles;
- **use of vegetated slopes**, high density wood species and shrubs that serve to mitigate the speed of vehicles leaving the highway accident platform, thus reducing the risk of mortality;
- **use of slopes** that are installed several types of windbreaks: they serve to mitigate the accident vehicle speed and having ecological value high;
- **mowing alternative sinusoidal grassy slopes**, ensuring the creation of ecological niches and a high diversity of flora;
- **use of grass median strip**: planting the role of shielding shrub species (anti-glare) and the colour ecological;
- **band management solution** to effect separation of the strips: planting the shrub species that provides anti-glare protection also provides a better absorption of noise and dust, but also serves as a corridor ecological;
- **use of textile mesh barrier** role to limit penetration of species of micro - and mezzo fauna to platform motorway;
- **installing warning signs** of the massive presence of specimens of amphibians;
- se of complex boundary of roads;
- **adopting rainwater drainage solutions:** maintenance of border areas between the blocks allowing rainwater to drain gutter grass;
- **use of natural spaces like structure of services**: grass gutters are designed to take water washed the platforms waterproof, and water is discharged gradually by infiltration;
- **camouflage solutions through a massive concrete gabions level of service areas**;
- **making walls of local material** (rock fill) structures that will ensure the possibility of colonizing species of flora and fauna parietal;

- **providing a level difference of 5 cm** between the platform and allows the mower to diffuse the flow of rainwater;
- **natural stone cladding massive concrete structures** in order to ensure better integration into the landscape;
- **complex solutions to take over the management** of rainwater and to their retention basin, serving to reduce the water flow rate and the risk of erosion;
- **functional integration in the natural cycle rainwater retention basins:** ecological niches will provide the header tanks;
- **solution to take over the major volume storm water:** the retention basin water management to reduce the flow rate. Also, these structures have a high retention capacity of pollutants (including floating) and local retention (source) accidental spillage of hydrocarbons;
- **use of sound-deadening panels and dimming;**
- **plating works concrete splint marble with aesthetic role;**
- **use of hydro-seeding technique (hydro-seeding)** in low fertility soils, strongly inclined slopes, slopes, embankments.

5.5. Proposed measures to prevent, reduce or offset adverse effects on human settlements and human health

- organizing site should be located away from inhabited;
- it will be respected legal hours and days of rest;
- modern equipment will be used to generate a noise level as low as possible;
- if they will be exceeded, the maximum allowable noise absorbing panels will be used;
- regular checking and repair of machinery and vans for transporting, so emissions to be as low;
- yard will be marked by warning signs;
- driveways will be maintained and kept clean and ensure access Intervention Teams;
- it will be chosen optimal routes for vehicles carrying construction materials, so as to avoid inhabited areas;
- to reduce emissions of particulate sediment main roads will be sprayed regularly;
- leaving the site will be landscaped spaces for cleaning machinery and commercial vehicle tires, so as not to be driven on public roads sediment or other material from the work fronts;
- building materials and waste will be stored in specially designated areas within the site organization. It is strictly forbidden outside its storage site organization, green spaces or near riverbeds;

5.6. Proposed measures to prevent, reduce or offset adverse effects on social and economic environment, landscape, cultural heritage

Impact on the socio - economic environment is limited. The technical project was proposed appropriate measures to reduce / eliminate environmental impact:

- identification of sensitive areas of the each cell to be attacked during the construction phase, so that the home can be taken the necessary measures to avoid the emergence of elements of discomfort, inconvenience local and addressing early solutions limiting the socio-economic;
- implementation of measures to limit the impact on the socio-economic environment even before the start of work (carrying route diversion, installation of sound-deadening panels, demarcation and installation of elements Warning zone works, provision of alternative network of utilities, etc. .);
- direct negotiation with the owners / managers of land to establish the amount of compensation or compensation from their respective areas of land damage;
- establishing work schedules and programs tailored to local elements, so as to eliminate duplication of sensitive periods (local social projects, fairs, holidays, etc.). Compliance with work schedules, work rules and adjusting working hours to weather-climate;
- ensure that all workers decent working conditions, putting them with appropriate protective equipment. Protection compliance and safety officers;
- establishing a program random unannounced check medical certificates issued by the workers' health assessment of their employment or annual analysis Bulletins (Occupational Medicine).

5.7. The proposed measures to prevent, reduce and compensate for the effects of noise and vibration

The proposed measures to mitigate the impact of noise and vibration are:

- imposing limits allowable under regulations specific objectives and performance monitoring;
- selection and monitoring sites representative receivers;
- limiting simultaneous operation of equipment;
- respect rest and tranquillity hours (minimum time interval 14.00 - 16.00);
- prohibition of the night work (the time interval 20:00 - 07:00);
- cessation of periods of weekend (Saturday and Sunday) and on public holidays or during events are organized locally (will agree with representatives of local communities);
- placement of berms and temporary sectors absorbing panels with sensitive receptors, for the period of work.

Particular attention has been paid to noise reduction solutions in areas with sensitive receptors, opting for the installation of sound-absorbing panels. The project has provided technical installation of soundproofing panels with a total length of 15 068 m

Also requests the Association "Milvus Group" will be installed soundproofing panels and the passage over DN 14A, the CF 4 + 970, respectively the passage over highway km 3 + 563.5 on the north side of the highway in order avoiding disturbance of bird species nesting.

Absorbing panels to be installed will have a minimum height of 4 m and will be made of material other than transparent.

6. An explicit indication of predictive methods used. Presentation of relevant environmental data and assumptions used

Still in the design phase have been taken to prevent environmental impact. The project was focused on preventing environmental impact, rather than on reducing the environmental impact.

The most important measure that can be taken at the design stage is to choose the route of the highway so as to be located as far as possible outside sensitive areas (residential areas, protected natural areas, forests).

Where it was possible to avoid the protected natural areas were chosen areas where no species or habitats protected.

For EIA was used evidence from the field, established valuation methods (such as the proposed methods of user JASPERS - Guides sectorial environmental impact assessment: construction projects of highways and roads, illustrative method Rojanchi).

Also, the general designer and environmental assessors have extensive experience in the construction of highways and roads, both within protected areas and outside them.

7. Inventory gaps in knowledge and uncertainties encountered in compiling the required information

There are no gaps in knowledge and uncertainties were not found in data compilation.

8. Outline surveillance and management programs and other plans for further analysis of the project

For the construction project of the Brasov - Oradea motorway, Ogra - Borş sector, the following monitoring plan was proposed:

Table 3. Monitoring plan during the construction period

Environmental factor	Location of monitoring points	Parameters monitored	Periodicity	Responsible
Air	- front line work area; - site organization; - concrete plants, natural aggregate sorting, astral mixtures and bituminous emulsions; - machine maintenance stations; - fuel stations;	COV, NOx, SO_2, Suspended particulates, sedimentable powders	Monthly	Antreprenor
Water	- site and production site organization; - machine maintenance stations; - fuel stations - water bodies in the vicinity of the project	According to Government Ordinance no. 188 / 2002 for approving some norms regarding conditions for discharging into the aquatic environment of wastewater modifiedand completed through HG nr. 352 / 2005 pH, suspension particles, CCO-Cr, CBO5, petrol products	Monthly	Antreprenor
Soil	- working fronts; - concrete plants, natural aggregate sorting, astral mixtures and bituminous emulsions; - machine maintenance stations; - fuel stations; - temporary deposits; - loan holes;	Total hydrocarbons from petroleum products, heavy metals	quarterly	Antreprenor
Noise	- in the vicinity of localities in the area of the motorway route; - site and production site organization; - working fronts; - the Natura 2000 protected area, close to the project.	Nose level dB(A)	Monthly	Antreprenor
Biodiversity	According to the management prescriptions	Invasive species Biodiversity indices	annualy	Antreprenor through field experts

Table 4. Monitoring plan during the operational period

Environmental factor	Location of monitoring points	Parameters monitored	Periodicity	Responsible
Air	- parking area, service spaces, support points; - the area of road junctions; - near the localities	COV, NOx, SO_2, Suspended particulates, sedimentable powders	quarterly on a period of 3 years	Entreprenour/ Beneficiary
Water	- parking area, service spaces, support points; - the hydrocarbon separator area - the pluvial discharge points in the emissary;	According to Government Ordinance no. 188 / 2002 for approving some norms regarding conditions for discharging into the aquatic environment of wastewater modifiedand completed through HG nr. 352 / 2005 pH, suspension particles, CCO-Cr, CBO5, petrol products	quarterly on a period of 3 years	Entreprenour/ Beneficiary
Sol	- areas in the vicinity of parking lots, service spaces; - areas in the vicinity of support points, maintenance centers; - in the vicinity of protected natural areas in the project area;	Total hydrocarbons from petroleum products, heavy metals	quarterly on a period of 3 years	Entreprenour/ Beneficiary
Noise	- in the vicinity of the inhabited areas near the project; - in areas where fonoabsorbent panels have been placed - protected area of the project nearby.	Nose level dB(A)	quarterly on a period of 3 years	Entreprenour/ Beneficiary
Biodiversity	According to the management prescriptions	Invasive species Biodiversity indices	annualy on a period of 3 years	Entreprenour/ Beneficiary through experts

The monitoring results will be reported annually to environmental protection agencies and other competent authorities. The Beneficiary will follow all proposed measures to reduce the potential impact that can be identified as a result of monitoring activities.

9. Non-technical summary, including a graphical presentation (maps, graphics, etc.)

The purpose of the project is to build the Brasov - Oradea motorway, Ogra - Borş sector, with a total length of 255,39 km.

The highway Braşov - Oradea (which will be connected with the Bucharest - Braşov highway and the Nădlac - Sibiu highway through the Sebeş - Turda Motorway) represents one of the national transport intensive network that will ensure the interconnectivity between Romania and the Center and the West of Europe Providing the connection with the Budapest - Miskolc Highway, from which the Miskolc - Debrecen section departs.

Brasov - Oradea motorway will have its starting point in the south of Ogra, it will cross the administrative territory of the Mureş, Cluj, Salaj and Bihor counties and will have the final point in Bors village, in the area of Santăul Mare, continuing in Hungary with the M4 motorway to Miskolc and Budapest.

The motorway Braşov - Oradea will absorb a substantial part of the traffic on the adjacent national road network, degrading them significantly and contributing greatly to a decongestion of the traffic from the transited localities.

The following works will be carried out for the implementation of the project:

- **Road works:**
  - construction of a 255,39 km long motorway, of which the length of the Gilau - Borş sector is 166,754 km;
  - the total width of the transversal profile will be 27.5 m / 28.5 m and includes the space for the sill to be placed on each side of the platform;
  - width of the platform:
    - a two-lane carigeway on each direction;
    - guide lanes, two on each direction;
    - median lane (waterproof);
    - one emergency lane on each direction;
    - two shoulders.
- In the area of road junctions, the width of the motorway platform is 29,50 m, by adding a meter to the width of each emergency lane, which turns into acceleration-deceleration lanes;;
- in the case of junction arms with two lane, the road platform width is 9.00 m, and in the case of junction arms with a single lane width of the platform is 6.00 m;

- **Works of art:**
  - bridges, passages, viaducts;
  - hidrotechnical works:
    - protection of concrete pillars;
    - protection with concrete pillar and gabion mattress;
    - wall of gabions;
    - recalibration and deviations of the river bed;

- river bed thresholds;
- river bed corrections;
- concrete tiles wall;
- masonary dry wall;
- gabion support walls, monolithic concrete foundation on cassettes;
- concrete culverts or gabion;
- threshold buried anti-erosion;
- docks;
- thresholds for torrents;

➢ **Consolidation works:**

- protection works for cut-and-fill embankments with geocells filled with soil;
- protection works for embankments with Geosynthetics;
- protection works for embankments with geocells / biodegradable mats ;
- backfill base reinforcement;
- deburring support structure from drilled columns;
- support structure of anchored prefabricated plates;
- mattress reinforced with geogrids;
- reinforcement of landfill with reinforced earth;
- reinforced earth support walls;
- deck support walls in drilled pilots;
- green terramesh system;
- consolidation pilots;
- grids
- dray walls;
- longitudinal drainage;
- Sowing and creating a vegetal layer;
- planting bushes;

➢ **Tunnel**: in the area of the Meses Mountains a tunnel with a total length of 2.4 km was designed, realized in a two-lane bitub system;

➢ **Drainage works:**

- pluvial waters acting directly on the motorway body will be collected and removed from the body of the motorway through gullies, ditches, guard ditches, drains, cassettes;
- the rainwater on the adjacent land of the motorway will be collected in the ditches at the base of the slope;
- pluvial water sewerage shall be separated on the left and right sides of the motorway;

- before discharging into the emissary, all the drained rainwater will be passed through a sludge separator and by-pass hydrocarbons that ensure efficient rainwater treatment;
- where necessary, decanters, desiccants, grease separators, retention basins were provided;
- in areas where there are no emissaries, the treated rainwater will be discharged into the environment by means of dispersion basins;
- culverts and bridges with 2,00 m and 5,00 m bridge span, were provided;
- Designed culverts operate in free-drain mode;

- **Roadwork rehabilitation works:** Over and undertracking has been provided to ensure the continuity of the national, county, communal and local road network on the motorway area;
- **Maintenance and Support Centers;**
- **Maintenance works:** On both sides of the motorway, roads specifically designed for maintenance work have been provided. These roads will have a 2.50 m roadway and access will be restricted to maintenance personnel only;
- **Traffic safety works: Lucrări pentru siguranţa circulaţiei:** road signs and horizontal marking;

All the works foreseen within the project will be carried out within the territory of Romania. No works will be carried out on the territory of Hungary, so that the construction and operation of the Brasov - Oradea motorway will have no impact on the Hungarian environment.

Brasov - Oradea motorway, Ogra - Borş crosses the territory of four counties: Mureş, Cluj, Sălaj and Bihor. The route is designed outside residential areas. The minimum distance between the axis of the motorway and the boundary of the Hungarian settlements is 4,36 km, so that the construction and operation of the Brasov - Oradea motorway will have no significant impact on residential areas.

As early as the design phase, the route of the motorway was tried not to pass through protected natural areas. Where this was not possible, areas where there are no protected species or habitats are chosen so as not to affect the integrity of the protected natural areas.

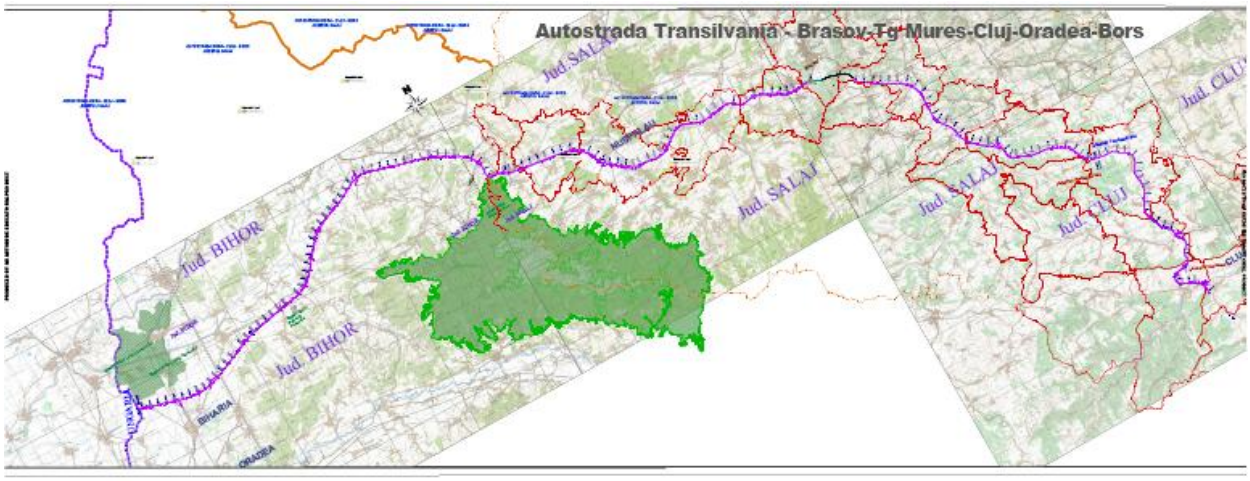

Figure 17. Location of the Brasov-Oradea motorway in relation to the protected natural areas declared on the territory of Romania

On the territory of Hungary, in the immediate vicinity of the Brasov - Oradea motorway site there are no natural protected areas. The minimum distance between the axis of the motorway and the boundary of the protected natural areas is 2.15 km (measured in a straight line up to the limit of the site of community importance HUNH20014 Kismarjai Nagy-szik), so that construction and operation of the motorway will not have a significant impact on the Hungarian environment .

The global impact analysis led to the conclusion that the environmental impact associated with the Orasa - Orasa - Ogra - Bors highway project remains within acceptable limits, the effects generated during the construction phase will disappear within a short time after the completion of the works Maximum 24 months). No potential effects of medium or long-term impacts, effects of significant direct or indirect significance on environmental factors have been identified and effects with cumulative potential remain within acceptable limits.

Also, the impact of the exploitation period is limited. The proposed measures to mitigate / eliminate the impacts of identified impacts have been dimensioned to outweigh the foreseeable impact level and comply with the principles underpinning environmental policies (precautionary principle, pollutant containment principle, biodiversity conservation principle).

Waste generated during the construction works will be collected and stored properly in the site organization, from where they will be taken over by an authorized firm.

The impact generated by the construction of the Brasov - Oradea motorway manifests strictly in its location, it is temporary and reversible, except for areas permanently occupied by works.

For the protection of each environmental factor potentially affected by the construction work, appropriate measures have been proposed for the application of which would lead to the reduction / elimination of the potential impact.

Also, the operation of the Brasov - Oradea motorway, Ogra - Borş sector, will not have a significant impact on the environment. Air quality will not be changed due to traffic conditions. The rainwater that falls at the level of the road platform will be properly picked up and treated (through roadways, retention basins, systems and treatment plants).

Both during the construction of the Brasov - Oradea motorway and during the first three years of the commissioning of the highway, the site of the project will be monitored and the monitoring reports will be submitted annually to the competent environmental protection authorities or at the request of these authorities The need to take additional measures, if necessary.

Taking into consideration the aspects presented in the documentation, it follows that by observing the measures and conditions proposed in the Environmental Impact Report, the project during construction and exploitation does not generate any impact on the environmental factors on the territory of Hungary.

Version translated into English
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