GRADIŠKA-BANJA LUKA (MAHOVLJANI) MOTORWAY
ENVIRONMENTAL IMPACT ASSESSMENT

EXECUTIVE SUMMARY

This document briefly summarizes results of the environmental impact assessment conducted for the section of European road E661 from Gradiška (border of Bosnia and Herzegovina and Croatia) to Banja Luka (Airport Mahovljani).

Environmental Impact Assessment has been prepared as a separate document forming the part of the Feasibility Study for construction of the Gradiška-Banja Luka (Airport Mahovljani) Motorway. Purchaser of the Feasibility Study and Environmental Impact Assessment is the Public Company "Republic of Srpska Roads", Banja Luka, and the consultant is the French company BCEOM, Société Française d'ingénierie from Paris in co-operation with Centar za puteve Vojvodine from Novi Sad, Serbia and Montenegro. Environmental Impact Assessment has been prepared in the beginning of 2004 and delivered to purchaser on April 30, 2004.

Basic Data

Section of Main road M16 from Gradiška to Banja Luka, most heavily loaded section in the Republic of Srpska, is a part of the European road E661 and belongs to the north-south corridor passing through Banja Luka. Road M16 runs from the Croatian border at Gradiška, through Nova Topola, Laktaši and Klašnice to Banja Luka, and then to Mrkonjić Grad, Jajce and south to Livno and Split, thus connecting Banja Luka with the Croatian border to the north, as well as with Pan-European Corridor X, and with the Croatian border to the south and Adriatic sea.

Section Gradiška-Banja Luka (Airport Mahovljani), 29 km long, was the subject of study in the last 30 years. Therefore, the following documentation exists, and it has been used in the preparation of the Feasibility Study and Environmental Impact Assessment:

- Preliminary Design of Okučani (Croatia)-Banja Luka section, 1973,
- Regional plans of Gradiška and Laktaši municipalities, 1986-2000,
- Conceptual Design of Croatian border-Gradiška-Klašnice section, purchaser: Ministry of Transport and Communications, Road Directorate, Banja Luka, consultant: Republic of Srpska Urban Planning Institute, Banja Luka, 1999,
- Environmental Impact Study of Croatian border-Gradiška-Klašnice section, purchaser: Ministry of Transport and Communications, Road Directorate, Banja Luka, consultant: Republic of Srpska Urban Planning Institute, Banja Luka, 1999,
- Pre-Feasibility Study Croatian border-Gradiška-Klašnice section, purchaser: Ministry of Transport and Communications, Road Directorate, Banja Luka, consultant: Republic of Srpska Urban Planning Institute, Banja Luka, 2000,
- Detailed Design of Mahovljani-Glamočani section, purchaser: Ministry of Transport and Communications, Road Directorate, Banja Luka, consultant: Republic of Srpska Urban Planning Institute, Banja Luka, 2002.

Studies in the Conceptual Design phase identified four possible alternatives:

- "West-hill" which runs through the contact of Kozara mountain and Lijevče polje, and west from the rivers (Borna, Osorna, Jurkovica) and channels by which these rivers are regulated in the downstream part;

- "West-field" close to the zone of the first alternative, but on the east side of the mentioned rivers and mainly on the west border of Lijevče polje field area;
- "Regional plan" taken over from the Regional Plan of Gradiška municipality with certain modifications necessary to reflect the existing urbanization in Gradiška area and limitations in the area of airport Mahovljani;
- "Preliminary design" taken over from Preliminary Design of Okučani (Croatia)-Banja Luka section with certain modifications necessary to adjust to the limitations in the area of airport Mahovljani.

For the "West-hill" alternative three zones are identified:
- in the first zone, right after crossing the Sava river, the alignment is placed along the river Jablanica, in the flood protection area (within the flood protection embankments),
- in the second zone, the alignment cuts through the complex of agricultural land in the length of 2,5-3,0 km and
- in the third zone, which forms ¾ of the total length, the alignment is placed in the contact zone of hill and field. The alignment, mainly in the cutting, is placed on the lower part of the hills towards the field, and on the hill part of the rivers. It passes along the west side of the airport.

In the "West-field" alternative, as for the "West-hill", the same three zones are identified:
- in the first and second zone the alignment is more or less the same as in the "West-hill" alternative and
- in the third zone, the alignment is also placed on the contact area of hill and field, but on the field land and on the field side of the rivers. The part of the alignment in the airport zone is identical as in the "West-hill" alternative.

For the "Regional plan" alternative, which passes through the field land of Lijevče polje, three modifications were made:
- on the part from the crossing over the Sava river, on the south border of Gradiška municipality, the alignment is partially adjusted to the existing state of urbanization,
- in the airport zone one section of the alignment is placed in the required direction and length and
- in the final part, the alignment is placed west from the airport. This was done in order to make this alternative competitive to other alternatives, under the same conditions.

The "Preliminary design" alternative, from the point where it crosses over the Sava river to Aleksandrovac, is directly taken over from the Preliminary Design, and mostly follows the corridor of the existing road. In the final part of the alignment, two modifications were made:
- introduction of required direction in the airport zone and
- taking over of the alignment from the Detailed Design of Mahovljani-Glamočani section in the area of the existing communication trench at Airport Mahovljani.

The Republic of Srpska Urban Planning Institute studies recommended the "West-hill" alternative as optimal for further development.

The activities of the Feasibility Study are focused on the assessment of a certain number of alternatives that deal with construction of the road in the defined alternative corridors or with the upgrade of the existing road for future operation. Each alternative solution also includes possible variations in the composition of cross section.

Rationale

The objectives of the investment project are the improvement of traffic capacity on this road by establishment of a new transit traffic scheme and relieving congestion of the corresponding main roads through the Republic of Srpska, as well as the improvement of a group of various effects, highlighting the environmental issues as one of most important.

The project should enable faster growth of the region as well, by shortening transport connections of West and East Europe with Adriatic coast. The economy of the Republic of Srpska and Bosnia and Herzegovina will benefit from faster connections, reduction of transport costs and improved reliability and safety.

Sponsors

Project sponsor is the Government of the Republic of Srpska in co-operation with international financing institutions, first of all with the European Bank for Reconstruction and Development and European Investment Bank.

Project is implemented and managed by the Public Company "Republic of Srpska Roads", Banja Luka.

Environmental Legislation

Project is fully implemented in accordance with the legislation of the Republic of Srpska and the European Union, as well as the requirements of the European Bank for Reconstruction and Development.

Existing environmental legislation of the Republic of Srpska includes:

- Law on Protection of Nature (Republic of Srpska Official Gazette, No. 52, 2002),
- Law on Environmental Protection (Republic of Srpska Official Gazette, No. 53, 2002),
- Law on Air Protection (Republic of Srpska Official Gazette, No. 53, 2002),
- Law on Water Protection (Republic of Srpska Official Gazette, No. 53, 2002) and
- Law on Waste Management (Republic of Srpska Official Gazette, No. 53, 2002).

Law on Environmental Protection stipulates the elaboration of environmental impact assessment for the purpose of identification, description and analysis of direct and indirect impacts of a certain project on environmental elements and factors (humans, flora, fauna, soil, water, air, climate, space, material goods, cultural heritage and interaction of these factors). Project sponsor has to submit approved environmental impact assessment when applying for the construction permit. The body responsible for enforcement of these laws, Republic of Srpska Ministry for Urban Planning, Civil Engineering and Ecology is, at the same time, responsible for evaluation and approval of environmental impact assessment, as well as for organization and realization of public consultations.

Present Environmental Conditions

Environmental characteristics before motorway construction can be described as follows.

Relief and Landscape

In the terms of geomorphology the area that was analysed in defining the alternatives for motorway alignment belongs to the low-land terrain of Lijevče polje and to a smaller extent to its west border. Hilly terrain with higher ground is the hinterland of Lijevče polje alluvium extending to the south-west, south and east. These are mostly slight slopes that gradullay rise into hilly terrain and with the grade up to 20° in respect to horizontal. These slight slopes slowly rise into hilly terrain, and then into the massif of Kozara mountain. Central ambiance

value is represented by the Sava river. Height of the ground in the studied area varies from 92 m to 130 m above sea level.

Soil

Sediments of Quaternary age are dominant. Older rocks (Triassic, Jurassic and Cretaceous age) form a smaller part of the ground, mainly in the area of mountains Kozara, Prosara and parts of Motajica. The biggest part of Lijevče polje wider area is formed of Neogene sediments, mainly sands, gravels, clays, marl and sandstone, small amount of conglomerates and lime stone, and sediments of Eocene and flysch series.

Spatial alluvial plain of the Vrbas river in this area is formed of Quaternary sediments. It is represented by alluvial gravels, sands and muddy clays, faeces of stagnant tributary, marsh sediments, alluvial-piedmont sediments, piedmont cones and terraces.

In the north part, along the Sava river, the ground is mainly covered with meadows and pastures, with occasional fields, while the area of Lijevče polje is intensively utilized for agricultural production, with necessary hydro-melioration works and improvements of physical characteristics. The hills of Kozara mountain are predominantly covered with pastures, meadows and orchards, and the ground is erosive.

Climate

Specific position of Dinaric high mountain massifs restrains the penetration of air masses from Mediterranean sea, and, due to the opening to the north, south-west and south-east, lower Vrbas area is exposed to the north and north-west penetration of air which comes from northern latitudes of the Atlantic Ocean, Central and North-east Europe and Siberia. Therefore, the area of lower Vrbas is characterized by temperate continental climate, although it is at a relatively small distance from the Adriatic Sea.

The area is characterized by long and hot summer periods, while winters are moderately severe and relatively long. Analysis of the average monthly air temperatures shows the lowest temperature in January, and it varies from -0,3°C to -1,8°C, while July is the warmest month with average temperature from 20,1 do 20,9°C in the observed area. Absolute maximum of the air temperature occurs in July and August, and varies from 38,0°C to 41,4°C, while absolute minimum of the air temperature occurs in January and February, and varies from -27,4°C to -31,5°C. The area is also characterized by high relative air humidity (above 75 %), higher number of days with precipitations (every 2-3 days), high number of days with fog (around 40 days), as well as with characteristic north and west winds, but with expressed periods of silence with about 30-50 % days without wind.

Hydrology

The studied area is characterized by high water potential of Sava and Vrbas rivers, and the planned motorway would run through their river basins

An important potential is the water spring in Lijevče polje, which is the reservoir of quality ground water with the possibility to secure regional supply of drinking water. Ground water is fed from surface flows (Vrbas and Sava), irrigation channels Osorna-Borna, Jurkovica and Nova Topola-Jablanica and by infiltration of precipitations, especially in those parts of Lijevče polje where there are gravel sediments on the surface, west of Gradiška-Nova Topola line.

Existing water pollution is a consequence of untreated industrial water and sewerage discharge and application of agro-technical measures during agricultural production.

However, intensity of these impacts is not important yet, and sample analysis of ground waters shows that the waters can be classified in II and I class.

Flora

The assessed area can be divided into two characteristic areas: area of the hilly terrain of Potkozarje and Lijevče polje area.

The area of hilly Potkozarje is covered with forests of cinnamon strawberry, oak tree, plain hornbeam, aspen, birch and willow, as well as with transitional stages of cinnamon strawberry and beech communities, beech and plain hornbeam and plain hornbeam communities. This area is also characterized by the presence of the following plants: sweet chestnut, heather, silver linden, bitter oak, willow and blackberry.

Lower ground of Lijevče polje is the habitat of oak, plain hornbeam, ash, marsh forests, black alder, hydrophilic forests of oak with gorse, and on Vrbas banks, forests of willows and poplar. There are no large plant communities on this agricultural land.

There are no endemic species in this area, but, due to human activities, certain changes occurred in the range of some species and plant communities, as well as in their structure and composition.

Fauna

The analyzed area is the habitat of various animal species, including big and small game. Game that can be found in the area includes deer, rabbits, partridges, pheasants and rarely wild boar. Game mainly settles in forests, but also on pastures, meadows and agricultural land. In the area of Berek, Romanovci and Cerovljani, there is a large number of birds' nests.

Negative impacts of human activities are visible predominantly on the east part as a consequence of urbanization, intensive agricultural production and transportation infrastructure, above all the road Gradiška-Banja Luka, while on the west part there are no significant negative impacts.

Cultural and Historical Heritage

The area from Gradiška to Banja Luka is a treasury of different cultures that determined the flow of cultural development from pre-historic to present times. There are some important sites of historical heritage in this area:

- pre-historic settlements, necropolis, marshes and Slavonic ring at Mahovljani,
- Roman Empire settlements at Laktaši and Berek,
- servitium and remains from the Roman Empire and Middle age at Gradiška,
- remains of a Roman road from Gradiška to Klašnice,
- remains from late Middle age at Đurića brdo and
- church St. Nicolas from the XVIII century at Romanovci.

Settlements and Existing Infrastructure

The planned motorway runs west of the urban area of Gradiška, as well as in the wide area of a certain number of settlements, mainly villages, the biggest ones being Nova Topola, Aleksandrovac and Mahovljani.

There are many infrastructure facilities in the assessed area:

- Main roads M14.1 Kozarska Dubica-Gradiška-Nova Topola-Srbac and M16 Gradiška-Banja Luka, Regional roads R477 Čatrnja-Nova Topola and R478 Vrbaška-Ivanjska, and dense network of local roads providing access to villages and agricultural land,
- Airport Mahovljani serving as the regional air traffic centre,

- water supply and sewerage network at Gradiška and Laktaši area,
- local and long-distance electric power network,
- sport and recreational grounds at Gradiška and Laktaši.

Negative environmental impacts of the studied area are predominantly the consequence of urbanization and traffic on the Main road M16 Gradiška-Banja Luka and include noise, vibrations and air pollution. These impacts are localized in the immediate vicinity of the road.

Potential Environmental Impacts

Gradiška-Banja Luka (Mahovljani) Motorway project comprises the construction of a modern motorway, that is going to be constructed according to the regulations of the Republic of Srpska, the European Union, TEM standards and the European Bank for Reconstruction and Development guidelines on environmental protection. Primary environmental impacts resulting from the construction of this motorway are related to:

- soil, water and air pollution resulting from traffic,
- land occupation,
- traffic noise,
- disposal of excavated material,
- fauna and
- social impacts.

Environmental Impact Assessment has been performed on the basis of the information available at the time of preparation (previous and ongoing studies published in the region, as well as additional field survey).

Soil Pollution

Soil pollution from the fuel components and/or motor oil and heavy metals can be expected in the vicinity of motorway, in the Lijevče polje area, in the vicinity of agricultural land.

Water Pollution

In case of inadequate collection of rain waters polluted with fuel components and/or spills, it is possible to expect ground water pollution in the Lijevče polje area.

Air Pollution

Air pollution can be expected as a consequence of vehicle exhaust gases emission, above all carbon monoxide (CO), nitrogen oxides (NO_x), sulphur dioxide (SO_2), hydro carbonates (C_xH_y), lead (Pb) and sooth particles and dust. It can be expected that the prescribed limit values, related to mean annual concentrations, will be exceeded for distances not bigger than 30 m from the edge of the carriageway. This is mainly the consequence of traffic volume and free corridors without edge construction.

Land Occupation

The planned area of land for the motorway is around 300 ha. This impact can not be eliminated with any protection measures, but having in mind the quality and use of land, there is a significant economic advantage of "West-hill" alternative, which does not include a large area of agricultural land.

Noise

Motorway section from Gradiška to Banja Luka (Airport Mahovljani), passes mainly through uninhabited area, but also comes close to the settlements (Gornja Čatrnja, Vukovac, Cerovljani, Vilusi, Mašići, Romanovci and Krnete). The foreseen traffic noise levels are around 76 dB(A) during daytime, and around 66 dB(A) in the night, on the distance of 25 m

from the edge of the carriageway. There is a need for installation of noise barriers at mentioned settlements.

Disposal of Excavated Material

There is a need to deposit excess material from cuts, as well as low quality material, at appropriate and previously prepared dump sites, which will be defined through the Detailed Design.

Fauna

Motorway construction is expected to have negative impact on fauna at the west border of Lijevče polje and Kozara mointain hills, especially on habitats and migration of game.

Social Impacts

Motorway construction will lead to changes in the economy as the traffic on the existing road from Gradiška to Klašnice will decrease significantly and result in major loss of current profit levels particularly in the service industry. However, significant positive effects are also expected, such as the higher value of real estate along the motorway and employment of local labour.

Proposed Environmental Protection Measures

The necessary protection measures should be defined during design, construction and operation of motorway.

Water Protection

The planned concept of rainwater drainage and protection of ground and surface waters includes the following:

- rainwater will be let into the recipient over the system of drainage protection channels from both sides of the road structure without any particular treatment,
- in the regions surrounding the water intake area, water will be drained by the system of watertight channels to the retention where, after treatment of grease and oils at the separator, it is let into the recipient,
- in the area of the Vrbas river basin, water will be led by a watertight channel system to a separator for grease and oils and after treatment let into the river.

In case of accident-related pollution in the Lijevče polje area, it is necessary to implement special protection measures which include controlled capture and drainage of water, and safety measures in the road cross section which will prevent car accidents and hazardous load spills.

Exact locations and type of protection measures will be defined through the Motorway Detailed Design, after additional geological and hydrological explorations.

Air Protection

Air protection measures will mainly be ensured through landscaping of the area around the road, and type and density of planting will be defined in Detailed Design of Technical Protection Measures.

Soil Protection

Measures envisaged for water and air protection also ensure efficient soil protection.

Measures for mitigation of negative impacts on morphology and landscape, and mitigation of surface erosion of embankments and cuttings will be planned in Detailed Design.

Noise Protection

During preparation of Motorway Detailed Design, technical measures for noise protection will be designed for settlements Gornja Čatrnja, Vukovac, Cerovljani, Vilusi, Mašići, Romanovci and Krnete. Appropriate protective measures will be implemented during construction.

During operation of the motorway, adequate restrictions of construction works along the motorway will be introduced and the increase in noise levels that is expected as a result of traffic volume growth will be closely monitored.

Excavated Material Disposal Sites

Disposal of excavated material that is suitable for later utilization will not be allowed outside the road area. Existing borrow pits will be used in case of lack of good quality material for construction works.

Disposal of excess and low quality material from cuts will be allowed only at approved and previously prepared locations, which will be defined in the Detailed Design.

Special attention will be paid to collection of urban waste in order to prevent the creation of illegal dump sites.

Fauna Protection

On the whole length of motorway, on both sides, fences will be erected to restrict access to the road.

Visual monitoring of migrations of wild animals will be organized after motorway construction, and if the need arises animal crossings will be constructed.

Environmental Action Plan

Preparation of Environmental Action Plan as part of Environmental Impact Assessment is determined in the Terms of Reference.

Recommendations for management of activities during design, construction, operation and maintenance of motorway are elaborated in the Environmental Action Plan.

Fulfilment of all environmental protection specifications is planned during the construction phase. Above all, there is a necessity to hire an Environmental Engineer to supervise the execution of works in terms of protection of the project sponsor interests. The engineer will be hired as a member of the construction works supervision team.

Furthermore, the constructor shall have, in his own team, person(s) responsible for environmental protection monitoring in according with the requirements of tender documentation.

During the implementation of Environmental Action Plan, the Environmental Engineer shall provide detailed procedures, technical guidelines/instructions for monitoring purposes.

Monitoring

Monitoring of environmental protection for Gradiška-Banja Luka (Airport Mahovljani) Motorway includes monitoring of air, soil, surface and ground waters quality indicators, noise levels, flora and fauna.

Monitoring will include the following:

- precise determination of sampling points,
- determination of measurement frequency,

- procedures of measurement in accordance with the regulations,
- detailed analysis of results and
- recommendations of additional protection measures and mitigation of negative impacts.

Public consultations and disclosure

During Environmental Impact Assessment of the Gradiška-Banja Luka (Airport Mahovljani) Motorway, consultations and disclosure of information have been conducted as follows:

- environmental impact assessment scoping has been performed during consultations with expert and professional organizations and societies dealing with environmental protection,
- public discussions were held at Gradiška and Laktaši municipalities, through which the motorway runs,
- environmental impact assessment has been available to public for 30 days, and the public has been asked to deliver its written comments,
- environmental impact assessment has been published on the web site of the Republic of Srpska Ministry for Urban Planning, Civil Engineering and Ecology (www.mpugie.rs.ba/news.php?nid=4),
- comments and results of public discussions were analyzed and in justified cases included in the final document of the environmental impact assessment.