ENVIRONMENTAL IMPACT ASSESSMENT OF THE RIJEKA – ZAGREB MOTORWAY PROJECT

EXECUTIVE SUMMARY

This document summarises the environmental impact assessments carried out on two sections of the Rijeka – Zagreb Motorway, i.e. Kupjak –Bosiljevo and Karlovac – Bosiljevo.

Project Description

The proposed project involves completion of the 148.45 km M12 Motorway between Zagreb and Rijeka. The project is an integral component of the international European motorways, E-65 and E-71 (Budapest – Leneye - Varaždin – Zagreb – Rijeka - Trieste) and E-59 (Graz – Maribor – Zagreb - Karlovac – Split).

The sections Rijeka-Kupjak (47.59 km) and Karlovac-Zagreb (40.03 km) are open, operational and subject to direct user tolling.

The remaining Motorway section Kupjak-Karlovac (60.83 km) will be completed within the framework of this project. This motorway part comprises of two sections:

- Kupjak –Vrbovsko - Bosiljevo; and
- Krlovac – Bosiljevo.

Two separate EIAs were commissioned the Croatian Road Authority and prepared by the Croatian Civil Engineering Institute, as follows:

- Preliminary Study on the Environmental Impact of Rijeka-Karlovac Highway, Section: Kupjak – Bosiljevo, September 1992;
- Environmental Protection Study, Highway Karlovac – Rijeka, Section Karlovac-Bosiljevo, July 1996.

The following additional documents have also been commissioned, prepared and submitted to the Croatian Road Authority:

- Annex to the Environmental Impact Assessment study -- List of Possible Impacts of the Highway on Animal Population, March 1993;
- Additional Investigations of Possible Highway Corridors in the Canyons of Kamacnik and Dobra, April 1993;
- Additional Research on Road By-Passes for Settlements of Jablan, Japici and Rožman Brdo, April 1993;
- Additional Investigations of Alternative Locations of Vrbovsko Inter-section, April 1993.

Construction of the project has already begun.

Rationale

The project should help develop trade and tourism between Western and Middle Europe, the Croatian coast and the Balkan region. As a major access road, the Motorway should facilitate post-war reconstruction in the region. The Croatian national economy will also benefit from more rapid connections, reduced transport costs and improved reliability and safety.

Project Sponsors

The project is sponsored by a private sector consortium via a special purpose concessionaire, Autocesta Rijeka-Zagreb (ARZ).

ARZ was incorporated in Zagreb pursuant to the Decision of the Government of the Republic of Croatia of 11 December 1997, as a fully State owned company. Its main activities are the financing, construction, operation and maintenance of the Rijeka – Zagreb Motorway. By the same Government's Decision of 11 December 1997, the State granted to ARZ concession rights over the Motorway over a period of 28 years.

During 1998, ARZ organised competitive tenders and awarded contracts for certain key engineering structures on the uncompleted section of the Motorway.

Applicable Environmental Standards

The project has been developed to fully comply with environmental regulations of the host country as well as the EU and the EBRD. Particular attention has been paid to environmental impact assessment, environmental performance and public consultation requirements.

Croatia has a well-developed set of environmental laws. There is a requirement under the Law on Environmental Protection (NN 82/94) for a comprehensive review of a project's potential environmental impacts (By-Laws on Environmental Impact Assessment, NN 34/97 and NN 37/97). The agency responsible for review and approval of environmental impact assessment (EIA), the Ministry of Environmental Protection and Physical Planning is also the main agency responsible for implementing the laws related to nature conservation, potential air emissions, water/wastewater management, and solid waste management. The assessment presented in this EIA incorporates information presented in the Croatian requirements for EIA.

As part of its plan to seek admission to the European Union (EU), Croatia has been making progress in harmonising its environmental laws with those of the EU. For example, the Croatian Law on Environmental Protection (NN 34/97), Law on Nature Conservation (NN 30/94), Law on Waste Management (NN 34/95), Law on Air Protection (NN 48/95) are being continuously updated to conform to EU Council Directives.

Existing Environment

The environmental features and conditions in the project area can be described as follows:

Relief and Landscape

- The sub-section Kupjak – Vrbovsko is situated in a mountainous area characterised by peaks of 600 to 800 m above sea level. The area belongs to the Dinaric Mountain Chain and its geomorphology is characterised by karst phenomena: numerous crevices, cuts, valleys, karst fields and depressions. It is known as 'high karst'. There are smaller and bigger watercourses in the area with the narrow valleys. The deepest valley is the Dobra river valley;
- The sub-section Vrbovsko-Bosiljevo is significantly lower, i.e. the altitude in Vrbovsko is 500 m above sea level and Bosiljevo is 220 m. This area is characterised as 'low covering karst'. It also has bare areas, so called 'green karst'. The other characteristic of low covering karst is the frequent occurrence of very deep depressions;
- The sub-section Karlovac – Bosiljevo is characterised by a low to hilly landscape with heights of 120 to 220 m above sea level. This area is also characterised as 'low covering karst'.

Soil

- The section Kupjak – Bosiljevo is in the Gorski Kotar area. In the southern part the soil is comprised of Jurassic lime stone; the north and central part is characterised by Palaeozoic sand, while the other sections of the motorway traverse areas of low covering karst built of Mesozoic lime stone and dolomites dating from the Cretaceous and Jurassic ages;
- Several points along the route are characterised by agriculturally valuable soils.
- The Karlovac – Bosiljevo section is situated in the area characterised by a complex soil structure of Halocene sediments, Tertiary sediments and Mesozoic lime stone and dolomites.

Climate

- Both sections, Kupjak – Bosiljevo and Karlovac – Bosiljevo are characterised by humid climate with dominant features of continental climate in the entire area. At higher altitudes, the medium annual temperature slowly decreases and the humidity increases. Summers are warm to moderately warm and short, while winters are severe (below -5°C, mostly in January).

Hydrology

- Major parts of the motorway route will pass through the water basin area of the Dobra and Kupa Rivers. The Kupa River basin represents a very rare, almost entirely unpolluted watercourse. The basin of nearly 11,500 km^2 stretches predominately in the zone of karst with large number of bigger and smaller tributaries and 2 lakes;
- The Dobra River flows into the Dobra River valley and passes over a karst plateau, which is very sensitive to pollution due to its porosity. The Dobra River belongs to water quality categories I and II, while the Kupa River is classified as

having a watercourse river water quality of II. These categories indicate that these rivers have been protected from industrial or urban pollution;
- A section of a motorway will pass in the vicinity of a second protection zone of drinking water source.

Flora
- The entire Kupjak – Karlovac section is characterised by forests of beech and fir, with minor spruce fir culture. Common and black pines are also present. In lower areas, some oak and hornbeam woods have been developed. The forests represent a good ecological feature of the area, which influences the water regime, prevents erosion and mitigates against climatic extremes. The motorway construction will encompass approx. 174 ha of land and reduce the total areas of forests by approx. 68 ha, agricultural land by approx. 37 ha, and hay fields, wood and pastures by approx. 67 ha.

Fauna
- The hills and valleys of the entire area contain habitat for large and small game and other species. Deer, bears and wolves can be found in the entire area. The lower areas are home to dormouse, squirrel, the common hamster, field mouse, hedgehog, etc.;
- The motorway route will cut through a habitat of large predator mammals such as wolf, bear and lynx;
- The upper parts of the Kupa River are inhabited by trout (family Salmo), while the low parts have a great number of carp, perch, catfish and pike.

Cultural and Historic Features
- In the area of Karlovac – Bosiljevo there are a significant number of cultural, historical and natural monuments, resources and areas of natural beauty, among which are the ruins of the medieval town of Novigrad with its gothic-baroque Church of Maria;
- An unusual type of park is located near the old town of Bosiljevo. It protects specific spices of plants, which originated in a natural old forest. It has been proclaimed as a "monument of garden architecture". St. Mauro and St. Anton's Churches in Bosiljevo are also of historical significance.

Settlements and Existing Traffic
- The motorway will pass by four larger towns: Ravna Gora, Vrbovsko, Bosiljevo, Novigrad and Karlovac; the largest of these is Karlovac;
- The area around Karlovac is an important crossroads representing the shortest traffic connection between Europe, North Croatia and the Adriatic Sea.

Impacts

The proposed project involves the construction of a modern motorway, which will be built according Croatian and EU environmental standards and guidelines. The primary environmental impacts associated with construction of the motorway are related to:
- Air emissions, water pollution and noise caused by traffic;
- Disposal of construction material;

- Wildlife; and
- Landscape infringement.

The evaluation of environmental impacts in the EIAs is based on the best available information at the time when the studies were prepared.

Air Emission Impacts

- The following four basic groups of potentially harmful emissions generated by future traffic were identified: particulates, CO_2, C_xH_y, SO_2, NO_x and lead. These emissions are caused by the following conditions:
    - Position of the route of the motorway in relation to terrain (cut, embankment, tunnel, viaduct, forest belt, etc.);
    - Traffic intensity and speed of vehicles on a motorway;
    - Vehicle fuel type and quality;
    - Vehicle standard, its maintenance level and age;
    - Meteorological conditions; and
    - Motorway construction and side vegetation.
- It is estimated that the average annual daily traffic will be over 18,500 vehicles/day in the year 2015. Based on experience in similar projects in Croatia and Europe, it is concluded that the air pollution level at the end of the planned period will not exceeded EU air quality standards.

Water Pollution Impacts

- As emphasised in previous text, this motorway will be built on limestone karst in Gorski Kotar which is extremely sensitive to water pollution. Due to karst porosity, run-off (storm water mixed with grease and oil) and possible spills (oil and/or fuel) if not collected adequately, may cause pollution of surface and groundwater sources, which are located along both sections, Kupjak – Bosiljevo and Karlovac - Bosiljevo.

Noise Impacts

- The motorway sections Kupjak – Bosiljevo and Karlovac – Bosiljevo will pass through mostly uninhabited areas. However, they will also encroach upon settlements (approx. 18-23%) and in few cases, pass closely by them. It is estimated that noise barriers to protect settlements from noise will need to be provided at these sites where the noise generated by the traffic will be above the maximum allowed level.

Disposal of Construction Material

- Due to the mountainous area where the motorway is located, large quantities of excavated materials will need to be adequately disposed off prior to being reused. Disposal sites will need to be selected and adequately prepared to avoid contamination of water sources.

Wildlife

- The construction of the motorway could have a negative impact on the habitat and movement of a number of animal species including bears boar, deer and/or wolves.

Mitigation Measures

Protective and mitigation measures will be carried out during project:

- Design;
- Implementation; and
- Operation and maintenance.

Air protection

- In places where the motorway cuts through cultivable soil, hedges will be planted to reduce air emission impacts. The type and density of hedges will be determined in technical specification documentation;
- AZR is obliged to participate in the financing of the "Global atmosphere monitoring in Croatia" in compliance with provisions for the basic monitoring;
- Forced ventilation in the Veliki Glo žac Tunnel, the automatic fire alarm and internal hydrant net will be provided.

Surface and groundwater protection

- Since the motorway sections Kupjak – Bosiljevo and Karlovac - Bosiljevo pass through karst areas which are very sensitive to pollution of underground waters, drainage of the sections will be addressed through the construction of a closed, controlled and watertight wastewater collection system. This system will ensure collection of wastewater from the carriageway and effluents from oil and grease separators. Effluents will be discharged after treatment. In the more sensitive areas, wastewater will be treated in separators and will be allowed to settle into lagoons;
- After additional geological and hydrological investigations are completed, locations of wastewater lagoons and lagoon outlets (micro location of each individual outlet) will be determined;
- Sites for disposal of sludges generated in separators and lagoons will be determined by the competent local authority on the basis of investigative studies;
- Special attention will be paid to aesthetic wastewater lagoon appearance, and its appearance in relation to natural environment, using to the maximum the natural geomorphologic forms;
- In the case of motorway accidents when pollution of ground waters may occur, procedures and measures will be determined for remedial actions.

Noise reduction

- During the review of the technical documentation it will be necessary, based on technical parameters to make an estimation of noise intensity at settlements along the motorway route, adequate measures will be implemented;
- Following the motorway commissioning procedure, control measurements of noise level will be made and, where applicable, adequate aesthetically designed noise barriers will be erected.

Disposal of construction material and waste management

- Where appropriate, excavated material will be stored for further use. In case of a shortage of fill material, a borrow site will be created;

- Special attention will be paid to municipal waste management (e.g. at the service centre and rest stations) in order to avoid inappropriate municipal waste dump sites and to ensure that the attraction of these locations for animals is reduced;
- Locations for the final disposal of waste removed from separators and lagoons will be determined in consultation with expert institutions.

Provision of fencing and animal underpasses

- On the complete length of the motorway route a safety fence need to be erected on both sides. The height and type of the safety fence to be chosen according to the kind of the wild and height of snowdrifts (ca. 1,8 to 2,4 m). As a low safety fence does not present an obstacle for bears, on the places of possible bear passage a special fence will be erected;
- Construction of passages for bigger animals will be carried out in a way that that animals can quickly adjust to and find them easily. This will be achieved by placing landmarks (hedges, solitaire trees, cuts through woods) into the landscape or by planting bushes, grass or trees forming attractive food for the animals;
- A number of adequate passages - tunnels to enable undisturbed daily and seasonal migration of game (game animals) will be built;
- Means of monitoring the migration and health status of wild animals after the motorway has been built, will be provided;

Prevention of landscape infringement

- All ancillary components of the motorway (existing roads, quarries, disposal sites, etc.) will be maintained during the construction period. After the construction is completed, the sites will be returned to their previous state;
- Mandatory biological repair along both sections of the motorway is envisaged. Therefore, all cuts, fills, and separation areas need to be stabilised not only by technical means but also through planting;
- During planting, care will be taken not to chose plants that attract animals on places other than the provided passages.

Monitoring

The monitoring programme will include determination of the base line conditions of air, soil, surface water, groundwater, noise, flora and fauna in selected, most sensitive points of the sections Rijeka – Bosiljevo and Karlovac – Bosiljevo.

Each of the above parameters need to be subjected to the following analysis:

- Measurement of a quality (particularly the quality of flora);
- Sampling points;
- Measuring procedure according to the Croatian standards;
- Evaluation of measuring results;
- Recommendations and suggested action measures.