

ROAD SECTION TARČIN-KONJIC OF CORRIDOR Vc

General information

This project refers to the **improvement of the Corridor Vc road section Tarčin-Konjic**¹.

In Bosnia and Herzegovina, trunk roads and regional roads extend for 8.501 km. Together these form the core road network of the country². The essential function of trunk roads is to connect the main economic and administrative centres of the country. In this network, there are also six European roads (i.e., E-roads), which extend for a total length of 995 km and that are classified in compliance with the European Agreement on the Main International Roads.

The need to improve the motorway sections of Corridor Vc has been included in the Memorandum of Understanding for the development of the core transport network of the South-East Europe³, which is based on the development of the road Core Network and in the Framework of Transport Strategy of Bosnia and Herzegovina (2016). Moreover, in final report of the EC High Level Group (EC, 2005), Corridor Vc has been identified as the only transnational axis of Bosnia and Herzegovina of significant importance for the European transport policy.

The road Corridor Vc connects the central coast of the Adriatic Sea with Budapest, representing a major route for many key trans-European communications. The road Corridor Vc is split into 9 sections, for a total length of around 336 km. The allocation of the sections - from North to South - is illustrated in Table 5-1 and displayed in Figure 5-1.

Table 5-1: Sections on the road Corridor Vc in Bosnia and Herzegovina (from north to south)

Section	Length [km]
Svilaj-Karuše	59,83
Karuše-Donja Gračanica	60,96
Donja Gračanica-Kakanj	23,93
Kakanj-Vlakovo (under construction)	45,35
Vlakovo-Tarčin	19,73
Tarčin-Konjic	21,15
Konjic-Jablanica	14,50
Jablanica-Mostar North	32,29
Mostar North-Southern border with Croatia	58,23
Total	335,97

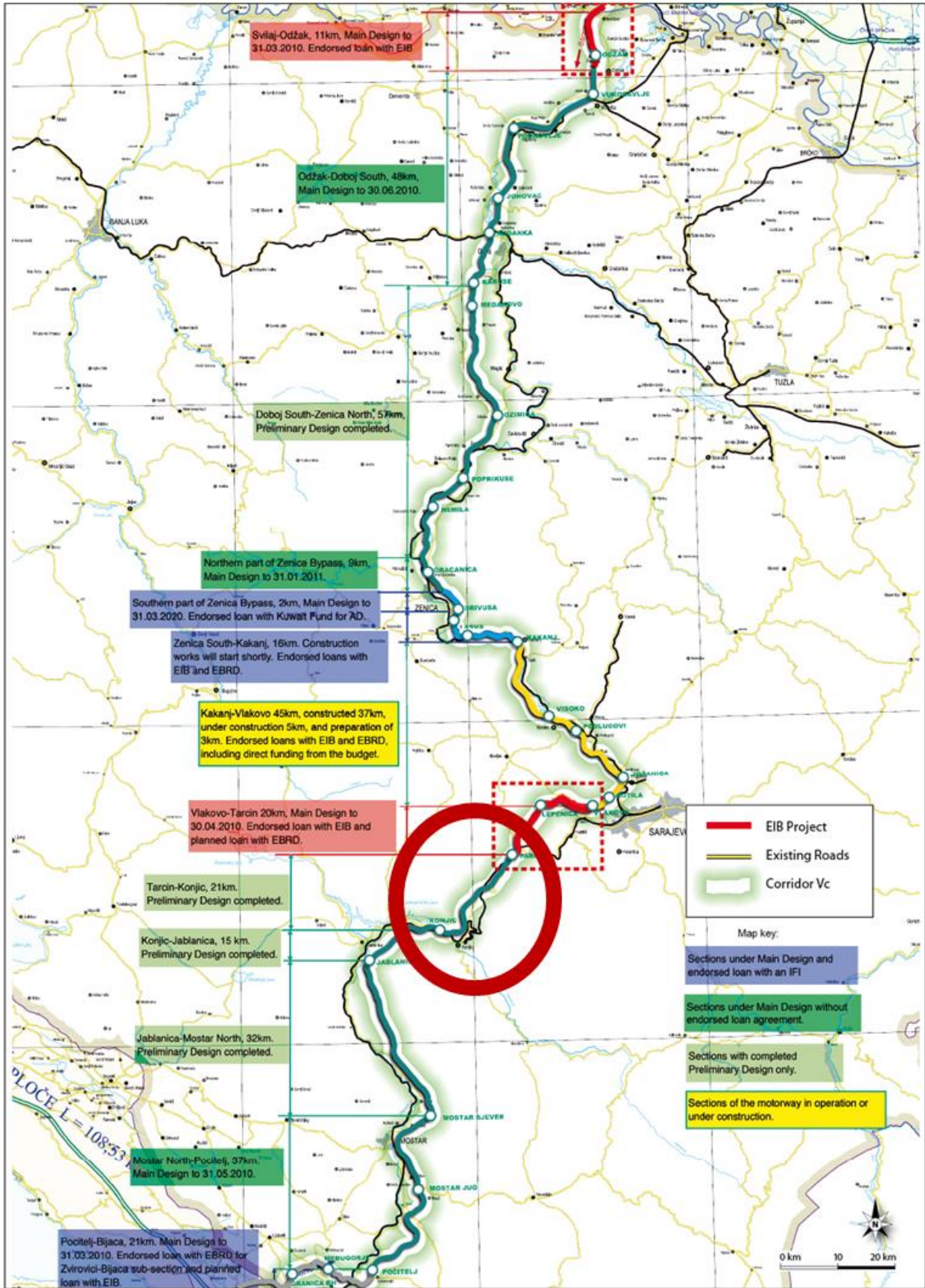
Source: IPSA-Sarajevo and IGH-Zagreb (2006)

¹ Corridor Vc is a road and rail corridor. It starts in Bosanski Samac (Northern border of Bosnia and Herzegovina with Croatia) and ends in Bijaca (Southern border of Bosnia and Herzegovina with Croatia).

² The total length of the trunk roads is 3.750 km (i.e., 44%), while the total length of the regional roads is 4.751 km (i.e., 56%).

³ On 11 June 2004, the “Memorandum of Understanding on the Development of the South-East Europe Core Regional Transport Network” has been signed in Luxembourg, on the one part, by Albania, Bosnia and Herzegovina, Croatia, former Yugoslav Republic of Macedonia, Serbia and Montenegro (incl. Kosovo), and on the other part by the EU Commission. This Memorandum was amended by the Addendum of 4 December 2007 regarding railway transport.

Figure 5-1: Motorway sections of Corridor Vc and localisation of the section Tarčin-Konjic



Source: TRT elaboration on EIB map

Technical description

The basic **technical and operational characteristics** of the alignment are the following:

- characteristics have been assumed according to TEM Standards and Recommended Practice (UNECE, 2002) for a design speed of 120 km/h,
- length of the section: 21,15 km;
- maximal longitudinal gradient: 4,99%;
- minimal curve radii: 650 m (except for the sub-section Drivuša-Kakanj, where the minimum is 450 m),
- characteristics of the transversal section:
 - 2 traffic lanes per carriageway, each 3,75-m wide (i.e., 15,00 m in total);
 - 2 emergency lanes, width of 2,50 m each (i.e., 5,00 m in total);
 - central reserve, width of 4,00 m;
 - 2 shoulders width of 1,00m (i.e., 2,00 m in total);
 - 2 berms after the shoulders, width of 2,0 m (i.e., 4,00 m in total).

The total **estimated investment cost** for this section is equal to € 469,02 million (i.e., € 22,17 million per km) (see Table 5-2).

Table 5-2: Estimated construction costs of the section Tarčin-Konjic

Item	Cost [€ million]
Construction costs	375,14
Other costs (designing, supervision and unforeseen works)	22,51
Land acquisition/reimbursements	3,22
Total realisation costs net of VAT	400,87
VAT (17%)	68,15
Total realisation costs	469,02

Source: IPSA-Sarajevo and IGH-Zagreb (2006)

The costs of the maintenance activities, according to the data of Road Directorate of Bosnia and Herzegovina for 2004, are shown in Table 5-3.

Table 5-3: Road maintenance costs for roads in Bosnia and Herzegovina

Type of Maintenance	Unit of measurement	Financial cost	Economic cost
Potholes	€/m ²	24,95	22,47
Cracks	€/m ²	5,92	5,34
Rutting	€/m ²	18,65	16,80
Shoulders	€/m ²	146,95	132,38
Resurfacing	€/m ²	16,86	15,19
Monitoring	€/km	503,82	453,89
Winter maintenance	€/km	3.205,65	2.887,97
Structures	€/km	32,96	29,69
Marks and signs	€/km	1.064,58	959,08
Settings, cleaning, ditches, drainage, etc.	€/km	492,34	459,34

Source: Road Directorate of Bosnia and Herzegovina (2004)

Project implementation

The project implementation schedule needs finalisation. According to the Government of Bosnia and Herzegovina, the project is mature and ready to be implemented, though the project management and supervision organization are not yet defined, as well as procurement plan and the source of financing.

Transport demand

Traffic forecast and modelling for the network with and without the motorway were carried out in accordance with the foreseen schedule of realisation per sections for the timeframe of 30 years upon putting individual sections into operation. Traffic forecasts were developed through network modelling.

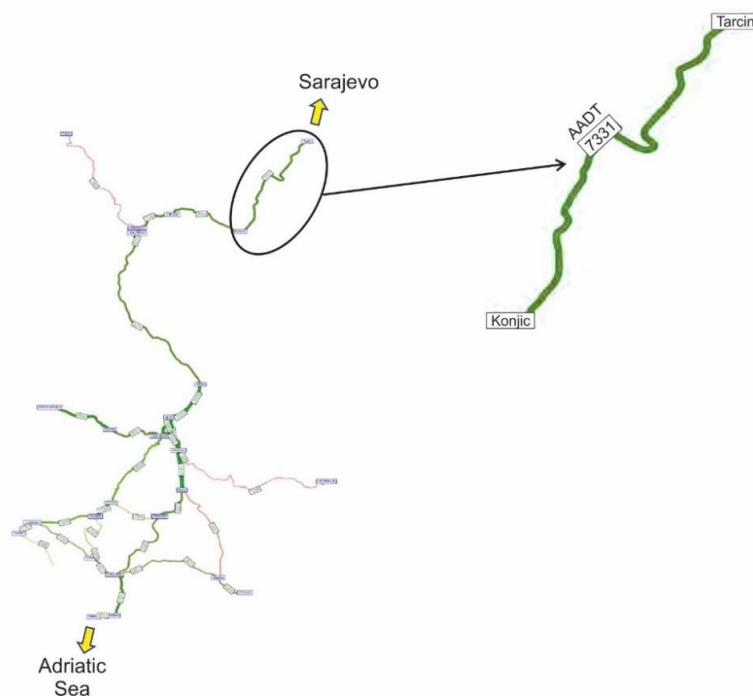
The adopted methodology for the analysis and traffic forecasts has been based on demand flows amongst specific zones, within wider area of the treated motorway. The influence area of the Motorway in Corridor Vc included the territory of Bosnia and Herzegovina and it extended to the neighbouring countries.

The forecasts were elaborated assuming the **average annual traffic growth rates** for Bosnia and Herzegovina of 5,8% in 2006 and 3,2% from 2036 onwards, which were assessed on the basis of a detailed socio-economic analysis and forecast.

Within the traffic study, the forecast of the expected generated traffic upon the construction of the motorway was also determined. Also, the analysis of “willingness to pay” regarding toll rates on motorway was carried out. All numerical and graphical presentations referring to volumes, composition and conditions of the traffic for the base year 2005 and all the time intervals (years of putting individual sections into operation and five-year intervals) are provided by the traffic study.

Figure 5-2 illustrates the estimated traffic along the relation Sarajevo South (i.e., Tarčin)-Southern border with Croatia, with focus on the section from Tarčin to Konjic.

Figure 5-2: 2005 AADT on Tarčin–Konjic along the relation Sarajevo South (i.e., Tarčin) – Southern border with Croatia



Source: TRT elaboration on figure from Traffic study, IPSA-Sarajevo and IGH-Zagreb (2006)

In 2005 (i.e., the base year), the **most intensive traffic flows** were recorded at sections of the trunk road M17 Mostar-Gnojnice, Mostar crossroads-Hadžići, Doboj-Karuše, Mostar North-Mostar and Buna-Žitomislčići, with an average annual daily traffic (i.e., AADT) between 13.000 and 16.000 vehicles.

At the linking roads, the most intensive traffic flows were recorded at section Karuše-Jelah, with over 12.000 AADT and on the sections Tromeđa-Čitluk, Široki Brijeg-Žovnica, Kaonik-Lašva and Doboj-Gračanica, with an AADT in the range 7.000-12.000.

Financial analysis

The financial analysis was conducted assuming the following procedures and characteristics:

- the Government of Bosnia and Herzegovina planned to realise the project through the application of a PPP scheme, in the form of BOT (i.e., Build, Operate and Transfer);
- construction of the road Corridor Vc sections by a concession company in which the Government of Bosnia would participate;
- with the purpose of making the project attractive, the concession company has to provide the financing sources exclusively for the construction works (VAT excluded). The financing sources for designing, supervision, unplanned works and expropriation are provided outside the project;
- two scenarios have been considered regarding expected revenues:
 - scenario 1: which includes the toll collection revenues reduced by the costs of maintenance, management and rehabilitation of the section Kakanj-Vlakovo;
 - scenario 2: which includes scenario 1 and the toll collection revenues reduced by the costs of maintenance, management and rehabilitation of the sections Vlakovo-Tarčin and Johovac-Karuše;
- Moreover, the financial analysis assumed:
 - costs of construction, VAT excluded;
 - obligations to the financing sources;
 - costs of motorway management, maintenance and rehabilitation;
 - toll collection revenues.

The results of the financial evaluation are presented in the Table 5-4. The section from Tarčin to Konjic shows a **limited financial profitability**. On the other hand, the overall road corridor Vc project shows a FIRR equal to 6,48% in scenario 1 and 7,25% in scenario 2, respectively. Table 5-5 shows the results of the **sensitivity analysis** conducted through the variation of investment cost and revenues (i.e., in the interval $\pm 20\%$).

Table 5-4: Financial performance indicators of the section Tarčin-Konjic

Section	Section length [km]	Construction costs [€ million]	FIRR	FNPV [€ million]		
				4%	5%	6%
Tarčin-Konjic	21,15	400,868	1,14%	-127	-153	-171
All sections scenario 1	290,62	3.041,126	6,48%	943	468	127
All sections scenario 2	290,62	2.752,713	7,25%	1.153	663	308

Source: IPSA-Sarajevo and IGH-Zagreb (2006)

Table 5-5: Sensitivity analysis of financial performance (variations on investments and revenues) of the section Tarčin-Konjic

Section	FIRR (%)
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Tarčin–Konjic	10,48	9,60	8,84	11,53	11,43	9,51	8,50	7,11	12,55	10,4	9,98
All sections	13,19	12,20	11,34	14,36	14,24	12,10	10,96	9,36	15,48	12,6	12,0

Source: IPSA-Sarajevo and IGH-Zagreb (2006)

Environmental analysis

Environmental issues related to the planned construction of the motorway from Svilaj to the southern border with Croatia were initially analysed in the first stage within the scope of the preliminary EIA. The objective of such preliminary EIA was to:

- examine the situation of the corridor under study;
- identify potential impacts on environment and possible environmental losses;
- identify impacts that have to be avoided either due to legal requirements or to high value of resources belonging to natural and cultural heritage;
- identify impacts which, although not regulated by law, have to be mitigated based on expert opinions formulated to this effect.

The following issues were studied: noise, vibrations, air pollution, water, soil, land reclamation, flora and fauna, visual pollution, natural and cultural heritage, as well as some other relevant impacts. A land occupancy map was constructed showing the main land use patterns⁴.

Based on the analysis of possible influences and protection measures required of the individual areas, the evaluation of alternatives of the corridor was carried out developing a multi-criteria analysis.

Upon the realisation of the preliminary EIA and the first round of public consultations in the affected area, competent ministries agreed to carry out the EIA study for the motorway project of Corridor Vc⁵. The EIA considered:

- the impact due to motorway construction or impacts related to construction (e.g., transport of the equipment to the construction site, temporary and final storage of earth material, pollutant emission, noise during construction, etc.);
- the impact of the motorway itself (i.e., use of land, influence on the territory, visual impediments, etc.);
- the impact due to motorway operation, i.e. impacts caused by traffic and road maintenance activities (emission of gases and powdery substances, polluted water draining from the road, noise emissions, etc.).

Thus, the following environmental aspects were developed in the EIA:

- socio-economic influences (improved or deteriorated access to workplace, reduction or increase in the value of land, general change in socio-economic living conditions);
- change of land occupancy and land pollution;
- impact to ground waters and prevention of water pollution;
- prevention of air pollution;

⁴ In terms of populated areas with respective lands, great industrial facilities, airports, water surfaces and wetland habitats, agricultural land, forests and forest land, meadows and other grassy vegetation and barren areas such as rocky land, gravel deposits and open air pits.

⁵ This decision included the obligation of the appointed consultant to consider the results of the first round of public consultations with institutional stakeholders (i.e., municipal administrations, power supply company, telecommunication company and other utilities) and wider public represented by inhabitants in the affected areas of the future corridor.

- prevention of noise and prevention of disturbance by headlights;
- protection of natural and cultural (developed) landmarks and resources;
- landscape protection and improvement;
- impact on ecosystems, plant and animal species and communities, with a special emphasis on protected species and areas;
- traffic safety and reduction in the number of accidents caused by traffic and natural hazards and disasters.

Specific conclusions on the impacts of the project are not available.

Safety levels

Within the pre-feasibility study, a research was undertaken for road accidents and their consequences along the road network in Bosnia and Herzegovina, and specially on trunk roads network within the zone of Corridor Vc.

Data from various information sources were elaborated (i.e., Annual Statistics of Bosnia and Herzegovina (2004), MUP of Republika Srpska and IPSA Institute Sarajevo (2005)). Table 5-8 shows the indicators obtained with regard to road accidents and their consequences.

Table 5-8: Summary indicators of road accidents and consequences

Type of accident	Number of traffic accident per 100 million vehicle·km (entire road network)		Number of traffic accident per 100 million vehicle·km (road network within the zone of Corridor Vc)	
	Bosnia and Herzegovina	Republika Srpska	Bosnia and Herzegovina	Republika Srpska
Fatalities	3,94	6,39	4,60	7,45
Injuries	41,90	46,04	21,76	23,91
Material damage only	121,50	130,68	39,08	42,94

Source: Annual Statistics of Bosnia and Herzegovina (2004), MUP of Republika Srpska and IPSA Institute Sarajevo (2005)