

European Commission

**Regional Balkans
Infrastructure Study -
Transport**

Appendix 1 - Final Report

Network Assessment

July 2003

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Prepared JC/BS
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1 General for road and rail

1.1 Introduction

The main objective of the Network Assessment was to undertake an analysis of the current state of the core network.

The study included the collection of up-to-date information on the geometry and condition of the entire network.

The study was carried out from late February to early May 2003.

1.2 Methodology and main results

The methodology adopted for the collection of technical data on the road and rail network basically followed the methodology used for the TINA study with minor modifications. The TINA project identified the corridors and then - in close co-operation with the actual countries - the bottlenecks in the network.

1.2.1 General observations, roads

Most of the roads have sufficient capacity to carry existing traffic but a severe backlog of maintenance has been observed. The typical situation is that rehabilitation of pavements - either partially or completely - is required. However, there are major differences between countries.

1.2.2 General observations, railways

The capacity of the railway network is more than sufficient for present traffic, but the speed is, on a number of sections, limited by the geometry of the alignment.

1.3 Collection of information and data

Data collection started with the preparation of questionnaires on geometrical information, condition of the road and rail system and information on the terrain.

The questionnaires were sent to all Road and Rail Authorities in the five countries.

The information received has been studied and validated by the consultant. Interpretations, revisions and assumptions have been made by the consultant due to insufficient and missing information in the material received from the local authorities. The interpretations, revisions and assumptions have not been commented on by the local authorities as it was the case in the TINA study.

2 Roads

2.1 Visit to the road authorities

Substantial amounts of information have been given to the consultant during meetings with road authorities and through the local REBIS offices.

The information received from the Road Authorities has been studied by the consultant. Validation and necessary adjustments have been made by the consultant due to insufficient and/or missing information in the material received from the local authorities. The interpretations, revisions and assumptions have not been commented on by the local authorities.

The condition of pavements and road geometry in the different countries has been inspected by the consultant by driving more than one thousand kilometres by car during the data collection.

2.2 Main results

2.2.1 REBIS Core Network

Upgrading projects until 2015 will typically be the rehabilitation of pavements, bridges and tunnels, widening of pavements to 7 m and some realignments.

Widening of narrow roads. An important issue is the widening of roads and increasing curve radii. About 870 km or 13 % of the roads need to be upgraded because they are too narrow. They have to be at least 7 m wide in order to fulfil the minimum AGR standard.

Corridor X has 4 lanes on most of its sections, except for the southern part, while other corridors and routes have 2-lane roads. In the central part of the region, bottlenecks of around 870 km of roads need widening or realignment due to insufficient pavement width.

The existing geometry of the road network is shown on the map Road Geometry in Figure 2-1.

Pavement condition. Another main issue is the upgrading of existing pavements for some of the roads. The condition of pavements is:

- | | |
|--|------|
| • Roads without problems | 28 % |
| • Roads which need new wearing course | 25 % |
| • Roads which need pavement rehabilitation | 24 % |

- Roads which need overlay +new wearing course 12 %
- Roads which need complete new pavement 11 %

However, there are major differences from country to country. The best pavement condition is found in Croatia, where the majority of the roads are in good condition. In Albania the roads are either newly rehabilitated or badly in need of complete reconstruction because the traditional pavement is a penetrated Macadam which is not able to resist present and future axle loads.

Corridor X has a reasonably good pavement condition, however, in certain areas, there is a need for a new wearing course and in the southern sections this would have to be combined with an overlay.

The existing pavement condition of the road network is shown on the Road Condition map (Figure 2.2).

By-passes. Transit traffic encounters obstacles near some of the big cities due to heavy internal traffic. For that reason some by-passes (around Belgrade, Tirana, Pristina, Mostar and Skopje) have been included by the Consultant.

Capacity. The majority of the roads have sufficient capacity to cover the traffic projection for 2015. Most of the roads which need upgrading due to capacity constraints, in order to meet projections in 2015, are already under construction.

The main geometry and the pavement condition of the road network is presented in Figure 2.1 and Figure 2.2.

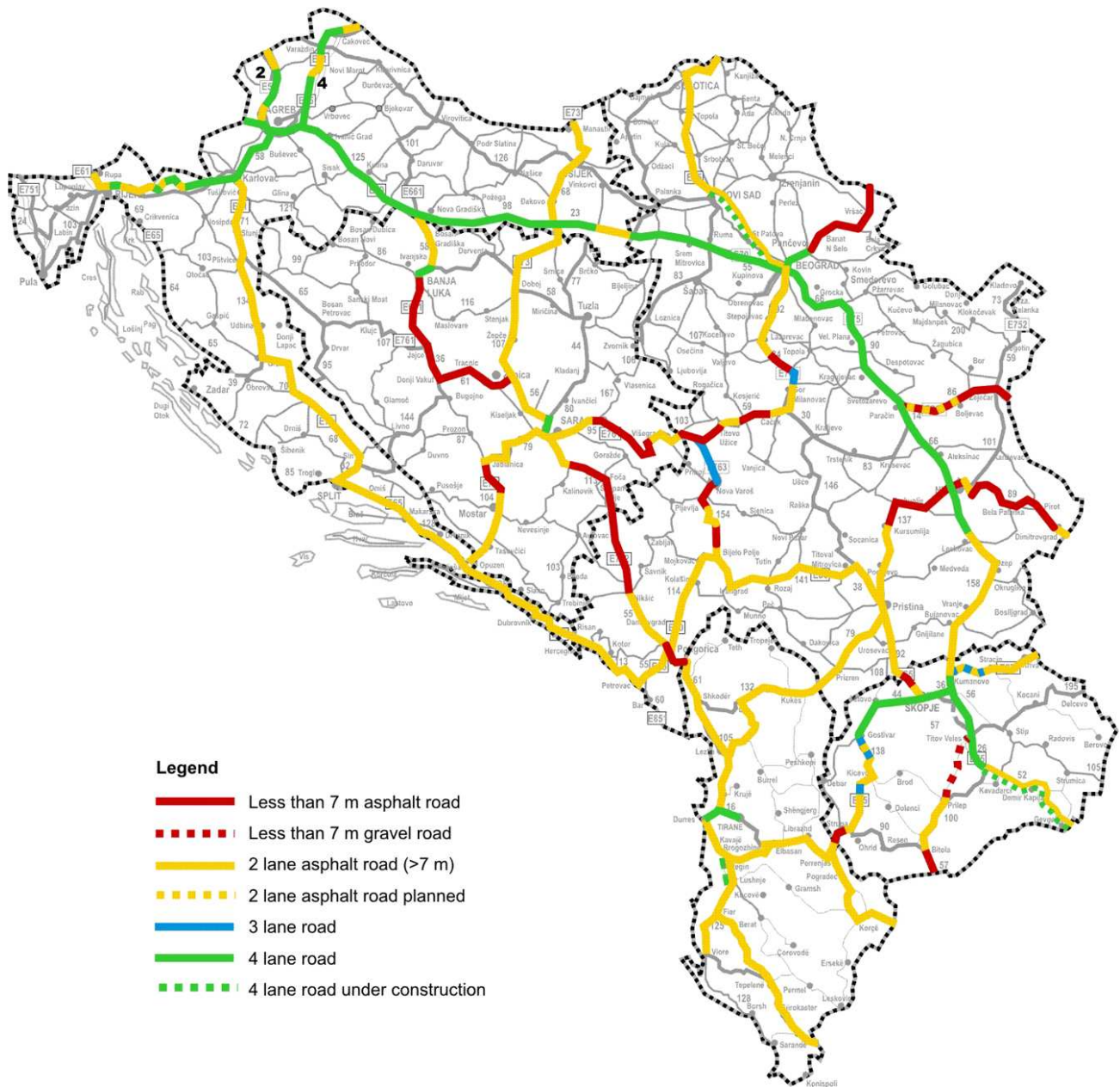


Figure 2.1 Road geometry.



Figure 2.2 Road condition.

2.3 Individual countries

2.3.1 Albania

Albania is the country which shows the widest variation in road quality. Until recently the entire road network was in a state of deterioration and in poor condition. A typical pavement consisted of penetrated Macadam with a large number of potholes but the country has, during the past few years, begun constructing new roads and reconstruction of some main roads.

Consequently, the roads in Albania are either in good condition without any problems or in an extremely bad condition and need reconstruction.

Albania is using Italian standards for construction of new roads. As an example, instead of constructing ordinary motorways with grade separation they are building 4 lane roads with 1 m hard shoulder on each side and with level crossings.



Figure 2.3 Typical road before upgrading.



Figure 2.4 New "motorway" between Dures and Tirana.

2.3.2 Bosnia and Herzegovina

Most of the roads in the core network in Bosnia and Herzegovina are 2 lane roads of which about 300 km are very narrow. The remaining roads in the net-

work are a 16 km 4 lane road near Banja Luka and 9 km 4 lane motorway under construction near Sarajevo.

Except for the motorway under construction near Sarajevo, no new roads have been constructed during recent years.



Figure 2.5 There is a need for rehabilitation and maintenance of some roads and tunnels and for protection against landslides.

2.3.3 Croatia

Croatia has given upgrading of the road net very high priority. The condition of the road network is, in general, very good and construction of new motorways or semi motorways is well underway.

The new motorways and semi motorways are constructed as toll roads.



Figure 2.6 Condition of the road network is, in general, very good.



Figure 2.7 New semi motorway near Kupjak.

2.3.4 FYRO Macedonia

FYRO Macedonia has about 180 km four-lane motorways in the core network and another 62 km are under construction.

The remaining roads are 2 lane roads, some of which are very narrow.

Existing traffic is low and the capacity of the majority of the roads is sufficient. However, there are a number of narrow roads with reduced road safety.



Figure 2.8 Typical motorway in FYRO Macedonia.

2.3.5 Serbia

The road capacity in the core network in Serbia has 2 major bottlenecks, the roads around Belgrade and the road between Belgrade and Novi Sad.

The Belgrade motorway by-pass has been planned since 1975. It is now under construction as a 4 lane road and the design is based on traffic forecasts up to 2010. The construction work has been stopped for the time being due to a lack of funds.

The road Belgrade - Novi Sad is a semi motorway. It is planned that it will be a 4 lane motorway. The first 20 km from Belgrade towards Novi Sad will be handed over to a contractor in the beginning of 2003. The Road Directorate hopes that loans for the remaining part of the road (about 30 km incl. a very long bridge) can be provided so that this part of the project can begin in March 2004.



Figure 2.9 Earthwork for 4 lane motorway has begun on western/westerly side of Belgrade - Novi Sad road.

2.3.6 Kosovo

In Kosovo, all roads in the core network are 2 lane roads and their total length is 288 km.

The pavement condition indicates a need for an overlay and new wearing course on almost half of the roads.



Figure 2.10 Road between Gabrica and Den Jankovic.

2.3.7 Montenegro

All roads in the core network in Montenegro are 2-lane roads some of which are very narrow.

No new roads have been constructed during the last 20 years, except for about 8 km of climbing lanes for trucks in mountainous terrain.

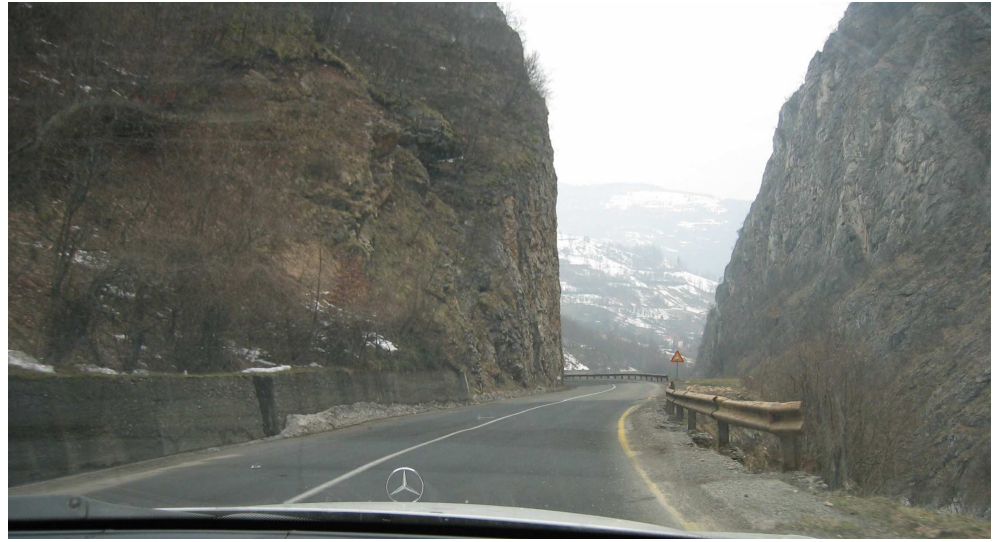


Figure 2.11 Montenegro needs climbing lanes and protection against landslides.

3 Railways

3.1 Data collection

3.1.1 Questionnaire

The questionnaire included the following information/data sheets:

- EU Strategic Railway Sections
- Line Section Details

As a helpguide to filling out the data sheets, an "Instruction leaflet" was enclosed.

In the schedule "EU Strategic Railway Sections" a preliminary proposal for splitting up the rail network in line sections was made. The railway companies were requested to check the proposed railway line sections and basic technical details, and make the necessary corrections and additions.

The line sections have been determined in order to form a reliable base for determining the costs for modernisation. Each line section is supposed to have an

equal technical standard, same type of terrain and equal present condition. The line sections vary in length, but are mainly less than 100 km.

Each railway company has been requested to fill in information on the "Line Section Details" sheets. The requested information includes main technical details, and plans for modernisation.

The details of the stations in each category are in accordance with the details specified in the TINA study.

3.1.2 Visit to the railway companies.

The railway companies in Zagreb, Belgrade, Sarajevo, Podgorica, Pristina, Skopje and Tirana were visited. The questionnaire and projects for modernisation of the rail network were discussed.

3.2 Existing condition

The present technical standard and condition varies over the network. The main differences in technical standard are shown on the map "Present Technical Condition" in Annex 1.1, and in the schedule "Present Technical Condition Details" inserted in Annex 1.2.

The existing technical condition for main items on the line sections has been described as "good" "medium" or "bad" by the local railway companies in the questionnaire. The result is shown in the schedule "Present Technical Condition Details". The following can be extracted:

- 86% of the network has single track
- 59% of the network is electrified
- only 11% of the network is classified as being in good condition while the remaining sections are in medium or bad condition

Most of the railway network has ample capacity to carry the present traffic volumes. However, on a number of sections the speed is limited by the geometry of the alignment and condition of the tracks and technical installations.

The main challenge - in the short term - is to restore original design speeds and technical standards of the network. Many lines are in poor condition which implies that operation speeds are below the original design speed.

Table 3.1 Overview of technical condition, railways.

Corridor/ route	Total length, km	Number of tracks		Electrification km	Max. /min speed km/h
		1 km	2 km		
Corridor X	1,048	547	501	1,048	160/35
Corridor Xb	150	150		150	100/60
Corridor Xc	104	104		0	80/40
Corridor Vb	339	339		339	120/40
Corridor Vc	531	439	92	428	110/40
Corridor VIII	406	406		0	60/30
Route 1	322	322		0	100/35
Route 2	143	143		0	100/30
Route 4	555	555		469	100/35
Route 9	87	87		87	80/40
Route 10	442	442		0	70/35
Route 11	138	138		0	100/35
Total	4,265	3,672	593	2,521	

3.2.1 Traffic data and present standard

The traffic data shows, that there is no immediate need for increasing the capacity of railway lines. However, it may be expected, that the traffic will increase with economic growth.

European traffic has been considered to have great importance, and in this respect Corridor X and Xb together with Corridor Vb have an important role to play. Around half of the sections on Corridor X have, today, a double track line and maximum speed 100-160 km/h.

Furthermore, the line section Jelina - Grapska in Bosnia and Herzegovina is a double track line.

All other existing lines are single track lines. Some are electrified and some not.

3.3 EU Strategic Rail Network

3.3.1 General

The EU Strategic Rail Network included in this study is shown on map no. T01 "EU Strategic Rail Network Balkan Region Present Technical Condition", ref. Annex 1.1.

3.3.2 International corridors

The EU Strategic Rail Network in the Balkan Region includes the following international corridors:

Pan-European Transport Corridors (Helsinki).

Corridor X: Border to Slovenia - Zagreb - Belgrade - Skopje - Border to Greece.

Corridor Xb: Border to Hungary - Novi Sad - Stara Pazova.

Corridor Xc: Nis - Border to Bulgaria.

Corridor Vb: Border to Hungary - Zagreb - Border to Slovenia.

Corridor Vc: Border to Hungary - Sarajevo - Ploce.

Corridor VIII: Border to Bulgaria - Skopje - Durres.

Additional Network AGC:

Zagreb - Split.

Belgrade - Bar.

Belgrade - Border to Romania.

Kraljevo - Skopje.

The TEN network also includes some of the lines listed above.

3.4 Individual countries

3.4.1 Albania

Collection of data

The questionnaire has been completed.

The Albanian Railways in Durres were visited on 10 March 2003. The technical data and plans for modernisation were discussed.

Existing technical condition.

In general the Albanian Railways consider the condition of tracks and structures to be "good". The condition of telecommunication is considered to be "medium", and the condition of signalling system to be "bad".

A brief visual inspection indicates that the general condition is rather poor.

3.4.2 Bosnia and Herzegovina

Collection of data

The questionnaire has been completed. The costs for modernisation have been given as total costs for modernisation of branches on corridor V.

The Bosnia and Herzegovina Railways and the Railways for Republica Srpska were visited in Sarajevo on 13 March 2003. The technical data and plans for modernisation were discussed.

Existing technical condition

The Bosnia and Herzegovina Railways regard, in general, the condition of the railway lines to be "medium" to "bad" mainly due to damage during the war and a general lack of maintenance.

3.4.3 Croatia

Collection of data

The questionnaire has been completed. The information does not include unit prices for modernisation.

The Croatia Railways in Zagreb were visited on 17 March 2003. The technical data for the railway lines and plans for modernisation were discussed.

Existing technical condition

The Croatia Railways consider the present condition of the railway lines to be "medium" to "good".

3.4.4 Kosovo

Collection of data

Some general information about technical details for the railway lines was collected. Unit prices were given for modernisation of the lines to obtain a speed of 100 km/h.

The UNMIK Railways were visited in Pristina on 6 March 2003. The technical data and plans for modernisation were discussed.

Existing technical condition

The UNMIK Railways consider the present condition of the railway lines to be "medium" to "bad".

3.4.5 FYRO Macedonia

Collection of data

The questionnaire was not filled in by the Macedonia Railways.

Technical information used in this study has been taken from the study "Investment Options in the Transport Sector" July 2002 by Louis Berger SA.

Existing technical condition

Based on a brief visit and visual spot check, the present condition of the railway lines may be considered as "medium".

3.4.6 Montenegro

Collection of data

The questionnaire has been completed. The unit prices have been given for modernisation of the railway lines to a speed of 100 km/h.

The Montenegro Railways were visited in Podgorica on 7 March 2003. The technical data and plans for modernisation were discussed.

Existing technical condition

The Montenegro Railways consider the present condition of the railway lines to be "medium".

3.4.7 Serbia

Collection of data

The questionnaire has been completed. Unit prices have been given for different types of modernisation.

The Serbia Railways were visited on 3 March and 4 March 2003. The technical data and plans for modernisation were discussed.

Existing technical condition

The Serbia Railways consider the present condition of the railway lines to be "medium".

Annex 1.1 Map no. T01: Present technical condition



Annex 1.2 Railway inventory

EU Strategic Rail Network - Balkan Region

Present technical condition details - rail

Country	International code	Section of line		Total length of section km	Number of stations	Terrain	Number of tracks	Electrification	Actual maximum speed Max/Min km/h	Present condition of line	Ongoing modernisation projects
		From:	To:								
Croatia	Corridor X	Savski Marof	Zagreb	26.1	4	Flat	2	Electrified	120/100	Medium	
Croatia	Corridor X	Zagreb	Dugo Selo	18.7	2	Flat	2	Electrified	130/100	Medium	
Croatia	Corridor X	Dugo Selo	Novska	84.6	11	Flat	1	Electrified	130/90	Medium	
Croatia	Corridor X	Novska	Vrpolje	118.9	10	Flat	2	Electrified	160/160	Good	
Croatia	Corridor X	Vrpolje	Tovarnik	66.5	7	Flat	2	Electrified	160/80	Good	
Serbia	Corridor X	Tovarnik	Stara Pazova	87.8	6*	Flat	2	Electrified	120/50	Medium	
Serbia	Corridor X	Stara Pazova	Novi Beograd	30.0	2*	Flat	2	Electrified	120/60	Medium	Rehabilitation Cor-tanovci - Petrovardin
Serbia	Corridor X	Beograd			1*	Flat	2	Electrified			HERMES network Management Information System
Serbia	Corridor X	Beograd	Velina Plana	90.4	5*	Flat	1	Electrified	100/40	Bad	Rehabilitation Kusadak - Velika Plana
Serbia	Corridor X	Velina Plana	Stalac	85.9	5*	Flat	2	Electrified	100/35	Medium	
Serbia	Corridor X	Stalac	Nis	67.2	2*	Flat	2	Electrified	100/80	Good	
Serbia	Corridor X	Nis	Precevo	156.1	5*	Flat	1	Electrified	100/40	Medium	
FYRO Macedonia	Corridor X	Precevo	Skopje	49.8	4*	Flat	1				
FYRO Macedonia	Corridor X	Skopje	Veles	50.9	3*	Flat	1				
FYRO Macedonia	Corridor X	Veles	Gevgelija	115.0	5*	Flat	1				

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Country	International code	Section of line		Total length of section km	Number of stations	Terrain	Number of tracks	Electrification	Actual maximum speed Max/Min km/h	Present condition of line	Ongoing modernisation projects
		From:	To:								
Serbia	Corridor Xb	Kelebia	Stara Pazova	149.6	5*	Flat	1	Electrified	100/60	Bad	
Serbia	Corridor Xc	Nis	Dimitrovgrad	103.9	3*	Mountain	1	Not electrified	80/40	Bad	Rehabilitation Nis - Dimitrovgrad
FYRO Macedonia	Corridor Xd	Veles	Bitola	129.3	9	Mountain	1	Not electrified	100/50		
FYRO Macedonia	Corridor Xd	Bitola	Kremenica	16.0	1	Mountain	1	Not electrified	30		
Croatia	Corridor Vb	Botovo	Dugo Selo	78.6	6	Flat	1	Electrified	120/90		
Croatia	Corridor Vb	Zagreb	Osarije	104.3	14	Flat	1	Electrified	120/70	Medium	
Croatia	Corridor Vb	Osarije	Sapjane	156.3	20	Flat	1	Electrified	80/40	Medium	
Croatia	Corridor Vc	Beli Manastir	Slavonski Samac	102.9	8	Flat	1	Not electrified	100/40	Medium	
Bosnia and Herzegovina	Corridor Vc	Bosanski Samac	Grapska	57.0	7	Flat	1	Electrified	100/50	Medium	
Bosnia and Herzegovina	Corridor Vc	Grapska	Jelina	92.0	13	Flat	2	Electrified	100/50	Bad	PABX rehabilitation in Zenica and rehabilitation of signalling in stations
Bosnia and Herzegovina	Corridor Vc	Jelina	Sarajevo	86.0	14	Flat	1	Electrified	100/50	Bad	Track overhaul Bradina - Konjic
Bosnia and Herzegovina	Corridor Vc	Sarajevo	Capljina	170.0	23	Mountain	1	Electrified	100/50	Bad	
Croatia	Corridor Vc	Metkovic	Ploce	22.8	4	Flat	1	Electrified	110/90	Bad	
FYRO Macedonia	Corridor VIII	Border to Bulgaria	Skopje	30.6*	11*	Mountain	1	Not electrified*			Under construction (Estimated 40 km not completed)

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Country	International code	Section of line		Total length of section km	Number of stations	Terrain	Number of tracks	Electrification	Actual maximum speed Max/Min km/h	Present condition of line	Ongoing modernisation projects
		From:	To:								
FYRO Macedonia	Corridor VIII	Skopje	Border to Albania	1,02.7.0*	10*	Mountain	1	Not electrified*			Not completed (Estimated 66,6 km not constructed)
Albania	Corridor VIII	Kufi	Lime								Not constructed (Estimated 3,8 km)
Albania	Corridor VIII	Lime	Mirake	49.0	4	Mountain	1	Not electrified	60/30	Medium	
Albania	Corridor VIII	Mirake	Rrogozhine	54.4	7	Flat	1	Not electrified	60/30	Medium	
Albania	Corridor VIII	Rrogozhine	Shkoze	32.9	5	Flat	1	Not electrified	60/30	Medium	
Albania	Corridor VIII	Shkoze	Durres	2.1	1	Flat	1	Not electrified	60/30	Good	
	Corridor VIII	Shkoze	Tirane	36.6	3	Flat	1	Not electrified	60/30	Medium	
	Corridor VIII	Rrogozhine	Vlore	83.3	10	Flat	1	Not electrified	60/30	Medium	
Croatia	1	Ostarije	Split	321..7	25	Mountain	1	Not electrified	100/35	Medium	
Montenegro	2	Podgorica	Bozaj	24.7	1	Flat	1	Not electrified	100/100	Good	
Albania	2	Kufi	Shkoder	35.3	3	Flat	1	Not electrified	60/30	Good	
Albania	2	Shkoder	Vore	83.4	9	Flat	1	Not electrified	60/30	Good	
Serbia	4	Pancevo	Stamora Moravita	85.4	3*	Flat	1	Not electrified	100/40	Medium	
Serbia	4	Beograd	Vrbnica	3,01.5	9*	Mountain	1	Electrified	100/35	Bad	Rehabilitation Resnik - Valjevo
Montenegro	4	Vrbnica	Mojkovac	33.5	3	Mountain	1	Electrified	60/60	Medium	
Montenegro	4	Mojkovac	Podgorica	83.1	7	Mountain	1	Electrified	75/75	Medium	
Montenegro	4	Podgorica	Bar	51.2	6	Flat	1	Electrified	90/70	Medium	

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Country	International code	Section of line		Total length of section km	Number of stations	Terrain	Number of tracks	Electrification	Actual maximum speed Max/Min km/h	Present condition of line	Ongoing modernisation projects
		From:	To:								
Bosnia and Herzegovina	9	Doboj	Banja Luka	87.0	11	Flat	1	Electrified	80/40	Bad	
Serbia	10	Kraljevo	Border to Kosovo	79.7	3*	Mountain	1	Not electrified	70/35	Bad	
Kosovo	10	Border to Serbia	Border to FYRO Macedonia	332.0*	37*	Flat	1	Not electrified			
FYRO Macedonia	10	Border to Kosovo	Skopje	30.0*	2*	Flat	1	Not electrified			
Serbia	11	Pozega	Stalac	138.1	5*	Mountain	1	Not electrified	100/35	Bad	

*) Estimated