

Reconstruction of the railway line Niš-Dimitrovgrad

General information

The project regards the **reconstruction and modernisation of the railway line Niš-Dimitrovgrad**.

The railway line connecting Niš with Dimitrovgrad and the Bulgarian border is the branch Xc of the SEETO Corridor X. This classification is a heritage of the Pan-European Corridors established during the 90s, when the branch Xc was defined as a connection between Niš, Sofia, Plovdiv, Dimitrovgrad (BG) and finally Istanbul.

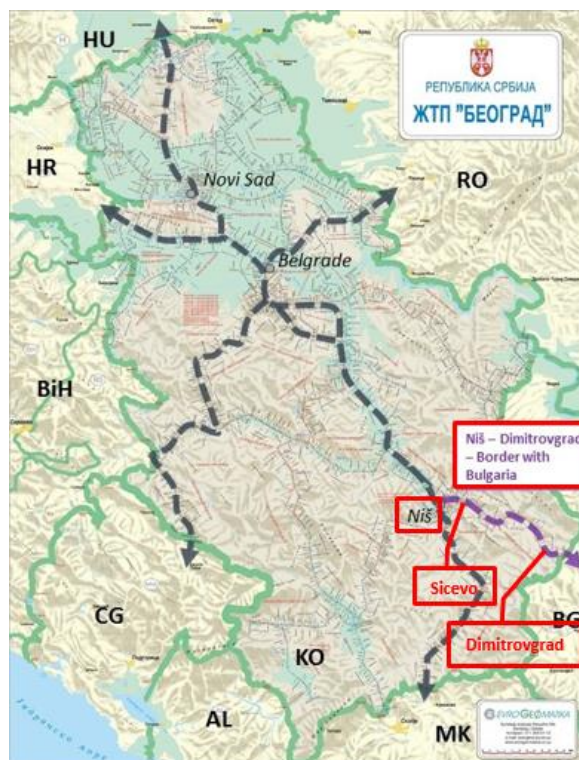
The line is part of the corridor connecting Central Europe to Bulgaria and Turkey through Croatia and Serbia. It is an alternative to the TEN-T Rhine-Danube CNC. The rail section between Niš and Dimitrovgrad is an important **bottleneck**, being the only part of the entire corridor that is not electrified and having a weight limits of category D3. The Bulgarian side of the corridor is electrified with the same system adopted in Serbia and in Croatia (i.e., 25 kV AC 50 KHz) and has a weight limit of category D4. This is the reason why the station of Dimitrovgrad is electrified, being reached by the Bulgarian network (see also section **Napaka! Vira sklicevanja ni bilo mogoče najti.**).

In terms of investments, the project can be divided into **two separate parts**:

- the reconstruction of the Sicevo-Dimitrovgrad section with preparatory works for electrification and signalling and telecommunication systems;
- electrification of the entire section.

The localisation of the line is presented in Figure 6-1.

Figure 6-1: Position of the railway line Niš-Dimitrovgrad-Bulgarian border within the main rail corridors of Serbia



Source: ŽS Serbian Railways plus Consultant's elaboration

As regards the history of the project developments, the modernisation of the line started years ago, but this process is still unfinished. A part of the works on the reconstruction and modernisation of Niš-Dimitrovgrad line was implemented in the period 2003-2005, but these works were limited only to the short section between Dimitrovgrad and the border between Serbia and Bulgaria. The railway line was reconstructed from km 97+000 to 104+000 and equipped with the contact line, electronic signalisation and fibre-optic cable. The joint border station of Dimitrovgrad was reconstructed, electrified and equipped with modern signalling and interlocking devices, as well as a part of the station Dimitrovgrad-Bulgarian border. Rehabilitation and reconstruction activities of 6 tunnels and 20 bridges were performed on the section Cele Kula-Stanicenje in order to provide necessary carrying capacity and the gauge for the line electrification, as well as for operation of combined transport in compliance with the international standards, and they were financed out of the proceeds of EIB loan 1. During the past years, the line was also interested by a possible loan of the Czech Export Bank for an amount of about € 55 million, but this possibility did not reach a finalisation.

This investment project is part of the extension of the TEN-T CNCs into the Western Balkans and SEETO's Core Network. It is thus included in the long-term sustainable development plans of the European Union and its partners. The modernisation of this line is a part of a larger project for setting up a more efficient railway line for mixed transport. The project will satisfy the following TEN-T priorities:

- **Bridging missing links and removing bottlenecks, particularly in cross-border sections:** this is the only section of SEETO Corridor X that is not electrified. The signalling system and train control system has been in use for more than 50 years, slowing travel speeds to 30 and 50 km/h.
- **Promoting the efficient and sustainable use of the infrastructure and, where necessary, increasing capacity:** the electrification, the improvement of stations and the implementation of a new signalling system will increase the overall efficiency and capacity of the infrastructure. The increase of the weight limits category to D4 and the extension of the length of the siding tracks to 750 m for all the stations (as required by TSI standards) will increase the efficiency of freight trains.
- **Improving or maintaining the quality of infrastructure in terms of safety, security, efficiency, climate resilience, environmental performance, social conditions and accessibility for all users:** the project will give access to better means of transport for more than 340.000 people living along the railway route proposed for rehabilitation (inside one of the poorest areas of Serbia). The modal shift from the road mode will produce a positive impact on safety and environment. The electrification will produce an additional decrease in current pollution levels caused by diesel locomotives operations.

At the moment, discussions are open between EIB and the Ministry of Construction, Transport and Infrastructure of the Republic of Serbia (i.e., the project promoter) for a possible loan from EIB. The final beneficiary can be identified in the Serbian Rail Infrastructure Manager (i.e., "Infrastruktura železnice Srbije"). The project is directly linked to the reconstruction of the railway node of Niš, where the alignment running through the city centre will be dismantled and replaced with a less impacting alternative.

Technical description

The existing line has a total length of about 104 km from Niš to the border with Bulgaria. Dimitrovgrad is at a distance of about 97 km from Niš, and such station is working as operational border between the Serbian and Bulgarian rail administrations.

The **existing characteristics** are:

- Single track, not electrified;

- Weight limits: category D3 (22,5 tons for axle load, 7,2 tons/m);
- Loading gauge: JŽ1;
- Speed: design speed of 80-100 km/h; the actual speed is much lower due to temporary speed restrictions;
- Maximum permitted train length (on the basis of the length of station tracks): variable from a minimum of 524 m to maximum of 791 m;
- Signalling: mechanical.

The two parts of the project include the:

- reconstruction and modernisation of the track, with upgrading of the track elements for the traffic speeds of up to 120 km/h, permissible axle load of 22,5 tons and permissible load per linear metre of 8 tons/m (Class D4); and
- the electrification of the whole railway line from Nis to the station Dimitrovgrad over the length of 97 km. The process of line electrification will require the construction of fixed installations for the contact line and substation power supply.

The **estimated investment costs** for the reconstruction of the Sicevo-Dimitrovgrad section, including preparatory works for electrification and signalling and telecommunication systems, was estimated to be € 84,4 million, while the electrification of the entire section from Niš to Dimitrovgrad was recently estimated to be € 59 million¹.

Information is not available regarding investment cost breakdown and operating and management costs.

Project implementation

On the basis of the gap analysis of the PPF5 (Project Preparation Facility)², closed on November 2016 the situation of the project implementation is summarised in Table 6-1.

Table 6-1: Status of the project implementation of the reconstruction of the railway line Niš-Dimitrovgrad

| Type of documentation | Available documents | Not available documents |
|--------------------------------|--|---|
| Spatial planning documentation | <ul style="list-style-type: none"> • Infrastructure Corridor Plan; • Regional spatial plan; • Municipal spatial plan; • General urban plan; • Land acquisition (land formally available). | <ul style="list-style-type: none"> • General regulation plan; • Urban design (to be verified if needed or not). |
| Technical documentation | <ul style="list-style-type: none"> • Prefeasibility study; • General project design; • Preliminary design; • Environmental impact assessment; • Final design; • Construction permit. | <ul style="list-style-type: none"> • Cost benefit analysis; • Tender documentation. |

Source: TRT elaboration

¹ See <https://seenews.com/news/eib-shows-interest-in-serbias-nis-railway-bypass-project-562469>.

² For info about PPF5 please see <http://www.ppf5.rs/>.

The project management and supervision organization is not yet defined, as well as the procurement plan for the project.

Transport demand

Limited information about the transport demand were collected by analysing the traffic forecasts produced during year 2013 by Italferr SpA during the preparation of the Railway Master Plan for years 2012-2021 for the Republic of Serbia³. The traffic model that was elaborated for that study was an update of the previous one prepared for the General Transport Master Plan of the Republic of Serbia (GTMP) that, in its turn, was based on Transtools. The re-calibration of the year 2009 model for year 2013 was focused on the update of the available O/D matrices. The re-calibrated model considered **three scenarios**:

1. Calibration scenario (Present scenario, year 2013);
2. Do-minimum scenario (maintenance of the existing rail infrastructure, year 2027);
3. Proposed plan scenario (development of the rail infrastructure, year 2027).

The results of the transport analysis for the Niš-Dimitrovgrad line and for each scenario are presented in Table 6-2, Table 6-3 and Table 6-4.

Table 6-2: Traffic forecasts for the present scenario (year 2013)

| From | To | Link ID | Length [km] | Traffic | | | |
|--------------|----------------------------|---------|-------------|--------------------|--------------------|--------------------|--------------------|
| | | | | [pass trains /day] | [pass trains /day] | [pass trains /day] | [pass trains /day] |
| Niš | Pirot | 96 | 70,48 | 2 | 14 | 214 | 7.126 |
| Pirot | Dimitrovgrad | 112 | 26,52 | 2 | 14 | 185 | 7.088 |
| Dimitrovgrad | Gradina | 111 | 2,34 | 2 | 14 | 155 | 7.049 |
| Gradina | Bulgaria border (Dragoman) | 1009 | 2,34 | 1 | 14 | 126 | 7.010 |

Source: Italferr (2013)

Table 6-3: Traffic forecasts for the Do-minimum scenario (year 2027)

| From | To | Link ID | Length [km] | Traffic | | | |
|--------------|----------------------------|---------|-------------|--------------------|--------------------|--------------------|--------------------|
| | | | | [pass trains /day] | [pass trains /day] | [pass trains /day] | [pass trains /day] |
| Niš | Pirot | 96 | 70,48 | 12 | 35 | 1.169 | 17.317 |
| Pirot | Dimitrovgrad | 112 | 26,52 | 10 | 34 | 960 | 17.240 |
| Dimitrovgrad | Gradina | 111 | 2,34 | 8 | 34 | 751 | 17.164 |
| Gradina | Bulgaria border (Dragoman) | 1009 | 2,34 | 5 | 34 | 542 | 17.087 |

Source: Italferr (2013)

Table 6-4: Traffic forecasts for the Proposed plan scenario (year 2027)

| From | To | Link ID | Length [km] | Traffic | | | |
|------|-------|---------|-------------|--------------------|--------------------|--------------------|--------------------|
| | | | | [pass trains /day] | [pass trains /day] | [pass trains /day] | [pass trains /day] |
| Niš | Pirot | 96 | 70,48 | 16 | 43 | 1.569 | 21.697 |

³ See Italferr SpA (2013), Rail Rehabilitation in Serbia / Technical Assistance for Railway Infrastructure (Railway Master Plan for years 2012-2021) - Traffic forecast report.

| | | | | | | | |
|--------------|-------------------------------|------|-------|----|----|-------|--------|
| Pirot | Dimitrovgrad | 112 | 26,52 | 13 | 43 | 1.313 | 21.554 |
| Dimitrovgrad | Gradina | 111 | 2,34 | 11 | 43 | 1.056 | 21.411 |
| Gradina | Bulgaria border (Dragoman) | 1009 | 2,34 | 8 | 43 | 799 | 21.267 |

Source: Italferr (2013)

It has to be remarked that the amount of passenger and freight trains per day was calculated by assuming respectively an average amount of 100 passengers and an average payload of 500 tons per train. The assumption of 100 passengers per train on average is probably low, especially for the forecasted scenarios. It should be assumed a higher average occupancy, given that such low values would be probably not profitable for railway companies.

The assumed **GDP growth rates** are reported in Table 6-5.

Table 6-5: Base GDP growths adopted for Railway Master Plan for years 2012-2021

| Item | Units | Scale | 2008 | 2009 | 2010 | 2011 | 2012 |
|----------------------|----------|----------|----------|----------|----------|----------|----------|
| GDP, constant prices | RSD | Billions | 1.908,12 | 1.841,34 | 1.860,17 | 1.890,32 | 1.881,32 |
| GDP, constant prices | % change | | 3,8% | -3,5% | 1,023% | 1,621% | -0,477% |
| GDP, current prices | RSD | Billions | 2.661,39 | 2.720,08 | 2.881,89 | 3.175,03 | 3.357,59 |
| GDP, current prices | USD | Billions | 47,669 | 40,244 | 36,677 | 43,315 | 37,199 |
| Item | Units | Scale | 2013 | 2014 | 2015 | 2016 | 2017 |
| GDP, constant prices | RSD | Billions | 1.919,86 | 1.968,73 | 2.012,04 | 2.052,28 | 2.093,32 |
| GDP, constant prices | % change | | 2,049% | 2,545% | 2,2% | 2% | 2% |
| GDP, current prices | RSD | Billions | 3.705,49 | 3.971,13 | 4.220,83 | 4.477,46 | 4.738,27 |
| GDP, current prices | USD | Billions | 38,645 | 41,066 | 43,439 | 45,888 | 48,356 |

Source: Italferr (2013)

On the basis of the above forecasts, the Master Plan adopted an average GDP growth of 2% until year 2017 and applied an elasticity factor of 0,7, thus identifying a maximum growth of traffic of 1,4% per year. This value was then applied as cap for the entire existing O/D matrix, thus reducing the increase of traffic that was previously estimated during year 2009. The re-calibrated matrices were then assigned to the multimodal network re-defined based on the proposed investments.

It has to be observed that:

- as first comparison, the variation of Serbian GDP at real growth rates was⁴:
 - year 2013: 2,6%
 - year 2014: -1,8%
 - year 2015: 0,8%
 - year 2016: 2,8%
- the average value was therefore 1,1% and not 2%, but the negative trend of year 2014 influenced the result;
- the correction based on the Serbian GDP had an impact on the overall matrices, but Serbia (and especially rail corridors) are interested also by through traffic, and not only by import, export and domestic traffic;
- this approach was adopted on both freight and passenger models. However, an approach based on per capita GDP would have been more effective, especially for passenger traffic.

⁴ See Statistical Office of the Republic of Serbia (SORS), updated on 28th of February 2017. 2016 value is a first estimation.

Financial analysis

The cost benefit analysis for this project is still not available. Only as a generic reference, the Railway Master Plan for years 2012-2021 for the Republic of Serbia prepared by Italferr SpA⁵ produced the following results:

- a FIRR of -8,80% (negative and below the discount rate of 5% that was adopted);
- a FNPV of € -255,75 million;
- a B/C ratio of 0,18.

It has to be highlighted that the pre-feasibility study carried out by Italferr SpA was made on different bases and assumptions. For instance, the investment cost taken into account was almost two times the amount now taken into account, namely €271 million against the current estimated €143,4 million (i.e., $84,4+59=143,4$). This is the reason why these figures are given just as reference.

Economic analysis

The Railway Master Plan for years 2012-2021 for the Republic of Serbia prepared by Italferr SpA comprises a cost benefit analysis based on an investment cost of € 271 million that produced the following economic indicators:

- an EIRR of 6,68% (higher than the discount rate of 5,5%);
- an ENPV of € 33,66 million;
- a B/C ratio of 1,14.

The value presented in the PPF5 Gap Analysis is 14,10% that, in this case, is referred to a total investment of € 122,7 million, slightly lower compared with the most recent € 143,4 million.

The results presented above show a general feasibility of the investment, even with costs that are higher than those considered in the most recent available documentation.

Environmental analysis

On the basis of what declared by the PPF5 Gap Analysis, the *“Environmental Impact Assessment has been prepared only for the project of reconstruction involving construction works, wherefore the preparation of a new study is necessary in order to scrutinise electrification of the subject-matter railway line”*. The Consultant’s remark is that electrification should anyway improve the environmental conditions thanks to the elimination of diesel locomotives.

Safety levels

A general improvement of the safety level for both section will be obtained with the implementation of a more advanced signalling system that will replace the existing mechanical system and possibly with the improvement of the existing stations and the de-leveling of level crossings.

There is no specific information on safety issues and black spots, before and after project implementation.

⁵ See Italferr SpA (2014), “Rail Rehabilitation in Serbia/Technical Assistance for Railway Infrastructure (Railway Master Plan for years 2012-2021) - CBA for Section G - Sičevo–Stanicenje–Dimitrovgrad, May 2014”.