

CONNECTION OF BORDERLAND CZ/D/PL TO THE TEN-T CORE NETWORK

OUTPUT SUMMARY

Final

11 2020

D.T2.3.1 Planning for improved transport to TEN-T nodes - between Liberec and Turnov
PP4 - KORID LK , Liberec (CZ)



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1. Mission

The aim of the project "Connecting of borderland CZ/D/PL to the TEN-T core network (railways)" is to gain a new perspective on the connection of the CZ/D/PL borderland triangle to the trans-European transport network. At NUTS LEVEL III, this is an area that comprises about 1.1 million inhabitants. Regional and related trans-regional links in the region are very strong from many perspectives. It is therefore surprising that, for example, from the point of view of transport planning, cross-border links outside the main roads - here especially the corridor along the A4 motorway between Germany and Poland - show relatively low load. This can be deduced, among other things, from cartograms of the last completed traffic census in all three countries in 2015, which, moreover, do not fully correspond in cross-border sections. Neither on the secondary routes nor on the main routes.

However, this project deals primarily with rail connections. With long-term international cooperation, it was possible to manage to build strong regional connections within the tri-border region - be it the Liberec - Zittau - Dresden or Liberec - Jelenia Góra axis, especially in passenger transport. Of the transregional connections, however, east-west interconnections are prevalent - and this is also the case connected with the above connections - among the region's most prominent populated areas. The north-south relationship, especially from the tri-border region towards the Central Bohemian Region and beyond, is not insignificant. From a geographical point of view, however, mountain ranges that extend along the northern border of the Czech Republic and extend about 20 to 30 km inland are in the way. This obstacle is essential, considering the above, where the intensity of traffic towards the national border is decreasing, while investment in infrastructure structures is increasing regarding to the terrain configuration.

This project seeks guidance on how to deal with obstacles and bring the inhabitants of the tri-border region closer to the main traffic arteries, which are already used by major transregional services, mostly trains of higher categories (IC, EC, SC, ICE). As part of this approach, there is also the goal to offer a comfortable and reliable commute to work and schools. To offer attractive driving times, easy to remember interval and to significantly promote environmentally friendly mobility.

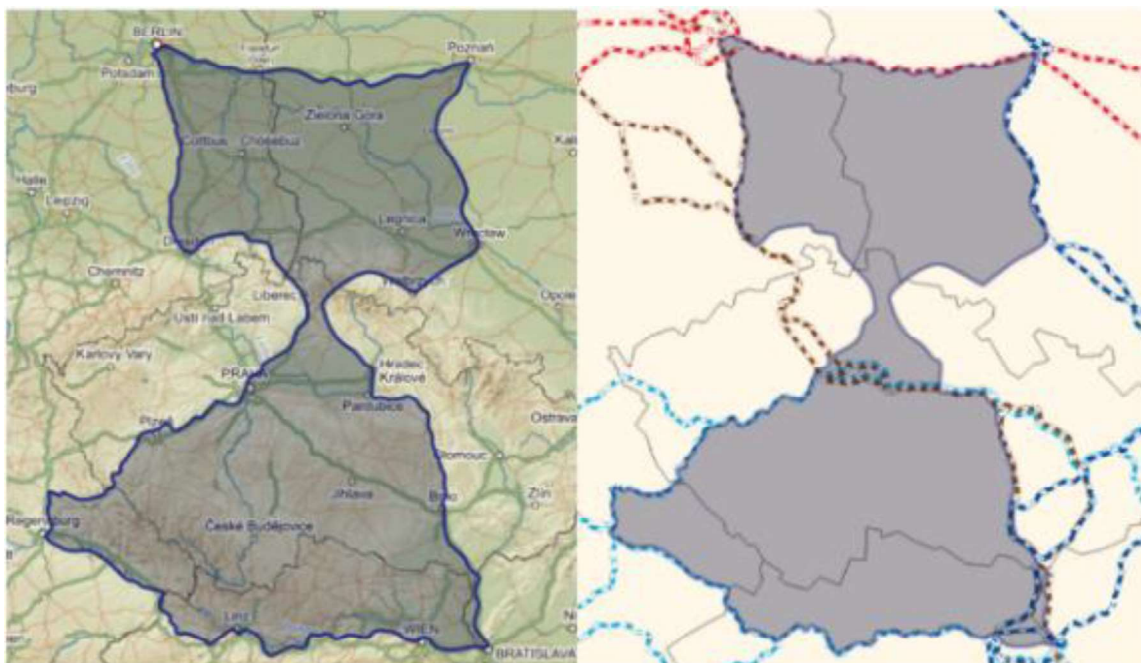


Figure 1: Definition of the wider area of interest on geographic map and on map of railway corridors



2. Means

2.1. Analysis

Two parts are processed in the analysis, which are the Opportunity study and the Traffic model. Both parts were processed in two steps, so that designs and outputs from the design parts - Connection Concept and Technical Study - could be incorporated into the final version. The analysis is intended to describe the expected behaviour of residents in the area based on generally available data. Whether from the point of view of demographic, economic or mobility, or rather expected mobility of the population.

2.1.1. Opportunity study

The opportunity study presents the area of interest concerned by the potential construction and modernisation of the railway connection on the Praha - Mladá Boleslav - Turnov - Liberec - tri-border region (Germany - Poland - Czech Republic) axis. Basic statistics on the demographic and economic activity of regions, their current transport network and positives and shortcomings in the transport context are presented. The aim of the study is not only to describe the territory based on the characteristics of the administrative breakdown, but also to present the principles of socio-geographical regionalization and the influence of the values of complex functional regions in the core area of interest and their development. Current traffic flows in all types of passenger transport and freight transport are described in detail. The potential of the region is also characterized from the point of view of tourism statistics. The interpretation of the potentials and a summary of the reasons that support the intention to build a new railway infrastructure between Praha and Liberec in connection with the German-Polish-Czech tri-border region is crucial.

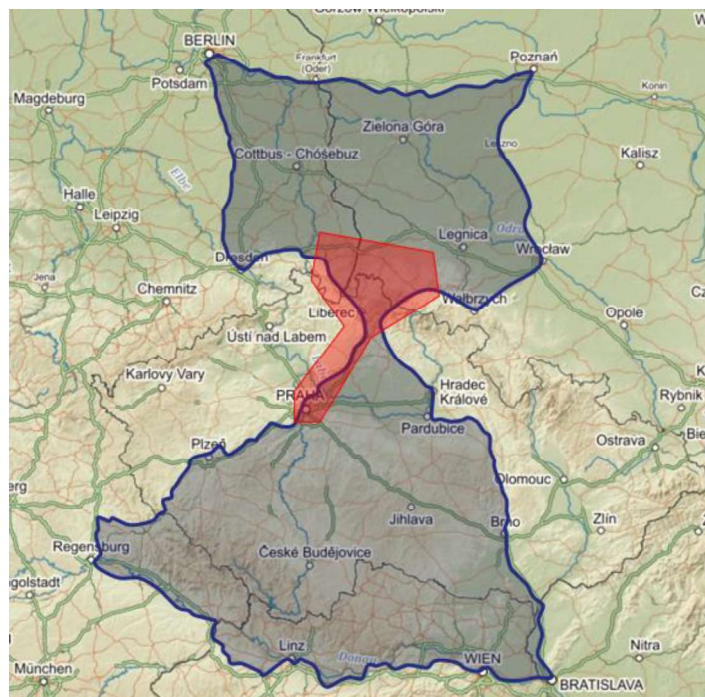


Figure 2: Definition of the narrow area of interest within the wider area of interest



The construction of a new rail link would make the railway line 089 in the direction of Zittau, Germany, line 037 to the north towards Zgorzelec - Zielona Góra in Poland, and line 036 to the east in the direction of Tanvald - Szklarska Poręba - Jelenia Góra more accessible and faster connected.

In the direction of Hrádek nad Nisou and Zittau in Germany, the connection between the densely populated German border part of the German district of Görlitz between Šluknov and Frýdlant Hook consists in the railway line (according to the Czech network marked 089, in the DB timetable marked 326). In addition to dense settlement, the area is characterized by a dense network of railway lines. It is a single-track non-electrified network with a maximum speed of 100 km/h. The potential for railways in this direction lies in the rapid and high-quality mobility of border residents by rail towards Liberec and further to Praha. The proposed construction would also significantly help German tourists to the Czech territory to the Jizera Mountains, the Giant Mountains or Bohemian Paradise.

The importance of the Frýdlant - Zgorzelec - Zielona Góra direction lies in the connection to the densely populated border region of the Polish Dolnośląskie voivodeship. The presence of a modern fast rail connection to Liberec and Praha would primarily benefit the inhabitants of the towns located on the railway line no. 037 to Raspenava (+connection to Hejnice and Bílý Potok) and Frýdlant (+connection to Nové Město pod Smrkem), which would significantly increase the transport time accessibility of Praha by rail. The connection to Zgorzelec, Poland, connects this German-Polish cross-border city to the railway system and the inhabitants of the Polish part will also be able to use the faster rail connection, for example, for tourist activities in the Jizera Mountains, Giant Mountains or when traveling to Praha. The line leading from Zgorzelec, Poland, will further introduce the Czech territory and Praha to the Polish cities of Lubań, Węgliniec, Iłowa, Żary, Żagań, Nowogród Bobrzański and, finally, the 150,000-strong centre of Lubuskie voivodeship - Zielona Góra. A characteristic feature of this Polish region is a very developed and dense network of railways, which would affect the overall use of railways in the core area of interest and thus increase the importance of the Praha - Liberec - tri-border region railway link on the Czech side.

Direction Jablonec n.N. - Tanvald - Jelenia Góra is important in connecting the densely populated North Bohemian conurbation of Liberec, Jablonec nad Nisou, Lučany nad Nisou, Smržovka, Tanvald, Desná, Kořenov and Harrachov, with the change in Tanvald also Velké Hamry. The importance of connecting railway line number 036 to a fast rail connection to Praha will increase the accessibility of the capital city of Praha for this area. The continuation of the railway line to Poland in the Section Kořenov - Jelenia Góra already brings excellent connections and an alternative to road transport towards Szklarská Poreba. Especially in the summer and winter season, the railway is used to connect important sports, ski, and cross-country skiing areas of Jakuszyce and the areas in the Jizera Mountains (Jizerka/Smědava), which generate a significant number of rail passengers. The line continues to the important Polish town of Jelenia Góra with almost 85,000 inhabitants. The proposed construction of the Praha- Liberec rail link would thus bring the city of Jelenia Góra significantly closer and has the potential to generate new routes using the railway to Liberec and Praha.

Conclusions of the analytical part:

- The difference in travel time on the Praha - Liberec route between rail transport and bus transport of 1h 15m in favour of the bus is currently an essential argument for favouring bus and individual car transport.
- The rail connection between Praha and Mlada Boleslav is more than 1 hour, which again cannot compete with bus transport (bus 0:45 h).
- Travel time by rail between Praha and Liberec is too long, there is no direct connection (connecting change in Turnov), the capacity of the Praha - Mladá Boleslav line is already insufficient, the Mladá Boleslav - Turnov line does not allow fast enough travel (high travel time).



- Providing a direct connection will reduce travel time and make transport more attractive. However, a direct connection is not possible without major construction work on the railway line. Improved connections between Praha and Liberec will also help to improve connections with the districts of Česká Lípa, Jablonec and Nisou, Semily and further development of regional and long-distance connections to Hradec Králové, Pardubice and further southeast.
- The improvement of connections with the cross-border regions of the tri-border region will also help to further tourism development. For foreign tourists, the accessibility of the Jizera Mountains, the Giant Mountains, Bohemian Paradise, as well as other tourist areas will improve.

Table 1: SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Advantageous geographical location, traditional cross-border links (Czech - Germany-Poland border) ▪ throughput of the border with Poland and Germany ▪ Fast road connection between Liberec and Praha with the possibility of reallocation of total transport work in favour of the public transport segment ▪ tourist potential of the naturally rich region (Jizera Mountains, Giant Mountains) ▪ Rail transport is the safest and relatively reliable transport system with a large transport capacity for passengers and freight ▪ Strong tradition and position of the manufacturing industry in the territory of interest ▪ Developed sector of logistics services ▪ Economically and in population growing regions (Praha, Liberec, Mladá Boleslav) 	<ul style="list-style-type: none"> ▪ Lack of high-quality and fast connection to the backbone corridor and TEN-T network, absence of a corridor line in the area of interest ▪ Lack of direct rail passenger transport connection Praha - Liberec ▪ Lack of direct rail connection from the Liberec Region to Mladá Boleslav město station ▪ Overload of exposed sections of the main road network ▪ Physical-geographical (morphological) barriers for the construction of cross-border transport infrastructure ▪ Increase in individual transport - high burden of noise, emissions and vibrations from transport ▪ Uncompetitiveness of rail transport vis-à-vis road transport (especially on long-distance sessions) due to the unsatisfactory technical condition of railway lines, limited throughput, low transport speeds and long journey times



Opportunities

- Interconnection of three countries (Germany, Poland and the Czech Republic) by modernising and optimizing existing lines or by building new lines / relocated lines (acceleration of transport links in the directions Praha - Dresden - Wrocław - Berlin)
- Connection of the area of interest to the TEN-T long-distance transport network
- Improvement of travel time to Praha from Liberec and other settlement areas of interest
- Increasing the number of visitors to tourist regions of transregional importance (Jizera Mountains, Giant Mountains, Bohemian Paradise, Kokořínsko)
- Ensuring a higher share of public transport in total transport performance
- Transfer of freight transport from road to rail, support for the development of combined transport
- Reaching a network of competitive fast connections (e.g. Liberec - Praha within 1 hour or within 30 minutes)
- to finance the development of transport infrastructure from EU funds

Threats

- Lack of financial resources for infrastructure development
- Postponement of the completion of the backbone routes of the area of interest and its connection to the international transport network
- Attenuation of public transport, increasing the intensity of individual transport in settlement areas
- Lengthy process of preparing infrastructure construction projects
- Process of promoting the construction of liner structures
- Moving out of residents from Polish and German border regions

2.1.2. Intermodal traffic model

The transport model is intended to answer the question of how the possible connection of the solved area of the tri-border region to the railway network will affect the behaviour of users, both in passenger and freight transport. The wider area of interest was defined in the opportunity study and is defined by the Berlin-Poznan line to the north and the Regensburg-Linz-Wien-Bratislava line to the south. The design of TEN-T network for individual modes of transport was specified in EU Regulation (EU Regulation 1315/2013). In the monitored modes, i.e. road transport and rail transport of both passenger and freight, only road I/35 is included in the TEN-T network in the addressed area, the proposed corridors for rail passenger and freight transport avoid the territory.

The traffic forecast is based on the calibrated model of the baseline of 2016 and the calculated forward horizons 2025, 2035 and 2065 for the baseline scenario of the project-free option (0BezP) and the project option. Population projection, automotive development and job projection are considered. The development of road infrastructure is considered according to the currently known state of the planned projects in the area of interest and is considered in accordance with the original study, which means that the road infrastructure is unchanged for the relevant time horizon across all previously assessed variants. The rail transport offer was defined by the proposed timetable for assessed variant. The amount of bus traffic takes into account the modifications of bus lines in order to maintain the continuity of regional buses with the new timetable.



The Praha -Liberec axis is at the heart of the detailed assessment of the model, but cross-border links are taken into account on the basis of the available data in the model. However, it is assumed that, even within these cross-border links, the effect of the new north-south link may be more pronounced than that of the relatively conservative model.

Conclusions of the transport model:

- In the model of the traffic situation without a project, i.e. without investment in the modification of railway lines, the greatest increases were reflected in the intensity of the individual transport on the D10 motorway in the background of Praha. This situation will no longer be suitable for motorway capacity and necessary investments in capacity (e.g. multi-lane extensions) can be foreseen.
- In the model of a traffic situation without a project, bus overload and problems with the quality and comfort of bus travel can be expected due to crowded services, especially during Sunday evening, Monday morning and Friday afternoon peaks.
- In the model of the transport situation with the project, i.e. with modifications to existing railway lines, there will be significant changes in the share of passengers transported by bus and rail in favour of the new railway
- The largest increase in the project variant of the year 2065 was evaluated in model on the profile Praha - Mladá Boleslav south, which depends on the inclusion of this line as high-speed with a design speed of 200 km/h.
- The resulting increase of almost 37 times the number of passengers on long-distance rail connections will make it possible to reduce transport streams or traffic intensities in other transport modes. The vast majority of passengers on the route according to the 2065 model in the project variant will be long-distance passengers (in the place with the highest transport streams value on the route up to 22,100 per day in both directions).
- Significant increases in the number of passengers on the route, especially in the context of long-distance rail transport, can also be seen in the profiles Mladá Boleslav north - Turnov direction Mladá Boleslav and Turnov direction Liberec - Liberec South. Roughly 12 times the number of passengers on long-distance services is modelled. In both cases, these are the main sections of the area of interest. Increases in transport streams on these profiles can be considered as key arguments for the implementation of the construction.
- By implementing the railway project, it will take over the role of the primary mode of public transport.
- The importance of long-distance rail transport from other important centres, such as Ostrava, Olomouc, Brno or Pilsen, will increase.

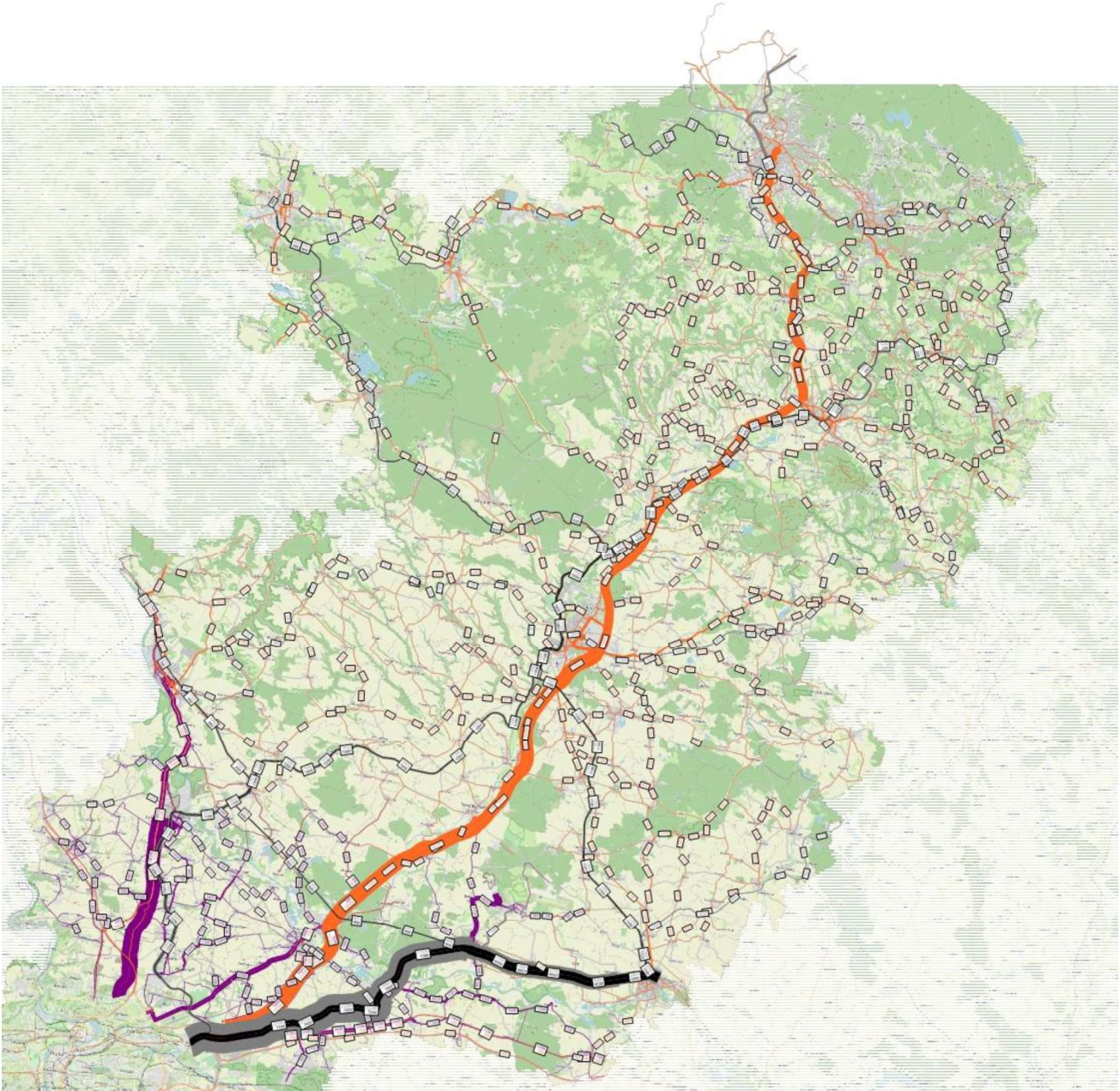
Changes in travel times:

- In the project traffic situation model, the bus is slower on all relations by a quarter of an hour to an hour and a quarter depending on the selected relation. This confirms once again that the railway will take over the primary mode of public transport on the route.
- Improving the accessibility of the Frýdlant Hook and the populated territory of the tri-border region - travel time on the Praha - Liberec - Frýdlant line 1 hour 35 minutes. The time saving compared to the present is 1 hour 30 minutes. The travel time of the bus connection is 2 hours and 20 minutes.
- Improving the availability of the Jablonec - Tanvald agglomeration and on to Poland towards Jelenia Góra - travel time 1 hour 41 minutes. The time saving compared to today is 54 minutes.

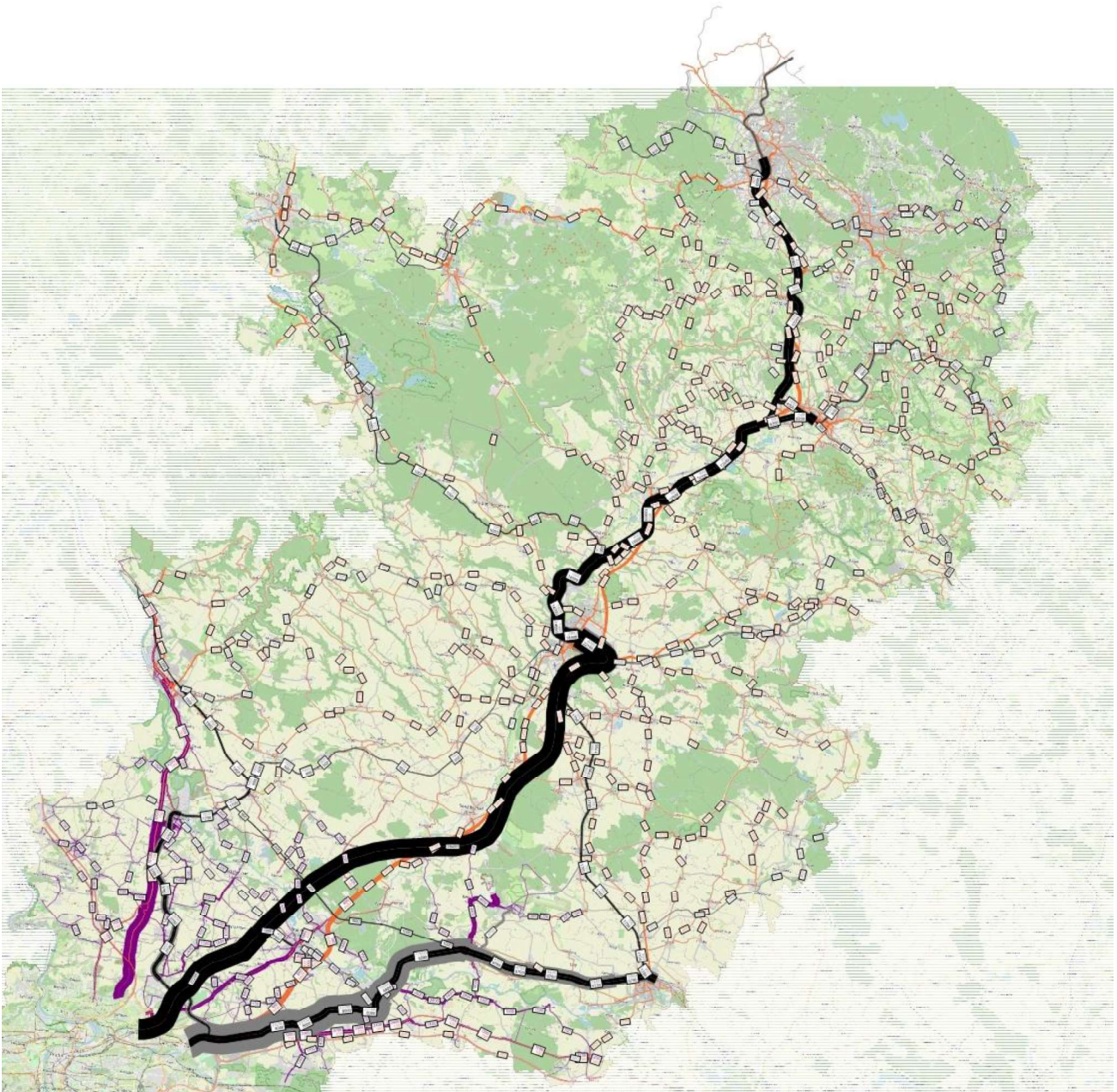


The travel time of the bus connection is 2 hours and 7 minutes. There will also be a connection towards the town of Jelenia Góra and densely populated areas of the Czech-Polish border.

- Improving accessibility to the tri-border area at Hrádek nad Nisou towards Zittau and Görlitz - travel time 1 hour 37 minutes. Time savings compared to the present 1 hour 23 minutes.



*Figure 3: Traffic load scheme for 2065 without project realisation
(orange and violet BUS, gray and black TRAIN)*



*Figure 4: Traffic load scheme for 2065 with project realisation
(orange and violet BUS, gray and black TRAIN)*



2.2. Technical part

The analytical part described in the previous chapter was the starting point for the preparation of the Connection concept and Technical study parts. These were processed on the basis of identified opportunities and distribution of traffic in the current and forward-looking conditions. Through technical and organizational measures, a status has been defined that meets the above general specifications:

- connect the region to the TEN-T core network
- ensure comfortable, safe and reliable
 - o commuting to work and schools
 - o access to long-distance connections
- offer attractive travel times and easy-to-remember interval
- support the increase in mobility in an environmentally friendly way

The basis for the above were previously developed technical solutions, which were available at various stages of the project preparation. The design of the technical solution for this study was then based on the optimization of previously proposed solutions. This was compiled with a focus on rail passenger transport, but with a reasonable offer for freight transport.

2.2.1. Technology concept

During the initial design phase, it was considered with routes running in the current track in ideal condition. In view of the scope of transport and the requirements for train crossing on single-track lines, an upgrade of trackside and station signalling equipment is proposed. During the study, in mid-December 2019, a feasibility study was approved by the Central Commission of the Ministry of Transport proposing to improve the railway connection between Praha and Mladá Boleslav in a variant counting on the modernization of the Sections Praha-Vysočany - Všetaty and Lysá nad Labem/Nymburk - Mladá Boleslav - Bakov nad Jizerou, including new construction of the so-called Všejanya, Bezděčín and Dalovice connections. This solution is referred to in the Praha - Liberec feasibility study as the "Deko" variant and the proposed modifications have been taken over.

The concept of connection according to the variant "Deko" improves the connection especially between Praha and Mladá Boleslav. However, the aim of this project is to increase the competitiveness of train transport between Praha and Liberec or the CZ/D/PL tri-border region. The basic requirement for this goal is to achieve travel time between Praha and Liberec in under one hour.

A fundamental change from previously processed designs is the "rotation" of the construction of the overall timetable. As decisive for the construction, the composition of single-track-lines in the area of the tri-border region or in its immediate vicinity was decisive. At the same time, the timetable was designed to meet the required time positions in nodes. During the construction of the timetable, the train paths of the 2nd, then the 1st and then the 3rd segment were gradually inserted. This could ensure the maintenance of links within the single-track network.

For passenger transport, the ExLib line is newly introduced within the 1st segment: Praha - Mladá Boleslav mesto - Liberec - Görlitz. This one is linked to the R21 and R21a lines and is designed to be operated by the same type of vehicles (for calculations intended in the Stadler Flirt design). The ExLib line is run in the section Praha - Mladá Boleslav město - Liberec in 60' interval, at an interval of 120' it is extended to the station Görlitz. The aim of the introduction of this line is to achieve a fast connection between the regional capital city of Liberec in the tri-border region and the capital city of Praha. While the above target of less than one hour to ensure absolute competitiveness has not been achieved, the resulting



travel time of 1 h 5m meets the requirements for achieving the transfer of passengers between modes in favour of the railway.

The scope of passenger transport and the share of individual single-track sections are decisive for the design of routes for freight trains within the timetable. Nevertheless, the Görlitz - Liberec - Mladá Boleslav - Nymburk freight route every 120 minutes was also secured during peak hours by appropriate measures. At the same time, a limit of 97% was reached in selected sections of train paths using optimal track throughput.

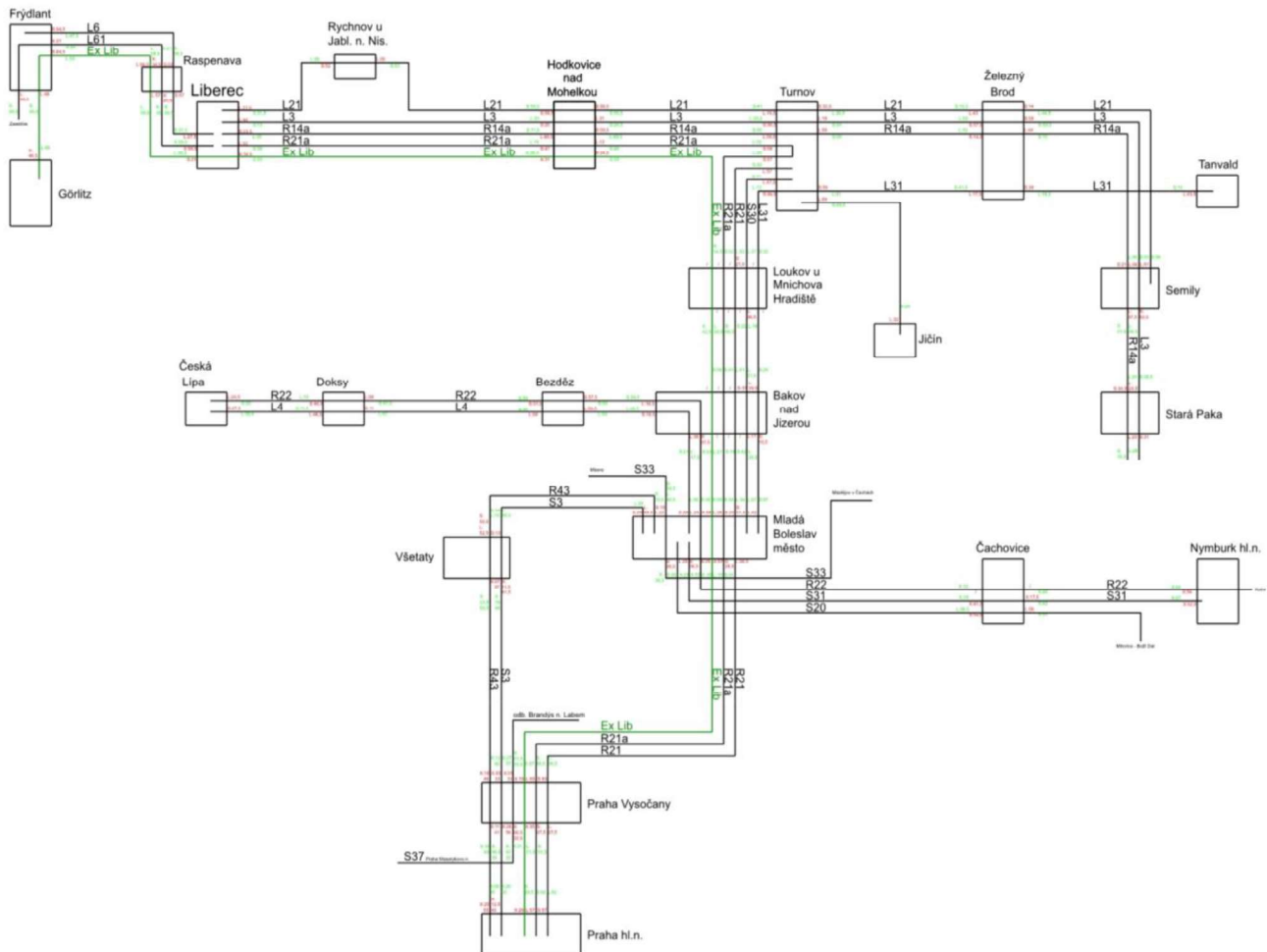


Figure 5: Network schema for project variant

2.2.2. Technical study

The assignment of this part of the project is to evaluate previously prepared technical proposals with regard to the considered solution of connecting the node points of the European TEN-T rail network in the Corridor Praha - Liberec - Zgorzelec/Görlitz and to define any further infrastructure interventions in the area of interest, necessary to ensure a high-quality and competitive rail connection of the Euroregion Nisa area. The following two works were decisive for the final solution:

- A. Search studies HST/RS5 Praha - Hradec Králové/Liberec - state border CZ/PL (SUDOP PRAHA a.s., 03/2018)
- B. Feasibility study Praha - Mladá Boleslav - Liberec, final version (Association „MP + AF-CITYPLAN - Praha - Mladá Boleslav - Liberec“, 09/2019)



While the project marked "A" is looking for a route for the high-speed connection Praha - Wrocław, the project marked "B" deals with the connection in the Praha - Liberec axis, but with the centre of gravity in passenger transport between Praha and the Central Bohemian region, or more precisely Mladá Boleslav.

Based on the work carried out, the basic parameters of the proposed technical solution were defined:

- construction in the category of conventional railways (<200 km/h)
- electrification of the backbone route
- connection to existing lines at basic nodes: Praha, Mladá Boleslav, Nymburk, Liberec, Zittau, Zgorzelec / Görlitz

The area of interest between Praha and the Euroregion Nisa can be divided into four areas, each area has its own specifics in terms of the possibilities of a technical solution and at the same time from the point of view of the demands that are placed on the infrastructure.

Connection to the railway junction Praha - border of the Capital City of Praha and the Central Boh. Region:

Assuming that it is necessary to offer a connection with the travel time Praha - Liberec of about 1 hour, the possibility of connection in accordance with the current state via Všetaty and the eastern option with connection via Lysá nad Labem for the outlook condition is excluded, since they offer the mentioned goal travel time between Praha and Mladá Boleslav. However, from the point of view of the long-distance connection, they can serve for a transitional period, until the completion of the preferred technical variant. This consists in building a new fast connection route, as this is the only way to achieve the required reduction in journey time. The entry to the railway junction Praha is planned according to the RS5 search study, which uses a concurrence of the RS4 variants (direction Ústí nad Labem) in the Section Praha-Vysočany - Kbely turn-off (km 11,667). The MB2 variant, which is routed at a design speed of 250 km/h, was chosen from the fast connection options, but with regard to the transport concept under consideration (the nature of the connections and the type of vehicles) it would be implemented as a conventional railway line with an operating speed of up to 200 km/h.

In this area, there is a significant overlap of infrastructure requirements - there is a high demand for suburban transport with a centre of gravity in Praha and at the same time a high demand for capacity for long-distance connections. This is one of the reasons why the implementation of a completely new route is proposed. Existing rail routes are already exhausted and do not allow the addition of an additional layer of long-distance services without reducing the existing range.

Borders of the Capital City of Praha and the Central Bohemian Region - Mladá Boleslav - borders of the Central Bohemian and Liberec Region:

The connection of Mladá Boleslav from the east was chosen, with a line through Mladá Boleslav město station and with the construction of the so-called "Dalovice" connection - i.e. direct connection of line No. 070 to line No. 064 in the direction to Bakov nad Jizerou (with no service in station Mladá Boleslav Central Station). In particular, it is the interconnection of the MB2 route with the Nymburk - Mladá Boleslav double track line in the area of the so-called "Bezděčín" connection (newly proposed turn-off Karlův Vrch) - modification of the line according to the Deko variant. The continuation then through the branches Krásná Louka and Dalovice thru Dalovice connection according to variant C2el to the existing line along Jizera. It will be electrified in the following section and modifications will be made to it according to the C2el variant, but only on as single-track. For operational reasons, a double-track solution is unavoidable in the section Zálučí - Loukov u Mnichova Hradiště, where a double-track according to the C2el variant is proposed in the current axis.

The area is characterised by relatively balanced requirements for suburban transport and long-distance connections. The available capacity is significantly limited by track construction - in most cases, the connecting lines are single-track lines and every hit to the timetable is copied to the connecting services.



Border of the Central Bohemian and Liberec Region - Liberec:

In order to meet the requirements of the connection concept, it is necessary to abandon the existing route at least in part of the section in order to increase the line speed and throughput of the line. Therefore, it is proposed to use the technical design according to the C2el variant in the section Loukov u Mnichova Hradiště - turn-off Čtveřín. Subsequently, the use of the existing line for electrification is proposed, up to the profile behind the crossing with the I/35 road (D35 motorway). From there (km 134.7) for capacity reasons, a double-track in the existing axis according to the C2el variant is again proposed. The C2el variant is then considered up to station Liberec. Although the route alignment corresponds to a design speed of 200 km/h, this speed cannot be achieved in the proposed structural and technical setup and is considered with an operating speed of 160 km/h that the considered vehicles are able to achieve on the sections concerned. The existing line via Rychnov near Jablonec nad Nisou is maintained for segment 3 trains (see section "connection concept").

Again, this is an area in which there is a relatively balanced demand for suburban transport and long-distance connections. In this area, the operational interdependence of single-track railway lines is most evident, again in view of the wide impact of any modification on a large area of the network.

Liberec - state border ČR/PL - Zgorzelec/Görlitz:

The connecting section between Liberec and the state border is particularly relevant for trans-regional links. As the likelihood of connection to VRT on Polish territory at this site is currently low, the use of the existing route is proposed. This would be electrified in its entirety, including the Zawidów - Zgorzelec - Görlitz section. It should be noted here that it is technically the contact of three power supply systems of the three national railway infrastructure managers (25kV 50Hz AC, 3kV DC, 15kV 16 2/3 Hz AC) and this study does not aim to define a specific technical solution. From the point of view of available technologies, it is already possible to use three-system vehicles. At the same time, it should be noted that such vehicles are in principle more expensive than dual-system or vehicles, powered for example, by a purely AC 25kV 50Hz system. At the same time, it is theoretically possible to reach an agreement with the electrification of the affected peripheral section in Poland or Germany with one power supply system (similar to the Znojmo - Retz section in our territory).

From the point of view of territorial throughput, these are generally mainly conflicts with the zoning plans of the municipalities concerned and with the regional zoning plans. In both source works, these conflicts were assessed with the same or very similar result. The most hierarchically serious risk of possible complications is the non-compliance with the regional zoning plans, which de facto applies to all sections proposed outside the existing railway lines - the new construction of the MB2 route, the so-called Bezděčín connection, Dalovice connection, section Loukov u M.H. - turn-off Čtveřín and also parts of the C2el route on cadaster Dlouhý Most, Vesec u Liberce. It is also risky to place a new track or modify an existing line in areas that, according to the zoning planning, are not primarily intended for rail transport. For this reason, in order to be able to successfully discuss the construction, it will be necessary that all sections of the selected corridor are included in the regional zoning plan and subsequently also in the zoning plans of the municipalities concerned.

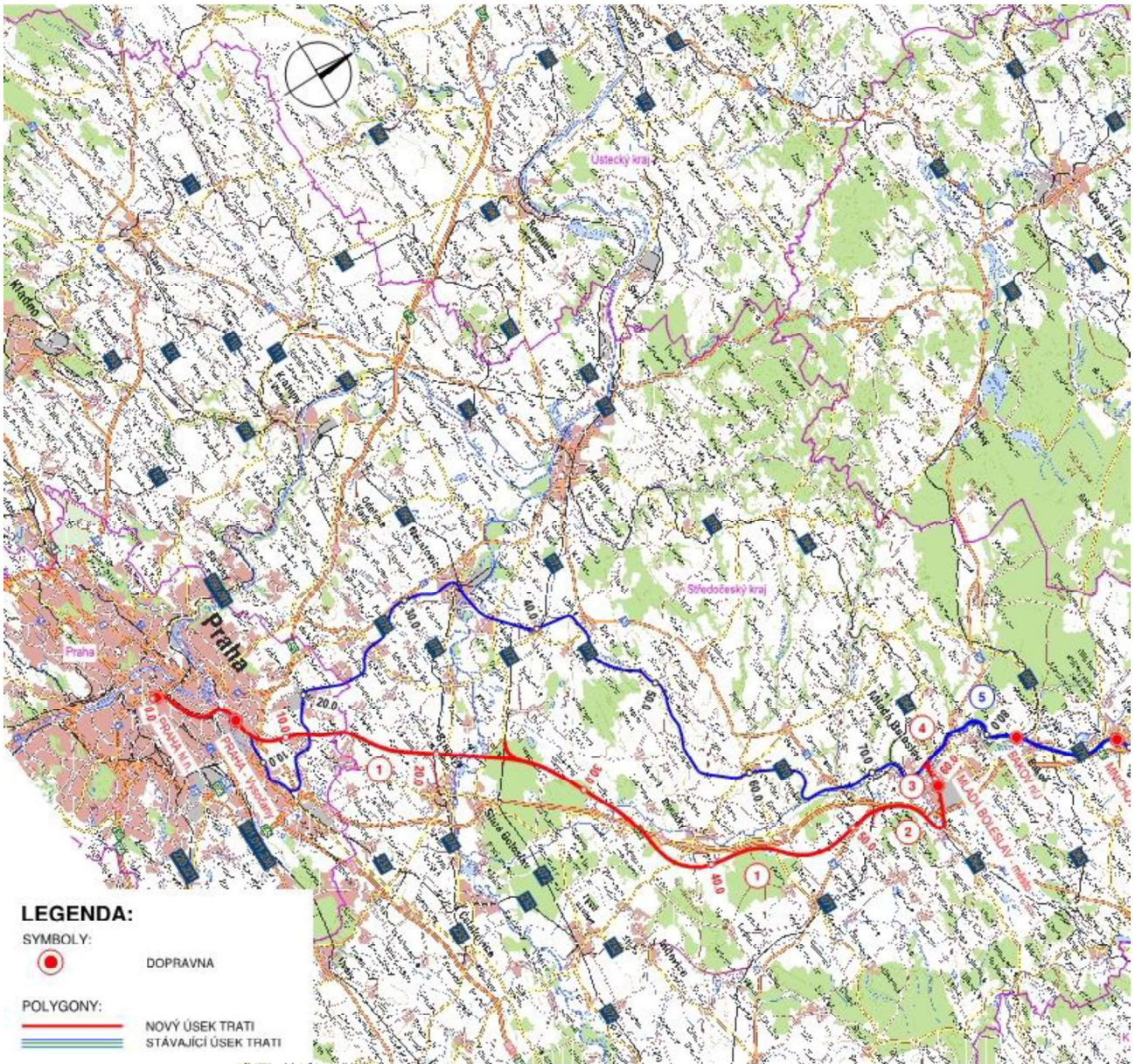


Figure 6: Overview plan of the route Praha - Mnichovo Hradiště

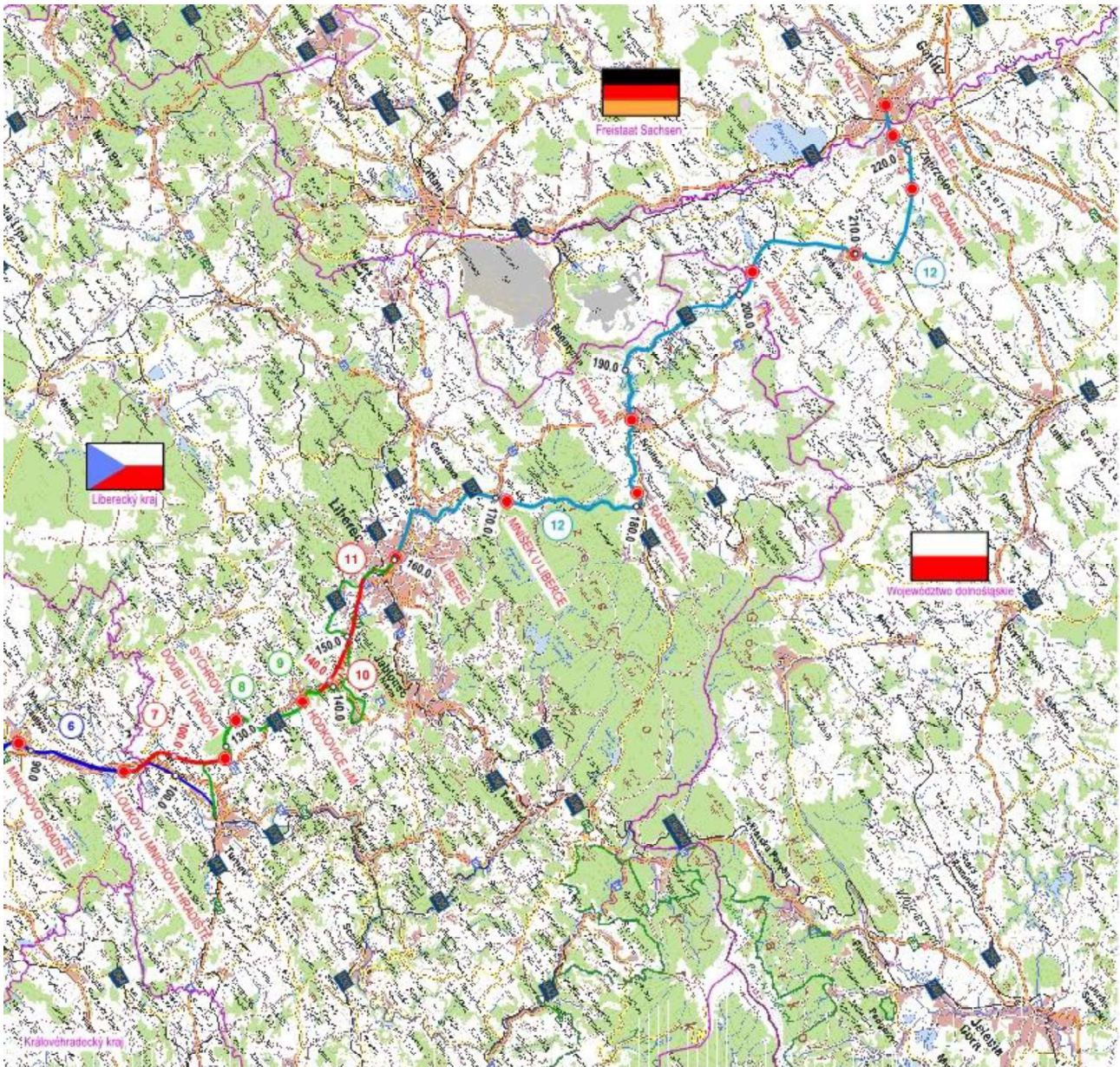


Figure 7: Overview plan of the route Mnichovo Hradiště - Zgorzelec / Görlitz



3. Conclusions and advices

This chapter summaries the implications of the proposed solution. Both technical and legislative contexts are described. In part, these are challenges, without which successful solution, the realisation of the project is not possible in its entirety. The project itself allows for progressive implementation. For example, electrification, modification of security equipment or optimisation of timetables and minor changes in infrastructure for future expansion. In this way, it is certainly possible to achieve the distribution of investment over the time. For the economic evaluation, in accordance with previously processed work, the assumption of implementation in the period 2025-2034, i.e. full operation from 2035, was accepted.

However, it is precisely the time and fragmentation of individual sub-projects in the corridor that leads to whether the construction can realistically be assessed by the CBA process according to the rules in force or not. The distribution of the investment over time and taking into account the impact of individual proposed modifications of a technical or organizational nature in investments and operations is crucial for the possibility of assessment according to the methodology for assessing the economic efficiency of transport construction projects. Here, however, an agreement between the various participants in the process, from public transport coordinators to the Ministry of Transport and to the infrastructure managers, is essential. Throughout the corridor under assessment, it is necessary to define the progress of all works (maintenance, investments, reinvestments) that have a major influence on the results of the economic assessment. The methodology for economic evaluation of railway structures currently does not have suitable tools in terms of coarser aggregation for the possibility of a basic strategic decision for constructions of a similar nature, as the proposed connection of the tri-border region in the Praha - Liberec - Görlitz axis. For the most advantageous outcome of the economic evaluation, it is necessary to prepare the basic data very detailed, for example, the calculation in the details of the documentation for the planning permit.

3.1. Contact to other intentions

In general, the proposed solution is not in any fundamental conflict with the intentions that have already been approved. Known plans have a different implementation schedule (the vast majority are projects that are close to implementation), have in view different objectives (e.g. increasing the capacity of the line between Mladá Boleslav and Nymburk) and have different outlook scenarios.

The aim of the project is to propose an alternative to the solutions studied before, that would have potential for all stakeholders concerned. That is why it is necessary to reach a political consensus between them if the project is to have a chance of continuing its preparation. At the same time, it is advisable to look for all possible synergy effects. An example could be use of the connection to the railway junction Praha if it was decided to prepare a route that would also allow connections in the direction of Liberec and Görlitz - Zgorzelec.

3.2. Need of innovations and changes

To make the proposed solution fully functional, a timetable has been designed, which envisages the deployment of modern vehicles. This is necessary for optimal use of line capacity while maintaining high reliability of operation. At the same time, such vehicles are attractive to passengers and work together to create pressure to change transport mode.

The technical challenge is to ensure suitable interoperable vehicles for cross-border direct links. In the case of electric traction, this currently means three-system electric units, as there will be a different



power supply system in each of the states concerned at the time of finishing the construction. Security equipment poses a similar challenge, although ETCS should be an established standard at the time of construction completion.

A separate point is the promotion of adaptations to technical standards and regulations for regional lines, since the affected single-track network dates mainly to the second half of the nineteenth century and the modifications carried out should be as efficient and cost-effective as possible.

3.3. Next steps

In particular, the political decision that the connection of the tri-border region to the TEN-T network is of fundamental trans-regional importance should be a crucial next step. If such a decision is supported, further work needs to be carried out on the technical basis and the specific schedule for preparations.

The whole project can be implemented progressively, one phase at a time. In this way, it should be possible to achieve significant improvements in sub-sections or areas before the completion of the whole project. Part of the project can be realized by small optimizations, for example, when deploying a suitable fleet or by implementing modifications to the security equipment.

From the point of view of project preparation, it is worth mentioning the need to ensure the consistency of the project with the relevant zoning planning documentation and to consider current experience in the preparation of projects of trans-regional importance in the time schedule.