



Rail Freight Corridor
North Sea – Baltic



Rail Freight Corridor North Sea Baltic Corridor Information Document

Book V

Implementation Plan



Co-financed by the European Union
Trans-European Transport Network (TEN-T)

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1.

General Information



Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22nd September 2010 concerning a European rail network for competitive freight¹, further referred to as ‘Regulation (EU) No 913/2010’ or ‘the Regulation’, lays down rules for the establishment and organisation of international rail freight corridors with a view to the development of a European rail network for competitive freight. It sets out rules for the selection, organisation, management and the indicative investment planning of freight corridors.

According to the initial Annex of the Regulation Rail Freight Corridor 8 was to link Bremerhaven, Rotterdam, Antwerp, Aachen, Berlin, Warsaw, Terespol and Kaunas. This Corridor is among three (out of a total of 9), that are scheduled to become operational in November 2015, two years after the launch of the 6 ‘2013 Corridors’.

Following the adoption of the Regulation (EU) No 1315/2013 of 11th December 2013 on Union guidelines for the development of the trans-European transport network² and the Regulation (EU) No 1316/2013 of 11th December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 (...) ³ relevant actions had to be taken. The CEF Regulation introduces 9 multi-modal Core Network Corridors (CNC), of which the Rail Freight Corridors are the railway backbone and changed the Annex of the Regulation (EU) No 913/2010. The routing of the Rail Freight Corridor 8 was extended – till 2018 additional branches have to be added, connecting the ports of Amsterdam, Hamburg and Wilhelmshaven to the Rail Freight Corridor 8, in 2020 the corridor has to be further extended to Riga and Tallinn via Rail Baltica. The Corridor was also renamed into Rail Freight Corridor North Sea – Baltic, in order to have the same geographical name as the corresponding CNC. After these changes and on the basis of the results of the Transport Market Study (TMS), the Management Board decided to propose an extension of the Corridor already by November 2015 to the ports foreseen for 2018 (Amsterdam, Wilhelmshaven, Hamburg) and to the Silesia Region via Horka. On the request of the Executive Board and the Czech Republic the possibility of extending the corridor to Prague was also considered in the TMS. Having results of this study, the Executive Board decided based on the proposal of the Management Board to extend the corridor to Prague via Bad Schandau and to Katowice via Horka. A Letter

¹ Published in the Official Journal of the European Union on the 20th of October 2010 L 276/ page 22.

² Published in the Official Journal of the European Union on the 20th of December 2013 L 348/ page 1.

³ Published in the Official Journal of the European Union on the 20th of December 2013 L 348/ page 129.

of Intent was sent to the European Commission by the end of June 2014. In July 2015 the Commission published its implementing Decision (EU) 2015/1111 of 7th July 2015 on the compliance (...) ⁴ stating that the joint proposal submitted by the Member States concerned for the extension of the North Sea - Baltic rail freight corridor was compliant with Article 5 of the Regulation.

The Commission decision also stated that an extension of the southern branch of the Corridor to Medyka (on Polish-Ukrainian border) would be compliant with the Regulation.

Rail Freight Corridor North Sea – Baltic includes ERTMS Corridor F (with CZ extension, part of ERTMS Corridor E as well) and the former RNE Corridor 3.

In this document Rail Freight Corridor North Sea – Baltic will be referred to as 'RFC 8'.

The implementation of a Rail Freight Corridor is a task given to all stakeholders and the procedures laid down by the Regulation envisage the participation of infrastructure managers, allocation body, relevant ministries, railway undertakings and owners of terminals belonging to the freight corridor including, where necessary, sea and inland waterway ports.

Regulation (EU) No 913/2010 foresees that the Management Board shall draw up an Implementation Plan at the latest 6 months before making the freight corridor operational and shall submit it for approval to the Executive Board. The Regulation also stipulates the contents of an implementation plan of a Rail Freight Corridor.

During March 2015 the draft Implementation Plan was consulted with stakeholders. After the approval of the Executive Board the RFC 8 Implementation Plan will be finally published in November 2015 as part of the Corridor Information Document.

⁴ Published in the Official Journal of the European Union on the 9th of July 2015 L 181/ page 82.

2. RFC 8 Description



In 2009 the European Commission established together with railway stakeholders six rail transport corridors to be equipped with ERTMS named from A to F. Corridor F aim was to improve transport between Eastern and Western Europe and encourage modal shift from road to rail. It connected Terespol (Polish-Belarussian border) via Warsaw, Poznań and Berlin to Aachen in Germany.

The next important step in improving the rail freight network was made by the Ministries of Transport of Belgium, the Czech Republic, France, Germany, Italy, Lithuania, Luxembourg, the Netherlands, Poland and Switzerland during the conference of Ministries regarding “Rail infrastructure for freight services: from corridors to network”, when the Rotterdam Declaration of Ministries on Rail Freight Corridors was signed on 10th June 2010.

After being adopted by the European Parliament and the Council on 22nd September 2010, Regulation (EU) No 913/2010 concerning a European rail network for competitive freight entered into force on 9th November 2010. As a result, 9 international rail freight corridors have been defined. One of them is RFC 8.

Together all RFCs will form the basis for a European rail network for freight, raising its attractiveness and efficiency compared to other modes of transport.

Regulation (EU) No 913/2010 provides for the implementation of corridors allowing freight trains to benefit from high quality routes, offering better services (in terms of punctuality and journey time) than at present. The principal guidelines specified by the Regulation focus on:

- establishing a single place for designated capacity allocation on the corridor;
- closer cooperation and harmonization between infrastructure managers and member states both for the operational management of the infrastructures and for investments, in particular by putting in place a governance structure for each corridor;
- increased coordination between the network and terminals (maritime and inland ports and marshalling yards);
- the reliability of the infrastructure capacities allocated to international freight on these corridors.

As stated in the introduction the original routing has been amended on several occasions. RFC8 will be gradually implemented, starting in November 2015.

The map in figure 1 presents the target shape of the Corridor by 2020.

Routing of the Rail Baltica north of Kaunas is presented in a schematic way as the actual routing is not known yet.

Dotted lines are the lines that will be a part of RFC 8 in future.

All definitions concerning RFC 8 lines are described in chapter 2.2.1.

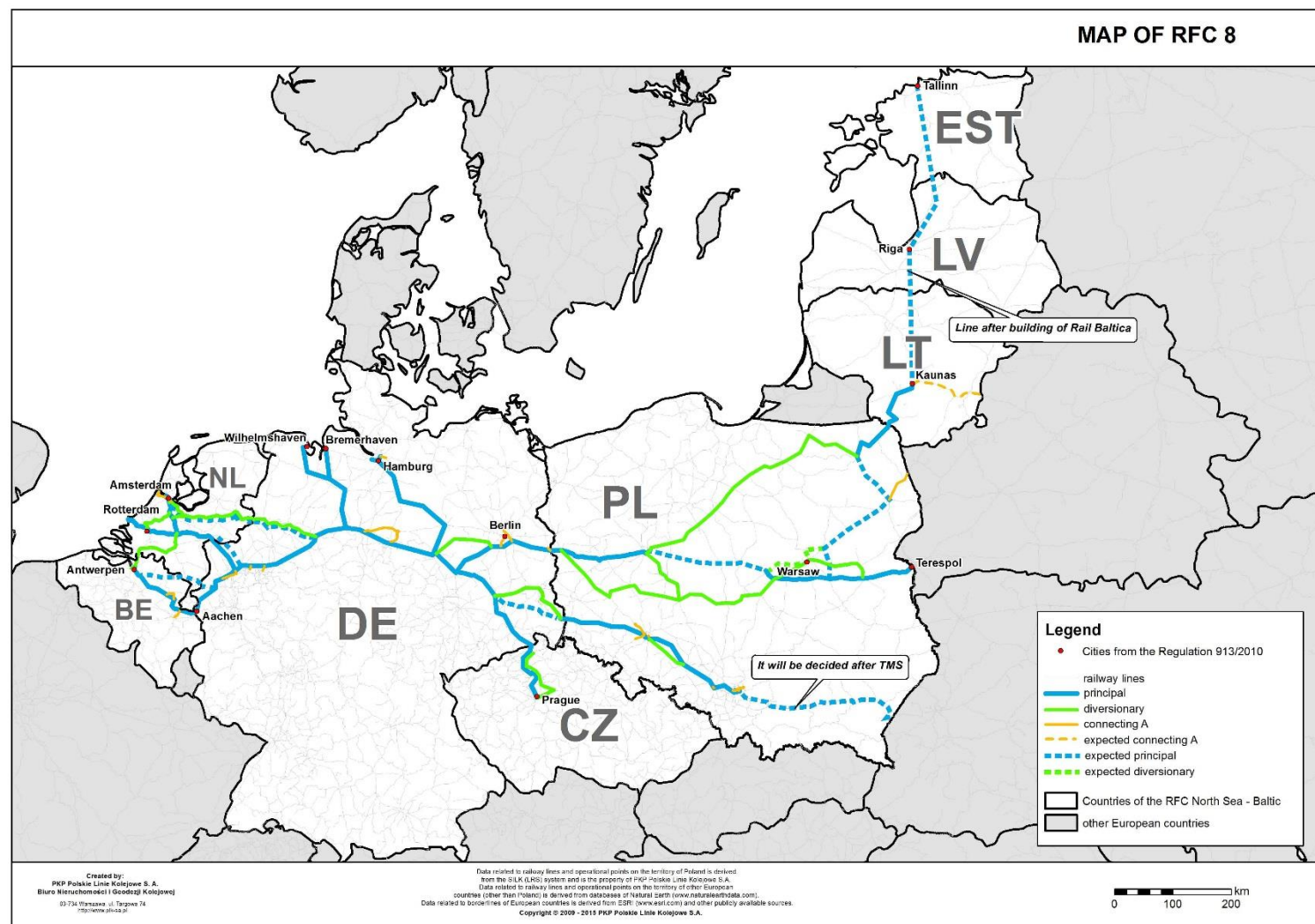


Figure 1. The possible future situation of RFC 8, Horizon 2020.

2.1 Measures for creating RFC 8

The establishment of the RFC 8 organisational structure was the crucial measure for creating the corridor. This establishment was initiated already in the first half of 2011 when the Infrastructure Managers involved established the Working Group Coordination (later changed into Working Group Coordination/pre-PMO) which from March 2011 on led to the further development of the RFC 8 structure and finally resulted in establishing the Management Board in May 2012.

As Regulation (EU) No 913/2010 foresees a governance structure on 2 levels, the Member States also launched their work on the implementation of the Regulation, resulting in setting up the Executive Board.

Furthermore, in November 2012 two Advisory Groups were established: one for railway undertakings and one for managers and owners of terminals. The organisational structure of RFC 8 is presented in figure 2.

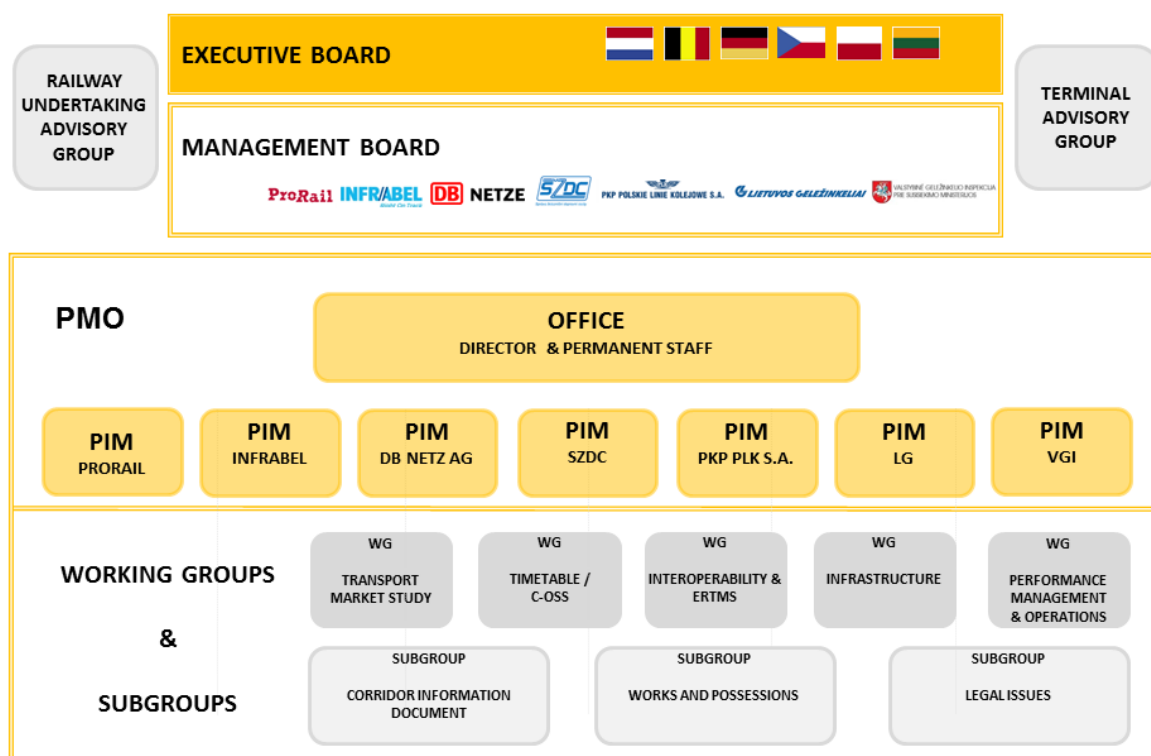


Figure 2. Organisational structure RFC 8.

2.1.1 Executive Board

Following the Declaration of Rotterdam the Member States started the cooperation on ministerial level. As a result of this, during the conference in Antwerp on 27th June 2011, the representatives of the Member States concerned expressed, by developing the Mission

Statement, their support to the future governance structure of RFC 8 (Management Board and Executive Board). In March 2012, the RFC 8 Member States set up the Executive Board.

By the end of June 2014 the Letter of Intent concerning Czech participation in the Corridor was signed by representatives of Ministries and submitted to the European Commission. On 9th July 2015 the Commission published its implementing Decision (EU) 2015/1111 stating that the joint proposal submitted by the Member States concerned for the extension of the North Sea - Baltic rail freight corridor was compliant with Article 5 of the Regulation.

On the 8th of October 2014, the Mission Statement was replaced by the “Agreement regarding the Executive Board of Rail Freight Corridor North Sea – Baltic” which was signed in Luxembourg by the relevant Ministers. It includes the Czech Republic as member of the Executive Board and underlines that decisions of the Executive Board, which are provided for by the Regulation, are legally binding and directly applicable.

All the decisions of the Executive Board are taken on the basis of mutual consent of the representatives.

The Executive Board is currently composed of representatives from the Ministries responsible for transport of Belgium, the Netherlands, Germany, the Czech Republic, Poland and Lithuania.



The Executive Board decided to have an alternating chairmanship. The chairman maintains a close working relationship with the Management Board in order to ensure an optimal work flow. The Executive Board's meetings take place alternately in every corridor country. The meetings take place at least 4 times per year.

In the Agreement it was stipulated the Executive Board shall work together where necessary with the European institutions and organisations. The Executive Board is responsible for dialogue and cooperation of Regulatory Bodies and National Safety Authorities' representation on the corridor.

Members of the Executive Board participate in meetings with Advisory Groups described in this Implementation Plan in chapter 2.1.3.

Representatives of Latvian and Estonian Ministries of Transport are invited to join the Executive Board as observers.

2.1.2 Management Board

On 18th May 2012 the Infrastructure Managers of the RFC 8 i.e. Infrabel (BE), ProRail (NL), Keyrail (NL), DB Netz AG (DE), PKP Polskie Linie Kolejowe S.A. (PL), Lietuvos geležinkeliai (LT) and the Lithuanian Allocation Body, Valstybinė geležinkelio inspekcija prie Susisiekimo ministerijos, signed an Agreement at the highest management level by which the Management Board as the decision-making body was formally established. The Management Board steers the further development of the RFC 8 structure by setting up the Project Management Office and the Working Groups.

On 24th April 2013 the Management Board approved the participation of Správa železniční dopravní cesty (SŽDC) in the RFC 8 structure as an observer on three levels: Management Board, PMO and Working Groups. This decision was followed by the decision to extend the corridor to Prague by November 2015 and its acceptance by the Commission's implementing decision. SŽDC is a full Member of the Management Board since the 9th of July 2015. In 2015 the tasks of Keyrail were acquired by ProRail.



On 5th November 2013 the Management Board decided to take the legal form of an EEIG (European Economic Interest Grouping). Currently the EEIG is under establishment and its seat will be in Warsaw.

The Management Board meets on a regular basis, at least four times a year, alternately in every corridor country. The meetings are chaired by the Chairperson. The current Chairperson of the MB is Mr Oliver Sellnick (DB Netz).

2.1.2.1 Project Management Office (PMO)

On the 1st January 2013 the Office was set up in Warsaw. It supports the Management Board in the interest of RFC 8 and acts as a fully independent (from any particular Infrastructure Manager) facilitator. Each Infrastructure Manager and Allocation Body nominates one of its employees as a Project Implementation Manager (PIM). The PIMs are the central contact person for the Office and are closely involved in all tasks and activities of the Office. The PIMs organise the contribution of their companies.

The Office coordinates the Working Groups and monitors all their assigned tasks on behalf of the Management Board. The Office conducts all its tasks and activities in agreement with all PIMs following the principle of transparency. The Office and the PIMs together form the PMO.

The PMO meets on a regular basis, usually once per month, alternately in every corridor country. The meetings are chaired by the Director of the Office, Mr Jakub Kapturzak.

2.1.2.2 Working Groups

In order to facilitate the work on the RFC 8 implementation, 5 Working Groups (WG) were set up. The Working Groups consist of experts of the Infrastructure Managers and Allocation Body involved in the corridor. All WGs started their work in 2012.

Working Group	In charge of:
Transport Market Study	<ul style="list-style-type: none"> • Coordination of Transport Market Study • Traffic demand analysis and projections
Timetable/C-OSS	<ul style="list-style-type: none"> • Corridor One Stop Shop (C-OSS) • Capacity • Authorized Applicants
Performance Management and Operations	<ul style="list-style-type: none"> • Operational rules at border crossings • Operational rules for cross-border information • Operational rules in case of disturbances • Operational bottlenecks • Punctuality

Interoperability and ERTMS	<ul style="list-style-type: none"> • Deployment Plan for ERTMS on RFC 8
Infrastructure	<ul style="list-style-type: none"> • Study on the Corridor's Infrastructure Characteristics • TMS long-term part • Infrastructure parameters analysis • Infrastructure bottlenecks

2.1.2.3 Subgroups

Furthermore 3 Subgroups were set up for specific tasks, which do not meet on a regular basis. The Subgroups consist of experts of the Infrastructure Managers and Allocation Body involved in the corridor. Their task is to provide support to the Management Board in the following fields:

Subgroup	In charge of:
Corridor Information Document	<ul style="list-style-type: none"> • Elaboration of the Book 2 of the CID
Works and Possessions	<ul style="list-style-type: none"> • Coordinating information on works and possessions on the corridor level • Coordinating publishing of works and possessions on the corridor level
Legal Issues	<ul style="list-style-type: none"> • Support the MB in legal matters

2.1.3 Advisory Groups (AG)

According to the Regulation (EU) No 913/2010 the Management Board shall set up two advisory groups:

- the Railway Undertaking Advisory Group (RAG);
- the Terminal Advisory Group (TAG).

The kick-off meeting of the TAG and RAG took place on the 27th November 2012 in the presence of the European Commission, the members of the Executive Board and the Management Board. Since then several meetings were organized

In the beginning the AGs had a limited number of representatives per country. However, to get as much input as possible from the stakeholders it was decided later to open up the Groups to all interested railway undertakings or terminal operators, if relevant to the Corridor.

The Advisory Groups are a unique possibility for railway undertakings and terminals to express their expectations towards the RFC 8 organization.

2.1.3.1 RAG

The RAG represents a platform for railway undertakings (RU) to facilitate the exchange of information, recommendations and mutual understanding about technical and operational issues and requirements, respectively strategic plans for improvements on this corridor in a non-discriminatory way with the MB. It may issue opinions on any proposal of the MB, which might have consequences for railway undertakings. It may also propose and deliver own-initiative opinions. The MB shall consider any of these opinions, as far as possible, in its work on the enhancement of the corridor. Proposals, which commonly might be raised and explained by the RAG will be carefully investigated and taken into account as far as they are feasible. However final decisions will remain the sole responsibility of the MB.

The current RAG Spokesperson is Mr Andreas Pietsch from Captrain.

2.1.3.2 TAG

The TAG represents a platform for managers and owners of terminals and port authorities to facilitate the exchange of information, recommendations and mutual understanding about technical and operational issues and requirements, respectively strategic plans for improvements on this Corridor in a non-discriminatory way with the MB. The TAG has the right to give advices to the MB. It may issue opinions on any proposal of the MB, which might have direct consequences for investment and the management of the terminals. It may also propose and deliver own-initiative opinions. The MB shall consider any of these opinions, as far as possible, in its work on the enhancement of the Corridor. In case of disagreement between the MB and TAG, the latter may refer the matter to the Executive Board. The Executive Board shall act as an intermediary and provide its opinion in due time. However final decisions will remain the sole responsibility of the MB.

The current TAG Spokesperson is Mr Jörg Schulz from Eurogate GmbH & Co. KGaA, KG.

2.1.4 Cooperation with other Rail Freight Corridors.

It is a priority for all Rail Freight Corridors to cooperate among each others in order to have processes as harmonised as possible.

The cooperation applies to all bodies involved in the work of the Corridor.

The Executive Boards work together in workshops in order to draft a common Framework for Capacity Allocation for the timetables 2016 and 2017 and to establish rules for cooperation with the Core Network Corridors.

The Management Boards work together in a regularly organized meetings: so-called RFC Talks and High Level Meetings with RailNetEurope (an association set up by a majority of European Infrastructure Managers and Allocation Bodies to increase the quality and

efficiency of international rail traffic). One of the main purposes of the cooperation is the development of common processes and IT tools for RFCs customers, which should improve the attractiveness of the offer.

RUs organized their joint action under the auspices of the UIC in the ECCO project (Efficient Cross Corridor Organisation).

2.2 RFC 8 characteristics

2.2.1 Routing

The railway lines of the RFC 8 link North Sea ports with major urban and industrial centers of eastern members of the European Union. As North Sea ports are main gates for delivery of goods for Continental Europe, the success of the RFC 8 could be one of the most important factors for modal shift to railway's advantage in European freight transport.

The railway lines of RFC 8 were divided into:

- 1) Principal line (on which Pre-arranged Paths (PaPs) will be offered);
- 2) Diversionary line (on which PaPs may temporarily be considered in case of disturbances, e.g. long lasting major construction works on the principal lines);
- 3) Connecting line A, i.e. lines connecting principal lines to a terminal (on which PaPs may be offered but without obligation to do so);
- 4) Connecting line B, i.e. line, siding or track system of private or local infrastructure (on which a priori no PaPs will be offered);
- 5) Expected line, i.e. any of above-mentioned which either are planned in future or under construction but not yet completely in service. Expected line can also be an existing line which shall be part of the RFC in the future.

In accordance with the Regulation (EU) 1315/2013 on Union guidelines for the development of the trans-European transport network if a corridor line is part of the TEN-T core network corridor or the European Deployment Plan (TSI CCS) it is intended be equipped with ERTMS.

2.2.1.1 Expected lines

On the map (figure 4) and schemes beneath (figures 3 and 6-15) RFC 8 is drawn without expected lines in contradiction to the map in figure 1. There are many reasons why some lines are only planned to be a part of the Corridor at a later stage.

2.2.1.1.1 Amsterdam/Antwerp - Bad Bentheim - Löhne route

At the corridor start in November 2015, the corridor line Amsterdam – Bad Bentheim - Löhne is partly defined as connecting line and partly as diversionary line.

Access to Germany from Amsterdam and the Belgian ports via Bad Bentheim will not be defined as a principal line unless future development of transport volumes makes it necessary. The route Amsterdam via Bad Bentheim will be mentioned as a future principal line and the MB and the Executive Board will continuously analyze when to change it to a principal line. The route Antwerp – Roosendaal – Den Bosch via Bad Bentheim will be

mentioned as a diversionary line. This connecting extension will not prevent the integration of the Iron Rhine – once it is realised - in the RFC 8 as principal line.

The definition of a line as a principal line will require at least one pre-arranged path (PaP) offered per day. While this PaP is unlikely to meet demand e.g. in terms of timing, it will in addition block capacity on a route otherwise operated as a diversionary stretch for the Betuweroute during the construction period for the part between Zevenaar and Oberhausen.

For these reasons it was agreed that the Bad Bentheim route, depending on i.a. the date of completion of the abovementioned construction works, will be a diversionary line which in future, depending on developments, can be re-qualified as a principal line.

2.2.1.1.2 Iron Rhine:

In the future corridor lines overview part of the Iron Rhine, Lier - border BE/NL – border NL/DE - Rheydt is mentioned as expected principal line. If (political) decision making on the Iron Rhine is finalised and the Iron Rhine is reactivated then the status will be principal line.

2.2.1.1.3 Emmerich-Oberhausen (third track):

After extensive construction works a third track (currently expected to be realised in 2022) will be available between Emmerich and Oberhausen. This line will be also part of the corridor as a principal line.

2.2.1.1.4 Knappenrode-Horka:

As the line section Knappenrode-Horka is closed till 2018 due to construction works (electrification, ERTMS implementation and second track) trains will be rerouted via Cottbus to Horka. After the end of the construction works Knappenrode-Horka will be also part of the corridor as a principal line.

2.2.1.1.5 Lines in Poland

Due to modernisation works on some crucial lines in Poland, at the corridor start in November 2015, the corridor lines Swarzędz – Łowicz, Tłuszcz – Ełk and Tłuszcz – Piława are defined as expected principal lines and corridor lines Łowicz – Sochaczew – Warszawa Gołębki and Warszawa Praga - Tłuszcz are defined as expected diversionary lines. When the modernisation works are finished, the lines will become respectively principal and diversionary lines.

Connecting line in north-eastern Poland will not be linked with any line with PaPs before modernisation of southern part of the Rail Baltica (Warszawa – Białystok) is completed.

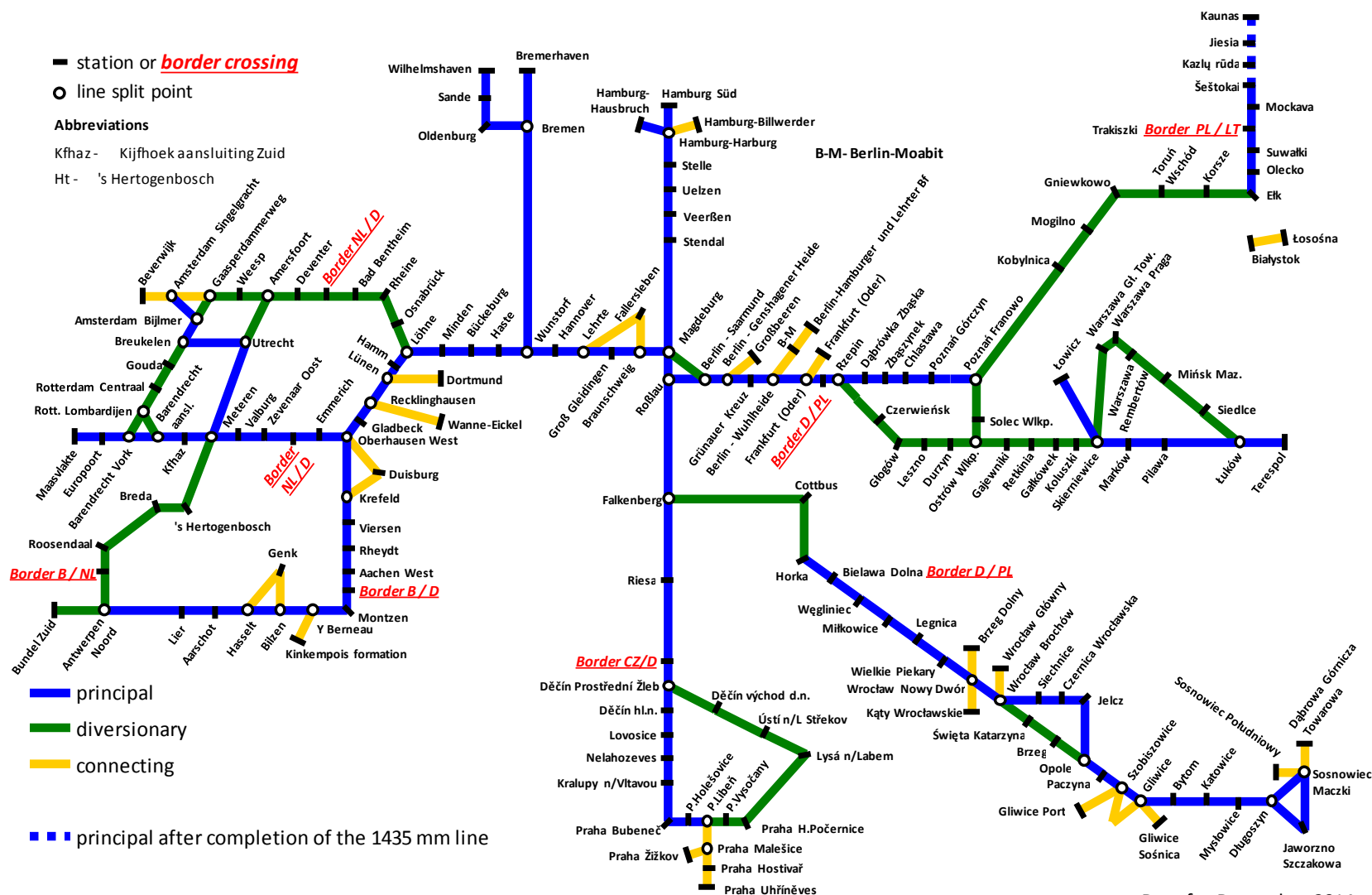


Figure 3. Types of lines of the RFC 8.

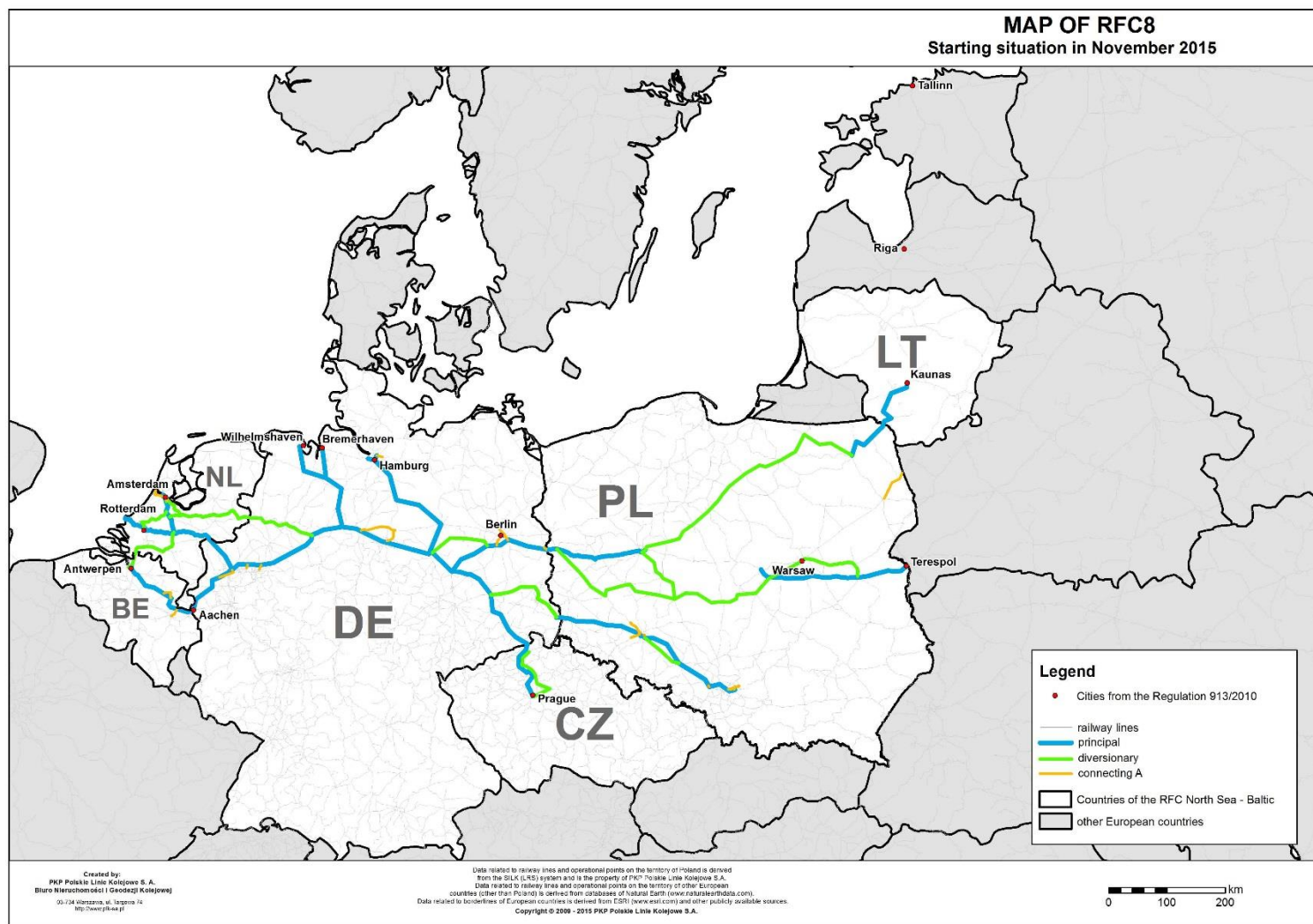


Figure 4. Lines of RFC 8 in November 2015.

2.2.2 Infrastructure parameters

In this chapter a number of infrastructure parameters of the lines belonging to RFC8 in November 2015 is presented in a schematic way. In the following Jumping Jacks the expected lines are not taken into consideration.

In order to describe the infrastructure characteristics the main infrastructural parameters were selected and defined with the aim to have a common approach for collecting the information. The information is gathered by each Infrastructure Manager on the predefined parameters that are described in the table below.

Parameter	Values			Definition
Type of line	Principal, diversionary, connecting..			Main corridor line or alternative route
Type of network	TEN-T core, TEN-T comprehensive, outside TEN-T..			The name of the network the line belongs to
Number of tracks	1, 2, 3, etc.			Number of tracks in the section
Type of power source	AC 25kV-50Hz/ AC 15kV-16,7 Hz/ DC 3kV/DC 1,5 kV /other (nominal voltage and frequency)/ Diesel.			The values of the catenary voltage and frequency in the section or Diesel
Max train length	..., 600, 650, 700, 740, ..., 1050 m, etc.			The maximum length of a freight train with locomotive set by IM
Axle load	Loading Class	Max Axle load	Max Meter load	Sum of the static vertical wheel forces exerted on the track through a wheel set or a pair of independent wheels divided by acceleration of gravity
	A	16,0 t	5,0	
	B1	18,0 t	5,0	
	B2	18,0 t	6,4	
	C2	20,0 t	6,4	
	C3	20,0 t	7,2	
	C4	20,0 t	8,0	
	CE	20,0 t	8,0	
Meter load	CM2	21,0 t	6,4	A total rolling stock weight resting on a given meter
	CM3	21,0 t	7,2	
	CM4	21,0 t	8,0	
	D2	22,5 t	6,4	
	D3	22,5 t	7,2	
	D4	22,5 t	8,0	
	E4	25,0 t	8,0	
	E5	25,0 t	8,8	
Profile	C 22, C 32, C 45, C 70, C 80, other C 341, C 349, C 351, C 364, C 400, C 410, other			Standard combined transport profile number for swap bodies
	P 22, P 32, P 45, P 70, P 80, other P 339, P 341, P 349, P 351, P 359, P 364, P 400, P 410, other			Standard combined transport profile number for semi-trailers
Max line speed	40, 50, 60,80, 100,...160 km/h, etc.			The maximum speed permitted for the best performing freight rolling stock
Parameter	Values			Definition

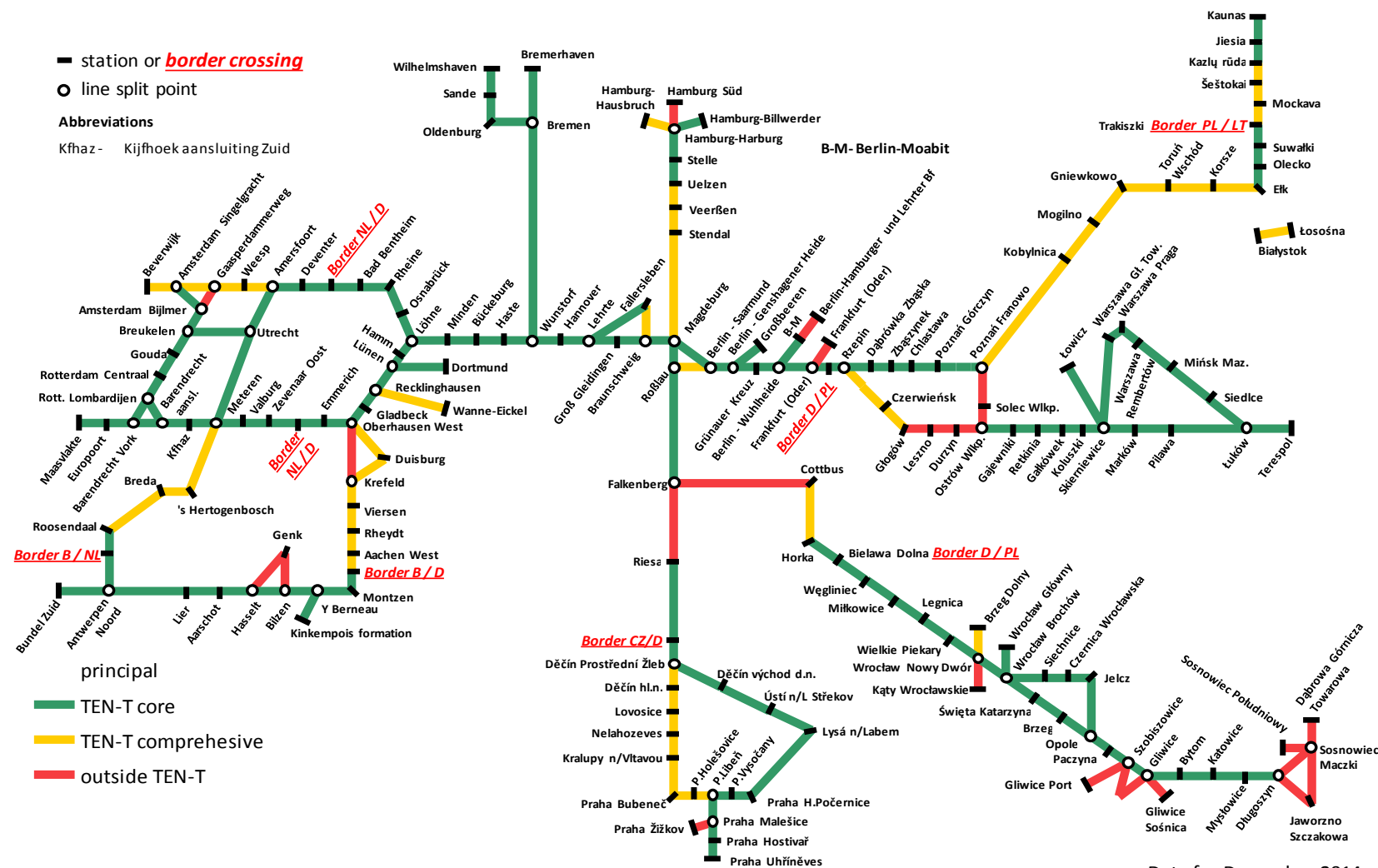


Loading gauge	GA, GB, GC, G2	A loading gauge defines the dimensions of the railway infrastructure e.g. bridges, tunnels and other structures allowing safe passage for railway vehicles and their loads
Gradient	The gradient expressed as a permillage	$\text{Gradient} = \frac{\text{ED (Elevation difference)}}{\text{HD (Horizontal distance)}}$ Deepest gradient on the section (expressed in ‰ in both directions)
Control and command system	Some examples: MPC, AB, PAB (Lithuania); SHP (Poland); Indusi (IATC), LZB, PCB (Germany); ATB-EG, ATB-NG, TBL (Netherlands); TBL, Crocodile (Belgium), LS (Czech republic).	National train control and command system used in the section
Telecommunication system	Analogue telecommunications network, RST (Radio Sol-Train, or Train to Surface Radio), GSM-R.	Telecommunication system used in the section

Figure 5. Values and definitions of predefined infrastructure parameters.

Values of infrastructure parameters are presented within Appendix 1.

The currently existing infrastructure parameters are presented on the following JJs as well. Differences between the values of the parameter along the corridor are shown in different colours. Each JJ presents different parameters.



Data for December 2014

Figure 6. Type of network. Most of the corridor lines are part of the TEN-T core network, however there are a number of lines that in 2015 belong to the TEN-T comprehensive network or are out of the TEN-T network.



Figure 7. Number of tracks. The majority of the corridor lines are double track lines.

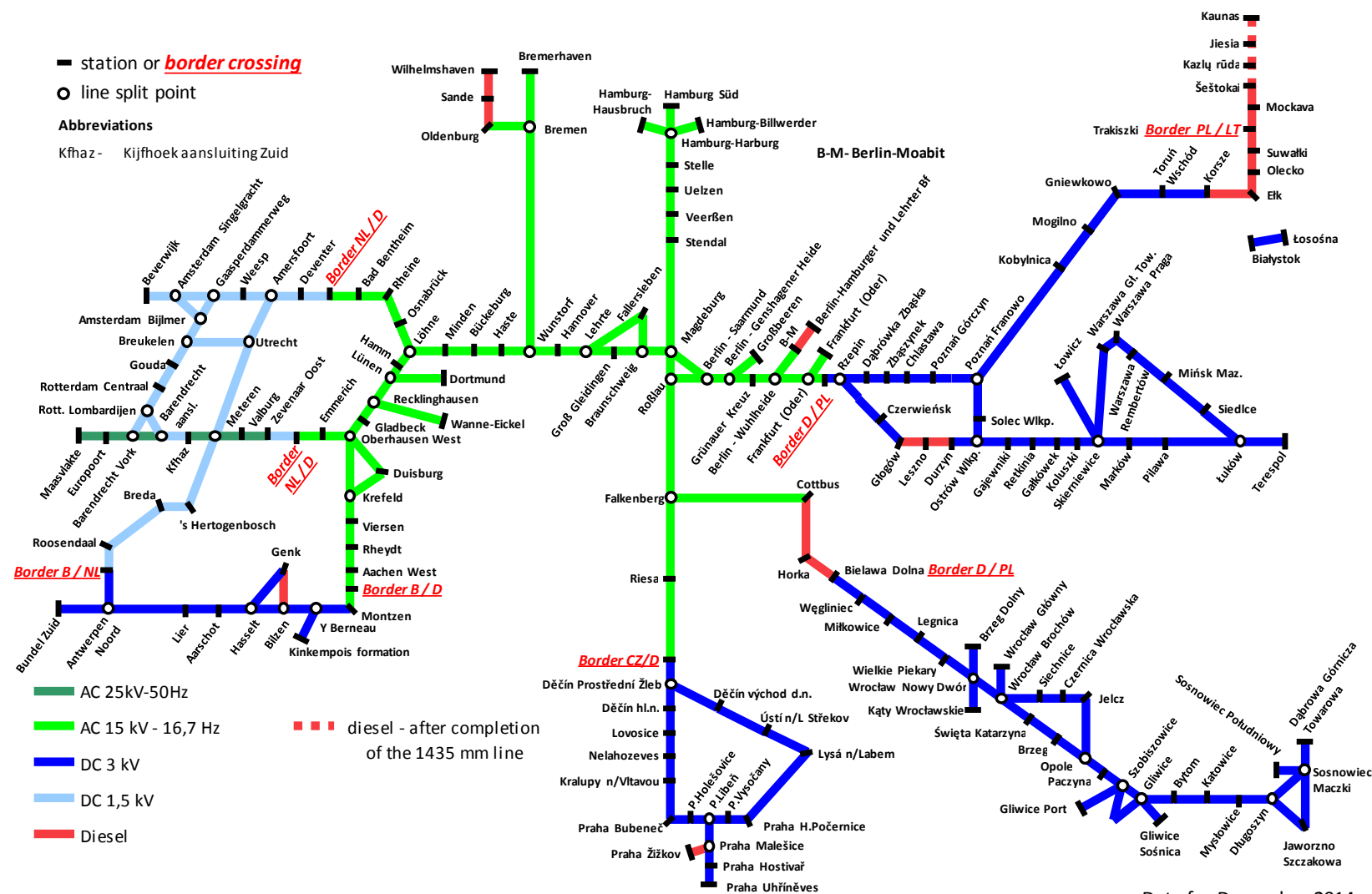


Figure 8.Type of power source. Almost each country has a different voltage and frequency value, and not all the sections are electrified.

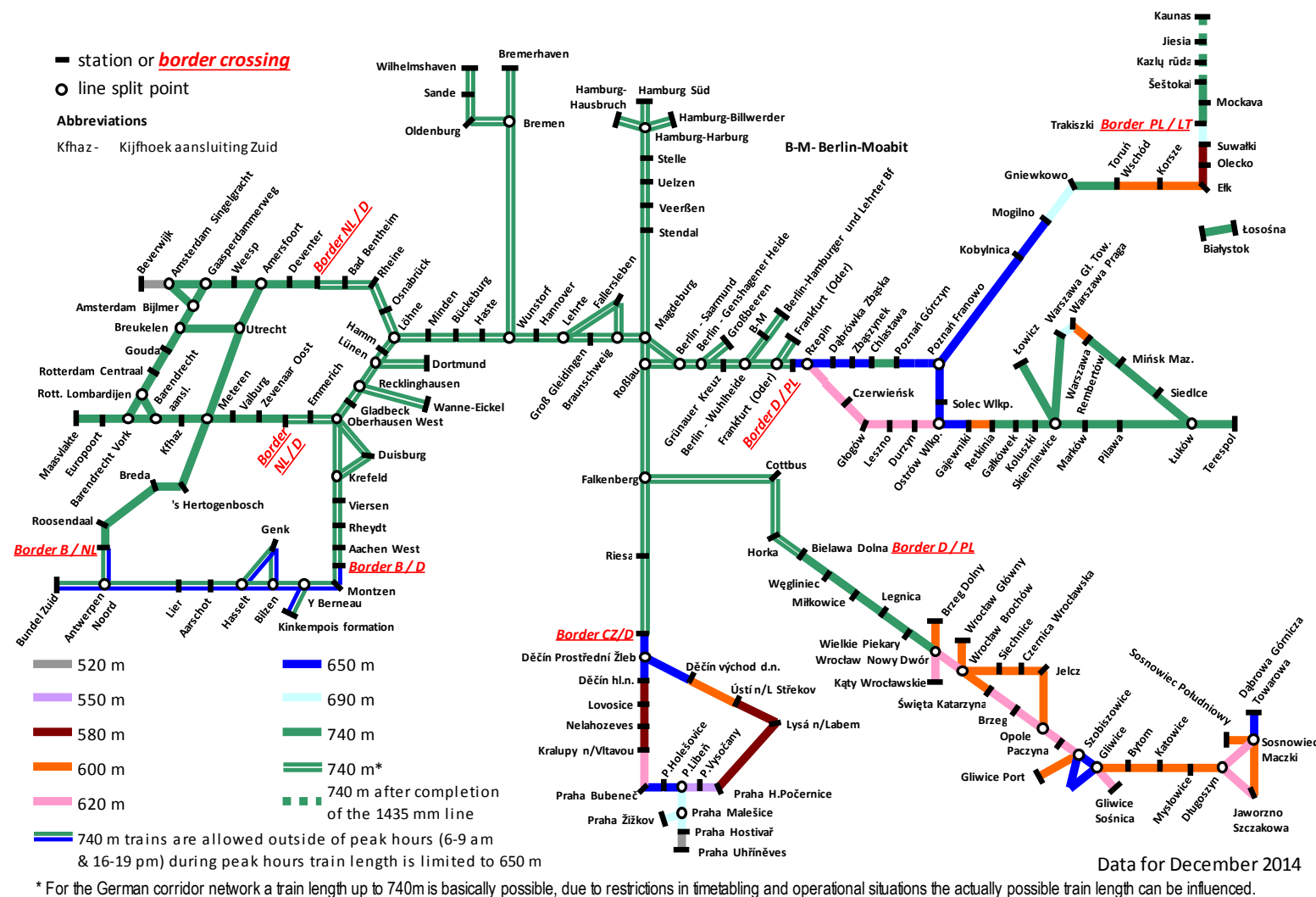
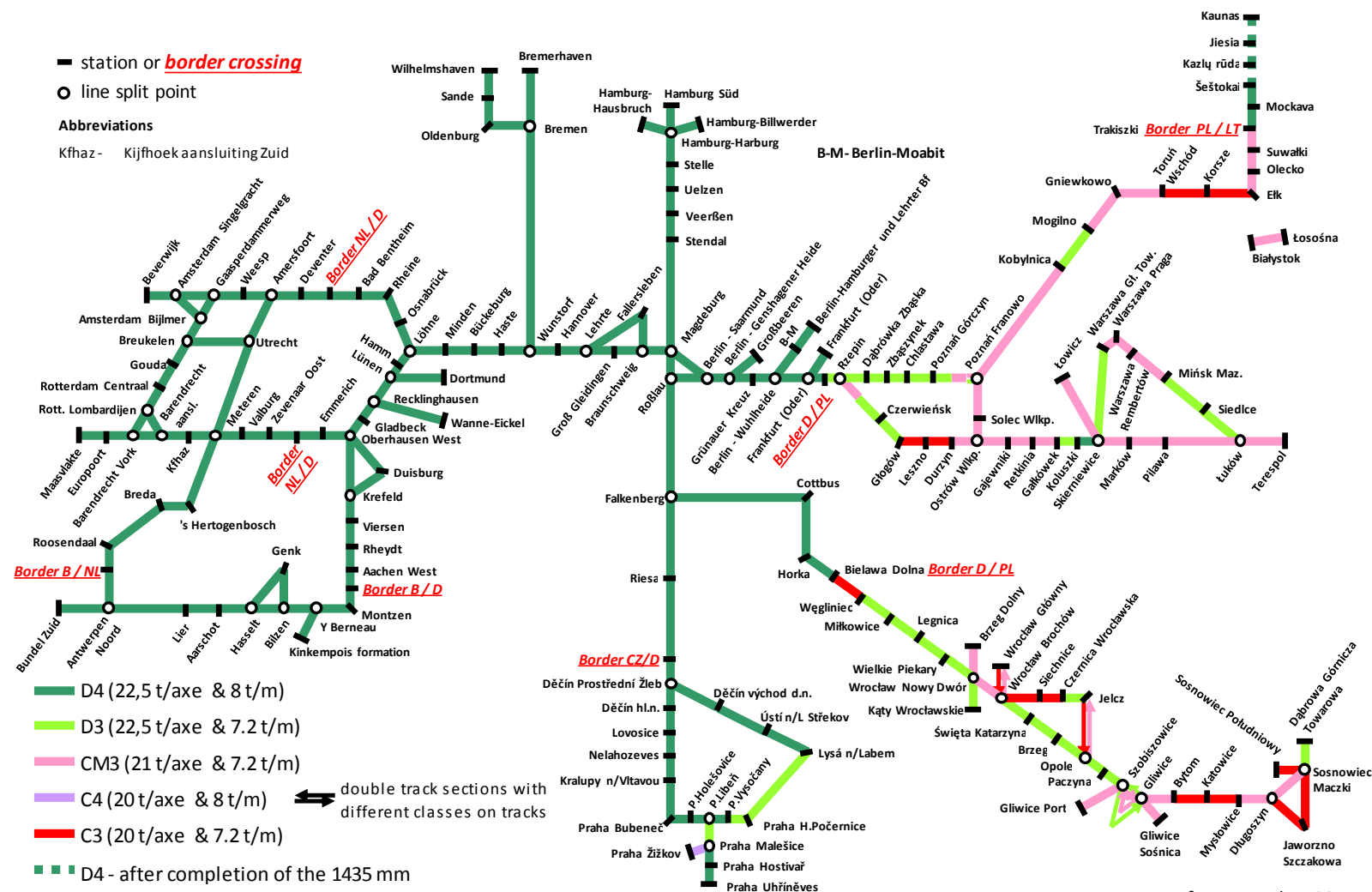


Figure 9. Max train length. The maximum train length on the corridor lines varies from 520 m to 740 m. Today journeys for 740 m trains on the entire corridor are not possible.



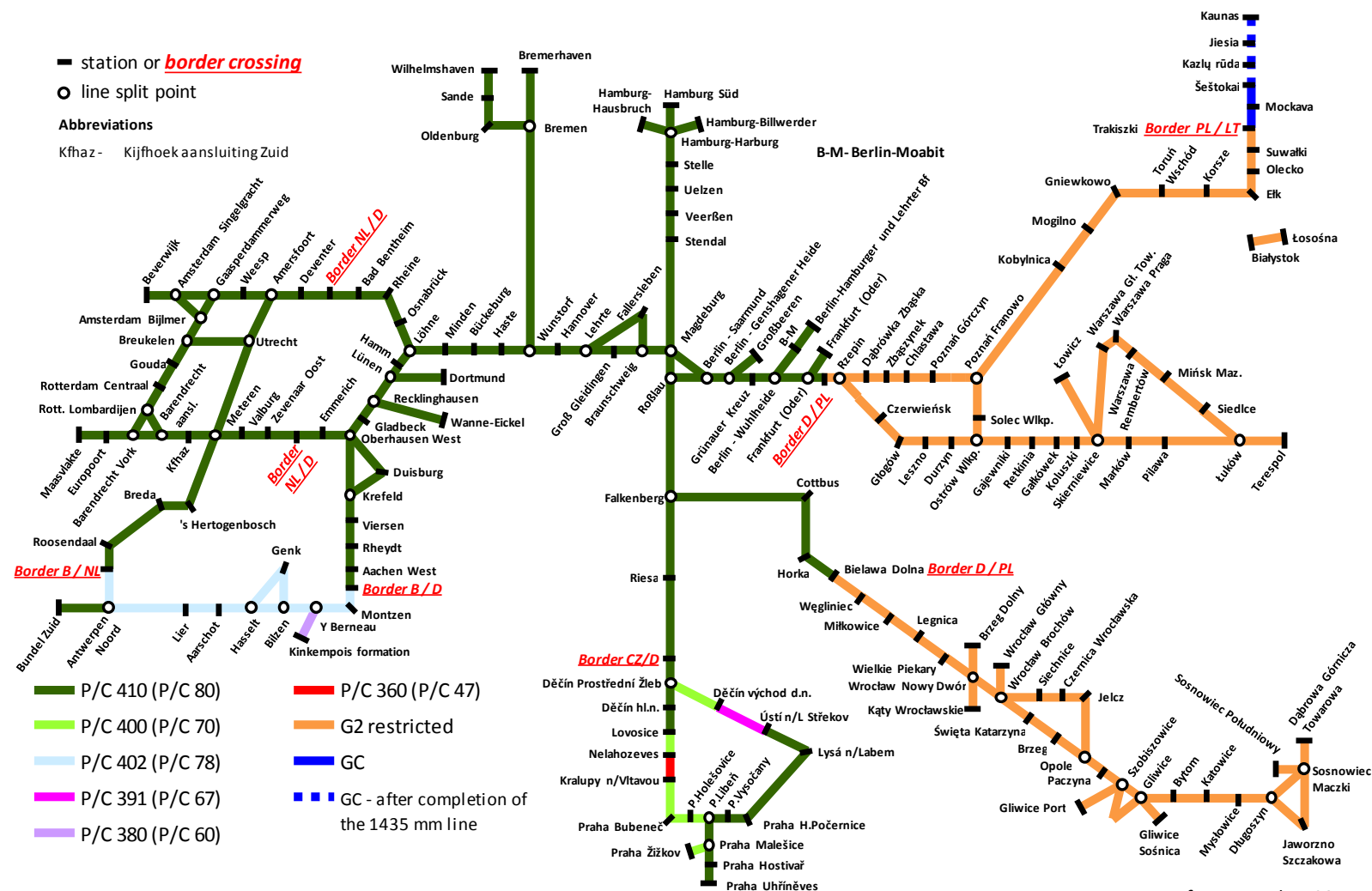
Data for December 2014

Figure 10. Axle/Meter load. In the major part of the corridor the allowed axle load is 22.5 t and meter load is 8 t, whereas the possibilities in Poland are more restricted.



Data for December 2014

Figure 11. Maximum speed. In the majority of the corridor for even and odd direction the allowable maximum speed on lines for freight trains is 100 km/h or more except certain regions where the speed is limited down to 40 km/h. For most of the sections there is no difference between values for odd and even direction apart from certain sections where the difference is relatively small.



Data for December 2014

Figure 12. Profile/Loading gauge. For the purpose of describing the loading gauge, the parameters given in the IM network statement were used (except Poland), i.e. Belgium and Germany – the profile parameter, the Netherlands and Lithuania – the loading gauge parameter.

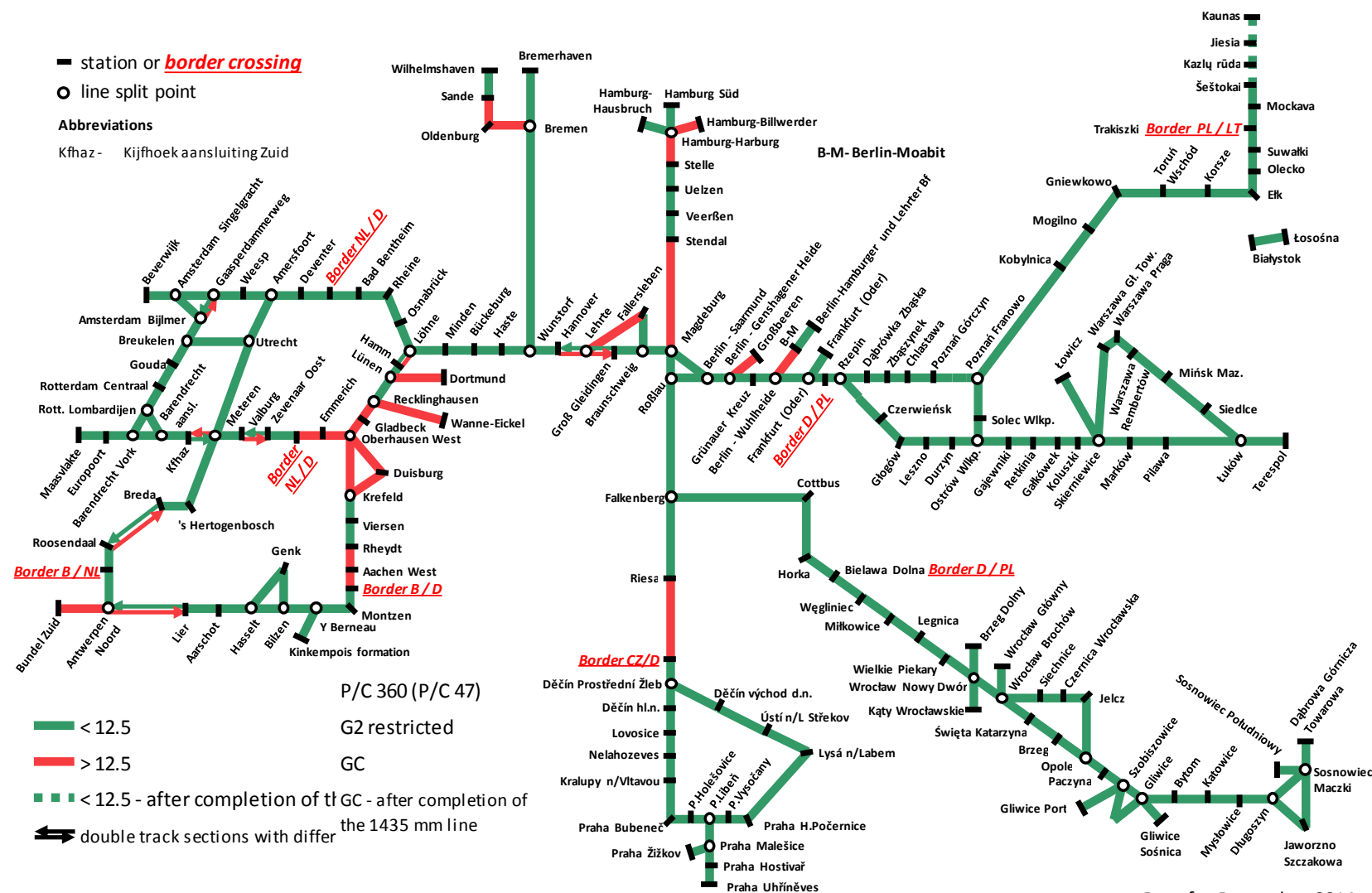


Figure 13. Gradient. On the majority of the corridor lines the gradient is less than 12.5% for even and odd direction.

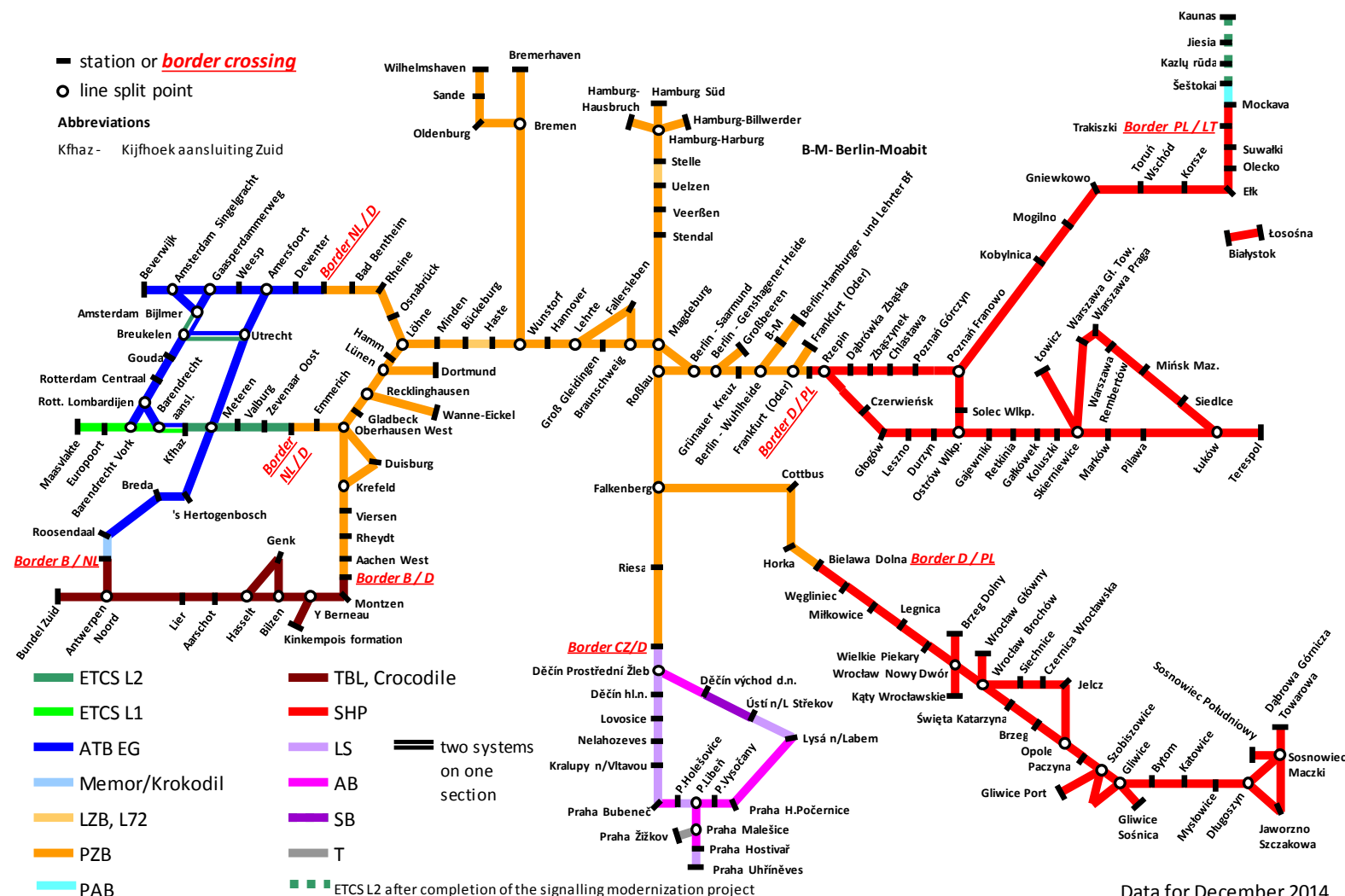


Figure 14. Control and command system. Each country has different national command and control system. In addition, the Netherlands and Belgium (Liefkenshoektunnel) have already equipped some (sections of) lines with ETCS.

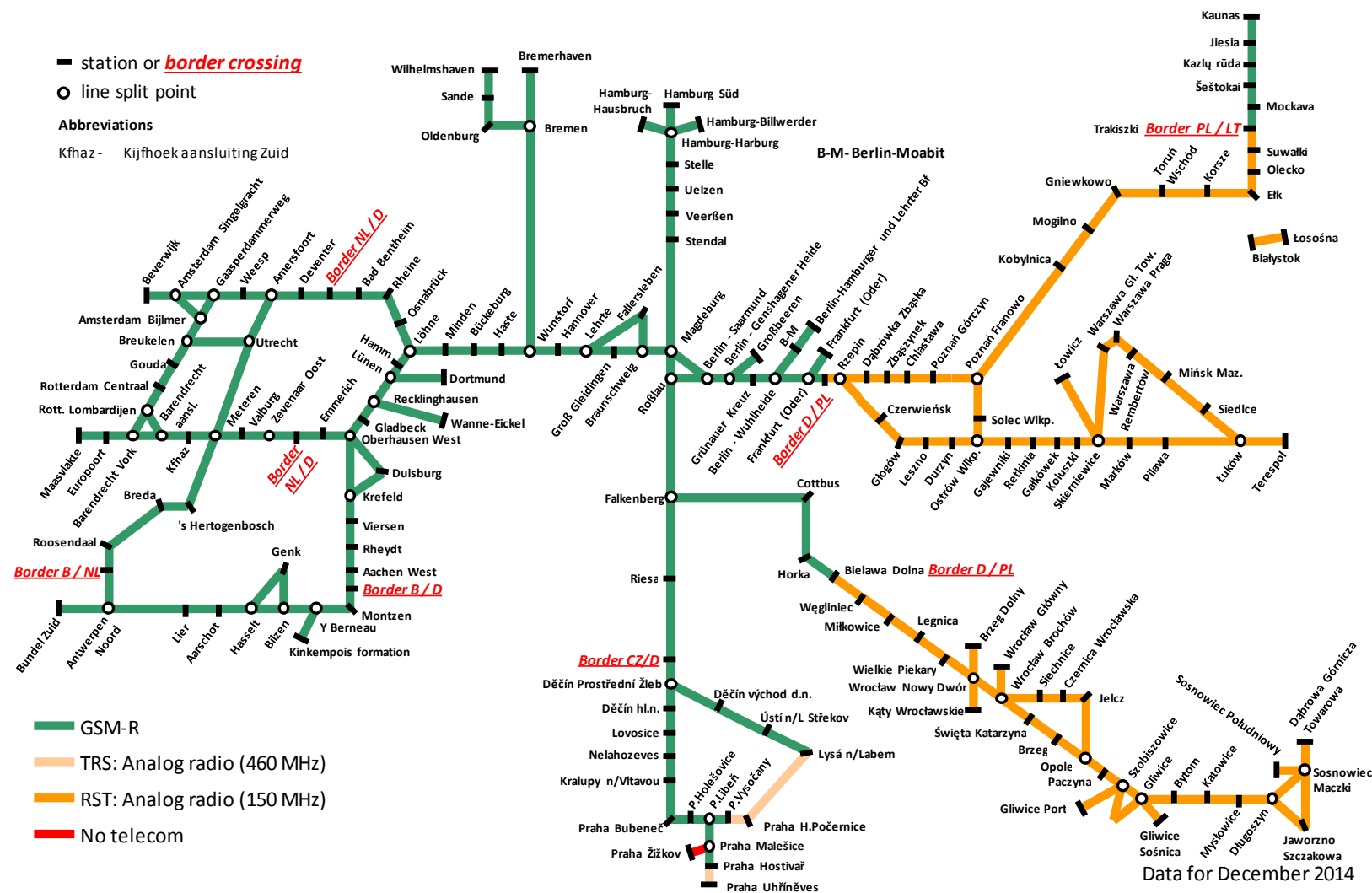


Figure 15. Telecommunication system. The western part of the Corridor and Lithuania is covered with GSM-R whereas the radio communication is different in Poland and parts of Czech Republic.

2.2.3 Operational bottlenecks

A bottleneck is a point or a section of a route with a capacity substantially below that characterizing other sections of the same routes caused by one of the following aspects:

- infrastructure,
- capacity,
- timetabling,
- outside influences,
- operational procedures.

One of the main issues that should be treated as operational bottlenecks are problems caused by lack of cross-border interoperability. Deficiencies in this area may be technical by nature but may also have different background, e.g. legal requirement concerning knowledge of foreign language by loco drivers.

Train delays can be analysed to identify operational bottlenecks, but this research requires resources and data. After installing regular monitoring and analysis of the train data, bottlenecks can be identified.

2.2.4 Infrastructural bottlenecks

Information about infrastructural bottlenecks is provided in section 6.4.

2.2.5 Corridor terminals

Terminals mentioned in beneath table are seen as relevant for RFC 8. It does not mean that other terminals cannot benefit from the Corridor traffic.

Country	Terminal	Handover station
BE	Antwerpen Cirkeldyck	Antwerpen Noord
	Antwerpen Zomerweg	Antwerpen Noord
	Antwerpen Gateway DP world terminal	Antwerpen Noord
	Hupac Terminal Antwerpen	Antwerpen Noord
	Combinant	Antwerpen Noord
	Antwerpen ATO	Antwerpen Noord
	Noordzee Terminal PSA	Antwerpen Noord
	Europa Terminal PSA	Antwerpen Noord
	SHIPIT (under construction)	Antwerpen Noord
	Mexico Natie N.V	Antwerpen Noord
	Deurganck PSA	Antwerpen Noord
	Delwaide Dock Terminal (DP World)	Antwerpen Noord
	Antwerpen Main Hub	
	Euroterminal Genk Exploitatie	Genk Zuid / Genk Goederen
	Haven Genk	Genk Zuid / Genk Goederen
	Liège Logistique Intermodal	Renory/Kinkempois
Country	Terminal	Handover station
BE	Trilogiport (under construction)	Renory/Kinkempois



	Renory/Kinkempois	
	Antwerpen Noord (Marshalling yard)	
NL	APMT	Maasvlakte West
	ECT Oostelijke Rail Terminal	Maasvlakte West
	Euromax-ECT	Maasvlakte West
	RTW-ECT Rail Terminal West	Maasvlakte West
	RWG (Rotterdam World Gateway)	Maasvlakte West
	Lyondell Basell	Maasvlakte West
	Rhenus Logistics	Maasvlakte West
	EMO	Maasvlakte
	Rotterdam Container Terminal (Kramer)	Maasvlakte
	Steinweg Hartel Terminal	Maasvlakte
	Abengoa	Europoort
	ADM	Europoort
	Broekman Logistics Europoort	Europoort
	Caldic	Europoort
	Ertsoverslagbedrijf Europoort CV	Europoort
	Euro Tank Terminal	Europoort
	European Bulk Services	Europoort
	Nerefco	Europoort
	P&O Ferries	Europoort
	Steinweg	Europoort
	Akzo-Nobel	Botlek
	Bertschi	Botlek
	Biopetrol	Botlek
	Borax	Botlek
	Broekman Car Terminal	Botlek
	Broekman Distriport	Botlek
	Cobelfret	Botlek
	Kemira	Botlek
	LBC	Botlek
	LyondellBasell	Botlek
	Odfjell	Botlek
	Odfjell, RCC	Botlek
	Openbare Laad- en losplaats	Botlek
	Rubis	Botlek
	Steinweg Botlekterminal	Botlek
	Vopak Chemiehaven	Botlek
	Vopak TTR	Botlek
	Vopak Terminal Botlek	Botlek
	Vopak Terminal RCC	Botlek
	Cerexagri / Arkema	Pernis
	Interforest	Pernis
	Koole	Pernis
	Rotterdam RTT	Pernis
Country	Terminal	Handover station
NL	Shell (diverse poorten)	Pernis
	Metaal Transport	Waalhaven Zuid
	Metaaltransport / Meijers	Waalhaven Zuid



	Openbare Laad- en losplaats	Waalhaven Zuid
	Rail Service Center	Waalhaven Zuid and Pernis
	RET	Waalhaven Zuid
	Rhenus Logistics	Waalhaven Zuid
	Rotterdams Havenbedrijf	Waalhaven Zuid
	Shunter (A. Plesmanweg)	Waalhaven Zuid
	Shunter (Blindeweg)	Waalhaven Zuid
	Steinweg Beatrixhaven	Waalhaven Zuid
	Steinweg Dodewaardstaart	Waalhaven Zuid
	Uniport	Waalhaven Zuid
	Tata-Steel	Beverwijk
	AVI West	Amsterdam Houtrakpolder
	De Rietlanden (Afrikahaven)	Amsterdam Houtrakpolder
	De Rietlanden (Amerikahaven)	Amsterdam Houtrakpolder
	Ter Haak	Amsterdam Houtrakpolder
	Cotterel (Vlothaven)	Amsterdam Westhaven
	EuroTank Amsterdam	Amsterdam Westhaven
	Igma Cargill	Amsterdam Westhaven
	Koopman Car Terminal	Amsterdam Westhaven
	Noord-Europees Wijnopslag Bedrijf (NWB)	Amsterdam Westhaven
	Openbare Laad- en losplaats	Amsterdam Westhaven
	Overslagbedrijf Amsterdam (OBA)	Amsterdam Westhaven
	Rotim	Amsterdam Westhaven
	Steinweg	Amsterdam Westhaven
	VCK Scandia Terminal	Amsterdam Westhaven
	Vopak Petroleumhaven	Amsterdam Westhaven
	Waterland Terminal	Amsterdam Westhaven
	PON Leusden	Amersfoort
	Defensie	Almelo (incl. Delden)
	Grindhandel Dollegoor	Almelo (incl. Delden)
	Openbare Laad- en losplaats	Almelo (incl. Delden)
	Van Merksteijn	Almelo (incl. Delden)
	Elementis	Almelo (incl. Delden)
DE	CT Wilhelmshaven (CTW)	Wilhelmshaven
	Ubf Hamburg Billwerder	Maschen
	Hamburg – Container Terminal Altenwerder (CTA)	Maschen
	Hamburg – Container Terminal Burchardkai (CTB)	Maschen
	Hamburg - Waltershof	Maschen
	Maschen Rbf	Maschen
	Hamburg – Container Terminal Tollerort (CTT)	Hamburg Süd
Country	Terminal	Handover station
DE	Hamburg - BUSS Hansa	Hamburg Süd
	CTB Bremerhaven	Bremerhaven - Speckenbüttel
	NTB Bremerhaven	Bremerhaven - Speckenbüttel
	MSC Gate Bremerhaven	Bremerhaven - Speckenbüttel
	Bremen Roland	Bremen



	Bahnhof Bremen Rbf	Bremen
	Bahnhof Oberhausen Osterfeld	Oberhausen Osterfeld
	Bahnhof Oberhausen West	Oberhausen West
	Bahnhof Duisburg Ruhrort Hafen	Duisburg Ruhrort Hafen
	DeCeTe Duisburg	Duisburg Ruhrort Hafen
	PKV Duisburg	Duisburg Ruhrort Hafen
	KV-Drehscheibe Rhein/Ruhr (Megahub Duisburg)	Duisburg Ruhrort Hafen
	Duisburg RRT (Rhein-Ruhr Terminal)	Duisburg Hafen
	Logport I Duisburg DIT	Rheinhausen
	Logport I Duisburg Kombiterminal (DKT)	Rheinhausen
	Logport I Duisburg Trimodal Terminal (D3T)	Rheinhausen
	Logport II Gateway West	Duisburg Hochfeld Süd
	Logport III	Krefeld - Hohenbudberg
	Bahnhof Wanne-Eickel	Wanne-Eickel
	Container Terminal Herne	Wanne-Eickel
	Container Terminal Dortmund	Dortmund - Obereving
	Bahnhof Seelze Rbf	Seelze
	Hannover Linden (until go live of KV Drehscheibe Lehrte)	Hannover - Linden
	KV Drehscheibe Lehrte (coming up)	Lehrte
	Wolfsburg GVZ	Fallersleben
	Braunschweig Containerterminal	Braunschweig
	Salzgitter GVZ - KLV Terminal	Salzgitter - Beddingen
	Magdeburg Rothensee	Magdeburg
	Ubf Großbeeren	Großbeeren
	Bahnhof Seddin Rbf	Seddin
	Ubf Dresden	Dresden - Friedrichstadt
	Dresden GVZ	Dresden - Friedrichstadt
	Berlin - Westhaven	Berlin Hamburger und Lehrter Bf
	Frankfurt (Oder)	Frankfurt (Oder) Pbf
CZ	Praha-Uhřetěves	Praha-Uhřetěves
	Praha-Žižkov	Praha-Žižkov
	Praha-Holešovice	Praha-Holešovice
	Lovosice	Lovosice
	Ústí nad Labem	Ústí nad Labem
	Děčín	Děčín
	Mělník	Mělník
PL	Euroterminal Sławków (Euroterminal Sławków)	Jaworzno Szczakowa
	Terminal Gądk (Polzug Intermodal Polska)	Gądk
Country	Terminal	Handover station
PL	Terminal Gliwice (PKP Cargo)	Gliwice
	Terminal Gliwice (port) (PCC Intermodal S.A.)	Gliwice (port)
	Terminal Kąty Wrocławskie (Shavemaker Logistics&Transport)	Kąty Wrocławskie
	Terminal Kutno (PCC Intermodal S.A.)	Stara Wieś k. Kutna
	Terminal Pruszków (Polzug Intermodal	Pruszków



	Polska)	
	Terminal Pruszków (PKP Cargo)	Pruszków
	Terminal Sosnowiec Południowy (Spedycja Polska Spedcont Sp. z o.o.)	Sosnowiec Południowy
	Terminal Warszawa Główna Towarowa (Spedycja Polska Spedcont Sp. z o.o.)	Warszawa Główna Towarowa
	Terminal Wrocław (Polzug Intermodal Polska)	Wrocław Główny
	Terminal Łódź Olechów (Spedycja Polska Spedcont Sp. z o.o.)	Łódź Olechów
	Centrum Logistyczne Małaszewicze (PKP Cargo)	Małaszewicze Południe
	Centrum Logistyczne Łosośna (Centrum Logistyczne w Łosośnej)	Sokołka
	Terminal Poznań Franowo (PKP Cargo)	Poznań Franowo
	Terminal Swarzędz (CLIP Logistics Sp. z .o.o.)	Swarzędz
	Terminal Brzeg Dolny (PCC Intermodal S.A.)	Brzeg Dolny
	Terminal Dąbrowa Górnicza (Polzug Intermodal Polska)	Dąbrowa Górnicza Towarowa
LT	Baltic FEZ terminal	Šeštokai (decision pending)
	Okseta terminal	Kaunas (decision pending)
	Kaunas intermodal terminal	Kaunas (decision pending)
	Kaunas railway station	Kaunas (decision pending)
	Mockava terminal	Mockava (decision pending)
	Šeštokai railway station	Šeštokai (decision pending)

Figure 16. List of the RFC 8 terminals with their handover stations.

3.

Essential elements of the Transport Market Study



According to the Regulation the Management Board has to carry out a Transport Market Study. It was conducted in 2013/2014. In the following chapter an Executive Summary of the TMS can be found.

The structure of the chapter uses the TMS output and graphics. That is why it does not comprise some information about the Czech Republic. The traffic towards the Czech Republic is published in separate subchapter (3.1.12. for the short term analyse and 3.2. for the long term analyse) stemming from the Czech module.

3.1 Executive summary of the TMS

3.1.1 Introduction

To enhance a European network for competitive rail freight the Regulation (EU) No 913/2010 stipulates the implementation of 9 initial rail freight corridors and a package of measures to improve the competitive situation of rail freight transport on these corridors. The RFC 8 is to be made operational by 10 November 2015. As an essential part of the implementation plan for the freight corridor a transport market study (TMS) has to be carried out according to Article 9.3 of the Regulation.

The TMS for the RFC 8 consists of two parts:

- 1) short term study (1 – 5 years perspective) considering the current situation and the period until 2017
- 2) long-term study (5 – 15 years perspective)

While the short term part has been carried out by the Consultant, the long-term part was independently elaborated by the Working Group Infrastructure of the corridor organisation. Both parts together then form the entire TMS report for the RFC 8.

3.1.2 Objectives and methodological approach

The main objective of the Transport Market Study is to provide the Infrastructure Managers in the RFC 8 with specific information and advice regarding the freight market development and future customer demand along the corridor. Thus the study will become an important prerequisite for the development of an implementation plan for the RFC 8. In order to achieve these goals the study focuses on the following major issues:

- 1) analysis and evaluation of the present transport market situation covering all traffic modes,

- 2) forecast of the transport market development based on an analysis of the socio-economic development trends,
- 3) analysis of the strengths, weaknesses, opportunities and threats of rail freight traffic in the corridor,
- 4) deduction of requirements to railway infrastructure and operational and organisational improvements in railway freight traffic in order to improve competitiveness of the railway sector, and to adequately meet the market demand,
- 5) assistance to the Infrastructure Managers and the Allocation Body to define parameters for train path allocation.

Investigations and analyses within this Transport Market Study have been carried out for major corridor sections, transport nodes, ports and freight terminals.

3.1.3 Corridor area

The Regulation (EU) No 913/2010 in its list of initial freight corridors defines RFC 8 as **"Bremerhaven/Rotterdam/Antwerp - Aachen/Berlin - Warsaw - Terespol (Poland - Belarus border) / Kaunas"**. For the aims and objectives of this Transport Market Study this general geographic outline has been specified more precisely with regard to the corridor area, the preliminary routing, the relevant border crossing points, ports and terminals.

The Regulation (EU) No 913/2010 has been amended by the Regulation (EU) No 1316/2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010. It redefines and extends the nine core network corridors resulting in the RFC 8 to be known as "North-Sea Baltic" corridor defined by the following alignment:

- Helsinki – Tallinn – Rīga
- Ventspils – Rīga
- Rīga – Kaunas
- Klaipėda – Kaunas – Vilnius
- Kaunas – Warszawa
- BY border – Warszawa – Poznań – Frankfurt/Oder – Berlin – Hamburg
- Berlin – Magdeburg – Braunschweig – Hannover
- Hannover – Bremen – Bremerhaven/Wilhelmshaven
- Hannover – Osnabrück – Hengelo – Almelo – Deventer – Utrecht
- Utrecht – Amsterdam
- Utrecht – Rotterdam – Antwerp
- Hannover – Köln – Antwerp

The RFC 8 is consistent with the existing ERTMS Corridor F and in major parts corresponds to RNE Corridor C03. It partially overlaps with RFC 1 in Belgium, The Netherlands and Germany as well as with TEN-T Priority Project No. 24. The latter is the railway axis Lyon/Genova-Basel-Duisburg-Rotterdam/Antwerp and corridor-relevant projects such as the third track between Zevenaar and Oberhausen as well as the Iron Rhine project. It has recently been incorporated by the Regulation (EU) No 1316/2013 into the Rhine-Alpine Corridor.

The clear definition of the corridor area was important, as all international freight train relations (corridor trains/additional trains) with their origin and destination within and outside the corridor area were to be analysed.



The corridor area in the countries involved was elaborated in close cooperation with the concerned Infrastructure Managers and finally agreed with the Management Board. An overview of the corridor area is given below.

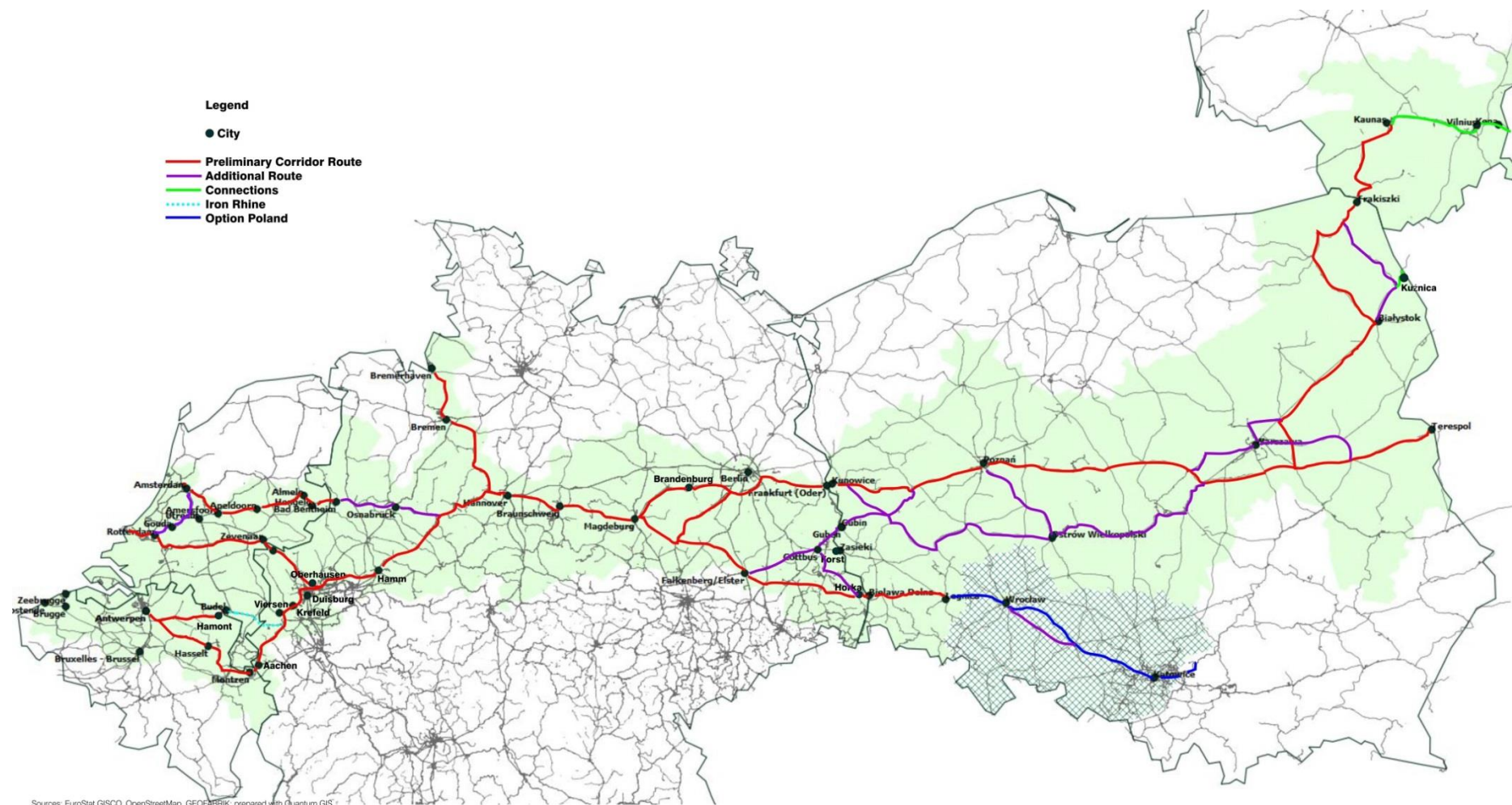


Figure 17. Preliminary routing and corridor area of RFC 8.

3.1.4 Socio-economic analysis

Factors influencing rail freight in Corridor 8 can broadly be seen to fall into four categories: political, economic, social, and technological (abbreviated to PEST). These factors have been analysed accordingly. The political analysis highlights relevant European and national legislations and guidelines for organising and operating freight services in and across the RFC 8 countries. The socio-economic analysis in turn offers information on each the RFC 8 country's status quo and development of GDP levels, population change, employment rates and wage development as well as foreign trade, including forecasting estimates where these are available. In terms of importance of freight volumes and entry/exit points in the corridor, a closer look at significant ports and terminals with regards to annual turnover and modal split for hinterland transport was taken.

The technological analysis highlights both the overlaps and diversions in infrastructure standards across the RFC 8 countries and pays particular attention to parameters such as train length, train weight, axle load, traction supply systems and track gauge relevant for cross-border rail freight traffic in the corridor. Organisational factors such as the setting up of One Stop Shops (OSS), train path allocation and access fee mechanisms are outlined and show that here too, a multitude of approaches (still) exist.

In conclusion of this analysis barriers and opportunities arising in RFC 8 based on the PEST analysis were identified.

Operating rail freight at harmonised levels as outlined in EU legislation in this corridor clearly faces a multitude of challenges. The PEST analysis has served to highlight both the commonalities as well as the differences between the RFC 8 countries.

Socio-economic trends suggest that the short-term forecast for the RFC 8 countries is promising and that economic activity is gradually picking up after the economic crisis. Especially for Poland and Lithuania GDP growth rates are encouraging, whilst GDP growth in the remaining corridor countries is less marked, but nevertheless forecasted to be positive. Due to government spending cuts and austerity measures, however, wage increases may very well remain marginal and subdued, in turn dampening domestic spending power. Poland and Lithuania display very low wages compared to the other corridor countries.

All the RFC 8 countries are affected by demographic changes. Germany especially faces the challenges of an ageing population coupled with very low birth rates. Poland and Lithuania currently face negative net migration rates (i.e. people leaving the country). To what extent shifts in population (absolute numbers, age distribution) will determine levels of goods flows cannot be easily ascertained.

In terms of political and technical elements, the PEST analysis has highlighted that diversity exists across the RFC 8 countries in terms of implementation levels of EU regulations and directives as well as infrastructure quality and standards. The list is long and is reflected in the identified barriers.

The developments (facilitators) which have the biggest effect on the demand for (rail) freight transport in the near future are:

- 1) Development of Gross Domestic Product in the countries along the corridor;
- 2) The further process of containerisation and terminal efficiency in freight transport along the corridor;

- 3) Decrease in barriers in international trade and transport along the corridor;
- 4) The development of harmonisation of costs, reliability and availability of rail transport and other transport modes along the corridor;
- 5) Effect of liberalisation on the competitiveness of rail freight transport along the corridor.

3.1.5 Analysis of current freight market situation

3.1.5.1 Current freight transport demand in the corridor area

In order to get a complete picture of the current freight transport demand along this important east-west corridor, all transport modes were analysed. This includes also short-sea shipping connections between the major North Sea ports and the Baltic region. The analysis focuses on important trade relations in the study area, the commodity split of freight transport demand and the modal split of transport services.

International rail freight flows were analysed in more detail, including such factors like train type (block trains, single wagon traffic, combined traffic) and technical parameters like train weight and length as well as requirements regarding ad-hoc / timetable traffic.

The results regarding the competitive situation of the rail freight services in the corridor are mainly based on interviews carried out with important stakeholders, mainly railway undertakings, ports and terminal operators and customers.

The RFC 8 is one of the major east-west transport axes, linking the North Sea ports with central and Eastern Europe.

The most intense freight traffic in the corridor has been identified between the Netherlands and Germany, and here especially between the North Sea ports and the Rhine/Ruhr area. Considerable traffic flows also exist between Poland and Germany. This rough traffic distribution within the corridor refers to all traffic modes.

There is a general tendency of a declining market share of rail freight transport in Europe over recent years, although rail freight volumes have been increasing in absolute figures. This general tendency can also be seen within the area of the RFC 8. In all corridor countries there was a decline in rail freight traffic in 2012 compared to the previous year.

The international freight traffic along the RFC 8 is dominated by road transport. The most significant origin/destination relations for road freight traffic along the corridor, similar to rail freight transport, are Netherlands – Germany and Poland – Germany.

Inland waterway (IWW) transport plays an important role in cross-border freight traffic between the Netherlands and Germany with a total transport volume of more than 100 million tons in 2012. Inland waterway transport between Belgium and Germany amounts to approximately 26 million tons. This kind of freight transport plays a rather insignificant role for traffic between Poland and Germany with less than one million tons in 2012.

Short-sea shipping connections between the North Sea ports and Baltic ports must be considered as a competing transport mode for rail freight traffic within RFC 8. This especially refers to feeder connections for container transports, but also to transport flows to/from Eastern Europe (Russia) and Asia via ports in Lithuania and Latvia.

Statistics and information from the Klaipeda sea port illustrate the relevance of short-sea shipping as a competing freight transport mode for the RFC 8. For Klaipeda sea port the most important freight flows are to and from ports in Germany (5,8 million tons) and the Netherlands (5,1 million tons). Both countries accounted for 38,3% of total freight turnover of the port in 2012.

Ro-Ro traffic amounts to 46,5% (2,72 million tons) of the total sea traffic with Germany via Klaipeda, container traffic accounts for 35,7% (2,08 million tons, 178.485 TEU) of the total.

The comparison of each transport mode – rail, road and IWW – in the respective the RFC 8 countries by type of goods shows that there are clear preferences of these transport modes for each good's group. For instance, coal, petroleum and refined products are understood to be classic mass goods transported mainly by ship on IWW. The same often applies for other bulk cargo. Bulk mining products are to a large degree transported by IWW; this especially applies to freight traffic between Germany and the Netherlands as well as from Germany to Belgium, where a significant inland waterway route such as the Rhine can be utilised. As Poland does not have a strong freight transportation system on IWW, coal and petroleum as well as mining products are transported by rail, the first accounting for 44,5% of all rail freight transports with the RFC 8 countries, the latter for 26%. A positive development for these products can be expected and mass goods like these therefore have a potential for the mode shift from ship to rail.

3.1.5.2 Analysis of corridor-related rail freight services

This analysis of exclusively corridor traffic is based on data provided by the Infrastructure Managers for corridor trains. Corridor trains start in the corridor area, cross minimum one corridor border, and then end in the corridor area.

The so called "additional trains", i.e. trains that start or end in the corridor area, cross minimum one corridor border and enter or exit the corridor area, were assigned to the corridor sections as overall number of trains without any further specifications (train type, ad-hoc/timetable, technical parameters).

The most intense freight traffic between the Netherlands and Germany as well as Belgium and Germany are also RFC 1 trains. This especially refers to corridor trains between Rotterdam and Oberhausen. As corridors are overlapping, they appear in the RFC 8 as well.

overlap NUTS-
Regions → corridor
trains both for RFC 1
und 8

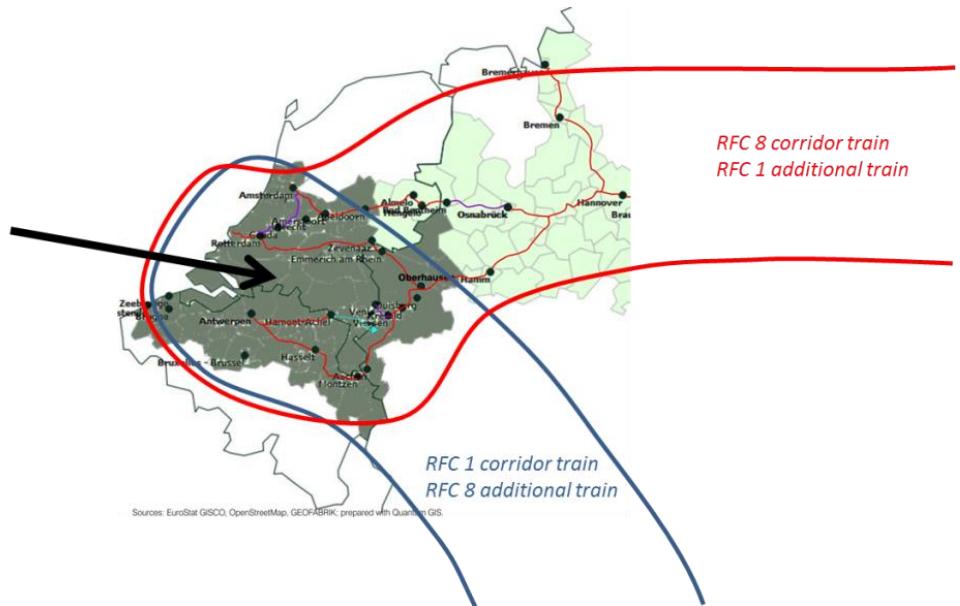


Figure 18. Overlap of RFC 1 and RFC 8.

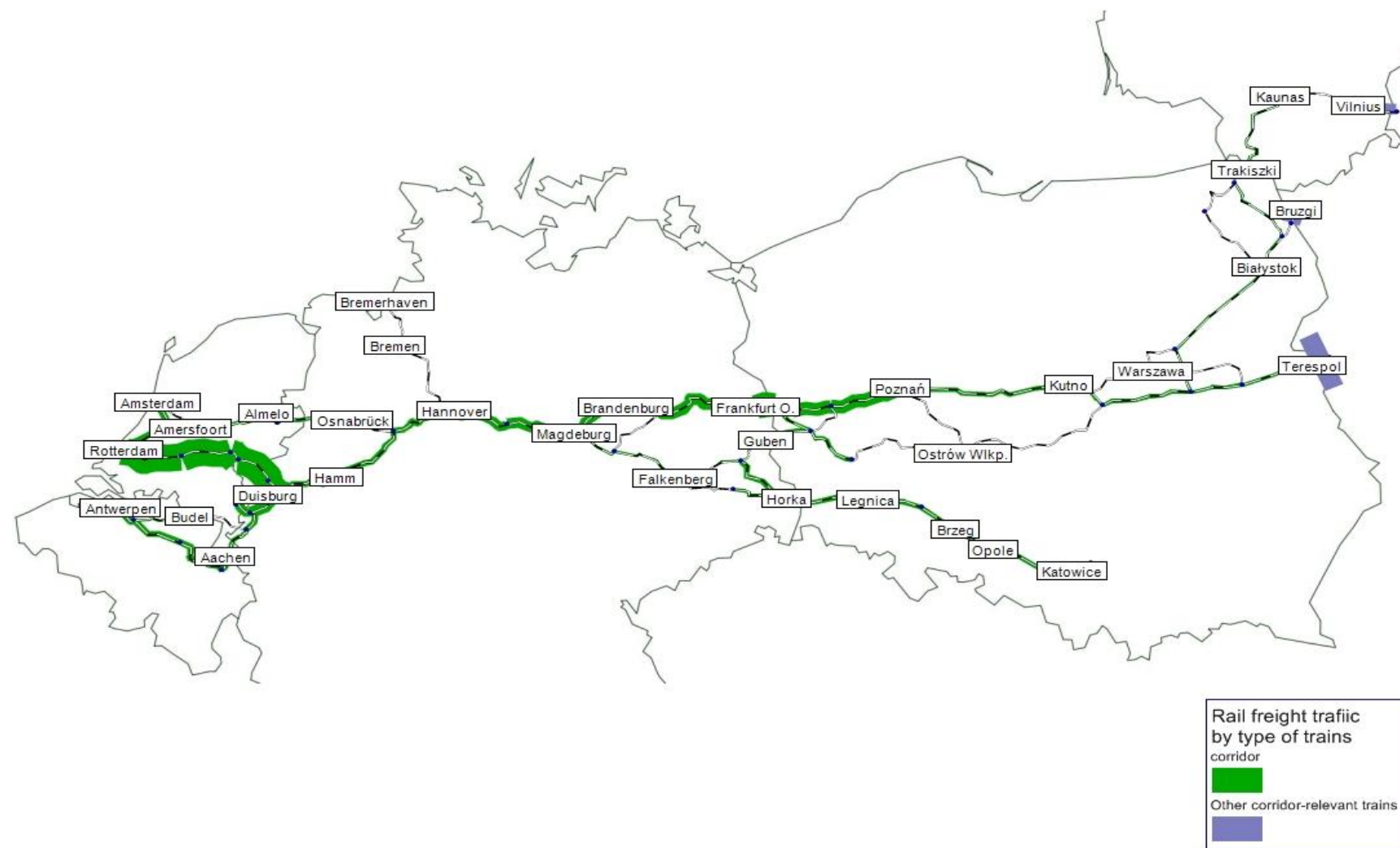


Figure 19. Total corridor trains in 2012 (both directions) on RFC 8.

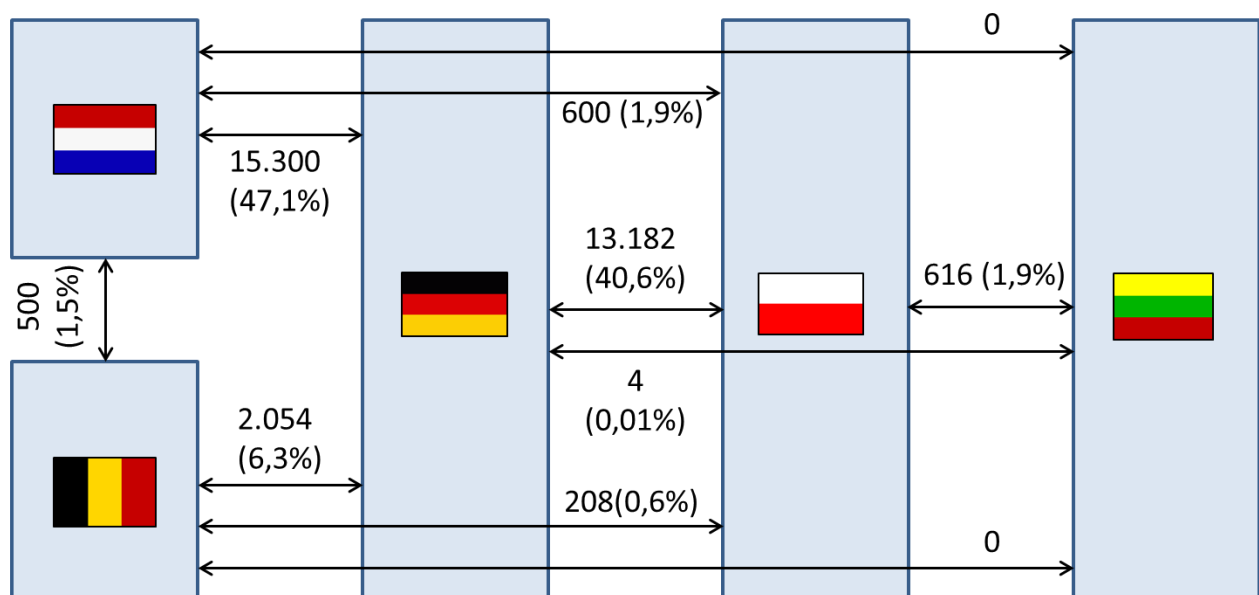


Figure 20. The total annual rail freight traffic (number of trains) in the corridor is shown in the figure above.⁵

Only 812 trains (2,5% of total corridor trains) cross two corridor borders. The majority of corridor trains cross just one corridor border. The longest train route in the corridor on which trains were operated in 2012 is Terespol – Antwerp.

This picture was also confirmed by the interview results. Stakeholders rated their own countries and usually the one immediately neighbouring them as “high” or “very high” in terms of O/D relations for their freight. This mirrors reports in the interviews that most sections served/operated in the corridor are part-sections, very often covering one’s own country. The geographically further away the other RFC 8 countries, the lower the ranking awarded to them by the stakeholders in general. No stakeholder indicated operating services along the entire corridor.

Reporting country:	Netherlands	Belgium	Germany	Poland	Lithuania
Netherlands		Very high	High	Medium	Medium-Low
Belgium	High-Very high		Medium	Medium	Medium-Low
Germany	High	High		Very high	Medium
Poland	Medium	Medium	Medium		Very high
Lithuania	Low-None	Low-None	Low-None	Low-None	

Figure 21. Interview results on importance of O/D relations of corridor rail freight traffic.

⁵ Data provided by IMs

These interview results are not entirely congruent with the statistical data on total annual rail freight presented for major O/D relations. For example the O/D relations Germany-Lithuania, Netherlands-Lithuania and Belgium-Lithuania were <1%, whereas in the personal interviews with German stakeholders Lithuania was deemed to be of medium importance in terms of business relations. Whilst the statistical data is of quantitative and objective nature, the data gathered from the interviews is qualitative, i.e. based on statements and subjective assessment of individual stakeholders' daily operations. 34 respondents either fully or partially rated the importance of business relations to the other countries. As a data set this obviously only offers a select view on the importance of O/D relations in the other corridor countries and consequently generalisations should not be based on the interview results presented here. These should rather be regarded as a snapshot of the current situation as rated by a number of key players.

Besides the corridor trains the so called "additional trains" have been analysed more broadly. The results clearly show that additional trains play a more than significant role in the western part of the RFC 8, especially between Belgium and Germany as well as between the Netherlands and Germany while declining farther east along the corridor. This clearly relates to the fact, that Germany as a whole (not only the corridor area) is a major origin/destination for freight from the ARA ports.

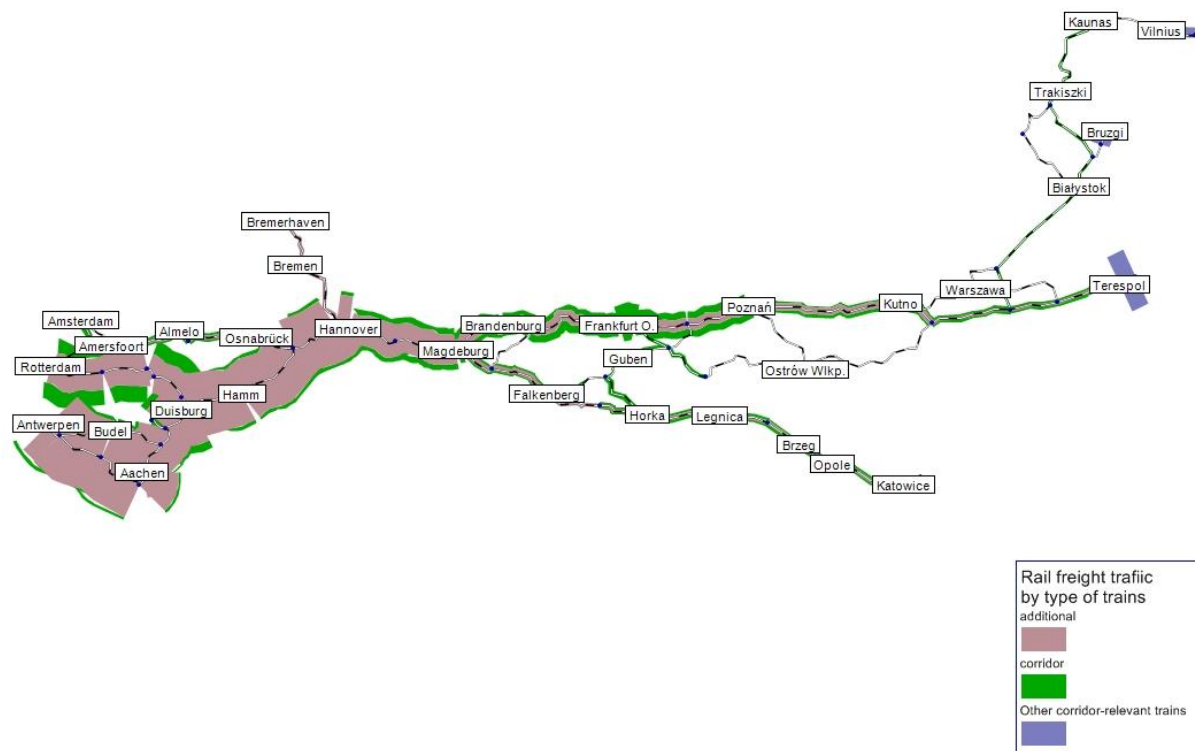


Figure 22. Additional train traffic in the Corridor.⁶

Also, in this figure, the so-called "other corridor-relevant trains" have been coloured separately to show potentially relevant trains stemming from rail freight traffic between Poland/Lithuania and their neighbouring country Belarus.

3.1.6 Passenger and other international freight services

⁶ Data provided by IMs

National (domestic) and other international freight trains and passenger trains were not part of this detailed analysis. But the share of corridor traffic in total rail traffic, including passenger trains, in major corridor sections was analysed in the corridor countries, using train data provided by the Infrastructure Managers.

3.1.6.1 The Netherlands

In the Netherlands, there is a high share of passenger traffic as part of total traffic between Amersfoort and Almelo accounting for 92% as well as between Hengelo and Bad Bentheim, accounting for 83%.

Between Zevenaar and Emmerich the majority of rail traffic is freight traffic (75%) which is almost evenly distributed between corridor and additional trains. Only 4% national and other trains run on this section. The rail section between Rotterdam and Geldermalsen is the Betuwe line, which is prohibited for passenger trains for safety reasons and therefore covers 100% freight traffic.

3.1.6.2 Belgium

In Belgium the share of passenger traffic is especially high in the western part of the corridor. Freight traffic share is increasing from Aarschot to the East. There is no passenger train traffic at the Belgian-German border (Montzen-Aachen).

3.1.6.3 Germany

In Germany, there are four rail sections, where freight traffic exceeds passenger traffic: Braunschweig-Magdeburg (53%), Bremen-Wunstorf (52%), Bremen-Bremerhaven (56%) as well as Biederitz-Roßlau (58%). There are a few sections with especially heavy passenger traffic. One of them is between Aachen and Rheydt, where passenger traffic accounts for 88% of all traffic. This is followed by Biederitz (near Magdeburg) – Brandenburg section with 74% capacity utilisation for passenger traffic, Berlin-Frankfurt Oder with 65% and Löhne-Wunstorf with 60%.

3.1.6.4 Poland

In Poland there are rail sections with a very high capacity utilisation of rail freight traffic, for instance between Skierniewice and Pilawa (92,9%), between Pilawa and Tłuszcz (99,8%) as well as between Horka and Węglińiec (99,9%). In 9 out of 28 rail sections, freight traffic has a higher capacity utilisation than passenger traffic.

3.1.6.5 Lithuania

In 2012 there were 3.050 other corridor-relevant trains operated from Gudogay via Kena towards Lithuania and 870 from Kena to the east.

In addition rail freight dominates the market between Lithuania and Belarus. The analysis of the hinterland market of Klaipeda Port also shows that Belarus has the highest share, followed by Russia and in much smaller amounts Kazakhstan and Ukraine.

3.1.7 Short-term evaluation of future transport market development

Regarding expectations on traffic growth for corridor-related services in the near future, stakeholders in the personal interviews expressed varying optimistic growth scenarios. German, Dutch and Belgian stakeholders' answers ranged from no growth/stagnation to

considerable growth, whilst Polish and Lithuanian stakeholders reported great potential for growth/involvement in future. Overall, however, the expectation that the involvement of the stakeholders' companies will increase by 2017 for corridor-related services dominated, albeit to varying degrees ranging from low-moderate to high and significant, in dependence of the commodities transported and corridor countries/route sections served.

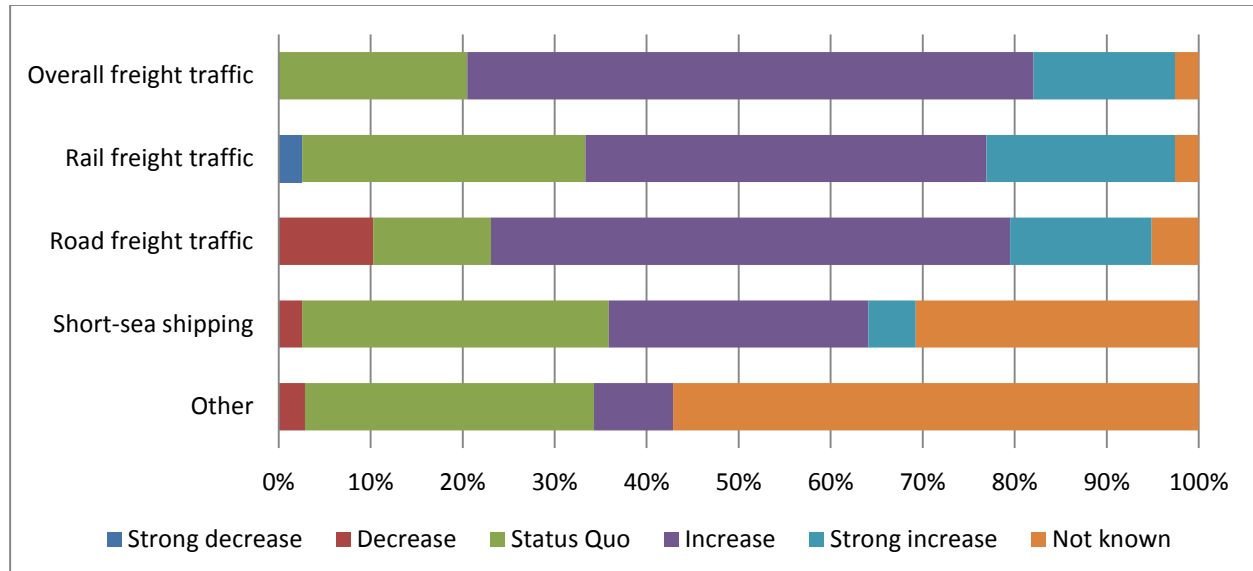


Figure 23. Assessment of future development of freight traffic volumes along the Corridor until 2017 (online respondents).

With regard to corridor trains, the highest increase is forecasted for traffic to and from Poland. Thus for example, the share of trains between Poland and Germany in total corridor traffic will increase from 40,6% in 2012 to 41,0% in 2017.

The O/D relation Germany-Netherlands will remain the most significant in the corridor with a share of 46,9% in total corridor traffic in 2017.

It must be noted that the forecast based on number of trains always bears uncertainties. Based on the development of transport demand (by quantities of goods), the extrapolated amount of trains needed may deviate from the actual amount of trains that will be operated by 2017. The following example illustrates these uncertainties inherent in demand forecasting: A new weekly container train service between Kaunas and any destination in Western Europe after 2015 necessitates 104 trains per year as calculated by the model. In 2012 there were practically no connections between Kaunas and Western European destinations. Therefore the model's scenario for 2017 suggests a significant increase in container trains compared to 2012 for these relations. The accuracy of these predictions can, however, only be evaluated post-2017, when actual figures for trains running between these destinations are available. Economic developments that may take place in the meantime may reduce or increase in model's calculation of 104 trains per year. The demand for freight transport between specific destinations is subject to the wider socio-economic developments and such multiple and complex factors cannot be fully reproduced in a model. The definite number of trains resulting from any new trade relation is consequently very hard to accurately predict in traffic models. This point was also reiterated by train and terminal operators in the personal interviews.

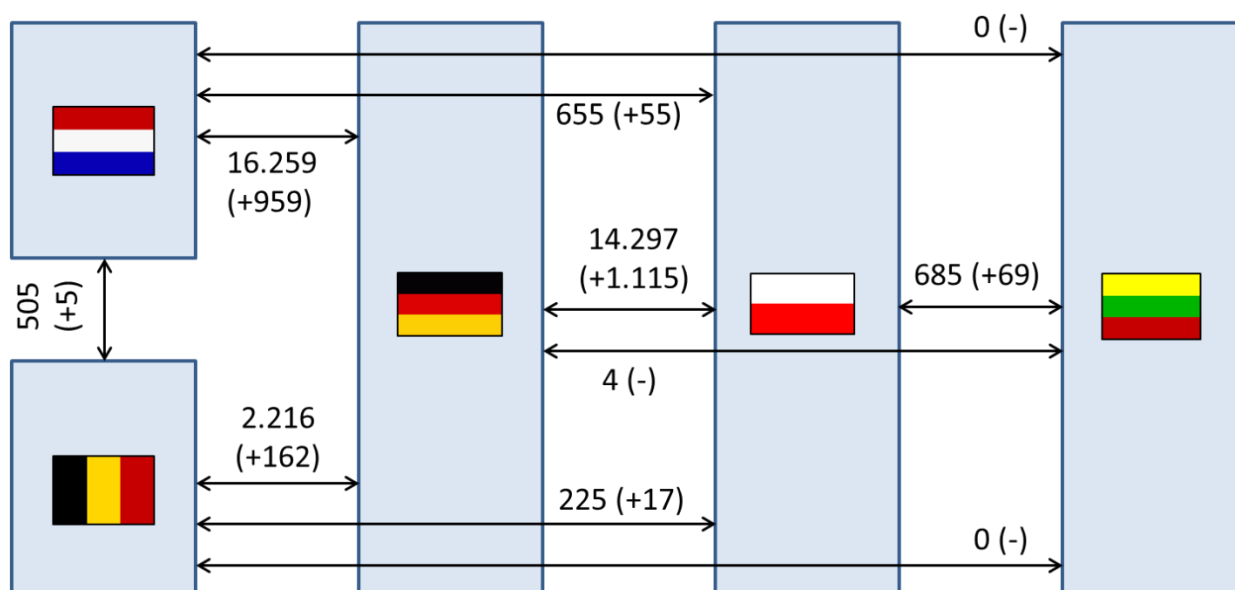


Figure 24. Future corridor rail freight traffic by O/D relation (number of trains), 2017.⁷

3.1.8 Stakeholder interviews

To obtain an “inside” view of the specific interests, opinions and development trends of stakeholders operating within the corridor, a raft of both personal interviews using an extensive questionnaire and web-based surveys were carried out by the Consultant in each respective corridor country. Overall 47 stakeholders were interviewed personally (by telephone or face-to-face) and a further 50 stakeholders submitted their answers by means of an online questionnaire. This approach ensured that the current and future market development of regions along the RFC 8 was described and assessed by various stakeholders and companies directly involved within the corridor countries.

⁷ Based on own estimation and calculation; numbers in brackets are the number of extra trains in comparison to 2012.

Country	Personal Interviews		Online Questionnaire	
	No	%	No	%
Netherlands	12	24%	4	8%
Belgium	5	10%	3	6%
Germany	18	37%	21	42%
Poland	8	16%	12	24%
Lithuania	6	12%	4	8%
<i>Country not stated</i>	0	0%	6	12%
TOTAL	49	100%	50	100%

Figure 25. Share of interviewees by country and interview technique.

In terms of respondents for both the online survey and the personal interviews, German stakeholders made up the largest proportion in both instances. With regards to the stakeholder categories railway undertakings and terminal operators made up just over half of all respondents in both the online survey and the personal interviews.

The questionnaires asked the respondents to assess their current involvement in freight traffic and more specifically rail freight traffic along the RFC 8, to assess the future short-term development of east-west freight traffic and economic development, to rate the relevant criteria for choice of transport mode and define the relevance of infrastructure parameters for rail freight traffic.

Stakeholders in both survey types were asked to indicate the **modal split** of their operations. Here, road and rail made up three quarters of all mentions, rendering these two modes the dominant ones. In relation to the train types used by those stakeholders' companies who indicated using rail as a mode, both the online and personal responses showed a very similar picture. In both instances block trains and combined/container traffic formed the most commonly used modes (equal spread), whilst single wagon trains received a minority mention.

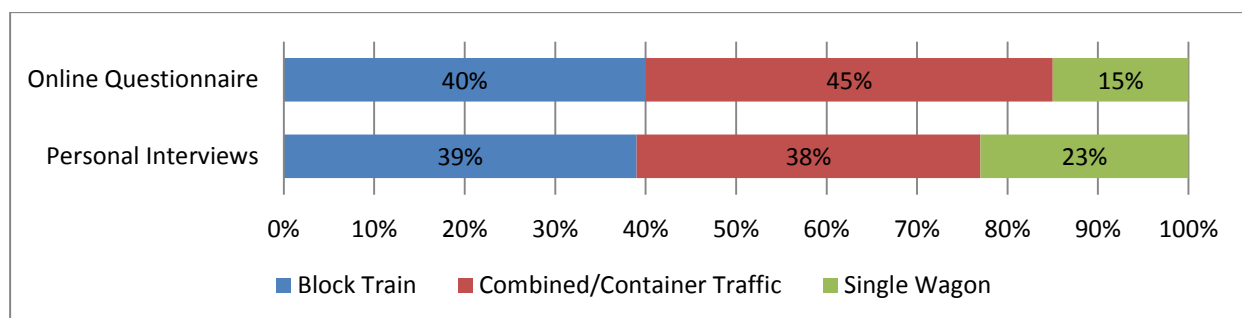


Figure 26. Type of rail service used/reported by survey type.

Regarding the share and relevance of **ad-hoc and time-table traffic** for current and future rail freight traffic, online respondents reported a very mixed spread of answers. In the personal interviews stakeholders reported a mixed spread of levels for ad-hoc traffic for Germany and higher/very high levels for Poland and Lithuania (in some instances 100% ad-

hoc traffic). However, this was the case for a small number of reports and therefore it cannot be extrapolated with certainty that these countries have higher ad-hoc traffic rates in general. When asked how ad-hoc traffic will change in the coming years, 37% of online respondents and 54% of personal respondents indicated that they could give no information on how rates may develop. 25% of online respondents foresee medium to high levels in the future, whilst 23% of personal interviewees stated that ad-hoc traffic will rise.

Assessing the pertinence of **transport criteria**, price emerged as the most important criteria in both the online survey and the personal interviews and received the most “high relevance” ratings. This was underlined by individual stakeholders’ comments such as “Price is all that matters”. Especially with regards to rail remaining competitive in a market segment where road haulage companies are putting pressure on freight transport prices and enticing customers away from rail to road. “Competition from HGV companies, especially Eastern European ones, is fierce in this corridor” as one stakeholder summed up the situation. Both online respondents and personal interviewees foresee an increase in transport volumes for the RFC 8. In terms of transport mode, a stronger increase in road-based transport is expected than for rail-based services.

When asked to rate the importance of **technical criteria**, both online survey and personal interview results show that longer-freight trains are attributed with high relevance. Stakeholders in the personal interviews identified this measure as the most important one to enhance rail freight in the corridor. Online respondents also identified a high axle load as a significant technical criterion, whilst stakeholders in the personal interviews stated that a standardised axle load of 22,5t either exists or should be implemented where it does not apply yet.

3.1.9 Choice of mode

Choice of mode is driven by a company’s desire to remain competitive by serving their customers both effectively and efficiently. As findings from research into choice of mode suggest, there are three major criteria, which influence the choice of transport mode:

- transport price,
- transport time,
- transport quality.

Transport price received the highest percentage of “very high” ratings in terms of its relevance by stakeholders. For the customer (e.g. industrial enterprise) the total price for transporting his goods from door to door plays a decisive role. Generally speaking, the role of transport price increases with the ratio weight/volume of the goods - price of the goods. Thus high-value goods are less sensitive to differences in transport price, with transport time and quality sometimes playing a more important role. Again, this finding hints at the concept of **mode affinity** depending on the commodity category at stake.

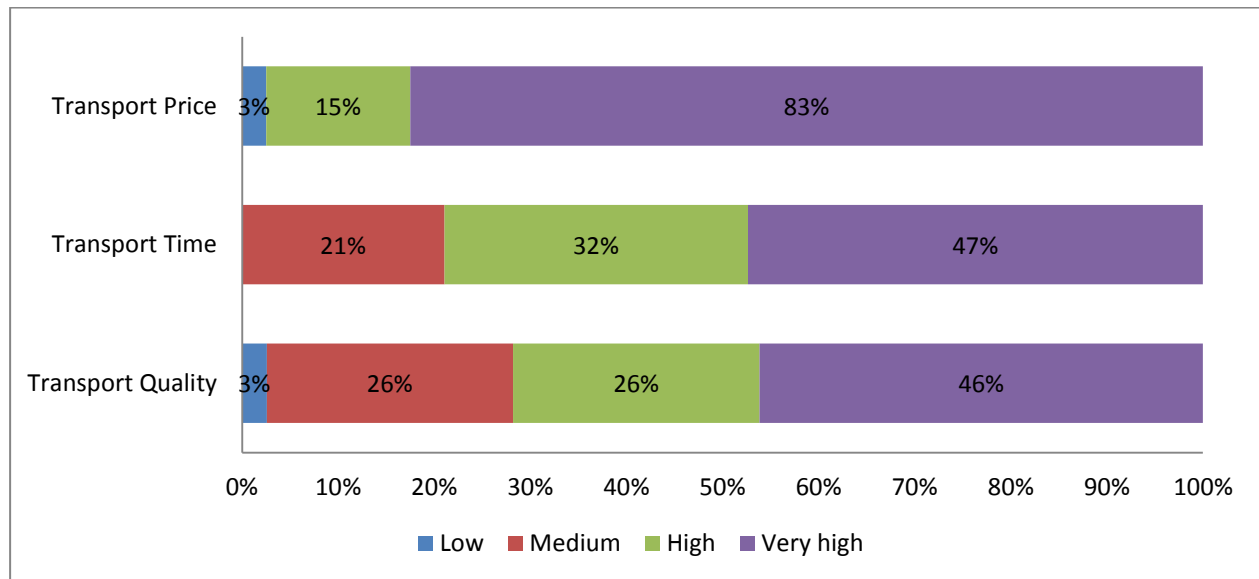


Figure 27. Ratings for transport price, time and quality by stakeholders in personal interviews.

To determine the competitive role of the different transport modes available to freight transport, charges for infrastructure use have to be taken into consideration too. This includes access charges for rail infrastructure, road tolls, port and terminal charges etc. In transportation research this is referred to as **internal costs**.⁸ Furthermore **external costs** caused by damage to goods, congestion, noise and traffic accidents affect the final transport price as well.

The importance attributed to **transport time** also strongly depends on the industrial sector and type of goods that require transportation. Factors such as supply chain management and just-in-time delivery are of major importance in this respect. Modal choice, as outlined in the previous sections, is clearly influenced by transit time requirements.

There is often a close interconnection between transport time and certain quality factors such as flexibility, reliability and availability. With regards to reliability it is sometimes not so much important how long cargo will spend en route, but that it will arrive at the time it needs to, as one stakeholder stressed. This is mirrored by the findings of several studies as one of them aptly states that “(...) *the reliability of promises regarding transit time is more important than the duration of transit time itself*”⁹. For rail to be competitive with respects to transport time, rail-based services could be on a par with road haulage once the Betuwe line – a dedicated rail cargo link – is fully operational. For stakeholders interviewed and concerned with operations in the corridor sections that are to benefit from the Betuwe line¹⁰ (Germany/Netherlands) this point was also raised.

Interestingly “transit time” seemed to receive mixed ratings, with only some stakeholders deeming it to be of high relevance. This suggests that transit time is not always the

⁸ Janic 2007

⁹ Ribbink et al 2004

¹⁰ The Betuwe line is a railway line (extension and new route sections) in the Netherlands for rail freight from the port of Rotterdam to Zevenaar close to the German-Dutch border.

determining factor for mode choice, depending on the type of good that needs to be transported (i.e. perishable/sensitive goods such as food/pharmaceuticals versus uncritical cargo such as scrap metal). This finding is backed up by research into the affinity of branches for transport modes¹¹.

As each freight transport mode (e.g. rail, road, inland waterways, air cargo etc.) differs in its unique selling points, so will their ratings of these criteria. The following table rates these major criteria for the four main transport modes for freight. (+ advantage, - disadvantage, 0 medium)¹². As transport quality encompasses several components, it has been split into two sub-definitions, namely predictability (*Will goods arrive at the scheduled time?*) and adaptation (*Are alternative routes available? Can varying transshipment volumes be accommodated? Are several departure times available?*).

Choice Criteria	Road	Rail	Short-sea shipping	Inland Waterways
Transit time	+	0	-	--
Transit costs	+	0	++	++
Quality: Predictability (punctuality)	0	+	-	-
Quality: Adaptation (flexibility)	0	-	0	++

Figure 28. Profile for choice of transport mode¹³.

Inland waterway's high score in terms of flexibility can be explained by this mode's advantage to offer varying shipment sizes, variable available capacities and frequent departures. Furthermore, where IWW can rely on a modern terminal infrastructure (high degree of automation and long opening hours), flexibility of this mode is further enhanced.

Interestingly rail scores medium on time and costs, but has an advantage in terms of predictability/punctuality and a disadvantage in terms of adaptation/flexibility. This was mirrored in reports by the stakeholders in the personal interviews who stated that ad-hoc train services (as opposed to timetable traffic) offer the necessary flexibility for customers, although not all railway undertakings reported to offer high levels of ad-hoc traffic to date. However, 20% of the stakeholders predicted a rise in the level of ad-hoc traffic in the coming 5 years. This could therefore be a response of rail to enhance its attractiveness to customers in terms of one central aspect to transport quality, i.e. flexible adaptation to customer needs.

The analysis of choice of mode factors determining freight movement suggests that criteria such as transit time, costs and quality comprise a row of components¹⁴. These are listed below and highlight that choice of mode always requires a weighing of numerous factors, so too for railway undertakings and shippers operating on RFC 8.

¹¹ Fraunhofer IIS / KPMG 2008

¹² Fraunhofer IIS / KPMG 2008

¹³ Fraunhofer IIS / KPMG 2008

¹⁴ CUTR (no date)

Choice Criterion	Factors determining mode choice
Total Logistics Costs	<ul style="list-style-type: none"> ▪ Order and handling costs ▪ Transportation charges ▪ Loss and damage costs ▪ Capital carrying cost in transit ▪ Inventory carrying cost at destination ▪ Unavailability of equipment costs ▪ Service reliability costs ▪ Intangible service costs e.g. billing processes
Physical Attributes of Goods	<ul style="list-style-type: none"> ▪ Shipment size ▪ Package characteristics ▪ Shipment shelf life ▪ Shipment value
Flow and Spatial Distribution of Shipments	<ul style="list-style-type: none"> ▪ Shipment density ▪ Shipment frequency
Modal Characteristics	<ul style="list-style-type: none"> ▪ Distance of shipment ▪ Capacity ▪ Trip time and reliability ▪ Equipment availability ▪ Customer service ▪ Handling quality – Damage Loss Reputation

Figure 29. Factors influencing freight movement choice of mode.

The major choice criteria mentioned at the outset of this chapter (transport time, price and quality) are, thus, underpinned by a host of factors, all of which influence a company's final choice of mode.

In order for rail to increase its modal share in RFC 8, rail-based services must boost their attractiveness for customers in terms of the above factors influencing choice of mode. With regards to total logistics cost, stakeholders commented that “price is all that counts” and in terms of time/quality (punctuality, reliability) as a modal characteristic rail faces a challenge as “once late and the customer will switch to road” as another stakeholder summed up the situation. Research studies have dealt with the issue of how to improve rail-based services to improve their modal share. The following table lists the three main suggested improvements from past research. These are substantiated by findings from the personal interviews, thereby emphasising the topicality of these suggested improvements for RFC 8.

Suggested improvements ¹⁵	Comments from stakeholder interviews	Recommendations by stakeholders
Forwarders/customers should increase their volumes transported	Longer trains emerged as the suggested measure with the most mentions, as longer trains would also reduce transport price. Running 740m trains throughout the corridor would be welcomed by stakeholders. This train length can currently not be handled on Polish line sections due the country's current rail network infrastructure. Due to train length restrictions, some customers/forwarders currently run two short trains to Poland, although the cargo volumes transport through Belgium, Netherlands and Germany could run on just one long train. As a result, lower prices for customers could be achieved by running longer trains, evidently rendering rail more competitive.	Aim to establish standardised corridor-wide train length of 740m
Rail should improve speed of freight transit	The average speed and not so much the maximum speed should be addressed for freight transport in the corridor, as stakeholders reported a great variation in speeds, depending on which line sections freight was being transported on. This ranged from 40km/h on some line sections in Poland to speeds between 50km/h and 100-120km/h in Germany, Belgium and the Netherlands (excluding sections with ongoing construction works).	Aim to establish reliable average speeds for the entire corridor. The focus would have to be on increasing speed in Poland, which would can, however, only happen if the network infrastructure is upgraded accordingly.
Rail should improve forwarders/customers' satisfaction with reliability of rail	Customer satisfaction is the key if customer retention rates should be kept high or shall be increased. Punctuality is often a central issue to customers and if the delivery of goods is delayed, customers with suitable cargo types for road will chose a haulage company next time. Winning back customers from road is very challenging.	Stakeholders suggested a raft of measures that would indirectly help improve customer satisfaction with rail. For example: Higher flexibility in train path allocation Extended terminal opening hours Reduced handling/change-over times at borders in order to increase speed Enhanced safety & security measures

Figure 30. Suggested improvements by stakeholders.

3.1.10 SWOT analysis

Concerning the short-term forecast period from 2013-2017 a SWOT analysis has been carried out covering the institutional, economical, organisational and technical parameters or factors for the RFC 8.

For the means of this study, four categories have been identified and assessed by SWOT analysis technique:

- 1) Institutional elements are understood to be external factors, such as EU regulations.

¹⁵ cf. Grue / Ludvigsen 2006

- 2) Organisational elements represent the internal dimension and include cross-country cooperation, information policies and generally factors that can be influenced by the IMs themselves.
- 3) Economic elements refer to overall economic developments in the EU as well as per RFC 8 country, per transport mode and per type of good.
- 4) Technical and infrastructural elements include issues such as ERTMS deployment status along RFC 8 and bottlenecks.

Category	Strengths	Weaknesses	Opportunities	Threats
Institutional	<ul style="list-style-type: none"> High safety standards of rail (Single European Safety Certificate) 	<ul style="list-style-type: none"> National law dominating and slow to integrate EU legislation Restrictive, inflexible and incompatible national train path allocation mechanisms 	<ul style="list-style-type: none"> Ongoing harmonisation of national legislation based on EU requirements 	<ul style="list-style-type: none"> Tightening regulations on noise, pollution and safety risks affect particularly the movement of hazardous goods in urban areas Preferential treatment of national RUs by National Railway Authorities¹⁶
Economic	<ul style="list-style-type: none"> Strong economic activity, especially between DE-NL-BE as well as DE-PL Rail as favoured mode for certain commodities (bulk, time-insensitive goods) and decrease of road in modal split in NL and BE 	<ul style="list-style-type: none"> High dependency on economic development and possible recessions in the EU area High operational and infrastructural costs for rail as opposed to road (e.g. access fees, ERTMS implementation) No corridor end-to-end O/D relations operational 	<ul style="list-style-type: none"> Positive economic outlook for corridor countries in next 5 years Expected trade flow increase (see strengths) New emerging markets in the East Road congestion and road user charging render mode less attractive Rail preferred 	<ul style="list-style-type: none"> Potential further economic crisis Prevailing operational hurdles (language barrier, driver shortages) Rising infrastructure costs and sinking investment levels Prevailing competition from dominant road transport sector

¹⁶ This argument is based as much on individual stakeholder ideas as on cross-reference checks on choice of mode.



			mode in EU policy	
Organisational	<ul style="list-style-type: none"> Working organisation for the RFC 8 established RU currently already operating cross-border Establishment of cross-border pricing schemes (use of rail yards, storage) Increasing offer of ad-hoc traffic 	<ul style="list-style-type: none"> Differing access fee schemes, performance regimes and infrastructure improvement focus Lack of information exchange on corridor trains Prevailing language barriers Time-consuming procedure for approving locos abroad 	<ul style="list-style-type: none"> Adapting PCS by all national IMs Establishing C-OSS Developing priority scheme for high/low priority freight Extending terminal and line operating hours to 24/7 	<ul style="list-style-type: none"> Train driver shortages experienced at current transport levels Unpredictability of capacity requirements for rail freight, depending on economic developments Low investment in rail
Infrastructural/ Technical	<ul style="list-style-type: none"> Planned ERTMS implementation on several RFC 8 sections until 2015/2020 Ongoing/recent construction of new terminals to add capacity (e.g. NL, DE, LT) Ongoing infrastructure enhancements (e.g. standard gauge in LT by 2015) Multisystem locos for cross-border traffic Good connections with major O/D ports in NL, BE, DE 	<ul style="list-style-type: none"> Diverging signalling systems until final implementation of ERTMS Different traction supply systems Terminal capacity problems requiring shorter trains Limited capacity on main hinterland corridors of major seaports (NL, BE, DE) where further growth is expected Lack of capacity on sidings and storage tracks No "standardised" 	<ul style="list-style-type: none"> Increased use of multi-system locos to ensure flexibility Focus on rail's unique selling point, i.e. ability to transport heavy goods over long distances Seize capacity enhancements through comparably small investments, i.e. reducing train block distance between signals 	<ul style="list-style-type: none"> Capacity losses due to conflict with increasing passenger traffic ERTMS implementation delay Capacity problems for storage of rolling stock during down periods and at specific bottlenecks Increasing weight and size of trucks as competitive advantage for road Expensive infrastructure investments for harmonisation of signaling to render rail too

		siding lengths along the RFC 8 enabling longer trains (up to 740 m) <ul style="list-style-type: none"> Low average speeds in PL due to poor track quality 		expensive compared to road
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Figure 31. SWOT analysis.

3.1.11 Analysis of the extension in southern Poland

3.1.11.1 Objectives and methodological approach

During the preparation of the TMS, the southern branch of the RFC 8 in Poland was running from the German/Polish border crossing at Horka/Bielawa Dolna to Legnica. The main objective was to provide the Management Board with all the necessary information on the amount of additional traffic resulting from the extension of the southern branch of the corridor from Legnica until Silesia region.

The analysis and methodology followed the same approach as for the rest of the corridor. Thus, train traffic to/from this extended corridor area is fully included in the traffic analysis shown in the according chapters above. Some major figures on the traffic on this southern branch of the RFC 8 in Poland have been highlighted for further explanation.

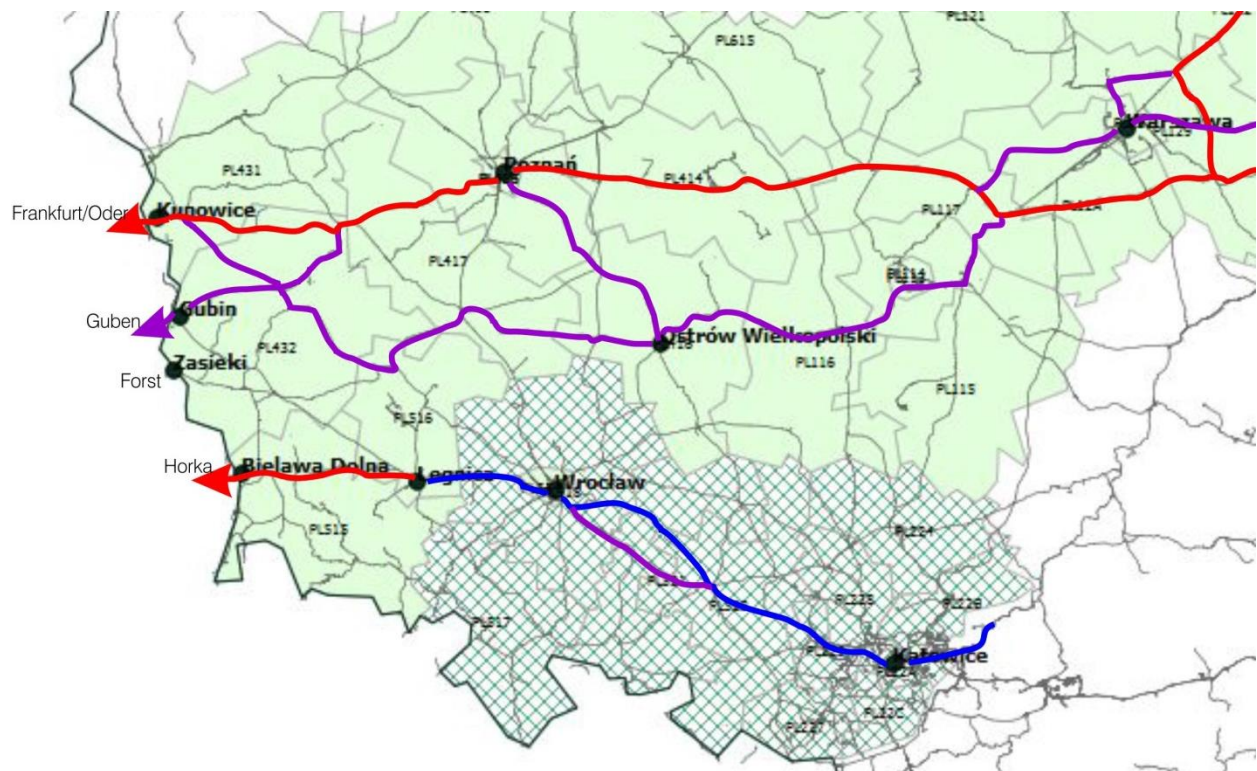


Figure 32. Excerpt for the possible extension in southern Poland.

3.1.11.2 Results

According to the train data provided by the IMs (DB Netz AG/PKP PLK) a total number of 3.450 freight trains per year were operated over the Horka/Bielawa Dolna border crossing in 2012. This accounts for 26% of all corridor trains crossing the German/Polish border.

Of the total number of 3.450 trains 1.550 trains were operated in the east-west direction and 1.900 trains from west to east. Almost 50% of this traffic (1.664 trains) are single wagon trains, about 40% (1.378 trains) are block trains. Container traffic amounted to only 11% (390 trains) of total corridor traffic over this border crossing.

According to the train data provided by the IMs more than 55% of the train traffic on this southern branch of the RFC 8 had its origins/destinations east of Legnica.

It must be assumed that the actual number of trains with origins/destinations within the extended corridor area is even higher. Approximately 1.500 corridor trains crossing the Horka/Bielawa Dolna border have Węglińiec as their origin/destination. They apparently are operated as national trains in the sections east of Węglińiec. Information on the real origins/destinations was not available.

The traffic forecast for this section of the corridor is based on the same assumptions as for the corridor traffic to/from Poland in general. Growth rates 2012/2017 are the highest for container trains (10,5%). For block trains a growth of 9,5% is assumed till 2017, and single wagon traffic will increase by 8,1% over this period. Growth rates are slightly higher for the traffic in the east-west direction, compared to west-east traffic.

The effect of the future status of a European Rail Freight Corridor on future transport potentials in the extended corridor section was taken into account similar to all other corridor sections in Poland.

Thus it can be summarised that there is a profound basis for extending the southern branch of the RFC 8 until the Silesia region, with far more than 50% of the corridor trains in this southern branch having their origin/destination east of Legnica.

3.1.12 Analysis of the Czech module

3.1.12.1 Objectives and methodological approach

The main objective was to provide the Management Board with all the necessary information to decide whether to extend the RFC 8 towards the Czech Republic or not.

In order to properly assess the advantages and disadvantages of a possible connection to the RFC 8, the freight traffic between the Czech Republic and the RFC 8 Countries has been analysed for the transport modes road, rail and inland waterways. Special emphasis is given to the freight traffic volumes between the Czech Republic and major North Sea ports and future traffic potentials.

3.1.12.2 Routing and corridor connections

The routing for a possible connection of the Czech Republic to the RFC 8 has been discussed and elaborated together with the Infrastructure Managers from DB Netz AG and SŽDC. The routing within the Czech Republic was defined in accordance with the Czech Infrastructure Manager SŽDC.

In contrast to the main study, for the Czech module the Port of Hamburg has been taken into account also, even though Hamburg is not within the Corridor area defined. The Port of Hamburg is an important freight traffic connection to/from the Czech Republic and was therefore considered separately.

3.1.12.3 Socio-economic, regulatory and technical analysis

In order to assess the possible influence of technical, socio-economic and regulatory elements on the possible connection of the routing selected above to the RFC 8, these have been analysed following the principles set forth in the short-term study. The analysis refers especially to the regulatory framework for rail freight traffic in the Czech Republic, the economic development of the country as well as technical criteria such as electrification and railway gauge.

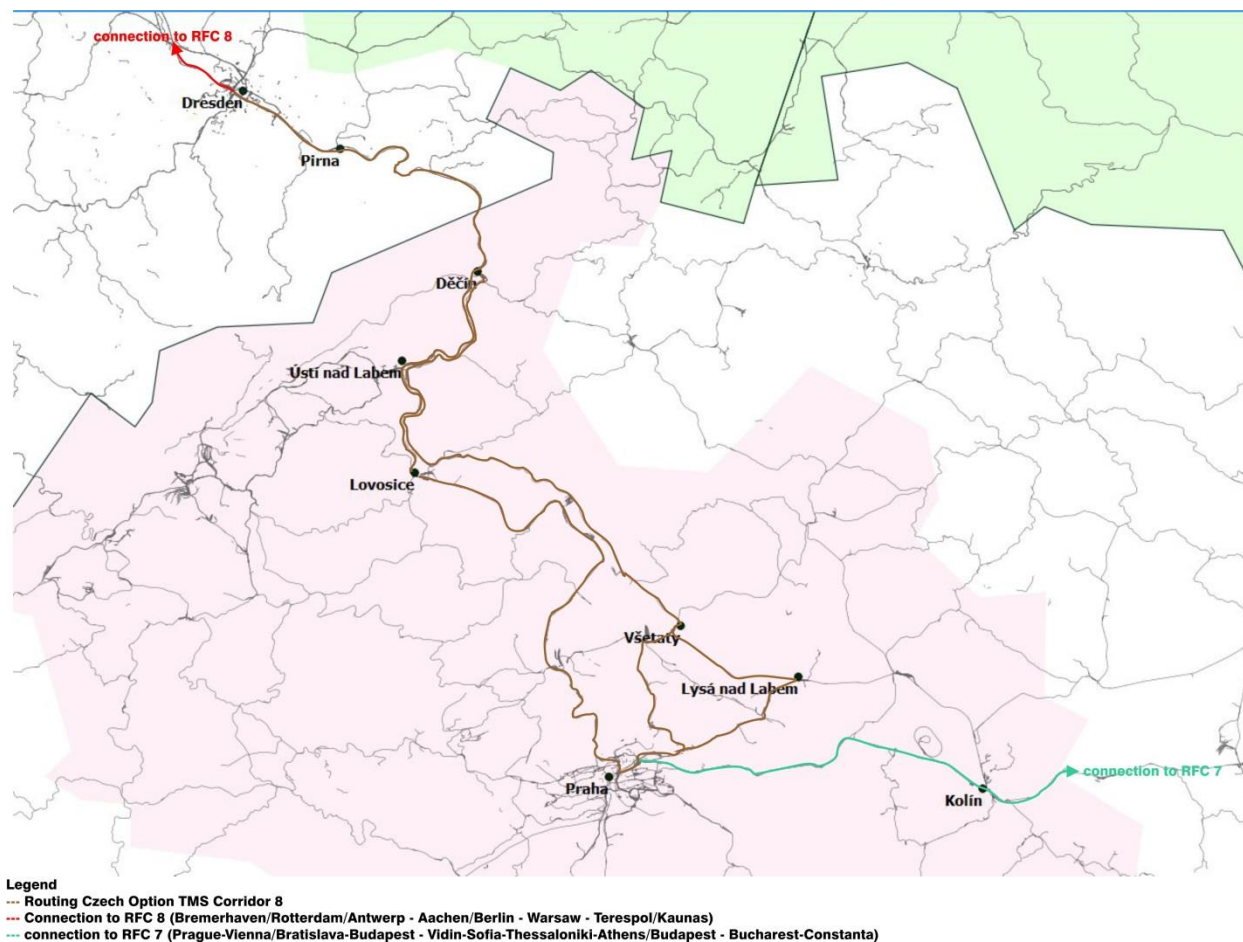


Figure 33. Preliminary routing Czech option.

3.1.12.4 Analysis of freight transport market

The extension of the RFC 8 with a link to the Czech Republic will provide development potentials for the major freight transport axis of the Czech Republic and other southeast European countries to the North Sea ports and the north of Europe. The most intense freight traffic in the corridor has been identified between the Czech Republic and the German sea port of Hamburg.

The rail freight traffic between the RFC 8 countries and the Czech Republic is stagnating. Only transport volumes with the Netherlands are rising over the last years.

The table below contains the origin/destination relations for rail freight traffic in 2012, based on information and data from Eurostat. The most important trade relations between the Czech Republic and other relevant countries within the corridor are

Czech Republic – Germany with nearly 85% of the traffic

Czech Republic – Netherlands with 13% of the traffic

In total over 11,6 million tons of freight were transported by rail between the Czech Republic and the relevant RFC 8 countries.

	Total rail freight traffic [1.000 net tons]							
	2005	2006	2007	2008	2009	2010	2011	2012
Netherlands	1.056	831	783	723	155	237	948	1.481
Belgium	350	167	194	172	114	112	157	139
Germany	7.531	8.521	9.440	8.873	8.360	9.456	10.024	9.939
Denmark	23	36	37	39	20	48	52	48
Sweden	56	87	86	97	63	73	76	71

Figure 34. Total rail freight traffic of the Czech Republic with corridor-relevant countries, 2005-2012 (1.000t)¹⁷.

The international freight traffic along the RFC 8 link to the Czech Republic is dominated by road transport.

The table below shows the cross-border road freight traffic loaded and unloaded in the relevant RFC 8 countries from and to the Czech Republic based on data from Eurostat.

	Loading/Unloading counterpart							
	Netherlands	Belgium	Germany	Denmark	UK	Norway	Sweden	Ireland
Czech Republic (Origin)	525	517	12.560	229	504	51	250	4
Czech Republic (Destination)	928	753	10.178	166	327	45	237	5
Total	1.453	1.270	22.738	395	831	96	487	9

Figure 35. Road freight traffic of Czech Republic with the RFC 8 relevant countries, 2012 (1.000t)¹⁸.

The most significant origin/destination relations for road freight traffic along the corridor are:

- 1) Czech Republic – Germany with a share of 84%

¹⁷ Eurostat

¹⁸ Ibid.

- 2) Czech Republic – Netherlands and Czech Republic – Belgium with a share of 5% each

In total over 21,6 million tons of freight were transported by road between the Czech Republic and the relevant RFC 8 countries in 2012.

3.1.12.5 Major origin destination relations

The total annual rail freight traffic related to the corridor is shown in below. Based on the figures provided by the IMs the biggest volumes are trains to and from the port of Hamburg, followed by trains to and from the port of Bremerhaven. Train numbers to/from ports in Belgium and the Netherlands are relatively low, but amount to about 12% of the total corridor-related rail freight traffic.

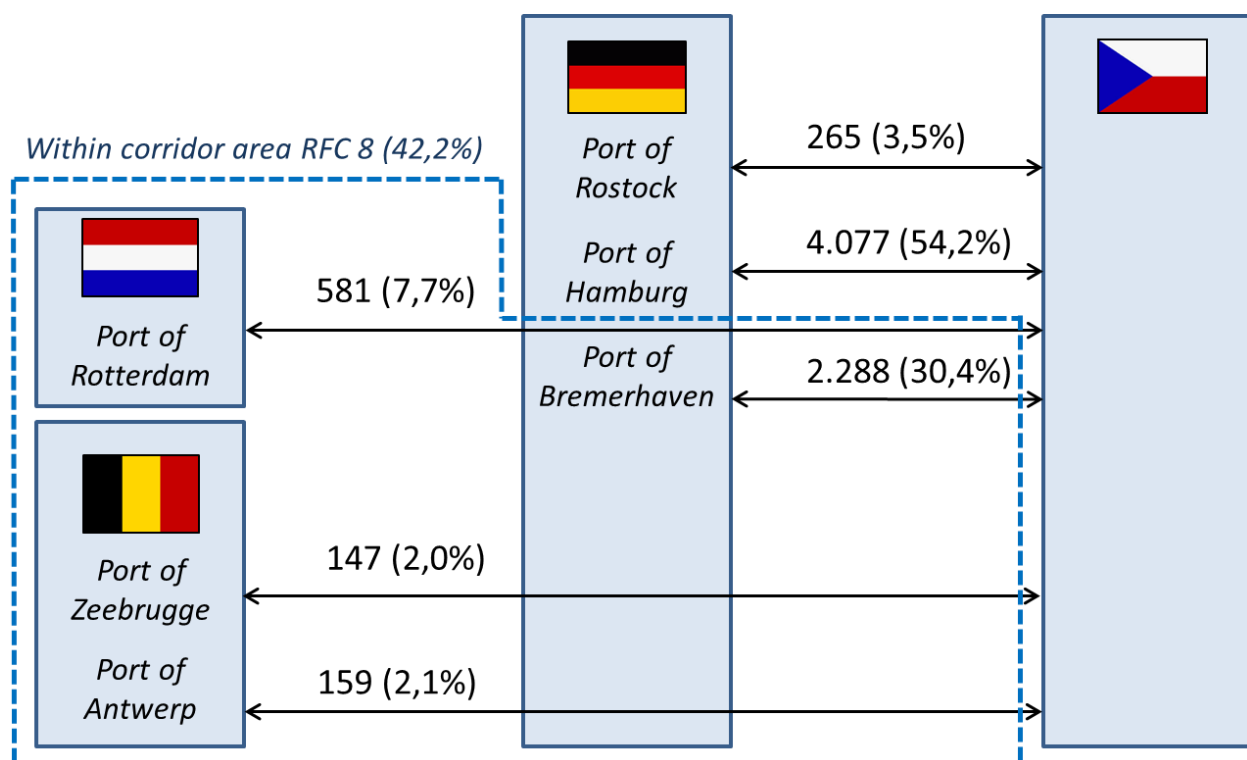


Figure 36. Total traffic in connection with Rail Freight Corridor 8 O/D relations, 2012.

3.1.12.6 Rail freight services by type of trains

There are two types of corridor-related trains: block trains and combined traffic / container trains.

The majority of the trains analysed are container trains with 6.667 trains per year (88,7%). There is a relatively low number of block trains between the Czech Republic and the identified major O/D destinations (849 trains per year or 11,3%). This clearly shows the importance of the hinterland connection from the North Sea ports towards the Czech Republic.

3.1.12.7 Future transport demand

The forecast of future transport demand is based on the development of major socio-economic factors, like GDP and foreign trade relations. Also already existing studies and reports have been taken into consideration. Within this study the traffic forecast includes only corridor-related freight trains and covers the period 2013 - 2017.

The increase in freight train volumes includes a general increase in transport demand and a certain increase in rail freight traffic due to improved competition situation of railways as a consequence of upgrading the route to European Rail Freight Corridor.

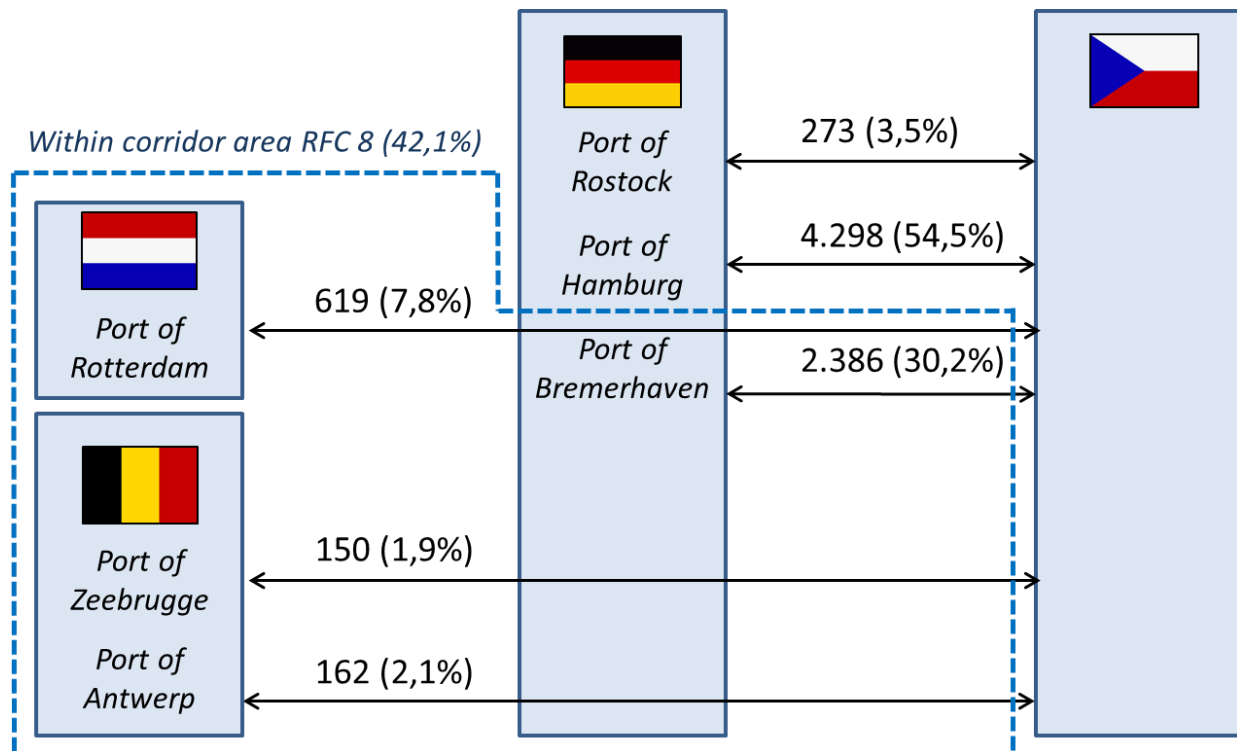


Figure 37. Total traffic in connection with the RFC 8 O/D relations, 2017 forecast.

Traffic of container trains will grow faster than block train traffic. Thus, the share of container trains in total traffic volumes will further increase to 7.014 trains per year in 2017 (or 88,9%) with an accumulated growth rate from 2012 to 2017 of 6,4%.

Block train traffic will increase by an average of 2,7%, with the highest growth rates for traffic to the ports of Hamburg and Rostock.

As mentioned above, growth rates for container train traffic will be considerably higher than for block train traffic. The biggest increase in train numbers will be observed in traffic between the ports and the Czech Republic. The Hamburg ports remain the by far most important origin/destination.

3.1.12.8 Conclusions and recommendations

Countries within the RFC 8 area are important economic partners of the Czech Republic. Together these countries account for 42% of Czech export and 37% of all import to the Czech Republic.

The robust economic development in the coming years and the strong connections with Germany concerning export and import trade, as well as the important traffic flows to the North Sea ports suggest a sound potential for a connection of the Czech railway network with European Rail Freight Corridors to the North of Prague. International traffic forecasts expect a stable increase of train traffic to the ports in the North, with especially high growth rates for combined traffic, which forms a sound basis for stable rail freight connection.

According to the Regulation (EU) No 913/2010 the Rail Freight Corridor 7 will be prolonged from Prague in direction to the ports of Bremerhaven, Wilhelmshaven, Hamburg and Rostock. Thus, RFC 7 will cover almost 90 % of the total rail freight traffic between the Czech Republic, Slovakia and Hungary and the North Sea/Baltic ports. These are also the traffic relations, where the major development potentials are seen.

About 10 % of the freight trains via Děčín/Bad Schandau to/from the ports are operated via Rotterdam and Antwerp. The future connection between the Rail Freight Corridor 7 and RFC 8 at their crossing point (e.g. at Falkenberg), for example by connecting pre-arranged paths at these crossing points, will guarantee a European Rail Freight corridor status for these transports, too.

Results of the stakeholder interviews suggest that the upgrade of lines to the North Sea ports to a European Rail Freight Corridor would render rail transport more competitive compared to road-based transport.

3.1.13 Conclusions and recommendations: Short-term study

The following elements will likely have the strongest effect on the demand of (rail) freight transport in the near future (facilitators):

- 1) Development of Gross Domestic Product (GDP) in the countries along the corridor
- 2) Decrease of barriers in international trade and transport along the corridor
- 3) The process of containerisation in freight transport along the corridor
- 4) The development of harmonisation of costs, reliability and availability of rail freight transport and other transport modes along the corridor
- 5) Effects of liberalisation on the competitiveness of rail freight transport along the corridor

In order to fully take advantage of those developments the following factors are deemed necessary (from the IM point of view) to facilitate growth in the short-term period until 2017

- 1) Cost-effective harmonisation of network related train parameters (train length, train weight)
- 2) Harmonisation of information data (constant monitoring and evaluation of requested international train paths)
- 3) Harmonisation of pricing regime along the corridor (transparent and reliable)
- 4) Establishing a C-OSS along the RFC 8 (comprehensive corridor management)
- 5) Harmonisation of infrastructure capacity in terms of providing additional storage and siding capacity in close coordination with the terminal operators (especially concerning storage capacity)
- 6) Providing flexible and reliable services towards the clients (RU) and ultimately the customers (shippers)

- 7) Enhancing the service portfolio to ease network access for all corridor network users (e.g. train handling and shunting services on shunting yards).

One of the major factors that will improve the market share of rail freight in the future will be the price of the services including total cost of use, followed by factors like reliability and flexibility of the services. In addition, service information for clients and customers as well as service orientation towards the customers (shippers) play a major role for the choice of rail as transport mode. In the following chapters the Consultant has highlighted where the IMs (and other stakeholders) will be able to support or influence these factors in the near future (short-term period until 2017).

3.1.13.1 Requirements to terminal and railway infrastructure

- 1) Standardisation and harmonisation of capacity offered and the technique installed throughout the network (e.g. for 740m trains, 22,5 t axle load).
- 2) Extension of sidings along the RFC 8 (with the aim of establishing a uniform train length of 740m)
- 3) Extension of storage capacity in coordination with the terminal operators
- 4) Enhancement of terminal capacities incl. 7/24
- 5) Agreement on common language to facilitate communication and reduce barriers related to language problems

3.1.13.2 Enhancement of international train path management

- 1) Harmonisation of information standards along the RFC 8 (establishing Corridor's wide standards on corridor trains (ensure a common definition, identification along the corridor) - for instance with corresponding/correlating train numbers.
- 2) Establishment of a Corridor One-Stop-Shop along Rail Freight Corridor 8 (even if the majority of trains will only cross one border along the corridor)
- 3) Transparent pricing regime along the RFC 8 for corridor trains (integrating the national access fee regimes)
- 4) Conduction of regular stakeholder interviews or stakeholder conferences along the corridor, using the information to enhance the services of the C-OSS

3.1.13.3 Technical and technological improvements incl. ERTMS

- 1) Simplify and reduce cost for ERTMS and ETCS installations to keep rail freight costs low
- 2) ERTMS should be implemented as soon as possible at least for the most important connections, i.e. the Netherlands – Germany (in connection with RFC 1), Belgium – Germany (it will be deployed in Belgium till the border by 2020) and Germany – Poland.

3.1.13.4 Legislative and organisational improvements

- 1) Integration of corridor and non-corridor development steps by the IMs
- 2) Provision of tracking and tracing information on trains
- 3) Up-to-date Information on performance of trains (delays, position, etc.)
- 4) Flexible train path management to be able to react to market developments on a national as well as international level (C-OSS)
- 5) Advance information on delays, maintenance and repair works

3.1.13.5 Definition of pre-arranged paths (PaPs)

The current distribution of corridor trains clearly shows that at some of the border crossings a higher amount of corridor trains exist than is indicated in the amount of corridor trains

before and after the border, which is likely to have its origins in the change of national to international train numbers (and vice versa). This indicates that the RUs do not want to commit themselves to long pre-arranged train paths but would rather keep these shorter to be able to react more flexible in the pre- and post-trip in the respective country's hinterland.

The stakeholders also indicated that they need a higher flexibility and availability meaning to be able to have train path booking as flexible as possible (to be able to react to market requirements or changes), which in turn should be as highly available as possible (somewhat a contradiction in itself). Whilst stakeholders from Poland and Lithuania reported that timetable requests and train path allocations take place at short notice and on an as-need-basis (=high level of ad-hoc traffic), German and Dutch stakeholders reported that train paths have to be requested one year in advance (=low level of ad-hoc traffic). Hence also the improvements mentioned by German and Dutch stakeholders suggest a higher degree of flexibility in allocating train paths.

The necessity in the short-term future to offer train paths along the corridor within the understanding of the Regulation (offer internationally coordinated pre-arranged train paths 11 months in advance) across more than 2 borders are quite negligible at the moment and this number of trains is not increasing dramatically over the next 5 years.

It might be expected that RUs in the future might go for this instrument at sections across borders where capacity restraints exist (sort of bottlenecks) and it is essential to secure capacity for its own traffic. So it is to be expected that rather short PaPs across the borders are requested in the future (mirroring the current development at certain sections).

3.1.14 Long-term development trends

3.1.14.1 Objectives and methodological approach

While the short-term part of the Transport Market Study takes the period from 2012 to 2017 into account, the long-term part considers the period from 2018 until 2025. However, for giving a clearer picture on the development over the long-term period, only the years 2020 and 2025 have been taken into account to show the possible progress of the flows on the corridor (mirroring the figures given in the short-term part). For the purpose of traffic forecast only routes that belong to the preliminary routing of the RFC 8 were taken into account (again mirroring the approach of the short-term part). The long-term part of the TMS is composed of three parts.

- 1) The first part of the study contains the chosen methodology for the forecast for each country based on studies made or approved by the transport ministries; however, in case national studies did not provide sufficient information, other official or IM ordered studies were used. The forecast is shown in ranges, giving a good prediction what freight traffic flows are to be expected. The majority of projections overlap, however in case major differences appear they can be explained by the differences in the assumptions.
- 2) The second part contains the most important investments on the preliminary corridor route that will have an impact on calculating the demand forecast of freight trains on the corridor due to increased capacity or better routing opportunities. The planned investments in the railway infrastructure taken into account are those that the national governments are planning to realise until 2025.

- 3) In the third part the forecasts and the available infrastructure (part 1 and 2) were transformed into trains per day in both directions on sections between stations and on border sections. This overall corridor transport flow prognosis was established without adjusting the national methodologies.

Overall this mirrors very much the approach taken within the short-term part of the study, which based the prediction of future freight trains on a forecast model. While the forecast for the short-term part is based on GDP development, the forecasts taken into account for the long-term part are partly more detailed, but all of them also take into account the forecasted GDP developments as one of the main factors. Major improvements of the railway infrastructure (new lines etc.) were not taken into account in the short-term part of the TMS due to the short time period covered (exempt being the opening of the standard gauge Rail Baltica).

3.1.14.2 Forecast methodology. Corridor methodology for the long-term forecast

Due to the fact, that the RFC 8 covers five different countries with different type of traffic on the corridor, i.e. corridor trains and non-corridor trains, and the different approaches taken by the country's Ministries of Transport (MoT) or railway Infrastructure Manager (IM) defining their long-term plans and strategies, a common methodology for forecasting long-term transport flows over the entire corridor does not exist at the moment. For this reason, the Working Group Infrastructure opted for the approach of presenting each country's national forecast studies and coordinating their projections for the needs of the long-term part of the study.

3.1.14.2.1 The Netherlands

In 2008 The Netherlands Organisation for Applied Scientific Research TNO presented a forecast that was made for the period 2020-2040¹⁹. The management of ProRail wanted to have an insight into more recent expectations for the year 2020 and the available projections for the period from 2020 to 2040. There are more and more questions about the expected developments in the long term. This concerns the freight development to be expected for the period 2020-2040 and its impact on the rail transport from, into, through and within the Netherlands. This study was widely consulted with stakeholders.

In 2012 TNO reviewed their work of 2008²⁰ in the study “Long-term perspective rail freight”, commissioned by the Ministry of Transport. Recent economic developments in the Netherlands and abroad have been taken into account. ProRail used this information and translated it to trains per working day, using the available routes.²¹

3.1.14.2.2 Belgium

The current long-term forecasts of Infrabel from the study “Growth on Railways and Increased Punctuality” has been developed by the consultancy office Roland Berger in 2009, in the framework of the management contract with the Belgian state. These forecasts are based on a simplified model²² of the network to estimate increases in volume between 2009 and 2030 for passenger traffic (domestic and international) and freight traffic for a limited number of scenarios. Four traffic growth scenarios were elaborated to support the future projections of the transport offer:

Scenario 1 "Slow Growth"

Scenario 2 "Freight Competitiveness"

Scenario 3 "Integrated Policies – Freight & Passenger"

Scenario 4 "Sustainable Growth"

The volume of passengers and tons has been converted into trains on the basis of the number of passengers or the volume of tons per section and timetable period. Trains are then compared to the available capacity of each network section including the impact of all projects formally decided, budgeted for and scheduled at that time. The traffic forecasts for the long-term part of the TMS for the RFC 8 are based on the real traffic in 2012, for scenario 3. Prognoses for the freight transport have been updated in 2013 but still need the approval of the Managing Board of Infrabel.

3.1.14.2.3 Germany

As a basis for the German Federal Transport Infrastructure Plan, the German Federal Ministry of Transport, Building and Urban Development²³ draws up a transport demand forecast for the time horizon of 2025. The forecasts for transport demand are based on the likely development of demographic and economic aggregates.

The conversion of the transport demand forecasts into route-specific vehicle flows, which was required for the evaluation calculations, was done using highly differentiated and

¹⁹ Scenario calculations rail freight for the period 2020 – 2040, TNO October 15th 2008, 2008-D-R1024/A.

²⁰ Lange termijn perspectief spoorgoederenvervoer, TNO 30 mei 2012, 2012 R10064.

²¹ Verwerking herijkte goederenprognoses PHS, ProRail 30 september 2013, EDMS #3235055

²² This model is simplified in that it does not fully cover the physical reality of the Belgian railway network

²³ Currently the actual name of German ministry responsible for transport is Federal Ministry of Transport and Digital Infrastructure.

computerised models to simulate operational conditions. The transport infrastructure networks upon which these were based form the status of the transport infrastructure in 2025.

The forecast of the Federal Ministry of Transport, Building and Urban Development shows for every line of the German federal rail network the forecast numbers of long-distance passenger trains, regional trains and freight trains per day. This forecast of the Federal Ministry of Transport, Building and Urban Development is the basis for the planning and designing of building measures of the network projects in Germany by DB Netz AG.

3.1.14.2.4 Poland

Traffic forecasts for rail and other transport modes covering the whole Polish transport network, which were worked out, officially adopted and published recently in Poland referred up to time horizon 2030, were elaborated in 5-year periods and were presented in the following basic documents:

- „Strategy for transport development until 2030” – adopted by the Council of Ministers on 22 January 2013 (hereinafter referred to as: „the Strategy”);
- „Master Plan for railway transport in Poland until 2030” – adopted by the Council of Ministers in December 2008.

The common characteristic of all above forecasts is the aggregation of results to the national level and presenting them only in a country-wide perspective. The forecasting process within „the Strategy” was based on quantified values of the main factor determining the demand for particular kinds of transport services. Forecasts in the Strategy were elaborated in two scenarios: maximum and minimum.

The number of trains for the RFC 8 were calculated on the base of the network factors from the “Master plan” adjusted in line with factors used in the Feasibility Study for the section Sochaczew – Swarzędz (remaining works), that were based on traffic volumes and macroeconomic indicators updated for 2010.

3.1.14.2.5 Lithuania

The long-term perspective of the Lithuanian transport market has been analysed in a number of studies. The official Long-term (until 2025) development strategy of the Lithuanian transport system was finished and published in 2005 by the Ministry of Transport; on 18th of December, 2013 the updated strategy was published, however, this study has already been finished by then. The strategy looks at the general perspectives of the Lithuanian transport market including, road, waterborne and railway transport, however it does not forecast transport flows of any mode of transport. Therefore the data needed to analyse the long-term transport market was collected from other sources mainly:

- Study “The Freight and Passenger Transport Flows Forecast Until 2040” prepared by Vilnius Gediminas Technical University (VGTU) in 2010;
- “Long-term (until 2025) development strategy of the Lithuanian transport system” (2005);
- Study “Rail Baltica” by AECOM (2011).

3.1.14.3 Major infrastructure investments

The most important investments on the preliminary corridor route have been taken into account for calculating the demand forecast of freight trains on the corridor due to the fact that their realisation will have a significant impact on the future development of rail freight in terms of a higher modal share based on the increased capacity along the corridor. These measures are those that the national governments are planning to realise until 2025.

3.1.14.3.1 The Netherlands

The investments in the Netherlands on RFC8 are aimed at optimising the handling of freight trains from the ports of Rotterdam and Amsterdam in relation to Germany and beyond. The most important projects are:

- 1) Upgrading Kijfhoek and Harbour Line yards,
- 2) Improvement of the connection of the Betuwe Line with Emmerich,
- 3) Improvement of the connection between Elst and Bad Bentheim.

3.1.14.3.2 Belgium

Infrabel is planning a number of investments on the RFC 8 in the short and long-term. These investment projects focus mainly on improvements in the Port of Antwerp and in the access to this port from its hinterland.

Short term:

- 4) The Liefkenshoek Rail Link in the port of Antwerp planned to open in 2014.

Long-term:

- 5) Construction of the so-called “second railway access” to the Port of Antwerp (Connection of Antwerpen-Noord marshalling yard with the Lier – Aarschot line (L16),
- 6) Enhancing the capacity on line L27A between Ekeren and Mortsels,
- 7) Reactivation of the “Iron Rhine”, a railway line connecting the Port of Antwerp with the German Ruhrgebiet via Weert in the Netherlands. An agreement between Belgium and the Netherlands on the reopening is still pending.

3.1.14.3.3 Germany

The investments on the RFC 8 are the results of the described methodology of the German Federal Transport Infrastructure Plan:

- 8) Upgrading line Border NL/D – Emmerich – Oberhausen,
- 9) Upgrading line Hoyerswerda – Horka – Border D/PL,
- 10) Upgrading line Rheydt – Dalheim – Border D/NL (- Roermond) – “Iron Rhine”²⁴.

3.1.14.3.4 Poland

The investments in Poland on the RFC 8 consist of the following projects:

- 11) C-E 20, section Poznań Górczyn - Poznań Franowo – Swarzędz
- 12) E 20/C-E 20, Poznań - Warszawa section: remaining works on section Swarzędz – Kutno – Łowicz – Sochaczew
- 13) C-E 20, section Łowicz Główny – Skierniewice
- 14) Modernisation of Skierniewice station
- 15) C-E 20, section Skierniewice – Pilawa – Łuków

²⁴ The final decision on the project has not been taken yet.

- 16) E 75 Warszawa Rembertów – Tłuszcz – Sadowne
- 17) E 75 Sadowne – Białystok
- 18) Line no. 6, section Białystok – Sokółka – Kuźnica Białostocka (State border)
- 19) Line E 75, section Białystok – Ełk – Suwałki – Trakiszki (Polish/Lithuanian border)
- 20) Line E 20, Łuków Local Control Centre
- 21) Line E 20 Terespol Local Control Centre
- 22) C-E 30 line Wrocław Brochów – Jelcz – Opole
- 23) Works on line no. 14 (and connecting line), section Ostrów Wlkp. – Zduńska Wola
- 24) Works on line no. 14, section Zduńska Wola – Łódź Kaliska
- 25) E 20 section Warszawa – Błonie
- 26) Lines no. 509 and 20 in Warszawa (section Warszawa Gołębki – Warszawa Gdańska)
- 27) E 20 line, section Warszawa Rembertów - Mińsk Mazowiecki, phase I
- 28) Works on line no. 14, section Głogów – Ostrów Wlkp.

3.1.14.3.5 Lithuania

The main investments in Lithuania on the RFC 8 are aimed to upgrade the line Lithuanian/Polish border – Mockava – Šeštokai – Marijampolė – Kazlų Rūda – Kaunas by building a new 1435 mm line along the current railway line and establish a Public Logistics Centre in Kaunas.

- 29) Rail Baltica
 - Rail Baltica 1: Polish/Lithuanian border – Kaunas is planned to be implemented till the end of 2015.
 - Rail Baltica 2: Kaunas – Lithuanian/Latvian border is planned to be implemented till the end of 2025
- 30) Signalling system modernisation - It is planned to upgrade train control, signalling, power supply and communication facilities. Implementation of the project will increase the safety and train capacity of the line.
- 31) 1435 mm railway track Kaunas – Palemonas – Rokai
- 32) Kaunas Public Logistics Centre
- 33) Establishment of Marijampole Free Economic Zone (FEZ)

3.1.14.4 Forecast results

The results of the long-term freight traffic forecast on the RFC 8 based on the national studies for the years 2020 and 2025 are summarised in following figures and show the expected number of freight trains per day in both directions for each designated section in the respective years, indicates the changes of projected number of trains per days for both directions in percentage from 2020 to 2025.

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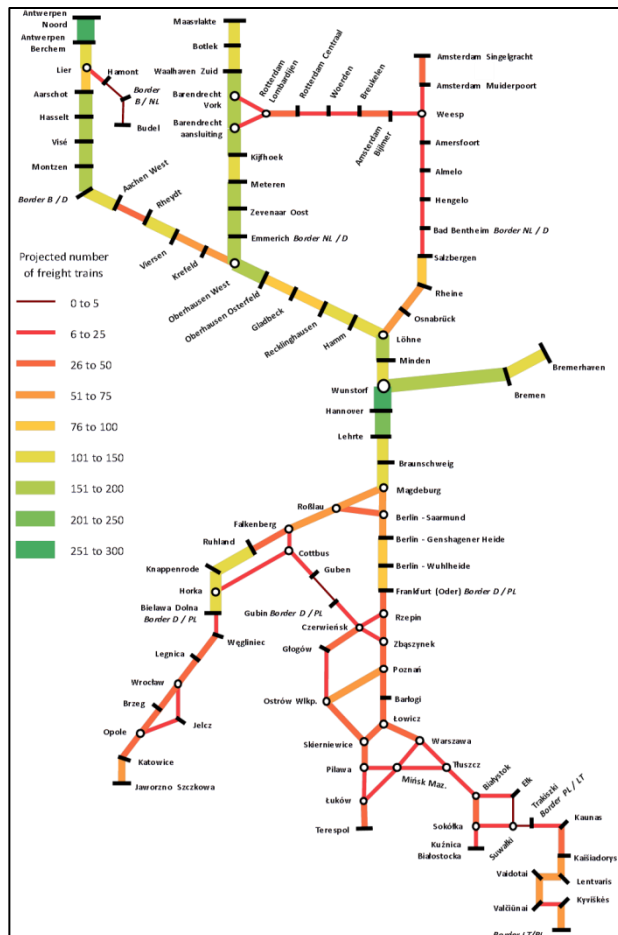


Figure 38. Traffic flow forecast 2020.

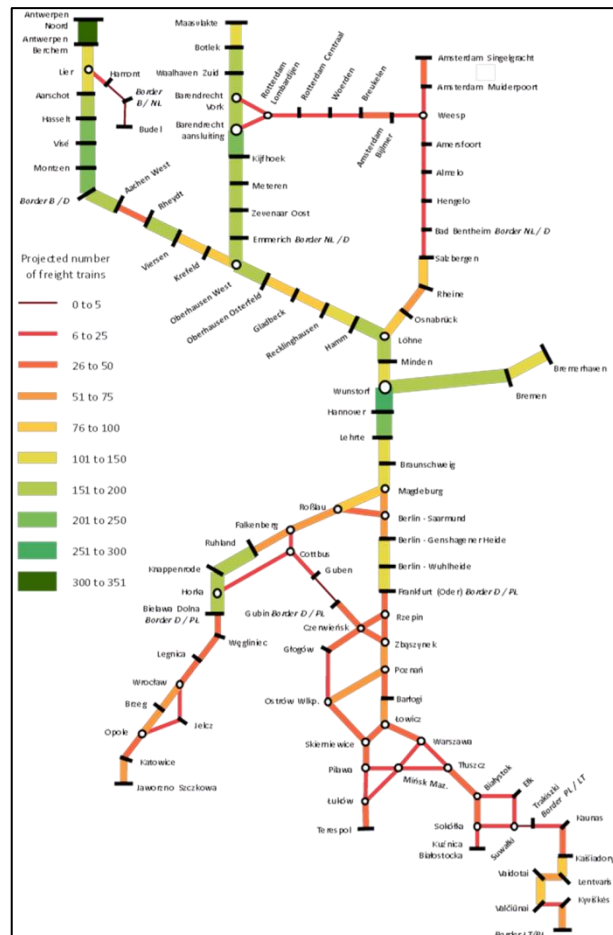


Figure 39. Traffic flow forecast 2025.

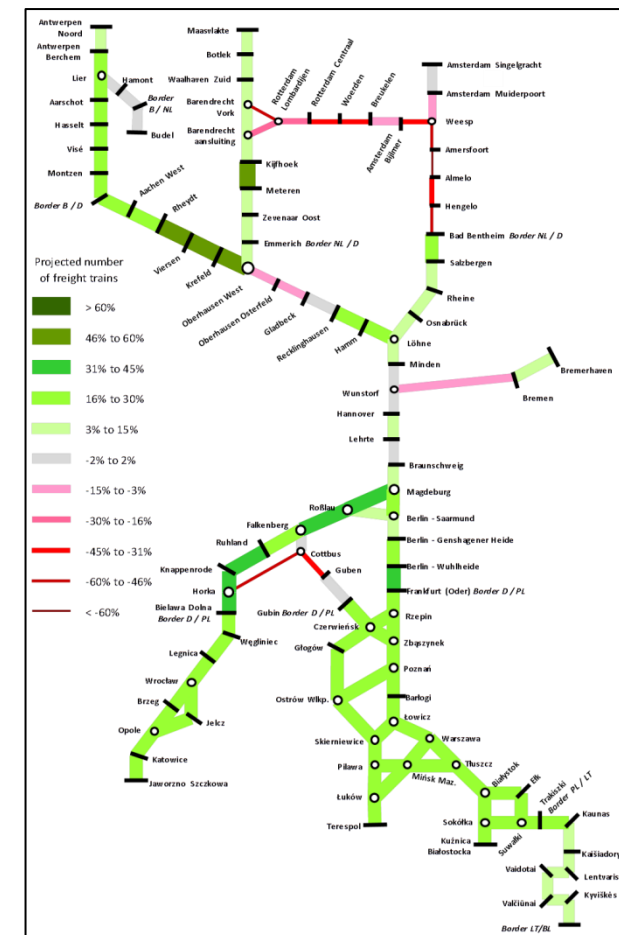


Figure 40. Change in traffic flow forecast from 2020 to 2025.

3.1.15 Summary of country-related forecast

The country-related forecast of the future rail freight transport volumes have been translated into freight trains on the RFC 8 for the years 2020 and 2025. The results clearly show that the estimated number of freight trains will increase on the majority of the sections of the corridor-related rail network from the year 2020 to 2025, mirroring the same development seen in the short-term part of the TMS. In most cases the growth rates range from 3% to 30%. However there are some exceptions where the volume increase is higher than 60%. This is due to the fact that a small change for example from 4 trains to 6 gives relatively big growth (50%).

3.1.15.1 Cases of significant/high increases

The section between Kijfhoek and Meteren shows a big increase (46% to 60%) because of the realisation of a new connection (assumed ready in 2025) near Meteren that gives possibilities to re-route trains from Kijfhoek to Venlo border using this new connection. The reason for the growth in the section between Rheydt and Oberhausen West is that non-corridor traffic comes in at Rheydt and goes off at Oberhausen West.

3.1.15.2 Cases of significant/high decreases

On the other hand for several sections on the corridor there is estimated a sharp decrease ranging from - 46% to - 60% for the forecasted traffic volume. A significant decrease is expected for the section Falkenberg – Cottbus – Horka / Guben because this line serves only as a temporary diversionary line as long as the section Knappenrode – Horka is under construction, which is foreseen to be upgraded until the end of this decade.

For the Dutch part the decrease on two sections Hengelo - Bad Bentheim Border NL/D, Weesp - Amersfoort and Barendrecht Vork - Rotterdam Lombardijen is caused by rerouting corridor trains from Bad Bentheim Border to Emmerich border.

It is also notable that for the section between Amersfoort and Almelo, the estimated decrease is bigger than 60%. The main reason for this is that the rerouted corridor trains represent a high share of the total number of trains on this route.

3.1.15.3 Other reasons to be mentioned for differences in the traffic flow

The German sections between Oberhausen West and Gladbeck as well as between Bremen and Wunstorf show a slight decrease. The reason is that in the 2025-prognosis additional projects (which are not shown) will bring a little change in the traffic flow in those areas.

3.2 Czech long-term part

The RFC 8 TMS, the executive summary of which was published in the previous chapter (3.1), was conducted by a consultant without a chapter on the long-term analysis of the area of the Czech Republic. Therefore this chapter contains supplementary information supplied by the Czech Ministry of Transport and the Czech infrastructure manager.

3.2.1 Forecast methodology

The Czech long-term part is based on the statistics of the Czech Ministry of Transport for the years 2005 - 2011, as well as the performance database of trains on the railway network of the Czech Republic during period 2009 - 2011. Results stem from nationwide Transport

Sector Strategies. Data obtained from major railway undertakings were taken into consideration. For the forecast calculations was used a simplified transport model, working with matrices of the most important sources and destinations of goods that were decisive for the entire calculation.

The long-term part of Czech TMS comprises all relations of freight trains using assessed section i.e. the line Prague – Děčín – border CZ/DE (left Labe river bank line) and the line Kolín – Děčín – border CZ/DE (right bank line). This analysis expects an increase of rail performance and its share about 87% by 2025 and about 98% by 2030 (both figures with comparison to the year 2012). Achieving this share means an increase in the volume of combined transport in the period 2005-2020 to more than triple. In practice, this means that increases not only the frequency of trains running over a whole week period but also in a single day. This fact will cause better utilization of existing train paths and making new train path. Overall prognosis is working with the development of import and export to and from North Sea ports.

3.2.2 Major infrastructure investments

SŽDC is preparing and planning several investments along RFC 8 both for short-term and long-term period. These projects are focusing especially on increasing capacity of railway lines and interoperability, especially on the deployment of ERTMS system.

The most important projects are:

- 1) Lysá nad Labem – Děčín Prostředbí Žleb: full modernization of the line, capacity improvement,
- 2) Lysá nad Labem – Všetaty – Děčín východ: deployment of ERTMS,
- 3) Praha Libeň – Lovosice – Děčín - state border Germany: deployment of ERTMS,
- 4) Kralupy n/Vltavou – Nelahozeves: upgrading of tunnels for combined transport code P/C 80/410,
- 5) Praha Vysočany – Lysá nad Labem, line modernization: capacity improvement,
- 6) Praha Libeň – Praha Vysočany- Lysá nad Labem: deployment of ERTMS.

3.2.3 Updated forecast with Czech part.

The results of the long-term freight traffic forecast on RFC 8 supplemented by Czech data are presented in a similar way as the original TMS results in figures 38-40.



Figure 41. Traffic flow forecast 2020.

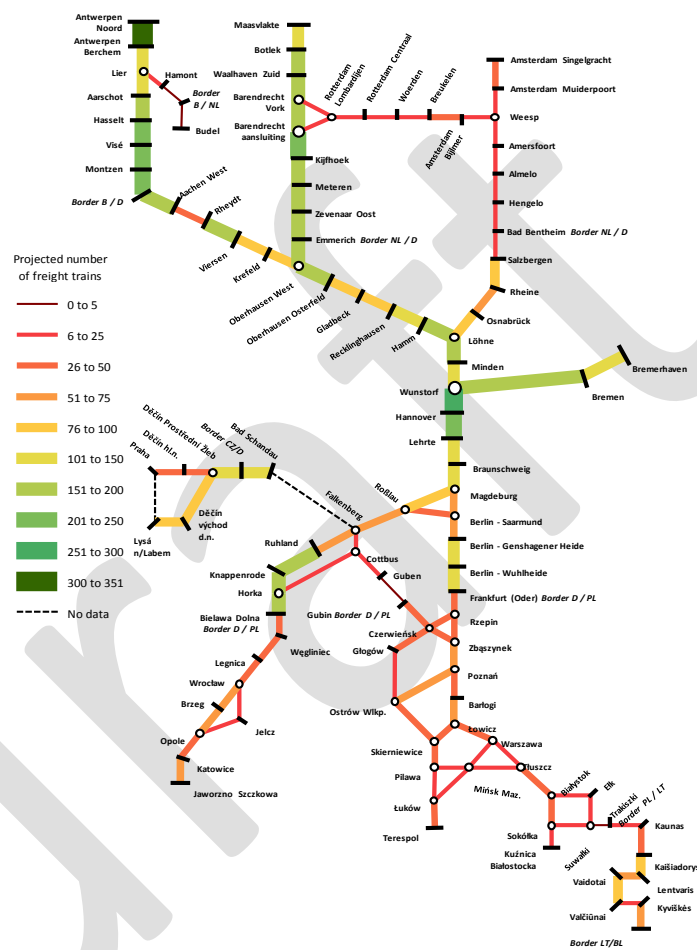


Figure 42. Traffic flow forecast 2025.

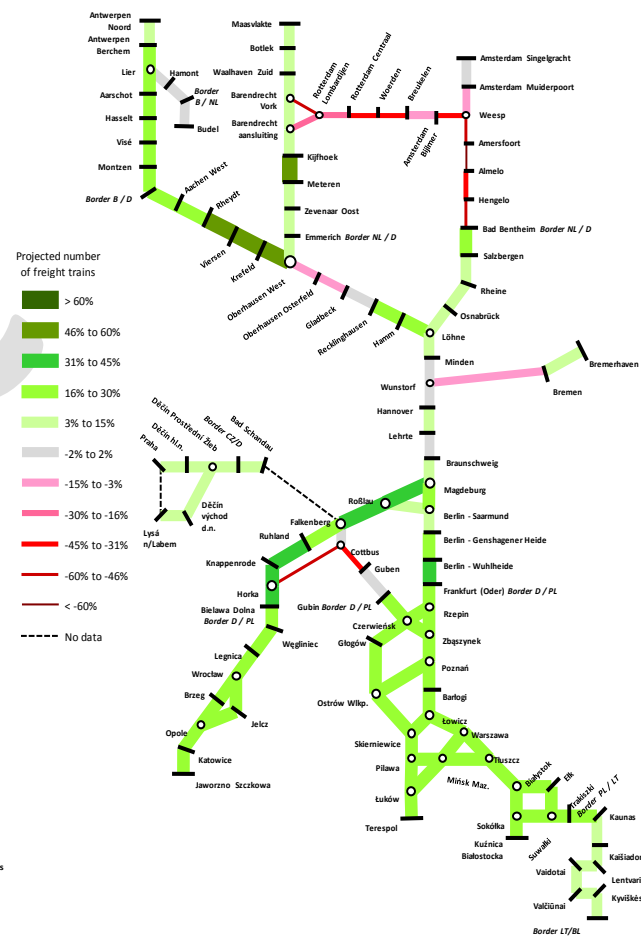


Figure 43. Change in traffic flow forecast from 2020 to 2025.

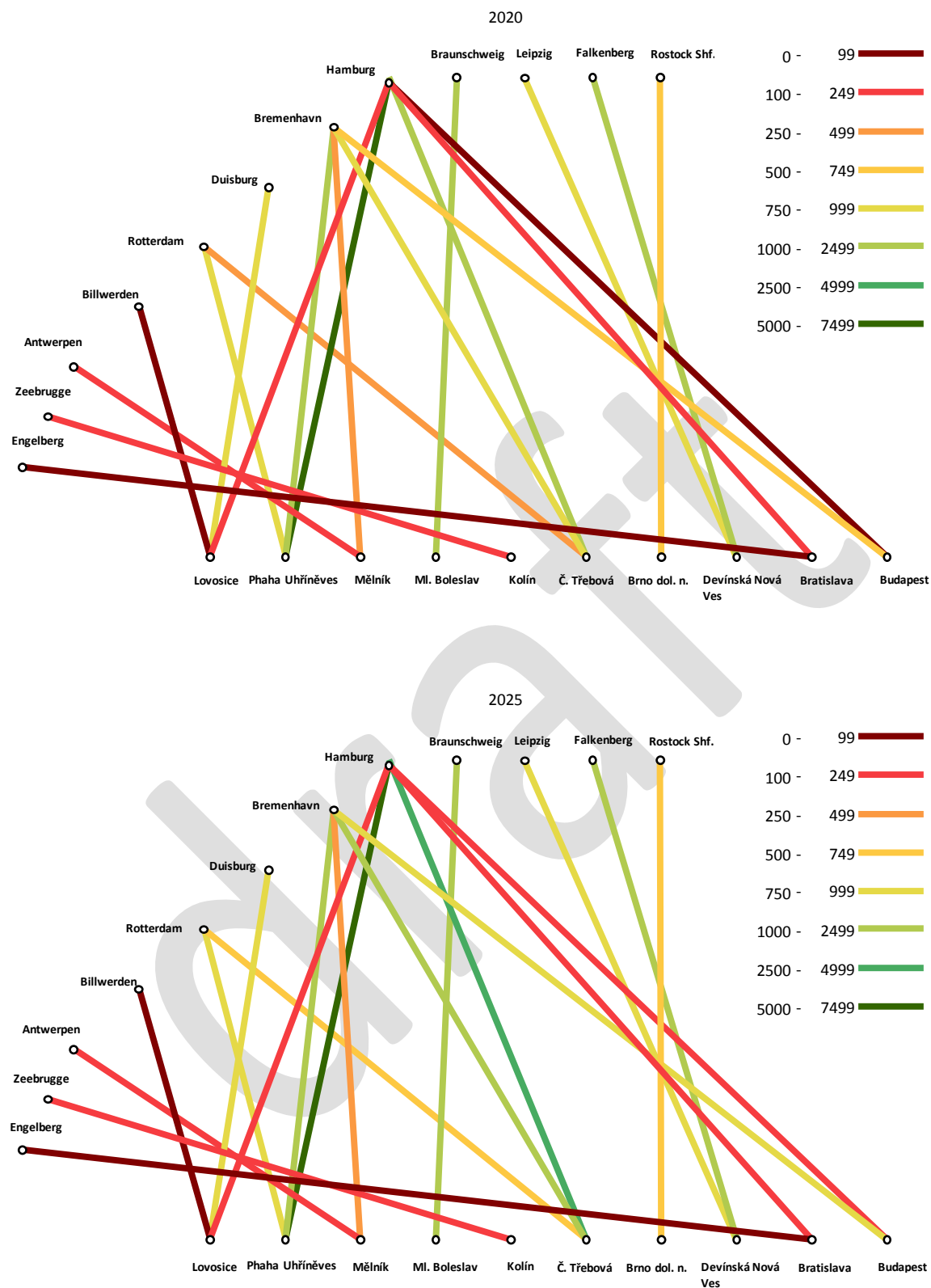


Figure 44. Traffic flow forecast among important nodes in 2020 and 2025.

3.3 Conclusions of the Management Board

The results of the study were taken into account when deciding on the routing, the terminals belonging to the corridor and PaPs.

The findings of the TMS reconfirmed the Management Board that implementing the requirements of the Regulation will improve the competitiveness of international rail freight on the North Sea – Baltic Rail Freight Corridor significantly.

Specific implementation action derived from the requirements of the Regulation is described in chapters 4, 5, 6 of this Implementation Plan.

Outcomes of the TMS were also discussed with the Advisory Groups members and later were submitted to the Executive Board.

During the discussion with the members of AGs several factors were indicated as necessary for commercial success.

One of them is a strong need to inform terminals about the actual running times of trains. The Train Information System (TIS) from RNE may be a useful tool to improve information exchange.

According to railway undertakings it is extremely important to harmonize the infrastructure parameters that will be provided by the RFC 8. Railway undertaking representatives underlined that the value of the RFC 8 offer is crucial, if along the corridor 740m long trains, with a high loading gauge and axle load were accepted. This would be a positive factor for developing continental freight services.

The question of crossborder interoperability was also raised. While interoperability should be understood wider than only a technical issue the technical interoperability of course must be provided which is already part of the EU requirements. The interoperability issue must mean reviewing any national criteria, since the criteria may impact on railway business.

A positive attitude towards above mentioned challenges is a key element that can provide success for any freight corridor. This may mean preservation of railway share in freight transport when total amount of transported goods is rising but it also may mean a modal shift of part volume from road to rail.

The results of the TMS were also given as an input for the North Sea - Baltic Core Network Corridor study.

In 2017/2018 an update of the TMS will be conducted to take into account future extensions of the corridor as foreseen. The update of the TMS would consider already the results of the first year of operation and the train volumes of 2017. This is in line with the suggestion of the European Commission to have an updated TMS before mid 2019.

4.

List of measures for implementation of Articles 12-19



Article 12 of the Regulation concerns the obligation of the Management Board to coordinate and publish schedule for carrying out all the works on the infrastructure and its equipment that would restrict available capacity on a Rail Freight Corridor.

Articles 13-19 of the Regulation concern the management of a Rail Freight Corridor. The Management Board is required to implement the following provisions:

- 1) to determine role and obligations of the Corridor One Stop Shop,
- 2) to manage capacity that is to be allocated to freight trains,
- 3) to extend the notion of applicant to the authorised applicants who are given right to request PaPs and reserve capacity,
- 4) to establish rules regarding traffic management (in the event of disturbance as well),
- 5) to publish regularly updated specific information about the Rail Freight Corridor,
- 6) to take care about service performance.

4.1 Coordination of infrastructure works

Major construction works and possessions on the Corridor are coordinated between the IMs. Until now, this has been done without one common structure and the results have been published on some of the homepages of IMs and on the RNE homepage. RUs have been informed accordingly by the IMs. This procedure shall be further improved by establishing a regular process for the early information and (on the later phase) involvement of the RUs on the Corridor.

Based on Article 12 “Coordination of works” of the Regulation (EU) No 913/2010, RNE guidelines provide recommendations for the process of coordinating and publishing activities reducing the available capacity on a Rail Freight Corridor. Included is a description of a tool which is recommended to be used by IMs and corridor organisations for gathering and publishing information about capacity restrictions.

To achieve this, the coordination and communication process will be enhanced to involve applicants regularly and publish the information for the entire corridor. A working group “Works and Possessions” of RFC 8 has been set up and will coordinate the possessions and renewal works in a way that the capacity on the network can be kept as high as possible.

This coordination process will be done as much as possible with related Rail Freight Corridors to create one process and one standardized way of publication. There is already an agreement with the IMs of Rail Freight Corridor Rhine-Alpine to have one and the same coordination and publication process. Current planning is to start the publishing on Works

and Possessions at the corridor go live in November 2015. To ensure proper and harmonized coordination RNE started to organize two coordination meetings a year in May and October on which all RFC 8 IMs and other IMs also participate to coordinate the works on their Corridor lines. To enhance the process RNE is adapting its relevant guidelines. The responsible representatives of the IMs are implementing the related procedures accordingly.

4.2 Corridor One Stop Shop

According to the Regulation Infrastructure Managers and Allocation Bodies of a Rail Freight Corridor are obliged jointly to define and organise PaPs for freight trains. They have to facilitate journey times, frequencies, times of departure and destination and routings suitable for freight transport services with a view to increasing the transport of goods by freight trains running on a Rail Freight Corridor. These PaPs shall be published not later than 3 months before the final date for receipt of requests for capacity.

The Infrastructure Managers and Allocation Bodies involved jointly construct a catalogue of PaPs for each corridor, creating a range of available international train paths. These PaPs are coordinated to better meet market needs and can be combined into a single international request. These paths are protected from any major changes.

Furthermore the Management Board should designate or set up a Corridor One Stop Shop (C-OSS), that is a joint body for applicants to request and to receive answers, in a single place and in a single operation, regarding infrastructure capacity for freight trains crossing at least one border along a Rail Freight Corridor.

The Management Board of RFC 8 decided to choose the representative C-OSS model (employees of one hosting Infrastructure Manager/Allocation Body (AB) work for the whole Corridor) and DB Netz will host the Corridor One Stop Shop for the first two years. Designated DB Netz employee to perform C-OSS tasks is Mr. Florian Müller.

The tasks of the C-OSS are following:

- 1) to be a contact point (art. 13.2)
C-OSS is providing basic information concerning allocation of infrastructure capacity, including the information about this topic as referred in art. 18 of the Regulation;
- 2) to plan and prepare PaPs (X-16 till X-12) and Reserve Capacity (X-4 till X-2);
C-OSS is monitoring the process between the MB and IMs during path coordination.
- 3) to support customers;
C-OSS supports and advises the customer in the preparation of requests for PaPs.
- 4) to display/publish dedicated PaPs and Reserve Capacity;
C-OSS is responsible for this task. Publication is done on the website of the corridor and in the booking tool PCS.
- 5) to deal with applications / path requests:
 - as a single contact point for applicants to request and receive answers/offers regarding the Corridor PaPs and Reserve Capacity,
 - by checking regarding acceptance of applicant for requests and allocation based on the information from IMs/AB (e.g. Authorised applicants or access rights);
- 6) to allocate dedicated PaPs and Reserve Capacity on behalf of the concerned IMs/AB;
The task is to proceed with formal allocation (incl. information of competent IMs/ABs regarding the applications and the decision taken).
- 7) to resolve conflicts:

- by taking final decision in case of double or more requests at X-8 for the same path based on Corridor priority rules,
 - by offering an alternative (non-requested) PaP to the losing applicant,
 - by offering / communicating a tailor-made alternative developed by the involved IMs/AB;
- 8) to forward requests with flexible approaches or if alternative is not accepted and receive feedbacks from IMs/AB for further procedure;
- 9) to keep path request register;
Register contains dates of the requests, names of the applicants, etc.
- 10) to provide information to Regulatory Bodies;
C-OSS keeps the register in order to proof its transparency and non-discriminatory behaviour. The register shall be submitted to the Regulatory Bodies in the event of complaints;
- 11) to collect feedbacks from applicants/customers (after sales PaPs);
- 12) to report regularly to the Management Board about defined KPI's.

The C-OSS will be available on business days (Monday-Friday) 09.00 – 17.00. It will be closed on public holidays as in the country the C-OSS is established in. These holidays will be indicated and published in the Corridor Information Document and on the Corridor website.

Reserve Capacity will be offered by RFC 8 beginning from the first day of operation of the Corridor and the first PaP catalogue will be published in January 2016 for the Timetable 2017.

4.3 Framework for allocation of capacity

As one of the Regulation's provisions requires, the Framework for allocation of capacity needs to be elaborated and signed by the Executive Board.

The Framework was signed for timetable 2016 on 12th January 2015. For the next timetable the document is being prepared now. The objective for Executive Boards is also to harmonise the documents among Rail Freight Corridors.

The Framework for capacity allocation was published on the RFC 8 website:

4.4 Authorized Applicants (AA)

According to Article 15 of the Regulation an authorised applicant may directly apply to the C-OSS for the allocation of PaPs/Reserve Capacity. If the PaP/Reserve Capacity was allocated by the C-OSS accordingly, the authorised applicant should appoint to the C-OSS within the time, as decided by the Management Board, the designated railway undertaking(s) which will use the PaP/Reserve Capacity on behalf of the authorised applicant. The designated railway undertaking has therefore to conclude the necessary individual contracts with the IMs or ABs concerned relying on the respective national network access conditions.

In Book 4 of the CID is defined how long before train runs the AA will have to inform about the operating RU. In the Framework for Capacity Allocation the Executive Board gives guidelines for the Corridor how to handle with AAs.

The Corridor Information Document will describe the rights and obligations of applicants vis-à-vis the C-OSS, in particular where no railway undertaking has been assigned yet.

4.5 Traffic management procedure

The present procedure describes the general operational proceedings in case of disturbance for RFC 8. In the document it's not regulated how to handle the traffic at each border point but to set up the procedure for traffic management on the Corridor in case of disturbance. This approach has been used because it's not possible to make detailed plans that suit the whole Corridor.

This procedure should be tested and if the procedure and TCCCOM (Traffic Control Centers Communication) fulfil the needs of the Corridor it can be implemented. If the test is not successful another solution needs to be found to comply with the Regulation.

4.5.1 Definition of disturbance

Incident or accident that has a major impact on the international freight traffic of the RFCs.

4.5.2 Thresholds

- 1) Line closure for more than 24 hours as a result of operational disturbance.
- 2) Strike with impact on the freight traffic on the corridor for more than 24 hours
- 3) Bad weather conditions resulting in delays for international freight traffic, of more than four hours for most trains.

4.5.3 Procedure for freight traffic (to be used in addition to the existing bilateral procedures)

In case of expected breach of a threshold, a responsible from the IM will send out a message via TCCCOM to inform the other IM's on the Corridor where the traffic will be impacted. The initial message only gives information on the disturbance and possible traffic restrictions.

This responsible will keep the IM's on the Corridor updated for the duration of the disturbance by regular messages with TCCCOM. These messages should include reliable information on the timeframe needed to resolve the disturbance and normalization of the traffic on the corridor.

If the disturbance is solved there should be a closing message, informing the corridor IM's traffic is returned to normal, with possible restrictions.

All border procedures for RFC 8 are listed in Appendix 2.

The railway undertakings running on the Corridor can get the information from the responsible IM.

4.5.4 Communication flows

- 1) Every IM on the RFC that is impacted by the disturbance should be informed (this possible using TCCCOM, this tool is currently being developed by RNE)
- 2) The C-OSS should also be informed; it can then relay the information to the RUs running trains on the Corridor.
- 3) RUs running trains on the network where the disturbance occurs, will be informed by the national procedures.

4.5.5 Messages

As the TCCCOM tool is still under development, we can propose the messages needed for the traffic management on the corridor.

4.5.6 Operational measures in case of disturbance

- 1) Bilateral communication must then be started between the neighbouring IMs on the Corridor, to make agreements on the operational traffic management. If language problems between the neighbouring countries exist, the Network Control Center of the IMs could use TCCCOM for communication.
- 2) RUs must be informed and contacted to coordinate traffic flow from each RU and inform them of the possibilities for their traffics. Informing the RUs should be done via a standard e-mail sent by the responsible of the IM (standard e-mail can be different depending on the IM). In this e-mail RUs are advised to contact their known contact points in the IM for more information.

4.6 Performance monitoring

A train performance management will be established in order to ensure regular performance monitoring and quality improvement of traffic on the corridor.

The goal is to describe the method for regular monitoring and analysing the international train performance, harmonized with the RNE “punctuality monitoring guidelines” and the system used on other corridors using the tools provided by RNE (TIS/OBI). For more information about the method see:

http://www.rne.eu/tl_files/RNE_Upload/Downloads/RFC%20Guidelines/Guideline%20-%20Punctuality%20Monitoring%20V2.0.pdf

RFC 8 will monitor performance by using a number of Key Performance Indicators (KPIs) and other measurements. This process has started by identifying international trains suitable for analysis in the yearly timetable published by the IM.

Suitable trains adhere to following criteria:

Mandatory:

- all trains using a PaP (no trains at the moment as PaPs are non-existent),
- at least 2 IMs involved,
- all international traffic, which is representative for the Corridor (an adequate sample to evaluate the quality on the corridor).

Optional:

- certain length (about 500 km),
- special demand of RU,
- main part of the Corridor is used (if data quality is sufficient).

For these trains data quality will be checked and if sufficient reports will be ordered from RNE to include these trains in the train performance management.

4.7 Customer satisfaction survey

The Management Board of the corridor will conduct a customer satisfaction survey annually. The first survey will be conducted in September 2016. The results will be analysed and taken into consideration in order to improve the performance of the Corridor.

The survey will be conducted by RNE on behalf of the RFCs. The results will be published as harmonized and separate for each Corridor on its website as well.

4.8 Corridor Information Document (CID)

According to Art. 18 of Regulation (EU) No 913/2010 the MB of the corridor is obliged to elaborate and publish regularly the Corridor Information Document (CID). This document should contain:

- 1) all the information in relation with the Rail Freight Corridor contained in the national network statements;
- 2) information on terminals;
- 3) information on capacity allocation (C-OSS operation) and traffic management, also in the event of disturbance;
- 4) the implementation plan that contains:
 - the characteristics of the Rail Freight Corridor,
 - the essential elements of the transport market study that should be carried out on a regular basis,
 - the objectives for the Rail Freight Corridor,
 - the indicative investment plan,
 - measures to implement the provisions for co-ordination of works, capacity allocation (C-OSS), traffic management etc.

The Corridor Information Document (CID) will follow the common structure as proposed in the RNE guidelines: *the RNE Corridor Information Document Common Structure*. The advantage of following the RNE common structure is to elaborate the document in a structure similar to the one of the other Rail Freight Corridors. Therefore the applicants will get access to similar documents along different Rail Freight Corridors and in principle, as in the case of the national Network Statements, to find the same information at the same place. The CID consists of five books:

- Book I: Generalities
- Book II: Network Statement Excerpts Timetabling year Y
- Book III: Terminal Description
- Book IV: Procedures for Capacity and Traffic Management
- Book V: Implementation Plan.

The CID will be published in English, normally in January together with the publication of the PaP catalogue, but it will be published for the first time exceptionally in November 2015.

5.

Objectives of RFC 8



5.1 Punctuality

Punctuality of a train will be measured on the basis of comparisons between the time planned in the timetable of a train identified by its train number and the actual running time at certain measuring points. A measuring point is a specific location on the route where the trains running data is captured. One can choose to measure the departure, arrival or run through time. The comparison should always be done against an internationally agreed timetable for the whole train run.

Punctuality will be measured by setting a threshold up to which trains will be considered as punctual and building up a percentage. This threshold will be defined in future TPM meetings.

5.2 Capacity

The C-OSS acts as exclusive dealer for PaPs and Reserve Capacity on the Corridor. PaPs for the annual timetable are provided by the IMs/AB to the C-OSS.

The PaPs are based on standard parameters for rail freight and previously coordinated between the IMs/AB at the borders so to enable for attractive running times. The path catalogue of PaPs will be published by the C-OSS in mid-January of each year for the next timetable period. Reserve capacity on the corridor is available from October of each year on, to allow for ad-hoc path applications.

The offer of the C-OSS will be displayed for information on the RFC8 website and for booking in the IT-application PCS (Path Coordination System) provided by RNE.

The objectives to offer capacity via the C-OSS is to have “one face to the customer” for international path requests along the Rail Freight Corridor and at the end harmonized path offers across at least one border. Furthermore the decision on the PaP pre-allocation will be done by the C-OSS by the end of April for the entire international PaP segment on basis of one harmonized allocation rule. As a result the RUs will get an earlier information about the PaP pre-allocation.

5.3 KPI's

The Corridor is monitored in terms of allocation process and in terms of train performance. As regards the train performance monitoring the process of building has started but there is no information about the performance yet.

The defining of KPI's will only start after at least half a year of monitoring (plan 2nd half 2016 for the definitions of the KPIs). Following this period, a proposal for KPI's is to be taken into consideration once data is available (2017 for the allocation process and 2018 for operations of trains). If the data for these KPI's is not available in TIS or the quality is insufficient KPI's may be dropped or exchanged for others.

At the moment it is being considered on which sections the Corridor's traffic can be monitored and measured. Only traffic that is included in the yearly timetable and for which there is information in TIS is eligible may be a subject of evaluation. A quality of data and a sufficient volume of the traffic are key elements that must be checked before specific sections and specific train are chosen for measurement in frames of Train Performance Management. In December 2015 after timetable change a decision will be taken on a definitive list of the sections on which selected trains performance will be monitored in 2016. The monitored traffic will be evaluated every year and its scope may be changed annually after the introduction of a new timetable.

5.3.1 Possible KPI's.

5.3.1.1 General Corridor Performance:

KPI 1 : Total Corridor Traffic

Measures the amount of corridor trains that have circulated on RFC 8. Trains that pass two RFC 8 border points will not be counted twice. This KPI is updated on a monthly basis.

KPI 2: Corridor Punctuality

Measures the average punctuality of a selection of corridor trains, in 26 Corridor passage points by using the RNE TIS. This KPI is updated on a monthly basis.

KPI 3: Theoretical Running Time

Makes the comparison between the average yearly timetable running time and the average PaP running time for predefined RFC 8 routes. The average speed will also be calculated, to be able to compare along the Corridor. This KPI is updated yearly after the publication of the Corridor PaPs Catalogue at X-11.

5.3.1.2 Monitoring of the allocation process:

These KPIs were established by the Executive Board within the Framework for capacity allocation for the Timetable 2016. It is possible that changes will be introduced in the Framework for Capacity Allocation for Timetable 2017.

KPI 4: PaPs per section

Number of offered PaPs at X-11 per section. This KPI will be updated on a yearly basis.

KPI 5: Requests for PaPs

The number of requests for PaPs in the period X-11 till X-8 and X-8 (-1 day) till X-2 (without feeder/outflow sections). This KPI will be updated twice a year after the given timeframe.

KPI 6: Allocated PaPs

The number of PaPs which are allocated by the C-OSS, in the period X-11 till X-8 and X-8 (-1 day) till X-2. This KPI will be updated twice a year after the given timeframe.

KPI 7: Reserve Capacity

The number of PaPs offered as Reserve Capacity, to be allocated by the C-OSS at X-2. This KPI will be updated on a yearly basis.

KPI 8: Allocated Reserve Capacity

The number of PaPs allocated by the C-OSS during the Reserve Capacity phase. This KPI will be updated on a yearly basis.

The Ministries have been working on unified standards for all RFCs. The Framework for Capacity Allocation for timetable 2017 is being elaborated. Some KPIs may be defined in this document.

5.3.2 Other Measurements

5.3.2.1 General Corridor Performance

OM 1: Cross Border Traffic

Measures all corridor trains per RFC 8 border point. This KPI is updated on a monthly basis.

OM 2: Delay Reason

Shows the share of each delay reason in the total amount of delays on a selection of corridor trains. The IM, RU or third parties responsibility is also indicated. This KPI is updated biannually.

OM 3: Top Corridor Flows

Gives an overview on the main origins, destinations and routes of corridor trains. This KPI is updated yearly.

OM 4: Users

Shows the share of each RU in the total number of corridor trains. This KPI is updated biannually.

OM 5: Lost minutes

Measures the amount of lost minutes on a selection of corridor trains, in 8 points on the corridor. This KPI is updated on a monthly basis.

5.3.2.2 Monitoring of the allocation process:

OM 6: Allocated PaPs in active timetable

The number of C-OSS allocated PaPs which reached active timetable phase. This KPI will be updated on a yearly basis.

OM 7 : Double Bookings

The number of conflicting applications for PaPs at X-8. This KPI will be updated on a yearly basis.

OM 8: Allocated paths for Reserve Capacity in active timetable

The number of C-OSS allocated paths during the Reserve Capacity phase, which reached active timetable phase. This KPI will be updated on a yearly basis.

6.

Indicative Investment Plan



The Investment Plan is without prejudice to the competence of the Member States regarding infrastructure planning and financing. Also this is without prejudice to any financial commitment of a Member State.

6.1 Methodology

According to Art. 11 of the Regulation (EU) No 913/2010 the Management Board shall draw up and periodically review an investment plan, which includes details of indicative medium and long-term investment for infrastructure on RFC 8.

Therefore an indicative investment plan was elaborated, based on the national investment plans. It covers the period until 2025. While delivering this input projects in relation to the needs of capacity enhancement, development of terminals that belong to the RFC 8 IMs, removal of identified bottlenecks and technical parameter enhancement such as increasing train length, loading gauge or axle load are taken into account. The indicative investment plan is presented in the form of a table providing basic information about the projects.

Each column explanations are given below:

- 1) **Section:** part of the line on the Corridor;
- 2) **Name:** name of the project;
- 3) **Description:** short description of the scope of the Project;
- 4) **Benefits for Corridor:**

Category	Meaning
Capacity	Capacity increase (bottleneck removal, new line/ creation of siding, passing tracks, extra tracks, renewal of tracks, etc.)
Train length	Increase of the track length (upgrade for 600 m, 650 m, 740 m, etc.)
Interoperability (INTER)	ERTMS or/and GSM-R deployment
Safety	Level crossing elimination, renewal/ enhancement of national signalling system (interlocking upgrade, block distance, headway), etc.
Environment (ENV)	Electrification, noise barriers, vibration reduction measures, etc.

Figure 45.

- 5) **End date:** year when the project ends;

6) **Project status:**

Category	Meaning
Initial Plan Study	Looking for alternative ways to solve the recognised bottleneck and an estimate of the costs.
Plan study	Elaboration of possible variants to realise the preferred alternative and a more accurate estimate of the costs.
Plan study/design	Elaboration of possible variants to realise the preferred alternative and a more accurate estimate of the costs, incl. approval process until building license is reached
Design/Realisation	This includes all the work to be done before going live: preparation, building license, construction, safety tests etc.
Realisation	Award procedure; physical execution of work, safety tests etc. etc.
In exploitation	Project can be used in exploitation.

Figure 46.

7) **Funding status:**

Category	Meaning
Open	Funding which is not yet part of any formal funding plan
Reserved	Funds in middle term budget (generally not approved)
Approved	Funds approved and released

Figure 47.

8) **Cost:** indicative costs of the project in EUR with the reference date “as for...”

9) **Financial sources:**

Category	Meaning
EU	The EU provides <i>funding</i>
Public	Public funding
IM	The IM provides funding
Other	Other funding sources
Negotiation ongoing	Negotiations on funding source

Figure 48.

There is one joint project that concerns Belgium, the Netherlands and Germany, i.e. the reactivation of the so called "Iron Rhine" railway link, through Dutch territory, between the Port of Antwerp and the German Ruhr area. This project is not yet included in this indicative investment plan because its realization is not foreseen before 2025.

6.2 List of projects

Indicative Investment Plan (dated 22/04/2015)										
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
1	NL	Europoort - Botlek	Maintenance Calandbrug	Maintenance Calandbrug.	Capacity	2019	Plan study	Open	n.a.	IM, Public
2		Botlek - Pernis	Botlekbrug, Harbourline - Oude Maas river crossing	Adjusting railway bridge to improve connection to Botlek freight Yard and upgrading tunnel capacity	Capacity	2016	Initial plan study	Open	n.a.	Public
3		Pernis - Waalhaven Zuid	Waalhaven - Zuid	redesign freight yard for containers	Capacity	2017	Plan study	Open	60 mio reserved total cost 200 mio	Public
4		Barendrecht asl - Kijfhoek asl Zuid	railconnection Harbourline -Betuweline 25 kV	change catenary supply 1,5 kV --> 25 kV	ENV	n.a.	Initial plan study	Open	n.a.	Public
5		Zevenaar Oost - border	Zevenaar Oost- Zevenaar border -> 25 kV AC	change power supply 1.5kV into 25kV Zevenaar Oost – Zevenaar border	ENV	2016	Design/realisation	Approved	part of 113	EU, public
6		Zevenaar Oost - border	3rd track Zevenaar Oost- Zevenaar border	third track Zevenaar Oost -Zevenaar border	Capacity	2018	Design/realisation	Approved	part of 113	EU, public

No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
7	NL	Amsterdam Harbour - Amsterdam Bijlmer	free level crossing at Amsterdam Dijkgracht	free entrance to Amsterdam Westhaven	Capacity	2023	Plan study	Reserved	n.a.	Public
8		Hengelo - Bad Bentheim	extend RB61 Bielefeld - Bad Bentheim to Hengelo	study to extend RB61 Bielefeld - Bad Bentheim to Hengelo	Capacity	2017	Initial plan study	Reserved	n.a.	Other
9		Meteren Zuid - Meteren	adjusting south - east curve at Meeteren	adjusting curve for 740m trains	Train length	2015	Plan study	Reserved	n.a.	IM
1	BE	Belgian part of RFC8	ETCS	Equipment of the Belgian part of RFC8 with ETCS	INTER	2020	Plan study	Reserved	n.a	Public
2		Antwerp	Junction Oude Landen	Construction of junction (L27A) to provide a better access to the port	Capacity	2025	Plan study	Approved	79*	Public
3		Antwerp	Junction Krijgsbaan	Modernisation of junction at Krijgsbaan (L27A) to provide a better access to the port	Capacity	2025	Plan study	Approved	82*	Public
4		Herentals - Mol	Iron Rhine	Electrification	Capacity	2015	Design/realisation	Approved	15,9*	Public

No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
5	BE	Belgian part of RFC8	Level crossing removal	Level crossing removal (L34, L35)	Capacity	2015	Design/realisation	Approved	n.a.	Public EU
6		Antwerp	Antwerp: Left bank	Extension and renewal works on left bank of port	Capacity	2025	Plan study	Approved	41,2*	Public
7		Antwerp	Antwerp: Right bank	Extension and renewal works on right bank of port	Capacity	2023	Plan study	Approved	16,5*	Public
8		Belgian part of RFC8	Side tracks 750m	Prolongation of existing side tracks or construction of new sidetracks of 750m	Train length	2025	Plan study	Open	n.a	public
1	DE	Emmerich - Oberhausen	Upgrade Emmerich - Oberhausen	Structural upgrade of capacity; 3-track upgrade; elimination of level crossings; ERTMS	Capacity	Open	Design/realisation	Approved	2,012	EU; public; IM
2		Knappenrode - Horka - Border D/PL	Upgrade Hoyerswerda - Horka - Border D/PL	Upgrade to a double track line with electrification and ERTMS	Capacity	Open	Design/realisation	Approved	477	EU; public; IM
3		Uelzen - Stendal	Upgrade Uelzen - Stendal	Upgrade to a double track line with electrification	Capacity	Open	Design/realisation/plan study	Partly approved/planned	270	Public; IM

*Amount €₂₀₁₂ for period 2013-2025 for all Belgian projects. Changes might be needed after agreement on the new investment plan.

No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
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4	DE	Oldenburg - Wilhelmshaven	Upgrade Oldenburg – Wilhelmshaven	Upgrade to a double track line with electrification	Capacity	Open	Design/realisation/plan study	Partly approved/planned	523	Public; IM
5		New Terminal in Lehrte nearby Hannover	MegaHub Lehrte	Upgrade the capacity by building a new terminal	Capacity	Open	Plan study	Planned	132	Public; IM
1	PL	Poznań – Swarzędz	works on Poznań freight by-pass	upgrade of the freight by-pass of Poznań Railway Node, to improve transit of freight traffic through the agglomeration	Capacity	2020	Plan study	Open	47,8	EU; public
2		Swarzędz – Sochaczew	remaining works on section Swarzędz – Kutno – Łowicz – Sochaczew	in particular works on railway stations, to increase the speed up to 160 km/h on the entire section Warsaw – Poznań	Capacity	2020	Realisation (design works)	Open	622	EU; public
3		Skierniewice	Skierniewice station	modernisation a junction station, that connects line no. 1 Warszawa Centralna - Czeszochowa – Katowice with section of C-E 20 Łowicz – Skierniewice – Pilawa – Łuków	Capacity	2016	Realisation (construction works)	Approved	86,1	EU; public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

4	PL	Łowicz Główny – Skierniewice – Łukow	C-E 20, section Łowicz Główny – Skierniewice – Pilawa – Łukow	Upgrade of the southern by-pass of Warsaw railway node for freight.	Capacity	2020	Initial plan study	Open	143,5	EU; public
5		Warszawa – Sadowne	E 75 Warszawa Rembertów – Tłuszcz – Sadowne	The 1st stage of works on the Rail Baltica. Comprehensive modernisation. Construction of additional pair of tracks for agglomeration traffic on the section Zielonka – Wołomin Słoneczna (access to Warsaw Node).	Capacity	2016	Realisation (design and construction works)	Approved	394,8	EU; public
6		Sadowne – Białystok	E 75 Sadowne – Białystok	The 2nd part of the work the Rail Baltica. comprehensive modernization aimed at: including construction of double-track bridge over the Bug river.	Capacity	2020	Plan study (feasibility study)	Open	717,7	EU; public
7		Białystok – Kuźnica Białostocka (State border)	Line no. 6 section Białystok – Sokółka – Kuźnica Białostocka (State border)	Upgrade of connection to/from Belarus through the border crossing at Kuźnica Białostocka.	Capacity	2020	Plan study (feasibility study)	Open	47,8	EU; public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

8	PL	Białystok – Trakiszki (Polish/Lithuanian border)	E 75, section Białystok – Ełk – Suwałki – Trakiszki (Polish/Lithuanian border)	The 3rd stage of works on the Rail Baltica, comprehensive modernization and construction of new line section between Ełk and Suwałki.	Capacity	2020	Plan study (feasibility study)	Open	598,1	EU; public
9		Łuków	Line E 20, Łuków Local Control Centre	Continuation of work covering three stations on the line E 20: Siedlce, Łuków, Miedzyrzecz Podlaski.	Capacity	2015	Realisation (design and construction works)	Approved	134,1	EU; public
10		Terespol	Line E 20 Terespol Local Control Centre	Continuation of work covering the most eastern section of the E 20 line in Poland, including Terespol and Małaszewicze stations and accesses to transshipment yards 1435/1520mm.	Capacity	2020	Realisation (design)	Open	119,6	EU; public
11		Wrocław – Opole	C-E 30 line Wrocław Brochów – Jelcz – Opole	Wrocław – Opole, freight connection between two cities.	Capacity	2021	Plan study (feasibility study)	Open	71,8	EU; public
12		Zduńska Wola – Łódź Kaliska	Works on line no. 14, section Zduńska Wola – Łódź Kaliska	The first phase of works on the line no. 14,	Capacity	2020	Plan study (feasibility study)	Open	107,7	EU; public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

13	PL	Ostrów Wlkp. – Zduńska Wola	Works on line no. 14 (and connecting line), section Ostrów Wlkp. – Zduńska Wola	The second phase of upgrade of the line no. 14,	Capacity	2021	Plan study (feasibility study)	Open	35,9	EU; public
14		Warszawa – Błonie	E 20 line, section Warszawa – Kutno, phase 1	improvement of agglomeration traffic organisation (section Warszawa LCS Łowicz border)	Capacity	2019	Plan study (feasibility study)	Open	23,9	EU; public
15		Warszawa	Lines no. 509 and 20 in Warszawa (section Warszawa Gołębki – Warszawa Gdańska)	works on the northern by-pass line in Warsaw	Capacity	2018	Realisation (design works)	Open	119,6	EU; public
16		Warszawa – Grodzisk Mazowiecki	Works on line no. 447 Warszawa Włochy – Grodzisk Mazowiecki	Works on the south access to Warsaw	Capacity	2018	Realisation (design works)	Open	83,7	EU; public
17		Warszawa - Mińsk Mazowiecki	E 20 line, section Warszawa Rembertów - Mińsk Mazowiecki, phase I	includes work on stations W-wa Rembertów, Sulejówek Miłosna and Minsk Maz. to improve capacity on access to the Warsaw Node.	Capacity	2019	Plan study (feasibility study)	Open	23,9	EU; public
18		Warszawa - Mińsk Mazowiecki	E20 line, section Warszawa Rembertów – Mińsk, phase II	Continuation works, build new tracks on section Warszawa Rembertów – Sulejówek Miłosna	Capacity	2020	Plan study (feasibility study)	Open	167,5	EU; public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

19	PL	Ełk - Korsze	Works on the line no. 38, section Ełk – Korsze, with electrification	Electrification line on section Ełk - Korsze	Capacity	2019	Plan study (feasibility study)	Open	95,7	EU; public
20		Głogów – Ostrów Wlkp.	Works on line 14, section Głogów – Ostrów Wlkp.	The third phase of works on the line 14,	Capacity	2021	Open	Open	287,1	EU; public
21		Gliwice – Bytom - Mysłowice	Works on lines no. 132, 138, 147, 161, 180, 654, 655, 657, 658, 699 section Gliwice – Bytom – Chorzów Stary – Mysłowice Brzezinka – Oświęcim oraz Dorota – Mysłowice Brzezinka		Capacity	2018	Plan study (feasibility study)	Open	71,7	EU; public
22		Gliwice Łabędy	Works on E 30 and E 65), phase II: line E 30 section Katowice – Chorzów Batory oraz Gliwice Łabędy	The second phase of upgrade of E 30 line in Katowice railway junction	Capacity	2020	Plan study (feasibility study)	Open	96,8	EU; public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

23	PL	Gliwice	Works on lines (E 30 and E 65), phase III: line E 30 section Chorzów Batory – Gliwice - Łabędy	The third phase of upgrade of E 30 line in Katowice railway junction	Capacity	2021	Plan study (feasibility study)	Open	263,1	EU; public
24		Whole country	Construction of ERTMS on TEN-T core network, where it won't be done within line-specific investment projects.	complete GSM-R coverage of lines that are included in the TEN-T core network	INTER	2022	Open	Open	227,3	EU; public
1	LT	Palemonas	design and construction of the Intermodal terminal in Kaunas public logistics centre	constr. 1435 and 1520 mm gauge railway tracks intermodal terminal (capacity of 1,120 TEUs), access roads from the highway	Capacity	2015	Realisation	Approved	24,69	EU; Public
2		PL/LT border-Kaunas	Rail Baltica 1	constr. new 1435 line from PL/LT border to Kaunas, modernization of the existing railway line from Kaunas to LT/LV border.	Capacity	2015	Realisation	Approved	246	EU; Public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources

3	LT	PL/LT state border-Kaunas	ERTMS and related systems installation in Rail Baltica line on section Lithuanian Polish state border – Kaunas	Equipping the line with ERTMS level 2. Expanding the GSM-R network.	INTER	2019	Award procedures/realisation (construction works)	Planned/ partly approved	75,3	EU; Public
4		Kaunas - Palemonas	Constr. the 1435 mm railway track and modernization of signalling equipment from Kaunas to Palemonas	Building of the new 1435 mm railway track plus signalling equipment modernization and ERTMS deployment.	Capacity	2020	Award procedures/realisation (design and construction works)	Planned/ partly approved	39,7	EU; Public
5		Jiesia – Rokai - Palemonas	Railway line reconstruction on section Jiesia - Rokai by building a new 1435 mm gauge track	Building of the new 1435 mm railway track	Capacity	2020	Award procedures/realisation (construction works)	Planned/ partly approved	69,5	EU; Public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
6	LT	Lithuanian/Poland state border-Kaunas	Electrification of the railway line Poland/Lithuania border – Marijampolė – Kazlų Rūda - Kaunas	Equipment of the 1435 mm railway track with catenary	ENV	n.a.	Initial Plan Study	Planned/ partly approved	2,8	EU; Public

1	CZ	Lysá nad Labem – Děčín Pr. Žleb	Upgrading of line Kolín – Všetaty – Děčín	Line upgrading	Capacity	after 2019	Plan study	Open	n.a.	EU, public
2		Praha Holešovice – Praha Bubeneč	Upgrading of line Praha Holešovice – Praha Bubeneč	Line upgrading	Safety	2015	Construction	Approved	40,8	EU, public
3		Praha Libeň - Lovosice - Děčín - st.border Germany	ETCS 1 st national corridor Kolín – Praha Libeň – Dolní Žleb – state border Germany	ETCS deployment	INTER	2019	Plan study	Open	30,15	EU, public
4		Lysá nad Labem – Všetaty – Děčín východ	ETCS in section Kolín – Nymburk – Mělník – Děčín východ	ETCS deployment	INTER	After 2020	n.a.	Open	23,85	EU, public
5		Lovosice	Upgrading of station CCS equipment	New station CCS equipment needed for future ETCS system	Safety	2016	Building licence	Planned	24,6	EU, public
6		Kralupy n/Vltavou - Nelahozeves	Modernization of railway station Kralupy nad Vltavou and upgrading of 3 Nelahozeves tunnels	Fulfilment of TSI PRM in station Kralupy n/V and meeting of code P/C 80/410 for combined transport (actual code 47/360)	Capacity	2020	Plan study	Open	n.a.	EU, public
No	Country	Section	Name	Description	Benefits for Corridor	End date	Project status	Funding status	Cost (mio EUR)	Financial sources
7	CZ	Praha Vysočany - Lysá nad Labem	GSM-R Pražský uzel (Beroun - Praha - Benešov u Prahy)	GSM-R deployment	INTER	2015	Construction	Approved	14, 05	EU, public
8		Praha Vysočany – Lysá nad Labem	Upgrading of line Lysá nad Labem – Praha Vysočany -2. Phase.	Line upgrading in the field of capacity and travel time reduction	Capacity	2021	Plan study	Open	n.a.	EU, public

9	Praha Libeň – Praha Vysočany - Lysá nad Labem	ETSC Praha – Lysá nad Labem	ETCS deployment	INTER	After 2020	Plan study	Open	4,55	EU, public
10	Praha Libeň – Praha Malešice	Modernization of railway line Praha Libeň – Praha Malešice (1. Phase)	Line upgrading	Capacity	2019	Plan study	Open	51,0	EU, public

Figure 49. Indicative Investment Plan.

6.3 Deployment Plan relating to interoperable systems

According to the Regulation (article 11.1(b)) within the indicative investment plan the MB includes a deployment plan relating to the interoperable systems along a Rail Freight Corridor which satisfies the essential requirements and the technical specifications for interoperability which apply to the network as defined in Directive 2008/57/EC²⁵.

6.3.1 ERTMS deployment plan

ERTMS (European Rail Traffic Management System) is the interoperable signalling system in Europe for conventional and high-speed railway lines and has been confirmed by the Member States and the rail sector as the single harmonised system in Europe. The equipment of the system is co-financed by the European Commission and the technical development is led by ERA (European Railway Agency).

The White Paper from 28th March 2011 supports the objective of modal shift to rail freight transport. Corridors were identified as an instrument for implementing the Core network (action 35) *“Creation in the context of the ‘core network’ multimodal freight corridor structure to synchronize investments and infrastructure works and support effective, innovative and multimodal transport services, including rail services over medium and long distances”*.

From the legal perspective, a framework and timeline for the equipment of lines have been established for ERTMS through the adoption of the European Deployment Plan in 2009.

The current EDP defines 6 ERTMS corridors that shall be equipped with ERTMS respectively by 2015 or 2020 with a possible delay of up to 3 years. The notifications, submitted by the Member States, provided a mixed picture, forecasting minor and major delays. 7 Member States have asked for a deadline extension. Also the European Deployment Plan is currently under revision.

Currently decision in force is Commission Decision of 25th January 2012 on the technical specification for interoperability relating to the control-command and signaling subsystems of the trans-European rail system (2012/88/EU).

EDP is a legal framework for implementation of ERTMS system even after changing the corridor structure.

After several intermediate steps, in April 2012, a Memorandum of Understanding was signed between the European Commission and the European Rail sector Associations (CER-UIC-UNIFE-EIM-GSM-R Industry Group – ERFA) concerning the strengthening of cooperation for the management of ERTMS.

Key elements are:

- 1) proposal of the ETCS Baseline 3 specifications, compatible with the existing ETCS Baseline 2;
- 2) additionally, trains equipped with ETCS Baseline 3 must be able to run on lines equipped with ETCS Baseline 2 and therefore, ETCS Baseline 2 lines will not need to be upgraded to ETCS Baseline 3 (backward compatibility);

²⁵ Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community. Published in Official Journal of the European Union L 191/1 on the 18th of July 2008..

- 3) with the ETCS Baseline 3, ERTMS will provide a sound technical basis which is a fundamental contribution to the interoperability of rail traffic in the European Union and to make international rail traffic more competitive. It is important to remark that in parallel with the technical standards, the Agency presented the Recommendation with the harmonized Operational Rules applicable for ERTMS.

This new Memorandum of Understanding replaces the two previous memoranda. Based on this recommendation, the sector considers that there is no need "to envisage another baseline in the foreseeable future".

Moreover, the sector committed on several key points:

- 1) ensuring that lines equipped before the stabilization of the specifications (ETCS Baseline 2 in 2008) are upgraded to a compatible standard by 2015;
- 2) further improving the cooperation in technical areas, in particular as regards feedback from projects;
- 3) using the standard as defined;
- 4) reducing costs by improving the standardization and simplifying the authorization process in the different Member States. The Parties are committed to strengthen their cooperation and to promote transparency as regards products and technical requirements;
- 5) the Parties are requested to use as much as possible cross acceptance procedures and to prepare and execute successful and reference procurement procedures to decrease costs;
- 6) accelerating deployment of ERTMS, particularly by stressing the importance to fulfil the European Deployment plan;
- 7) finding solutions to the question of interferences affecting the communication system (actually GSM-R) and the exchange of information between control centres and trains.

Present situation on the Corridor regarding:

- 1) command control and signalling systems,
- 2) deployment of the GSM-R

is presented in chapter 2.2.2. (figures: 14 and 15).

Pursuant to Art. 45 of Regulation (EU) 1315/2013 on 12th March 2014 Mr Karel Vinck was appointed by the EC as Coordinator for a horizontal priority – the ERTMS deployment. Two main tasks of the new coordinator are to provide state of play of ERTMS implementation along the nine Core Network Corridors (CNC) and define the way of its acceleration. In order to achieve this goal a draft 'Breakthrough program' was prepared. The Program was then approved by the Member States.

The current challenge of the ERTMS Coordinator is to propose a timetable for a realistic ERTMS Deployment Plan with the definite time horizon of 2030 and to obtain agreement of the plan by the Member States.

6.3.1.1 ERTMS Deployment in each country of RFC 8

6.3.1.1.1 The Netherlands

Current situation

The Betuweline links the harbour of Rotterdam with the German border and consists of four sections. On the red sections (1, 3) in the figure 50, ERTMS is in operation since 2007/2009 and at the black ones (2, 4) the installation of ERTMS is realised since October/December 2014.

Also Amsterdam Duivendrecht – Utrecht line is equipped with ERTMS.

Future situation

In 2014 the Dutch ministry, in collaboration with the Dutch rail sector, has decided that until 2028 ERTMS will be deployed in a substantial part of the Netherlands: In the preferred scenario ERTMS (European Rail Traffic Management System) will be implemented with the tried-and-tested technology of Level 2 on the railway network in large parts of the broader Randstad in the period up to 2028. In 2022, ERTMS will have been installed in all of the rolling stock in use by the Dutch railways. The customer will be prioritised within the rollout of ERTMS; passengers and freight transporters must benefit from the advantages and ideally be unaware of the transition.

More information is to be found in Railmap ERTMS (European Rail Traffic Management System) version 3.0 on the website of the ministry:

<http://www.government.nl/documents-and-publications/parliamentary-documents/2014/04/11/letter-to-parliament-about-preference-decision-ertms-and-railway-map-3-0.html>

<http://www.government.nl/documents-and-publications/reports/2014/04/01/railway-map-ertms-version-3-0-memorandum-on-alternatives.html>

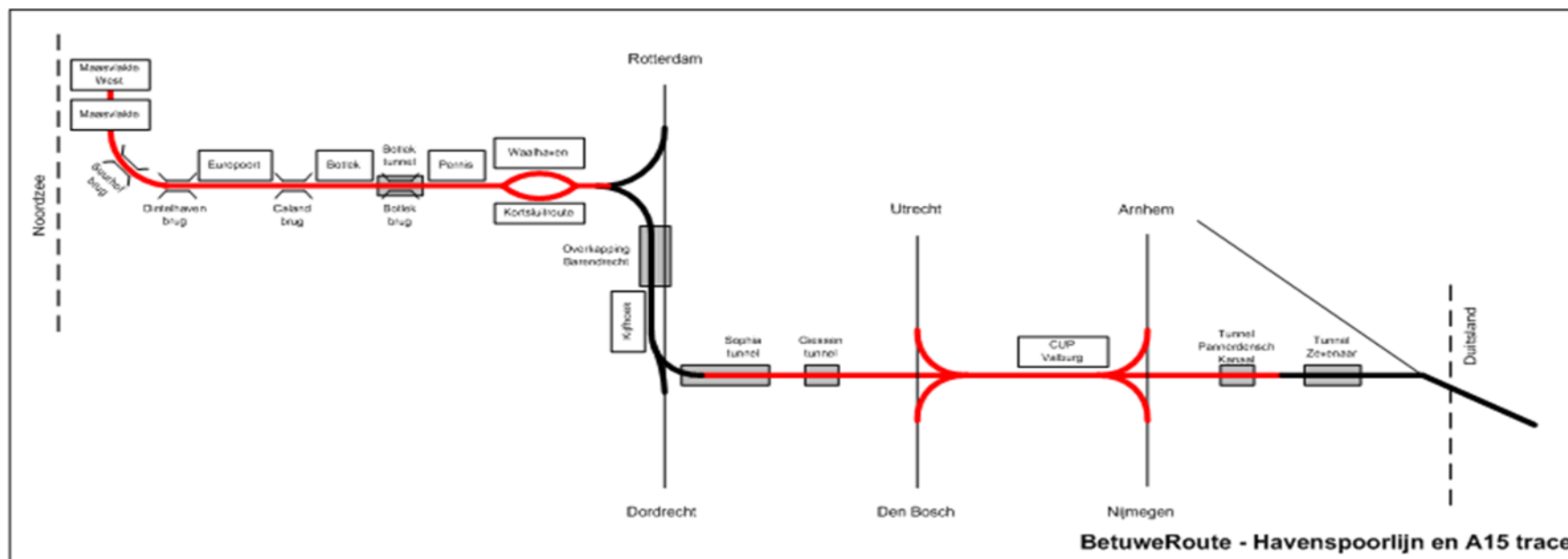


Figure 50. Scheme of railway line Betuweroute – Havenspoorlijn.

Betuweroute – Havenspoorlijn

	section	km	connection	ERTMS
1	Harbourline	40	Seaports and Kijfhoek.	Dec 2009
2	Kijfhoek	8	along marshalling yard Kijfhoek	October 2014
3	A-15	100	Kijfhoek and Zevenaar	June 2007
4	Zevenaar	3	Zevenaar-border	Dec 2014

Figure 51.

6.3.1.1.2 Belgium

Current situation (22/05/2014)

Currently, most lines of the conventional network are equipped with a simple warning system (Crocodile), which is required on board. A few conventional lines are additionally equipped with a simple ATP system (TBL1), which is not supported anymore by the supplier and is 'end of life'.

The conventional lines are also equipped with a simple ATP system (TBL1+) based on ETCS components. The TBL1+ system is an improved version of TBL1, including a simple speed control in rear of a number of main signals at stop aspect. The roll out is still on-going, although all critical locations are already equipped.

Two HS lines are equipped with national systems (L1 to the French border with TVM430 and L2 Leuven – Liège with TBL2). The most recent HS lines are equipped with ETCS Level 2 + ETCS Level 1 (L3 Liège – German border and L4 Antwerp – Dutch border). The version is 2.2.2 with the CR contained in the subset 108 v1.0. Already several parts of Corridor C are equipped with ETCS Level 1 (v.2.3.0d): section Hever – Wijgmaal on the line Mechelen - Leuven (also part of Corridor A/1), Limal - Florival and Anseremme - Athus.

Future situation

In 2011 Infrabel developed a Master plan for ETCS implementation on the whole conventional network.

The main goals are to achieve a higher safety level and an optimal level of interoperability. The current implementation of TBL1+, considered as a first step towards ETCS, will be completed in 2015 and this will improve the train protection significantly.

ETCS will be installed first on the new or upgraded lines and on the Corridor C/2 lines as required in the ERTMS European Deployment Plan. The remaining lines of the conventional network will be equipped until 2022. The complete picture will be a mix of Level 1 FS, Level 2 FS and Level 1 Limited Supervision (LS) will be installed on lines with lower traffic density.

Migration

The TBL1+ implementation (99,9 % of the risk to be covered) will be completed by the end of 2015. The existing ETCS on the HS lines will be upgraded to 2.3.0d (likely in 2014).

The Corridor C/2 lines are being equipped with ETCS (2.3.0d, Level 1). All historical lines or Corridor C will be fitted with ETCS by 12/2015 except some diversionary routes.

ETCS will be installed on the whole conventional network (except some harbour lines and industrial lines) by 2022.

As from 2025 it is very likely that all rolling stock will be required to be equipped with ETCS, to be allowed to run on the conventional network.

6.3.1.1.3 Germany

Current situation

Nearly all lines of the conventional network of DB Netz AG are equipped with PZB (kind of intermittent automatic train running control) as defined by German law. PZB ensures a high standard of train protection with several functions.

According to German law all lines operated with speed higher than 160 km/h are equipped with LZB, which is a continuous train control system.

Future situation and migration

The technology strategy of DB Netz AG will be to equip all future new built lines in accordance with the baseline 3 system specification. Depending on the line-specific operating requirements, either Level 2 or Level 1 in Limited Supervision mode (available from SRS version 3.4 onwards) will be used. As ETCS Level 1 Limited Supervision makes use of data structures which are elements of baseline 3, the commissioning of such lines should from now on be possible. Nevertheless there are no such certified products available for the moment. For all the aforementioned lines, the following applies today:

Implementation standard:

- lines with $V > 160$ km/h will be equipped with ETCS Level 2 based on SRS Version 3.4.0
- ETCS Level 2 will be equipped on lines with $V \leq 160$ km/h if high performance block or specific performance requirements make this necessary
- lines with $V \leq 160$ km/h will be equipped with ETCS Level 1 LS based on SRS 3.4.0 in case the performance of PZB is sustainably sufficient depending on the costs
- from approx. 2025–onwards an optimised replacement of LZB with ETCS Level 2 is planned.

Class B systems in use

German lines of RFC 8 are already equipped with PZB and in parts with LZB. A migration scenario for PZB is not planned. As long as signals are in use, they will be equipped with PZB – possibly in parallel with ETCS.

LZB is to be removed step by step from 2025 onwards.

At the moment there is no specific planning or financing for the ERTMS equipment of the RFC 8. A general commitment by the government for the ETCS equipment of the RFCs is still missing. Currently the government's activities considering the RFC's are concentrated on Corridor A/1. At Corridor A it has to be determined if the specifications lead to a compatible and safe operation of rolling stock and railway lines equipped with different versions of ETCS. A later update of all Corridors will not be possible if there are several thousand kilometres of railway lines already equipped, also from a financial point of view. Taking this situation into account, the implementation dates as mentioned in the EDP for Corridor F are no longer realistic. Therefore Germany is drafting together with the European Commission a revised, more reasonable EDP.

6.3.1.1.4 Poland

Current situation

Nearly all lines of the PLK's conventional network are equipped with SHP (a kind of train protection system). This system makes a train stop in case of lack of the engine driver's reaction.

Future situation

In accordance with the European Deployment Plan, Poland undertook to implement the ERTMS on Corridor F. The main purpose is to reach a higher safety level and to achieve interoperability for this corridor by 2020 (2023). The implementation of ERTMS on many sections of this Corridor has to be preceded by modernization of the line itself (infrastructure, interlocking, line block systems, etc.). Modernizations of the sections Swarzędz – Sochaczew and Local Control Centre Terespol (Biała Podlaska – Terespol) are

foreseen in the current (2014-2020) financial perspective. There are also upgrading projects which include a deployment of the GSM-R on this line. At the moment there are no other plans or approved financing for the period between 2015-2020. There is, however, a list of investments that comprises deployment of the ERTMS on this line.

Implementation Plans for the ERTMS are being reviewed and the decision regarding levels on particular sections was not yet taken. According to preliminary planning it should be possible to implement the ERTMS/ETCS level 1 on the Kunowice – Chrośnica section and level 2 on the section Chrośnica – Swarzędz. Deployment of the ERTMS/ETCS level 2 should also be possible on the sections Sochaczew - Warszawa Gołębki and Mińsk Mazowiecki - Siedlce because they have already been modernized and are now equipped with computer interlocking devices and Local Control Centres. There are plans to implement the ERTMS/ETCS level 2 on the sections Swarzędz - Mińsk Mazowiecki and Siedlce - Terespol as well as to deploy the ERTMS/ETCS on the Łowicz Główny - Łuków section (CE 20).

6.3.1.1.5 Lithuania

Current situation

Most of the main lines of the Lithuanian Railway network are equipped with a Microprocessor Based Interlocking (MPC) and Automatic Line Blocking system (national signalling system class B) including Automatic Locomotive Blocking system (ALS). Throughout the Lithuanian railway network, it is installed GSM-R system for transmission of voice information.

Future situation

In the near future, up to 2020, it is planned to implement ERTMS from the Polish border to Kaunas. ETCS L2 is being implemented in the new 1435 mm line which is being built now. Implementation of ERTMS (ETCS level 2) will be made after the construction of the 1435 mm railway line. This project also includes GSM-R system modernization for ETCS L2 data transmission on the newly built 1435 mm line.

6.3.1.1.6 Czech Republic

Current situation

Most of main lines of the conventional network in Czech Republic are equipped with national system LS. It is a system using the continuous transmission of the aspects by means of coded track circuits. In case of transmission of restrictive or prohibitive aspects it controls the specified reaction of a person driving the rail vehicle. According to TSI CCS CR it is national train protective equipment of the Class B and according to Czech law is used for maximum speed up to 160 km/h.

Future situation

As mentioned in the currently valid new National Implementation Plan for ERTMS (approved by Czech ministry of transport on 10th of February 2015) the main goal is to achieve full interoperability of the selected national railway net (ERTMS corridor E, TEN-T lines). In this new plan is expected following deployment of GSM-R and ERTMS L2 (2.3.0d) in relationship to the RFC8 railway lines:

Line	GSM-R	ERTMS (realisation)
Praha - Lovosice - Děčín hl.n. - Prostřední Žleb - Shöna (DB)	in operation	2016 - 2019
Praha – Lysá n/L	2014 - 2015	after 2020
Lysá n/L – Mělník – Děčín východ - Prostřední Žleb	in operation	After 2020

Figure 52.**Migration**

Migration strategy in the ETCS system is based on use of dual equipment on the track enabling concurrent operation of the vehicles equipped with ETCS and the vehicles equipped with national LS system only where the national LS system may have the important role as a backup system for cases of ETCS system outage. Implementation strategy is based on the fact that the ETCS system will be implemented markedly slower than the GSM-R system. The implementation rate is limited first of all by the accessible volume of financial means, not only in the track part area, but above all in the area of vehicles equipment with the mobile part of the system. In the view of ETCS system implementation expensiveness it is necessary to measure the implementation effort in accordance with TSI CCS CR, in particular on tracks of the primary core of the ERTMS corridors network (in our case the Corridor E) and other rail freight corridor lines.

6.3.1.2 Implementation of ERTMS on RFC 8

The planning of ETCS deployment along the corridor lines as established in November 2015 is described in the following.

Apart from the historical lines of the ERTMS Corridor F, RFC 8 also includes the lines starting from the ports of Rotterdam (the Netherlands) and Antwerp (Belgium) and the connection from Warsaw to Kaunas. The lines connecting Amsterdam, Wilhelmshaven and Hamburg will already be included in RFC 8 in 2015 instead of 2018 as foreseen by the Regulation (EU) No 1316/2013 as well as the extension from Hannover to Prague. The current German planning is limited to the lines of ERTMS Corridor F, but without anticipation of a revised EDP valid from 2016.



Country	Line section	ERTMS system		
		ETCS version	Date	Telecomm. system
NL	Maasvlakte - Europoort	Version 2.3.0.d (level 1)	in operation	GSM-R
	Europoort - Botlek	Version 2.3.0.d (level 1)	in operation	GSM-R
	Botlek - Pernis	Version 2.3.0.d (level 1)	in operation	GSM-R
	Pernis - Waalhaven Zuid	Version 2.3.0.d (level 1)	in operation	GSM-R
	Waalhaven Zuid - Barendrecht Vork	Version 2.3.0.d (level 1)	in operation	GSM-R
	Barendrecht Vork - Barendrecht aansluiting	Version 2.3.0.d (level 1)	in operation	GSM-R
	Barendrecht aansluiting - Kijfhoek aansluiting Zuid	Version 2.3.0.d (level 1)	in operation	GSM-R
	Kijfhoek aansluiting Zuid-Meteren	Version 2.3.0.d (level 2)	in operation	GSM-R
	Meteren - Valburg	Version 2.3.0.d (level 2)	in operation	GSM-R
	Valburg - Zevenaar Oost	Version 2.3.0.d (level 2)	in operation	GSM-R
	Zevenaar Oost - Zevenaar grens	Version 2.3.0.d (level 2)	in operation	GSM-R
	Barendrecht aansluiting – Rotterdam Centraal	to be decided	to be decided	GSM-R
	Rotterdam - Gouda	to be decided	to be decided	GSM-R
	Gouda - Woerden	to be decided	to be decided	GSM-R
	Woerden - Harmelen	to be decided	to be decided	GSM-R
	Harmelen - Breukelen	to be decided	to be decided	GSM-R
	Breukelen – Amsterdam Bijlmer	to be decided	to be decided	GSM-R
	Amsterdam Bijlmer - Gaasperdammerweg	to be decided	to be decided	GSM-R
	Beverwijk - Haarlem	to be decided	to be decided	GSM-R
	Haarlem - Amsterdam Singelgracht aansluiting	to be decided	to be decided	GSM-R
	Amsterdam Singelgracht aansluiting - Gaasperdammerweg	to be decided	to be decided	GSM-R
	Gaasperdammerweg - Weesp	to be decided	to be decided	GSM-R
	Weesp - Hilversum	to be decided	to be decided	GSM-R
Country	Line section	ERTMS system		



		ETCS version	Date	Telecomm. system
NL	Hilversum - Amersfoort	to be decided	to be decided	GSM-R
	Amersfoort - Deventer	to be decided	to be decided	GSM-R
	Deventer - Hengelo	to be decided	to be decided	GSM-R
	Hengelo - Oldenzaal grens	to be decided	to be decided	GSM-R
	Roosendaal border - Roosendaal	to be decided	to be decided	GSM-R
	Roosendaal - Breda	to be decided	to be decided	GSM-R
	Breda - Tilburg	to be decided	to be decided	GSM-R
	Tilburg - 's Hertogenbosch	to be decided	to be decided	GSM-R
	's Hertogenbosch – Meteren Noord	to be decided	to be decided	GSM-R
	Utrecht - Amersfoort	to be decided	to be decided	GSM-R
	's Hertogenbosch - Nijmegen	to be decided	to be decided	GSM-R
	Nijmegen - Arnhem	to be decided	to be decided	GSM-R
	Arnhem – Zevenaar Oost	to be decided	to be decided	GSM-R
	Amsterdam Singelgracht aansluiting - Amsterdam Bijlmer	to be decided	to be decided	GSM-R
	Amsterdam Bijlmer - Breukelen	Version 2.3.0.d (level 2)	in operation	GSM-R
	Breukelen - Utrecht	to be decided	to be decided	GSM-R
	Utrecht - Meteren Noord	to be decided	to be decided	GSM-R
	Meteren Noord - Meteren	to be decided	to be decided	GSM-R
BE	Antwerpen – Lier	Version 2.3.0.d (level 1 FS)	2016	GSM-R
	Lier - Aarschot	Version 2.3.0.d (level 2)	2017	GSM-R
	Aarschot - Hasselt	Version 2.3.0.d (level 2)	2018	GSM-R
	Hasselt – Montzen	Version 2.3.0.d (level 2)	2020	GSM-R
	Montzen – Montzen border	Version 2.3.0.d (level 2)	2020	GSM-R
	Lier – Herentals	Version 2.3.0.d (level 2)	2018	GSM-R
	Herentals – Mol	Version 2.3.0.d (level 2 / level 1 LS)	2017	GSM-R
	Mol – Hamont border	Version 2.3.0.d (level 1 LS)	2018	GSM-R

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
BE	Liefkenshoek Rail Link (tunnel section)	Version 2.3.0.d (level 1 LS)	in operation	GSM-R
	Antwerpen Noord – Essen border	Version 2.3.0.d (level 2)	2020	GSM-R
DE	Aachen Grenze - Aachen West	to be decided	to be decided	GSM-R
	Aachen West - Rheydt	to be decided	to be decided	GSM-R
	Rheydt - Viersen	to be decided	to be decided	GSM-R
	Viersen - Krefeld	to be decided	to be decided	GSM-R
	Krefeld - Oberhausen West	to be decided	to be decided	GSM-R
	Oberhausen West - Gladbeck	to be decided	to be decided	GSM-R
	Gladbeck - Recklinghausen	to be decided	to be decided	GSM-R
	Recklinghausen - Hamm	to be decided	to be decided	GSM-R
	Hamm - Löhne	to be decided	to be decided	GSM-R
	Löhne - Bückeburg	to be decided	to be decided	GSM-R
	Bückeburg - Haste	to be decided	to be decided	GSM-R
	Haste - Wunstorf	to be decided	to be decided	GSM-R
	Bremerhaven - Bremen	to be decided	to be decided	GSM-R
	Bremen - Wunstorf	to be decided	to be decided	GSM-R
	Wunstorf - Hannover-Linden	to be decided	to be decided	GSM-R
	Hannover-Linden - Groß	to be decided	to be decided	GSM-R
	Groß Gleidingen – Magdeburg	to be decided	to be decided	GSM-R
	Magdeburg - Roßlau	to be decided	to be decided	GSM-R
	Roßlau - Saarmund	to be decided	to be decided	GSM-R
	Saarmund - Grünauer Kreuz	to be decided	to be decided	GSM-R
	Grünauer Kreuz – B.-Wuhlheide	to be decided	to be decided	GSM-R
	B.-Wuhlheide - Frankfurt (O)	to be decided	to be decided	GSM-R
	Roßlau - Falkenberg	to be decided	to be decided	GSM-R
	Falkenberg - Knappenrode	to be decided	to be decided	GSM-R
	Knappenrode - Horka - Border	to be decided	to be decided	GSM-R
	Falkenberg - Cottbus	to be decided	to be decided	GSM-R
	Cottbus - Horka	to be decided	to be decided	GSM-R
	Falkenberg - Abzw Zeithain B.	to be decided	to be decided	GSM-R
	Abzw Zeithain B. - Border D/CZ	to be decided	to be decided	GSM-R
	Bad Bentheim - Osnabrück	to be decided	to be decided	GSM-R
	Magdeburg - Saarmund	to be decided	to be decided	GSM-R
	Wilhelmshaven - Oldenburg	to be decided	to be decided	GSM-R
	Emmerich - Oberhausen Osterfeld	to be decided	to be decided	GSM-R
Country	Line section	ERTMS system		



		ETCS version	Date	Telecomm. system
PL	Kunowice (Border D/PL) - Rzepin	to be decided	to be decided	GSM-R (2016)
	Rzepin - Chlastawa	to be decided	to be decided	GSM-R (2016)
	Chlastawa - Chrośnica	to be decided	to be decided	GSM-R (2016)
	Chrośnica - Poznań Górczyn	to be decided	to be decided	GSM-R (2016)
	Poznań Górczyn - Poznań Starołęka PSK	to be decided	to be decided	GSM-R (2023)
	Poznań Starołęka PSK - Poznań Starołęka	to be decided	to be decided	GSM-R (2023)
	Poznań Starołęka - Pokrzywno	to be decided	to be decided	GSM-R (2023)
	Pokrzywno - Poznań Franowo PFA	to be decided	to be decided	GSM-R (2023)
	Poznań Franowo PFA - Nowa Wieś Poznańska	to be decided	to be decided	GSM-R (2023)
	Nowa Wieś Poznańska - Swarzędz	to be decided	to be decided	GSM-R (2023)
	Swarzędz - Podstolice	to be decided	to be decided	GSM-R (2016)
	Podstolice - Sokołowo Wrzesińskie	to be decided	to be decided	GSM-R (2016)
	Sokołowo Wrzesińskie - Konin	to be decided	to be decided	GSM-R (2016)
	Konin - Barłogi	to be decided	to be decided	GSM-R (2016)
	Barłogi - Zamków	to be decided	to be decided	GSM-R (2016)
	Zamków - Kutno	to be decided	to be decided	GSM-R (2016)
	Kutno - Łowicz Główny	to be decided	to be decided	GSM-R (2016)
	Łowicz Główny - Placencja	to be decided	to be decided	GSM-R (2016)
	Placencja - Skierniewka	to be decided	to be decided	GSM-R (2016)
	Skierniewka - Skierniewice	to be decided	to be decided	GSM-R (2016)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Skierniewice - Marków	to be decided	to be decided	GSM-R (2016)
	Marków - Czachówek Zach.	to be decided	to be decided	GSM-R (2016)
	Czachówek Zach. - Czachówek Wsch.	to be decided	to be decided	GSM-R (2016)
	Czachówek Wsch. - Jażwiny (Pilawa)	to be decided	to be decided	GSM-R (2016)
	Jażwiny - Żołnierka	to be decided	to be decided	GSM-R (2023)
	Pilawa - Poważe	to be decided	to be decided	GSM-R (2016)
	Poważe - Łuków	to be decided	to be decided	GSM-R (2016)
	Łuków - Biała Podlaska	to be decided	to be decided	GSM-R (2016)
	Biała Podlaska - Małaszewicze	to be decided	to be decided	GSM-R (2016)
	Małaszewicze - Terespol	to be decided	to be decided	GSM-R (2016)
	Terespol – Terespol (Border PL/Belarus BY)	to be decided	to be decided	GSM-R (2016)
	Żołnierka - Kędzierak	to be decided	to be decided	GSM-R (2023)
	Kędzierak - Jasienica	to be decided	to be decided	GSM-R (2023)
	Jasienica - Krusze R7	to be decided	to be decided	GSM-R (2023)
	Tłuszcz - Prostyń Bug	to be decided	to be decided	GSM-R (2023)
	Prostyń Bug - Małkinia	to be decided	to be decided	GSM-R (2023)
	Małkinia - Czyżew	to be decided	to be decided	GSM-R (2023)
	Czyżew - Łapy	to be decided	to be decided	GSM-R (2023)
	Łapy - Białystok	to be decided	to be decided	GSM-R (2023)
	Białystok - Białystok Starosielce	to be decided	to be decided	GSM-R (2023)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Białystok Starosielce - Turczyn	to be decided	to be decided	GSM-R (2023)
	Białystok Starosielce - Knyszyn	to be decided	to be decided	GSM-R (2023)
	Knyszyn - Osowiec	to be decided	to be decided	GSM-R (2023)
	Osowiec - Ełk	to be decided	to be decided	GSM-R (2023)
	Ełk - Olecko	to be decided	to be decided	GSM-R (2023)
	Olecko - (Gw)	to be decided	to be decided	GSM-R (2023)
	(Gw) - Papiernia	to be decided	to be decided	GSM-R (2023)
	Papiernia - Suwałki	to be decided	to be decided	GSM-R (2023)
	Suwałki - Trakiszki	to be decided	to be decided	GSM-R (2023)
	Trakiszki - Trakiszki (Border PL/LT)	to be decided	to be decided	GSM-R (2023)
	(Poznań Gł.) P. Starołęka Psk - Poznań Krzesiny	to be decided	to be decided	GSM-R (2023)
	Poznań Krzesiny - Kórnik	to be decided	to be decided	GSM-R (2023)
	Kórnik - Solec Wlkp.	to be decided	to be decided	GSM-R (2023)
	Solec Wlkp. - Jarocin	to be decided	to be decided	GSM-R (2023)
	Jarocin - Franklinów	to be decided	to be decided	GSM-R (2023)
	Franklinów - Stary Staw	to be decided	to be decided	GSM-R (2023)
	Rzepin - Jerzmanice Lubuskie	to be decided	to be decided	GSM-R (2023)
	Jerzmanice Lubuskie - Czerwieńsk	to be decided	to be decided	GSM-R (2023)
	Czerwieńsk - Głogów	to be decided	to be decided	GSM-R (2023)
	Głogów - Leszno	to be decided	to be decided	GSM-R (2023)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Leszno - Kąkolewo	to be decided	to be decided	GSM-R (2023)
	Kąkolewo - Osusz	to be decided	to be decided	GSM-R (2023)
	Osusz - Durzyn	to be decided	to be decided	GSM-R (2023)
	Durzyn - Ostrów Wielkopolski	to be decided	to be decided	GSM-R (2023)
	Ostrów Wielkopolski - Gajownik	to be decided	to be decided	GSM-R (2023)
	Gajownik - Retkinia	to be decided	to be decided	GSM-R (2023)
	Retkinia - Łódź Kaliska Towarowa	to be decided	to be decided	GSM-R (2023)
	Łódź Kaliska Towarowa - Łódź Chojny	to be decided	to be decided	GSM-R (2023)
	Łódź Chojny - Łódź Olechów	to be decided	to be decided	GSM-R (2023)
	Łódź Olechów - Gałkówka	to be decided	to be decided	GSM-R (2023)
	Gałkówka - Kozłowski	to be decided	to be decided	GSM-R (2015)
	Kozłowski - Skierniewice	to be decided	to be decided	GSM-R (2015)
	Łowicz Główny - Bednary	to be decided	to be decided	GSM-R (2016)
	Bednary - Warszawa Gołębki	to be decided	to be decided	GSM-R (2016)
	Warszawa Gołębki - Warszawa Główna Towar.	to be decided	to be decided	GSM-R (2023)
	Warszawa Główna Towar. - Warszawa Gdańska	to be decided	to be decided	GSM-R (2023)
	Warszawa Gdańska - Warszawa Jagiellonka	to be decided	to be decided	GSM-R (2023)
	Warszawa Jagiellonka - Warszawa Targówek	to be decided	to be decided	GSM-R (2023)
	Warszawa Targówek - Warszawa Michałów	to be decided	to be decided	GSM-R (2023)
	Warszawa Michałów - Warszawa Wschodnia Tow.	to be decided	to be decided	GSM-R (2023)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Warszawa Wschodnia Tow. - Warszawa Rembertów	to be decided	to be decided	GSM-R (2023)
	Warszawa Rembertów - Stojadła	to be decided	to be decided	GSM-R (2016)
	Stojadła - Mińsk Mazowiecki	to be decided	to be decided	GSM-R (2016)
	Mińsk Mazowiecki - Siedlce	to be decided	to be decided	GSM-R (2016)
	Siedlce - Łuków	to be decided	to be decided	GSM-R (2016)
	Skierniewice - Pruszków	to be decided	to be decided	GSM-R (2015)
	Pruszków - Józefinów Podg	to be decided	to be decided	GSM-R (2015)
	Warszawa Główna Towarowa - Józefinów	to be decided	to be decided	GSM-R (2023)
	Warszawa Główna Towar. - Warszawa Główna Towar.	to be decided	to be decided	GSM-R (2023)
	Warszawa Jagiellonka - Warszawa Praga	to be decided	to be decided	GSM-R (2023)
	Warszawa Praga - Legionowo	to be decided	to be decided	GSM-R (2016)
	Legionowo - Tłuszcz	to be decided	to be decided	GSM-R (2023)
	Białystok - Sokółka	to be decided	to be decided	GSM-R (2023)
	Poznań Franowo - Kobylnica	to be decided	to be decided	GSM-R (2023)
	Kobylnica - Mogilno	to be decided	to be decided	GSM-R (2023)
	Mogilno - Gniewkowo	to be decided	to be decided	GSM-R (2023)
	Gniewkowo - Toruń Wschód	to be decided	to be decided	GSM-R (2023)
	Toruń Wschód - Iława	to be decided	to be decided	GSM-R (2023)
	Iława - Korsze	to be decided	to be decided	GSM-R (2023)
	Korsze - Ełk	to be decided	to be decided	GSM-R (2023)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Wrocław Brochów - Wrocław Główny	to be decided	to be decided	GSM-R (2023)
	Bielawa Dolna (Border D/PL) - Węgliniec	to be decided	to be decided	GSM-R
	Węgliniec - Miłkowice	to be decided	to be decided	GSM-R
	Miłkowice - Legnica	to be decided	to be decided	GSM-R
	Legnica - Wrocław Nowy Dwór	to be decided	to be decided	GSM-R (2015)
	Wrocław Nowy Dwór - Wrocław Muchobór	to be decided	to be decided	GSM-R (2015)
	Wrocław Muchobór - Wrocław Stadion	to be decided	to be decided	GSM-R (2023)
	Wrocław Stadion - Wrocław Brochów	to be decided	to be decided	GSM-R (2023)
	Wrocław Brochów - Siechnica	to be decided	to be decided	GSM-R (2023)
	Siechnica - Czernica Wrocławska	to be decided	to be decided	GSM-R (2023)
	Czernica Wrocławska - Jelcz Miłoszyce	to be decided	to be decided	GSM-R (2023)
	Jelcz Miłoszyce - Biskupice Oławskie	to be decided	to be decided	GSM-R (2023)
	Biskupice Oławskie - Opole Groszowice	to be decided	to be decided	GSM-R (2023)
	Opole Groszowice - Strzelce Opolskie	to be decided	to be decided	GSM-R (2023)
	Strzelce Opolskie - Paczyna	to be decided	to be decided	GSM-R (2023)
	Paczyna - Pyskowice	to be decided	to be decided	GSM-R (2023)
	Pyskowice - Gliwice Łabędy	to be decided	to be decided	GSM-R (2023)
	Gliwice Łabędy - Gliwice	to be decided	to be decided	GSM-R (2023)
	Gliwice Port - Szobieszowice	to be decided	to be decided	GSM-R (2023)
	Gliwice - Gliwice	to be decided	to be decided	GSM-R (2023)

Country	Line section	ERTMS system
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		ETCS version	Date	Telecomm. system
PL	Gliwice - Zabrze Biskupice	to be decided	to be decided	GSM-R (2023)
	Zabrze Biskupice - Bytom	to be decided	to be decided	GSM-R (2023)
	Bytom - Chorzów Stary	to be decided	to be decided	GSM-R (2023)
	Chorzów Stary - Katowice Szopienice Północne	to be decided	to be decided	GSM-R (2023)
	Szabelnia - Katowice Szopienice Północne	to be decided	to be decided	GSM-R (2023)
	Katowice Szopienice Północne - Stawiska Podg	to be decided	to be decided	GSM-R (2023)
	Stawiska Podg - Stawiska Podg	to be decided	to be decided	GSM-R (2023)
	Stawiska - Mysłówice	to be decided	to be decided	GSM-R (2023)
	Mysłówice - Szabelnia	to be decided	to be decided	GSM-R (2023)
	Mysłówice - Długoszyn	to be decided	to be decided	GSM-R (2023)
	Jaworzno Szczakowa JSB - Długoszyn Podg	to be decided	to be decided	GSM-R (2023)
	Długoszyn Podg - Sosnowiec Maczki	to be decided	to be decided	GSM-R (2023)
	Sosnowiec Maczki - Sosnowiec Maczki	to be decided	to be decided	GSM-R (2023)
	Sosnowiec Maczki - Jaworzno Szczakowa	to be decided	to be decided	GSM-R (2023)
	Wrocław Brochów - Święta Katarzyna	to be decided	to be decided	GSM-R (2015)
	Święta Katarzyna - Brzeg	to be decided	to be decided	GSM-R (2015)
	Brzeg - Opole Groszowice	to be decided	to be decided	GSM-R (2015)
LT	Border – Mockava	ETCS 2	2020	GSM-R
	Mockava-Šeštokai	ETCS 2	2020	GSM-R
	Šeštokai-Kalvarija	ETCS 2	2020	GSM-R
	Kalvarija-Marijampolė	ETCS 2	2020	GSM-R
	Marijampolė – Vinčai	ETCS 2	2020	GSM-R
	Vinčai- Kazlų Rūda	ETCS 2	2020	GSM-R
Country	Line section	ERTMS system		



		ETCS version	Date	Telecomm. system
LT	Kazlų Rūda-Mauručiai	ETCS 2	2020	GSM-R
	Mauručiai-Jiesia	ETCS 2	2020	GSM-R
	Jiesia-Kaunas	ETCS 2	2020	GSM-R
CZ	Praha - Lovosice - Děčín hl.n Prostřední Žleb – Border CZ/D	ETCS L2 2.3.0d	2019	GSM-R
	Praha – Lysá nad Labem	ETCS L2 2.3.0d	After 2020	GSM-R (2015)
	Lysá n/L – Mělník – Děčín východ - Prostřední Žleb	ETCS L2 2.3.0d	After 2020	GSM-R

Figure 53. ERTMS Deployment Plan for RFC 8.

6.3.1.3 Implementation of ETCS on-board equipment

6.3.1.3.1 Interoperability Directives

Reference: 2008/57/EC of 18 June 2008 and related documents: directive 2013/9/EU of 11 March 2013 amending Annex III to Directive 2008/57/EC and Commission Recommendation 2011/217/EU on the authorization for the placing in service of structural subsystems and vehicles under Directive 2008/57/EC (DV29), directive 2011/18/EU of 1 March 2011 amending Annexes II, V and VI to Directive 2008/57/EC, directive 2009/131/EC of 16 October 2009 amending Annex VII to Directive 2008/57/EC.

<http://www.era.europa.eu/Document-Register/Pages/Directive-interoperability.aspx>

6.3.1.3.2 Control-command and signalling subsystems - CCS TSI

Reference: 2012/88/EU of 23 February 2012 and related documents: decision 2012/696/EU amending Decision 2012/88/EU on the technical specifications for interoperability relating to the control-command and signalling subsystems of the trans-European rail system.

<http://www.era.europa.eu/Document-Register/Pages/CCS-TSI.aspx>

6.3.1.3.3 Specifications (SUBSET)

Set of specifications # 1 (ETCS baseline 2 and GSM-R baseline 0)

<http://www.era.europa.eu/Core-Activities/ERTMS/Pages/Set-of-specifications-1.aspx>

Set of specifications # 2 (ETCS baseline 3 and GSM-R baseline 0)

<http://www.era.europa.eu/Core-Activities/ERTMS/Pages/Set-of-specifications-2.aspx>

Additional information for Belgium

Technical requirements for vehicles: possible evolution as from 2015

In the Ministerial Decree of 30/07/2010 a clause gives Infrabel the possibility to impose justified restrictions as from 01/01/2015 on trains, not equipped with TBL1+ nor ETCS, to run on lines equipped with both ETCS and TBL1+ (unless the train and the line are equipped with TBL1). For the time being, no such restrictions have been decided yet.

Legislation to fade out the legacy system in favour of ETCS has come into force by Royal Decree on 9 July 2013. From 1 January 2016 onwards, the class B system Memor/Crocodile will be put out of service on those lines equipped with ETCS Level 1 version 2.3.0.d (the balises will also continue to transmit the packet 44 TBL+ information; ETCS (or TBL+) on-board systems will be mandatory to run on those lines.

Technical requirements for vehicles: possible evolution as from 2025

Another adaptation of the above mentioned Royal Decree by 2025 is very likely to enforce ETCS as a track access condition (and removing the Memor-crocodile system) on all rolling stock in Belgium.

For admission of rolling stock on Dutch ERTMS-tracks, among other things, the required operational scenarios in the ProRail guideline RLN00295 have to be performed.

6.3.1.4 GSM-R situation

6.3.1.4.1 The Netherlands

GSM-R is installed throughout the Netherlands. However there are a lot of cases of connection loss, at this time there are no generic problems with GSM-R on the ERTMS L2 tracks.

6.3.1.4.2 Belgium

GSM-R is installed on the entire Infrabel network.

6.3.1.4.3 Germany

In Germany nearly the whole network is equipped with GSM-R for voice communication. Details concerning specific routes can be found in the infrastructure register (ISR) of DB Netz AG.

6.3.1.4.4 Poland

The first pilot project for the implementation of the GSM-R network for the 82 km section was completed in March 2014. Tests of the ETCS L2 are in progress. There is a plan to complete the GSM-R implementation on approx. 1,400 km of railway lines by the end of 2015.

6.3.1.4.5 Lithuania

Now throughout 1520 mm the Lithuanian Railway network is implemented and working GSM-R system for transmission of voice information. For the new 1435 mm line, this system will be modernized and fitted (if necessary) for ETCS 2 data transmission.

6.3.1.4.6 Czech Republic

GSM-R, designated as a system for transmission of data to trains, is installed on the 1104 km double track principal railway lines in the Czech Republic. Due to this fact there are no problems with deployment of this system as the first step before installing ETCS L2 system on selected lines.

6.3.2 Benefits of the projects on RFC 8

6.3.2.1 Interoperability

Until the deployment of ETCS, railway undertakings have to change their locomotives every time they cross a border or they have to equip these locomotives with multiple expensive on-board control-command systems. The first choice has a negative impact on travel time and on rolling stock management. The second one is expensive.

With ETCS, they will be able to use locomotives that can run from the origin to destination with a single on-board control-command system. This will facilitate asset management, save journey time and reduce costs.

Nevertheless additional waiting time may arise from:

- change of electric traction supply system,
- administrative procedures,
- change of train driver due to language requirements or other reasons.

On RFC 8, today a locomotive must be able to communicate with up to 6 different signalling systems in the worst case. There is actually not one border crossing with the same signalling system on both sides.

So, on RFC 8, ETCS is an opportunity for railway undertakings to use their own rolling stock and act with open access, opening up competition and potentially bringing prices at market level. Precondition is however a stable and conclusive specification of ETCS.

6.3.2.2 National legacy systems (“Class B”)

ETCS will replace, in the mid or long run, the national control-command systems in use, and will hence provide a solution to the obsolescence of these legacy systems.

The deadline is not the same among infrastructure managers.

It has to be considered, that the deployment of ETCS will not be as simple as the mere renewal of legacy systems. The complexity will depend on the characteristics of the legacy systems but in some cases, the new and the old systems will have to cohabit for many years and the old system may even have to be renewed after the deployment of ETCS.

Nevertheless, ETCS is a state of the art tool as far as safety is concerned and, at various degrees, its deployment provides several infrastructure managers with an increase of safety compared to the safety provided by their subpar legacy systems.

ETCS will then bring for these infrastructure managers the optimal benefit with regards to capacity and safety while elsewhere it will bring at least just interoperability with neighbouring infrastructure managers.

Moreover ETCS may allow a faster recovery in the event of disturbances compared to some current legacy systems. Consequently, the deployment should lead to more robust performance.

6.3.2.3 Conclusion

The computation of a monetary value for the benefits listed above is difficult, as corridor members/partners use different methods to assess them. This is in particular the case for the assessment of safety improvement. On top, the value of time saved due to ETCS when operating a railway node is a factor that cannot be determined, as it is sensitive to the node characteristics, and the time and conditions of operation.

All in all, corridor members share the view that the ground deployment of ETCS does not provide an immediate financial return on investment nor a positive socio-economic net asset value. The traffic gains induced by the use of ERTMS are presently difficult to assess, especially in the starting phase when few trains will be running in ETCS mode.

What is more, the socio-economic benefits of ETCS vary a lot from one country to another as it depends on the characteristics of the legacy control-command system and on the size of the country.

Source: “Rail Freight Corridor 2, Corridor Information Document, Book V – Implementation Plan, Timetable 2014”, RFC 2.

6.3.2.4 Summary

A final determination of the location, level and version of the ERTMS system implementation requires the consent and decision of Member States.

The use of ERTMS can give you benefits such as: interoperability, national legacy systems (“Class B”) renewal, increased competition, reduction of externalities, safety, recovery in the event of disturbances.

From the point of view of the ability of a rail system to allow the safe and uninterrupted movement of trains, the conditions of the lines of RFC 8 should be improved in order to implement the interoperability requirements and confirmed by appropriate certificates EC. Sidings and cargo tracks are not required and will not be covered (decision of Infrastructure Manager) by the ERTMS system.

6.4 Capacity management plan

The WG Infrastructure elaborated a capacity management plan in the form of a table, which is based on the information from the indicative investment plan. Figure 54 describes all the measures to solve bottlenecks (current and future) that have been identified so far by each country. Thus measures to remove identified bottlenecks are already included into the national investment and incorporated into the Indicative investment plan.

Generally, capacity bottlenecks are defined as sections on the RFC 8, where the total traffic demand of freight trains and passenger trains exceeds the available capacity including consideration of capacity used for maintenance works per section. The methodology for recognizing and defining bottlenecks is subject of every ministry of transport respectively infrastructure manager (IM) and therefore it can differ. This is without prejudice of Art. 47 of the Directive 2012/34/EU.

Indicative Capacity Management Plan (Dated 16/01/2015)								
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
1.	NL	Europoort – Botlek	Interference with sea ships	Maintenance Calandbrug.	Maintenance Calandbrug	2019	n.a.	IM, Public
2.		Botlek – Pernis	high demand for freight trains	Adjusting railway bridge to improve connection to Botlek freight Yard, and upgrading tunnel capacity	Botlekbrug, Harbourline – Oude Maas river crossing	2016	n.a.	Public
3.		Pernis – Waalhaven Zuid	Traffic demand change	redesign freight yard for containers	Waalhaven – Zuid	2017	reserved 60 mio total cost is 200 mio	Public
4.		Barendrecht asl – Kijfhoek asl Zuid	Missing link	change catenary supply 1,5 kV → 25 kV	rail connection Harbourline – Betuweline 25 kV	not available	n.a.	Public
5.		Barendrecht asl – Kijfhoek asl Zuid	Missing link	change ATB to ERTMS	rail connection Harbourline – Betuweline ERTMS	Q 4 2014	n.a.	Public
Nr	Country	Section	Cause of	Measures	Project name	End date	Cost	Financial

			bottleneck				(mio EUR)	sources
6.	NL	Zevenaar Oost – border	Missing link	ERTMS level 2 V2.3.0d from Zevenaar Oost to Zevenaar Border	ERTMS Zevenaar Oost – Zevenaar Border	2014	part of 113	EU, public
7.		Zevenaar Oost – border	Missing link	change power supply 1.5kV into 25kV Zevenaar Oost- Zevenaar border	Zevenaar Oost- Zevenaar border -> 25 kV AC	2016	part of 113	EU, public
8.		Zevenaar Oost – border	Missing link	third track Zevenaar Oost –Zevenaar border	third track Zevenaar Oost- Zevenaar border	2018	part of 113	EU, public
9.		Amsterdam Harbour – Amsterdam Bijlmer	high density of freight and passenger trains	free entrance to Amsterdam Westhaven	free level crossing at Amsterdam Dijksgracht	2023	n.a.	Public
10.		Hengelo – Bad Bentheim	Missing passenger trains passing border	study to extend RB61 Bielefeld – Bad Bentheim to Hengelo	extend RB61 Bielefeld – Bad Bentheim to Hengelo	2017	n.a.	Other
11.		Meteren Zuid – Meteren	Functionality not good for 740m trains	adjusting curve for 740m trains	adjusting south – east curve at Meeteren	2015	n.a.	IM
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources

1.	BE	Antwerp	Possible lack of capacity due to increase of capacity demand	Construction of junction at Oude Landen (L27A) to provide a better access to the port of Antwerp	Junction Oude Landen	2025	79,1	Public
2.		Antwerp	Possible lack of capacity due to increase of capacity demand	Modernisation of junction at Krijgsbaan (L27A) to provide a better access to the port of Antwerp	Junction Krijgsbaan	2025	82	Public
3.		Herentals-Mol	No catenary	Equipment of line with catenary	Iron Rhine	2015	15,9	Public
1.	DE	Emmerich – Oberhausen	Missing third track caused by high demand for passenger and freight trains	Structural upgrade of capacity; 3-track upgrade; elimination of level crossings; ERTMS	Upgrade Emmerich – Oberhausen	Open	2,012	EU; public; IM
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
2.	DE	Knappenrode – Horka	2nd track miss. & electrification by	Upgrade to a double track line	Upgrade Hoyerswerda – Horka – Border D/PL	Open – before	477	EU; public;

			high demand for freight trains	with electrification and ERTMS		2020		IM
3.		Uelzen – Stendal	Partly miss. 2nd track by high demand for freight trains	Upgrade to a double track line with electrification	Upgrade Uelzen – Stendal	Open	272	Public; IM
4.		Oldenburg – Wilhelmshaven	miss. Electrific. caused by high demand for freight trains	Upgrade to a double track line with electrification	Upgrade Oldenburg – Wilhelmshaven	Open	690	Public; IM
5.		New Terminal in Lehrte nearby Hannover	Missing capacity caused by high demand for freight trains	Upgrade the capacity by building a new terminal	MegaHub Lehrte	Open	136	Public; IM
6.		Dalheim – Rheydt	Missing second track and electrification caused by high demand for freight trains	Upgrade to a double track line with electrification	Iron Rhine	Open	n.a.	Open
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
1.	PL	Poznań Górczyn - Poznań Franowo	old rtc devices on stations, lack of automatic block,	construction of new rtc devices, upgrade of infrastructure	Works on C-E 20, Poznań Freight By-pass	2020	47,9	EU; public

			low speeds					
2.		Marków - Czachówek Zach.	closure of one track, low maximum speed	upgrade of infrastructure , inc. reopening of the closed track	Works on C-E 20, section Łowicz Główny – Skierniewice - Łuków	2020	143,5	EU; public
3.		Łuków - Biała Podlaska	old rtc devices on stations, lack of automatic block, on-going works	construction of new rtc devices, upgrade of infrastructure	Works on E 20 line, Łuków Local Control Centre	2015	134,1	EU; public
4.		Warszawa Gołębki - Warszawa Gdańska	old rtc devices on stations, lack of automatic block, low speeds	construction of new rtc devices, upgrade of infrastructure	Works on lines no. 509 and 20 in Warszawa (section Warszawa Gołębki – Warszawa Gdańska)	2018	119,6	EU; public
5.		Warszawa Rembertów - Stojadła	long sections with mixed traffic (agglomeration, long distance freight & passenger)	construction of additional stations, construction of new rtc devices, upgrade of infrastructure	Works on E 20 line, section Warszawa Rembertów - Mińsk Mazowiecki, phase II	2020	167,5	EU; public
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
6.	PL	Tłuszcz - Sadowne	old rtc devices on stations, on-going works	construction of new rtc devices,	Works on E 75 section Warszawa – Sadowne	2016	394,8	EU; public
7.		Sadowne - Prostyń	old rtc devices on	upgrade of infra,	Works on E 75 section	2020	717,7	EU; public



		Bug	stations, next section is a short single-track section	incl. constr. of missing 2nd bridge & track Prostyn Bug - Małkinia and modern rtc devices	Sadowne – Białystok			
8.		Łapy - Białystok	long section with semi-automatic block only	upgrade of infra, incl. deployment of automatic block	Works on E 75 section Sadowne – Białystok	2020	717,7	EU; public
9.		Sokółka - Kuźnica Białostocka	old rtc devices on stations, low speeds	construction of new rtc devices, upgrade of infra	Works on line no. 6 section Białystok – Sokółka – Kuźnica Białostocka (border BY)	2020	47,8	EU; public
10.		Opole Zachodnie - Brzeg	mix of passenger and freight trains	upgrade of infra to separate freight and pass. traffic	Works on C-E 30 line Wrocław Brochów – Jelcz – Opole	2018	71,8	EU; public
11.		Retkinia - Gajownik	old rtc devices on stations, low speeds	upgrade of infrastructure, incl. new rtc devices	Works on line no. 14, section Zduńska Wola – Łódź Kaliska	2019	107,7	EU; public
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
1.	LT	Lithuanian/Polish state border-Kaunas	Missing signalling system	Equipping the line with ERTMS level 2 and expanding the GSM-R network.	ERTMS and related systems installation in Rail Baltica line on section Lithuanian/Poland state border – Kaunas	2019	75,3	EU; Public



2.		Kaunas - Palemonas	Missing link with Kaunas PLC	Building of the new 1435 mm railway track plus signalling equipment modernization and ERTMS deployment.	Construction of the 1435 mm railway track and modernization of signalling equipment from Kaunas to Palemonas	2020	39,7	EU; Public
3.		Jiesia – Rokai - Palemonas	Missing bypass	Building of the new 1435 mm railway track	Railway line reconstruction on section Jiesia - Rokai by the installation of 1435 mm gauge track	2020	69,5	EU; Public
4.		Lithuanian/Poland state border-Kaunas	No catenary	Equipment of the 1435 mm railway track with catenary	Electrification of the railway line Poland/Lithuania border – Marijampolė – Kazlų Rūda - Kaunas	n.a.	n.a.	n.a.
1.	CZ	Lysá nad Labem-Děčín Prostřední Žleb	Lack of capacity caused by high demand	New line CCS	Upgrading of line Kolín – Všetaty – Děčín	After 2019	unknown	EU, public
Nr	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
2.	CZ	Praha Holešovice-Praha Bubeneč	Old line and station CCS	New station and line CCS	Upgrading of line Praha – Holešovice – Praha Bubeneč	2015	40,8	EU, public
3.		Praha Libeň-Lovosice-Děčín-st.border Germany	Non ETCS section	ETCS deployment	ETCS 1 st national corridor Kolín - Praha Libeň – Dolní	2019	30,15*	EU, public



					Žleb – state border Germany			
4.		Lysá nad Labem – Všetaty – Děčín východ	Non ETCS section	ETCS deployment	ETCS in section Kolín – Nymburk – Mělník – Děčín východ	After 2020	23,85*	EU, public
5.		Lovosice	Old station CCS	New station CCS	Upgrading of station CCS equipment	2016	24,6	EU, public
6.		Kralupy n/Vltavou – Nelahozeves	Code P/C 47/360 for combined transport in 3 tunnels	Upgrade of tunnels for code P/C 80/410 for combined transport	Modernization of railway station Kralupy nad Vltavou and upgrading of 3 Nelahozeves tunnels	2020	unknown	EU, public
7.		Praha Vysočany - Lysá nad Labem	Non GSM-R section	GSM-R deployment	GSM-R Pražský uzel (Beroun - Praha - Benešov u Prahy)	2015	14,05*	EU, public
8.		Praha Vysočany- Lysá nad Labem	Lack of capacity caused by high demand	New line CCS	Upgrading of line Lysá nad Labem - Praha Vysočany - 2. Phase.	2021	unknown	EU, public
No	Country	Section	Cause of bottleneck	Measures	Project name	End date	Cost (mio EUR)	Financial sources
9.	CZ	Praha Libeň - Praha Vysočany - Lysá nad Labem	Non ETCS section	ETCS deployment	ETSC Praha – Lysá nad Labem	After 2020	4,55*	EU, public
10.		Praha Libeň – Praha Malešice	Axle load	Line modernization	Modernization of railway line Praha Libeň – Praha Malešice (1. Phase)	2019	51,0	EU, public
* estimated cost								

Figure 54. Indicative Capacity Management Plan.

draft