RHINE-DANUBE RAIL FREIGHT CORRIDOR

TRANSPORT MARKET STUDY

2024 UPDATE

Funded by
the European Union

Tplan Panteia

CONTENTS

EXECUTIVE SUMMARY ..... **I**

1 INTRODUCTION **1**

1.1 LEGAL BASIS AND PURPOSE OF THE TRANSPORT MARKET STUDY 1
1.2 COMMON METHODOLOGY FOR A JOINT TMS UPDATE 1
1.3 REPORT STRUCTURE 2
1.4 LIST OF ACRONYMS 2

2 CORRIDOR PRESENTATION **4**

2.1 CORRIDOR CHARACTERISTICS 4
2.1.1 Corridor lines *4*
2.1.2 Corridor terminals *6*
2.1.3 Corridor Border-Crossing Points *7*
2.1.4 Corridor infrastructure parameters *10*
2.1.5 Infrastructure, operational bottlenecks and proposed solutions *17*
2.1.6 Ongoing and planned projects *36*
2.2 CORRIDOR OPERATIONAL PERFORMANCE 49
2.2.1 Key Performance Indicators *49*
2.2.2 Specific performance objectives and targets *52*
2.2.3 Railway undertakings operating freight services along the 11 RFCs and RFC RD *56*
2.2.4 Passenger train operations along the RFC RD *57*

3 2024 TMS UPDATE BACKGROUND INFORMATION **59**

3.1 TRANSPORT MARKET TRENDS IN THE EU 59
3.2 RAIL MARKET MONITORING INDICATORS 68
3.3 2030 FUTURE MARKET SCENARIOS 74
3.3.1 Economic projections towards 2030 ..... *75*
3.3.2 Rail projects finished by 2030 ..... *79*
3.3.3 Sensitivity analysis: an 11 RFCs Network in line with TEN-T standards *81*

4 ANALYSIS OF THE CURRENT RFC RD TRANSPORT MARKET **84**

4.1 DEFINITION OF CATCHMENT AREA AND CORRIDOR AREA 84
4.2 INTERNATIONAL FREIGHT TRANSPORT IN THE 11 RFCS NETWORK 85
4.2.1 Corridor and catchment areas of the 11 RFCs Network *86*
4.2.2 ALL International freight transport for the 11 RFCs network catchment AREA *88*
4.2.3 International rail freight transport in the 11 RFCs network catchment area *92*
4.2.4 International rail freight transport flows in the 11 RFCs network catchment area *97*
4.3 INTERNATIONAL (RAIL) FREIGHT TRANSPORT ALONG THE RFC RD CATCHMENT AREA 98
4.3.1 Corridor and catchment area of RFC RD *99*
4.3.2 ALL International freight transport in the RFC RD catchment area *102*
4.3.3 International rail freight transport in the RFC RD catchment area *105*
4.3.4 International rail freight transport flows On the RFC RD catchment area *107*

5 ANALYSIS OF THE FUTURE TRANSPORT MARKET **109**

5.1 FUTURE TRANSPORT MARKET IN THE 11 RFCS NETWORK AREA 109
5.1.1 Future of all international freight transport for the 11 RFCs network catchment area 109
5.1.2 Future of international rail freight transport for the 11 RFCs Network catchment area 112
5.1.3 Future of international rail freight transport on the RFC RD 115
5.1.4 Development of the most important BCPs on the RFC RD 118

6 OCCURRED AND EXPECTED CHANGES ASSOCIATED WITH THE ESTABLISHMENT OF THE RFCS: 2023 11 RFCS JOINT TMS SURVEY 120

6.1 CHANGES OCCURRED SINCE THE ESTABLISHMENT OF THE RFCS AND EXPECTED CHANGES CONCERNING THE FACILITATION OF INTERNATIONAL RAIL FREIGHT TRANSPORT 121
6.1.1 Governance Issues 122
6.1.2 Operational Efficiency Issues 124
6.1.3 Capacity Planning Issues 127
6.2 EXPERIENCED AND EXPECTED MARKET DEVELOPMENTS 131
6.3 MARKET DRIVERS 141

7 KEY FINDINGS AND RECOMMENDATIONS ON FACILITATING AND STRENGTHENING RAIL FREIGHT MARKET ALONG THE 11 RFCS NETWORK AND THE RFC RD 143

7.1 SUMMARY OF KEY FINDINGS OF THE STUDY 145
7.1.1 The rail freight market in Europe and on the RFC RD 145
7.1.2 Occurred and expected changes due to the establishment of the RFCs 150
7.2 STUDY RECOMMENDATIONS 152

ANNEX 1 – OVERVIEW OF THE NEAC MODEL I

LIST OF FIGURES

Figure 1 RFC RD - Type of RFC lines 5
Figure 2 RFC RD alignment, terminal locations and BCPs 9
Figure 3 RFC RD - Track gauge 11
Figure 4 RFC RD – Electrification 12
Figure 5 RFC RD - Speed 13
Figure 6 RFC RD – Axle load 14
Figure 7 RFC RD - Train length 15
Figure 8 RFC RD - ERTMS 16
Figure 9 RFC RD – Trains at BCPs along the RFC RD (2022) 50
Figure 10 Average planned speed of PaPs, km/h 52
Figure 11 Transport trends in billion tkm EU27 (1995=100) 59
Figure 12 The RFC RD within the 11 RFCs Network 60
Figure 13 EU-27 performance by mode for freight transport 2013-2021 (billion tkm) (2013=100) 61
Figure 14 Forecasts population and GDP development in the EU27 between 2015 and 2045 76
Figure 15 Forecasts on freight transport by road and rail (tkm, index 2010=100) for the EU27 77
Figure 16 Forecasts on fossil energy demand for the EU27 77
Figure 17 Development of GDP (Index 2020=100) for European countries according to the EU Reference Scenario 78
Figure 18 Development of GDP between 2020 and 2030 in IMF economic blocks of countries 79
Figure 19 Schematic concept of the geographic coverage of the market analysis 85
Figure 20 Corridor area and rail network of the 11 RFCs Network 87
Figure 21 Schematic concept of the geographic coverage of the results presented in this section 88
Figure 22 Estimated volume (million tonnes) and share of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network in 2022 89
Figure 23 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 for the top 10 origin countries in the 11 RFCs Network catchment area. 89
Figure 24 Estimated volume (million tonnes) of *all* international freight transport over land by *destination* in 2022 for the top 10 destination countries in the 11 RFCs network catchment area. 90
Figure 25 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of all international freight transport over land in 2022 within the 11 RFCs network catchment area 91
Figure 26 Volume distribution (million tonnes) by distance (km) in the catchment area of the 11 RFCs network area in 2022 91
Figure 27 Origins of international rail freight transport (in million tonnes) for the 11 RFCs network catchment area 93
Figure 28 Destinations of international rail freight transport (in million tonnes) for the 11 RFCs network catchment area 94
Figure 29 Estimated Volume and share of international rail freight transport (million tonnes and %) by cargo type in 2022, in the 11 RFCs network catchment area 95
Figure 30 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the 11 RFCs network catchment area 95
Figure 31 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the 11 RFCs network catchment area 96

Figure 32 Estimated volume of international rail freight transport (million tonnes) on the top 10 most important relations in 2022 in the combined 11 RFCs network catchment area 97
Figure 33 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 .. 98
Figure 34 Corridor area and rail network of the RFC RD 99
Figure 35 Origins of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area 100
Figure 36 Destinations of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area 101
Figure 37 Estimated volume (million tonnes) and share of *all* international freight transport by mode and cargo type in the *catchment* area of RFC RD 102
Figure 38 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 within the catchment and corridor area of RFC RD 103
Figure 39 Estimated volume (million tonnes) of *all* international freight transport over land by *destination* in 2022 within the catchment and corridor area of RFC RD 103
Figure 40 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of *all* international freight transport over land in 2022 within the corridor area of RFC RD 104
Figure 41 Volume distribution (million tonnes) by distance (km) within corridor area of RFC RD in 2022... 105
Figure 42 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 within the catchment (and corridor) area of the RFC RD 105
Figure 43 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the catchment and corridor area of the RFC RD 106
Figure 44 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the catchment and corridor area of the RFC RD 106
Figure 45 Estimated volume of international rail freight transport (million tonnes) on the top 10 most important relations in 2022 in the corridor area of the RFC RD 107
Figure 46 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 108
Figure 47 Development of volume (in million tonnes) by mode and scenario for the combined 11 RFCs Network catchment area 110
Figure 48 Development of volume (in million tonnes) of all international freight transport by the top 10 origin countries in the 11 RFCs Network catchment area. 111
Figure 49 Development of volume (in million tonnes) of *all* international freight transport by the top 10 destination countries in the 11 RFCs Network catchment area 111
Figure 50 Development of volume (in million tonnes) of all international rail freight transport by the top 10 origin countries within the 11 RFCs Network catchment area 112
Figure 51 Development of volume (in million tonnes) of all international rail freight transport by the top 10 destination countries within the 11 RFCs Network catchment area 113
Figure 76 Ranking of type of trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) on any RFC 135
Figure 82 Experienced and expected traffic trend on the type of O/Ds of the trains served at terminals crossing at least one border crossing point(s) in any RFCs 138
Figure 87 Potential effect of market drivers on the evolution of international rail freight transport operated by RUs until 2030 141

LIST OF TABLES

Table 1 Corridor extent by Member State 4
Table 2 RFC RD - Type of RFC lines and overlapping RFCs 4
Table 3 List of terminals on the RFC RD 6
Table 4 RFC RD BCPs 8
Table 5 List of bottlenecks and proposed solutions for the RFC RD sections in Germany 18
Table 6 List of bottlenecks and proposed solutions for the RFC RD sections in Austria 19
Table 7 List of bottlenecks and proposed solutions for the RFC RD sections in Czechia 20
Table 8 List of bottlenecks and proposed solutions for the RFC RD sections in Slovakia 23
Table 9 List of bottlenecks and proposed solutions for the RFC RD sections in Hungary 24
Table 10 List of bottlenecks and proposed solutions for the RFC RD sections in Romania 27
Table 11 RFC RD congested sections in Romania 36
Table 12 List of projects in Germany 37
Table 13 List of projects in Austria 38
Table 14 List of projects in Czechia 38
Table 15 List of projects in Slovakia 41
Table 16 List of projects in Hungary 42
Table 17 List of projects in Romania 44
Table 18 Number of freight trains per BCP along the RFC RD 49
Table 19 Number of freight trains crossing at least one RFC RD BCP 49
Table 20 Capacity Management KPIs 51
Table 21 Punctuality 51
Table 22 Corridor objectives and monitoring approach 54
Table 23 RUs operating international freight trains in 2022 on all 11 RFCs 56
Table 24 RUSs using RFCs in 2022 by class of number of operated trains 56
Table 25 RUs using RFCs in 2022 by number of RFCs where they operate 57
Table 26 Main international cross-border relations of passenger trains encoded in TIS and using RFC RD in 2022 57
Table 27 EU-27 performance by mode for freight transport 2013-2019 and 2019-2021 (billion tkm) 62
Table 28 Combined transport traffic based on data from the members of UIRR 62
Table 29 RFC RD countries performance by mode of freight transport 2013-2019 and 2019-2021 (billion tkm) 62
Table 30 Share of rail in total freight transport in % (based on tkm) 63
Table 31 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes ‘000) in the EU 27 64
Table 32 Goods transported by group of goods - from 2008 onwards based on NST 2007 (tkm ‘000.000) in the EU 27 65
Table 33 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes ‘000) in the RFC RD countries 66
Table 34 Goods transported by group of goods - from 2008 onwards based on NST 2007 (tkm ‘000.000) in the RFC RD countries 67
Table 35 Market liberalisation and number of operating freight RUs 69
Table 36 Market shares of freight railway undertakings (based on net tkm) 70
Table 37 Rail traffic in million train-km (passenger and freight services) and share of freight services 71

Table 38 Rail freight traffic in billion net tkm 72
Table 40 Rail projects considered in the Projects scenario 2030 80
Table 41 Freight volume (million tonnes) between the 15 most important origin and destination countries in the catchment area of the 11 RFCs network. 90
Table 44 Freight volume (million tkm) in 2015 and 2022 145

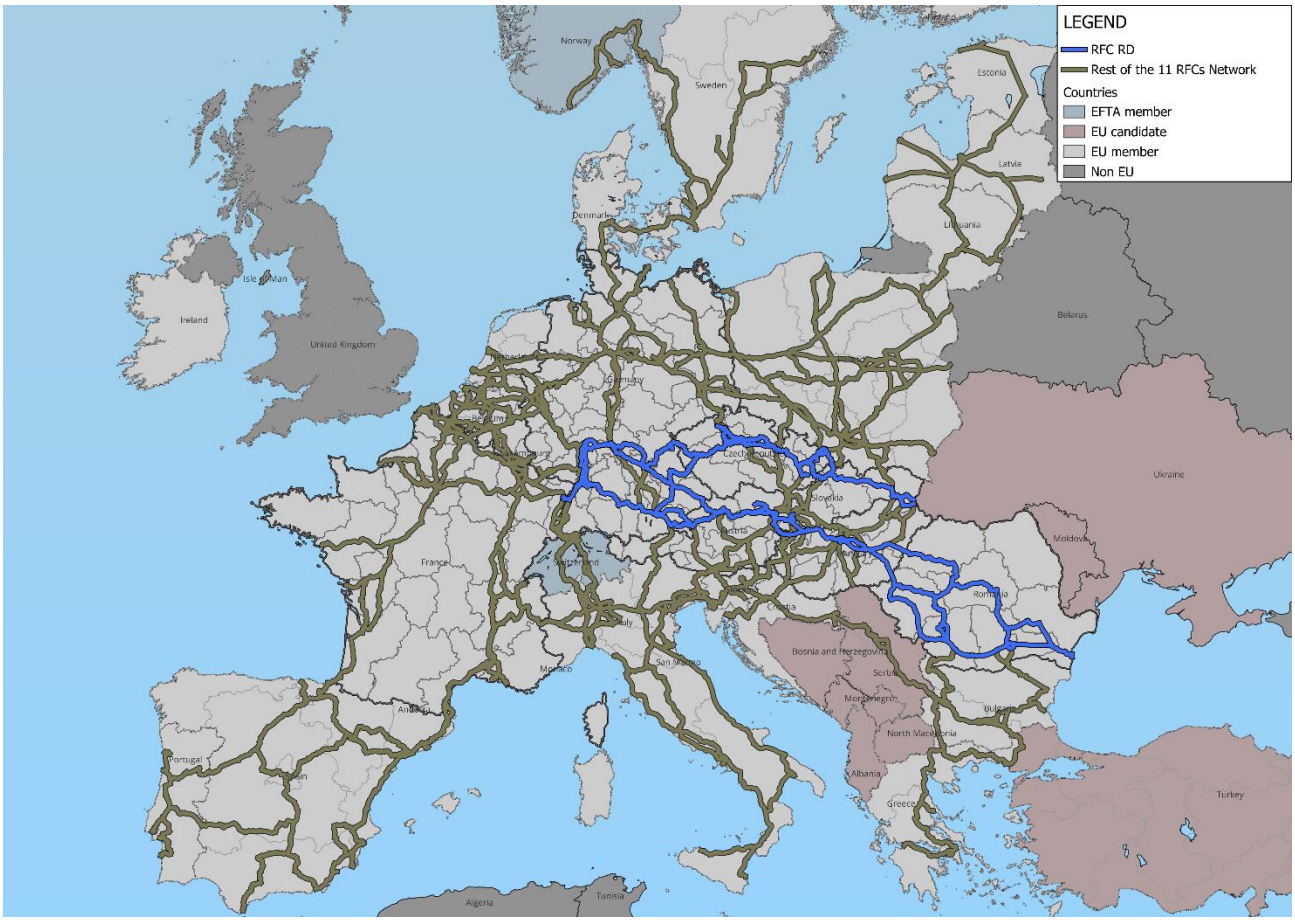
EXECUTIVE SUMMARY

RFC RD 2024 TMS UPDATE RESULTS WITHIN THE 2024 JOINT TMS UPDATE OF THE 11 RFCS BELONGING TO THE EUROPEAN RAIL NETWORK FOR COMPETITIVE FREIGHT

The Rail Freight Corridor Rhine-Danube (RFC RD) is one of the 11 RFCs currently in operation, established under the scope of Regulation (EU) 913/2010 concerning a *European rail network for competitive freight*. According to Article 9.3 of Regulation (EU) 913/2010, the Management Board of the RFC shall carry out and periodically update a Transport Market Study (TMS) related to the observed and expected changes in the traffic on the freight corridor as a consequence of the RFC being established.

Over the past decade, RFCs elaborated first TMSs and, in most cases, TMS updates. However, these studies were carried out without a common approach or a shared methodological framework. To support the RFCs in achieving compliance with the above requirement in a coordinated and harmonised manner, the Management Boards of the 11 RFCs decided to execute a Joint TMS Update under the coordination of RailNetEurope (RNE). The main findings and results of the 2024 TMS Update for the RFC RD are summarised in the following pages.

The RFC RD within the 11 RFCs Network



Source: Authors based on CIP

For the analysis of the current and future transport markets along the 11 RFCs, a European-wide transport model has been used – the NEAC Model – which combines socio-economic, trade and transport statistics

with traffic flows for different transport modes. The geographic scope of the model covers the European Union and the non-EU countries crossed by the 11 RFCs and involved in their catchment areas. The model has been calibrated to the year 2022 (Model Base Year). Future scenarios have been elaborated for the 2030 time horizon.

Due to the adoption of a common, network-wide approach and use of an EU-wide network model, the analysis of the individual RFCs has been performed within the framework of the 11 RFCs Network and overall European policy and market trends. This approach is also appropriate considering that the 11 RFCs share many infrastructure components, i.e. corridor lines, logistics nodes and Border Crossing Points, as well as their catchment areas. Also, regulatory, policy and economic backgrounds and developments, as well as most available statistics on the sector, generally concern the country or EU territorial scale.

Specifically concerning the study policy background, the 2024 11 RFCs Joint TMS Update has been conducted in the framework of the rail sector specific milestones introduced by the EC in its Smart and Sustainable Mobility Strategy to support the achievement of the ambitious target of the European Green Deal, of reducing transport emissions by 90% by 2050 (compared to 1990 levels), i.e., doubling passenger high-speed rail traffic by 2030 and tripling it by 2050, while increasing rail freight by 50% by 2030 and doubling it by 2050 (compared to 2015 levels). With reference to the 50% target growth set in the EU policies for the period 2015-2030, the following table provides transport volume figures in million tkm for the EU27 in 2015, and 2022. Data show that the gap to be filled between 2023 and 2030 is significant, especially for the international segment.

Freight volume (million tkm) in 2015 and 2022

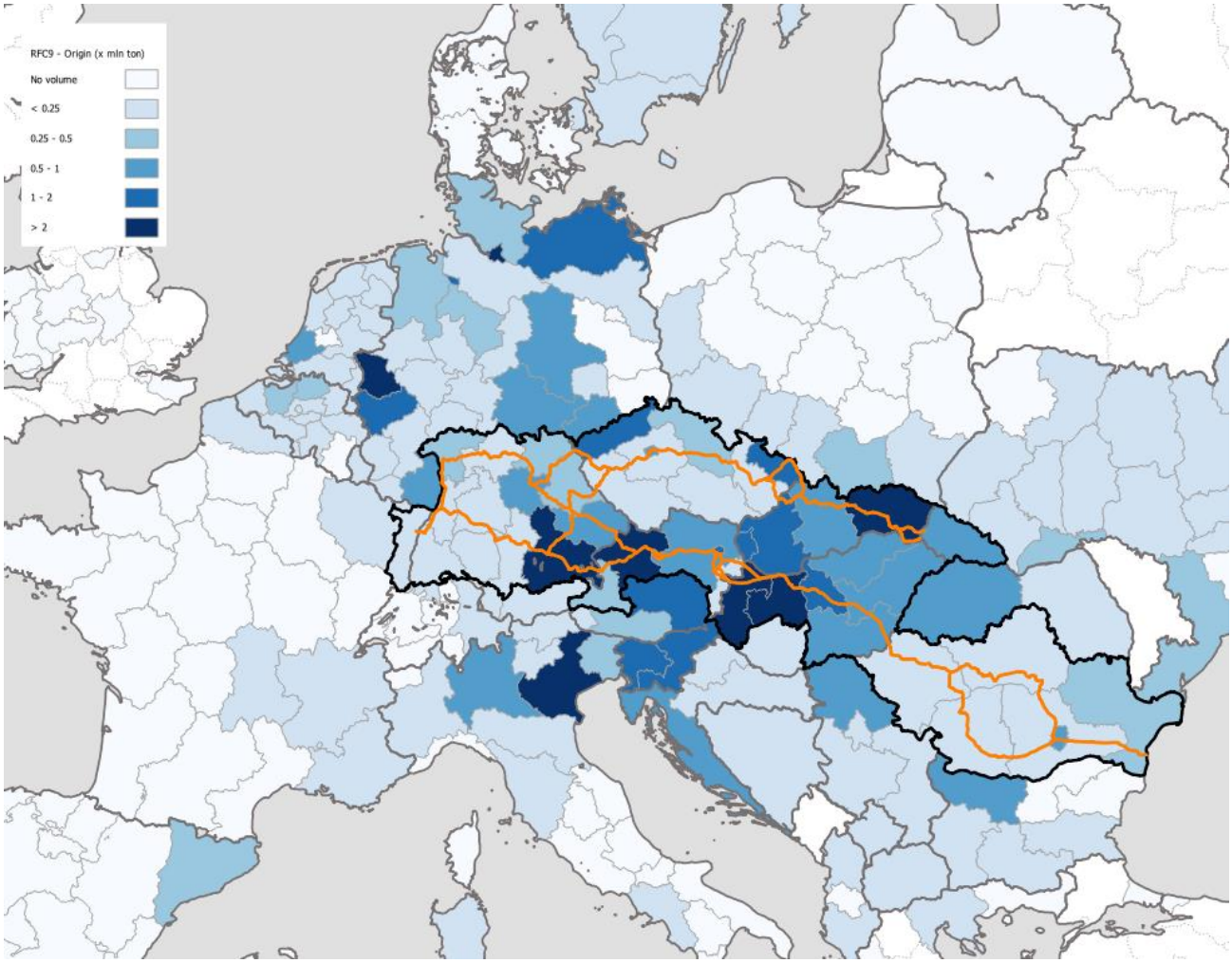
	2015	2022	Var. % '15-22
International rail freight transport	155,289	149,032	-4%
National rail freight transport	181,811	199,830	10%
Total rail freight transport	337,100	348,862	3%

Source: Eurostat [rail_go_typepas]; Notes: (1) Data for Belgium are excluded from the total as they are not available for 2015 and 2022. (2) Data are limited to main undertakings

For the analysis of the current market (Base year scenario), train data from the Train Information System (TIS) managed by RNE have been used, which combined with available trade and economic data available at the NUTS 2 area, served as a basis to define the RFC RD catchment area and main origin and destinations, prior to estimate the volumes of the transported goods and the modal share by land transport mode.

The catchment area for international rail freight transport of the RFC RD - namely the NUTS 2 regions where trains cross at least one RFC RD BCP have either their origin and/or destination – exceeds the corridor area, i.e. the area crossed by the corridor infrastructure (see overview in the overleaf figures). The RFC RD catchment area captures (large parts of) Germany, France, Czechia, Austria, Hungary, Slovakia and Romania. A large proportion of the rail freight transport uses the RFC RD, and its border crossing points, to ship freight by rail from different origins to different destinations. The picture below shows the origins in the catchment area of the RFC RD, with important origins such as Munich, Linz, East Slovakia, West Hungary, and Budapest. Also, outside the corridor area different zones can be seen that contribute to the RFC RD, such as the rest of Germany (Rhine-Ruhr area, Hamburg), France, Italy, Poland, Serbia, Greece, and Ukraine.

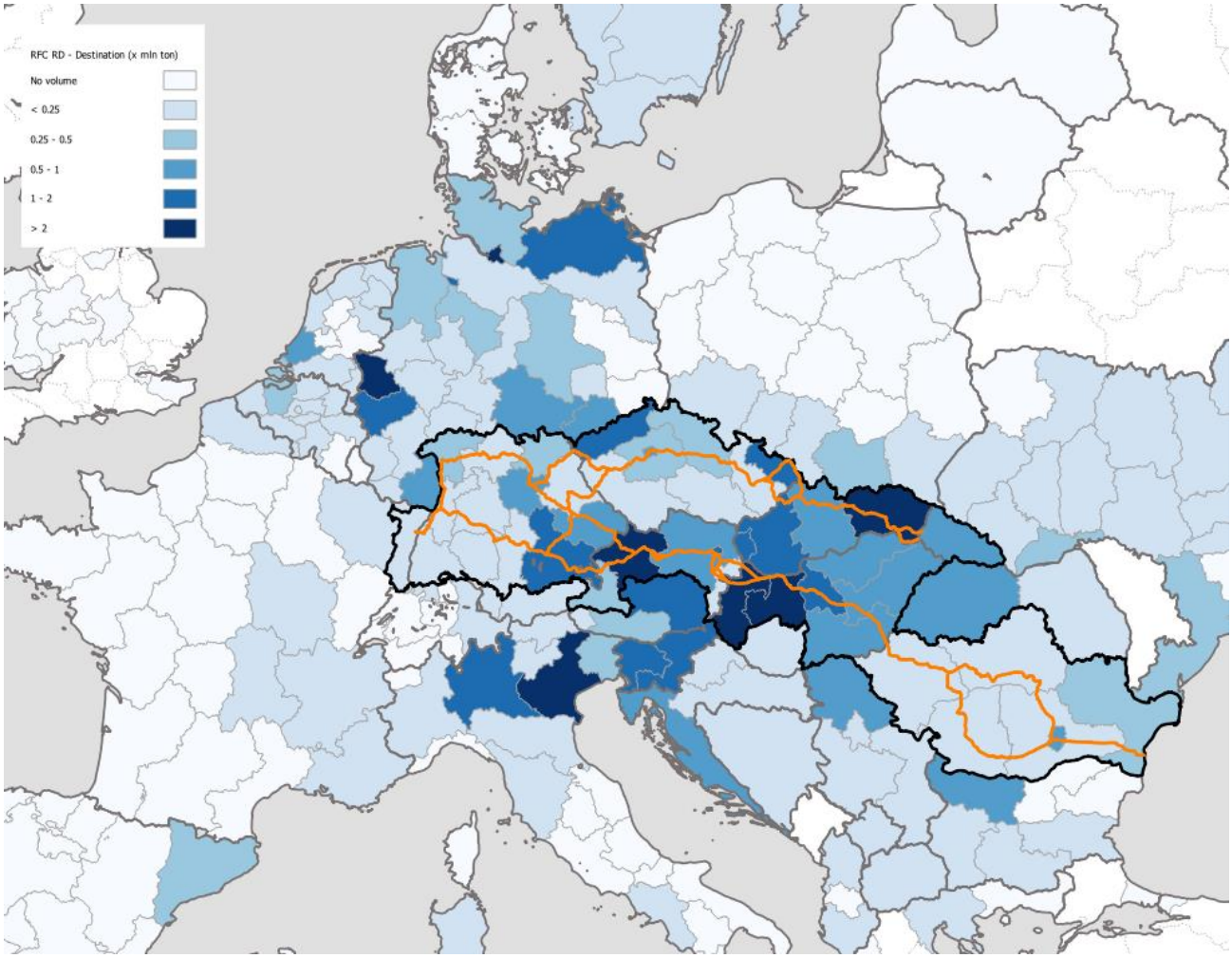
Origins of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area



Legend: Orange = rail tracks of RFC RD. Blue = Volume by origin. Black = Delineation of corridor area

The next figure presents the destinations within the RFC RD catchment area. The figure highlights similar zones as the origins that exhibit the high freight volumes dispatched from these destinations. It is evident from the figure that numerous zones benefiting from RFC RD's services fall outside the corridor area, such as areas in in the rest of Germany (Rhine-Ruhr, Hamburg), Italy (Veneto), Serbia, Croatia and Bulgaria.

Destinations of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area



Legend: Orange = rail tracks of RFC RD. Blue = Volume by origin. Black = Delineation of corridor area

For the purposes of the 2024 Joint TMS Update, future scenarios have been built only considering socio-economic and infrastructure developments. This solution reflects the decision to develop only short-term forecasts up to 2030 and adopt a pragmatic and as far as possible, concrete approach, thus omitting the simulation of the possible effects associated with policy developments such as:

- The proposed weights and dimensions directive and electrification of Heavy Goods Vehicles;
- The internalization of external costs of road transport (road pricing);
- Incentives to rail/combined transport operations;
- Technological/operational improvements of intermodal transport solutions and logistics chains;
- Market sensitivity to climate and energy transition.

In line with this approach, the following scenarios have been defined, all of them at the 2030 time horizon:

- *Reference or background scenario*: It describes the economic developments (in terms of GDP changes), which have the most important impacts on the future of rail transport. The base for this is the EU reference 2020-2050 scenario and the World Economic Outlook 2023.
- *Projects scenario*: It provides an overview of the impacts resulting from the expected developments in the rail transport system. Actually, a number of projects are ongoing and/or planned for the improvement

of the railway infrastructure belonging to the 11 RFCs Network. Such projects were first identified in the 11 RFCs Implementation Plans, which were further confirmed by the 11 RFCs. Furthermore, the list of the investments planned for the development of the 9 TEN-T Core Network Corridors was consulted to integrate the information available from the RFCs. The ongoing and planned investments differ in size. Some are big projects such as Rail Baltica or the Fehmarnbelt. But there are also many investments related to the modernisation and rehabilitation of railway lines to meet the TEN-T standards, improve network interoperability or increase capacity by upgrading railway lines and nodes. Not all projects have been considered for future scenarios simulation purposes. First of all, projects have been selected which are assumed to be completed before or in 2030. Second, only major projects were considered which should be able to 'translate' into a time gain or cost reduction. This approach reflects the purpose of the study and nature of the model, limited to freight market analysis and thus transport volumes and modal share estimation by land transport mode, excluding network capacity simulation and assessment, and looking at the short-term time horizon.

- *Sensitivity scenario: the completion of the TEN-T network at standard in 2030*: It provides an overview of what would happen if – in addition to the investments included in the projects scenario - ERTMS is fully introduced, 740 meter long trains are allowed to operate anywhere on the whole network, 22.5 tonnes axle load is achieved on the entire network, intermodal loading gauge is also possible along the RFCs and if the RFCs network rail gauge meets European standards. This TEN-T completion scenario should be considered as a sensitivity analysis, as the projects required to reach the TEN-T standards will not be fully implemented before 2030.

In the absence of a consistent historical series of data and information on the operations along the 11 RFCs – worth also considering that the RFCs were established and entered into operation in different years between 2013 and 2020, and their alignment adjusted over time to reflect market needs – an e-survey was conducted as part of the 2024 Joint TMS Update – *2023 11 RFCs Joint TMS Update Survey* – to assess the occurred and expected changes associated with their establishment on three main areas: occurred and expected impact of the RFCs, occurred and expected market developments along the RFCs, and market drivers. The survey involved the Railway Undertakings Advisory Groups (RAGs) and Terminal Advisory Groups (TAGs) of the 11 RFCs.

KEY STUDY FINDINGS ON RAIL FREIGHT MARKET IN EUROPE AND ALONG THE RFC RD

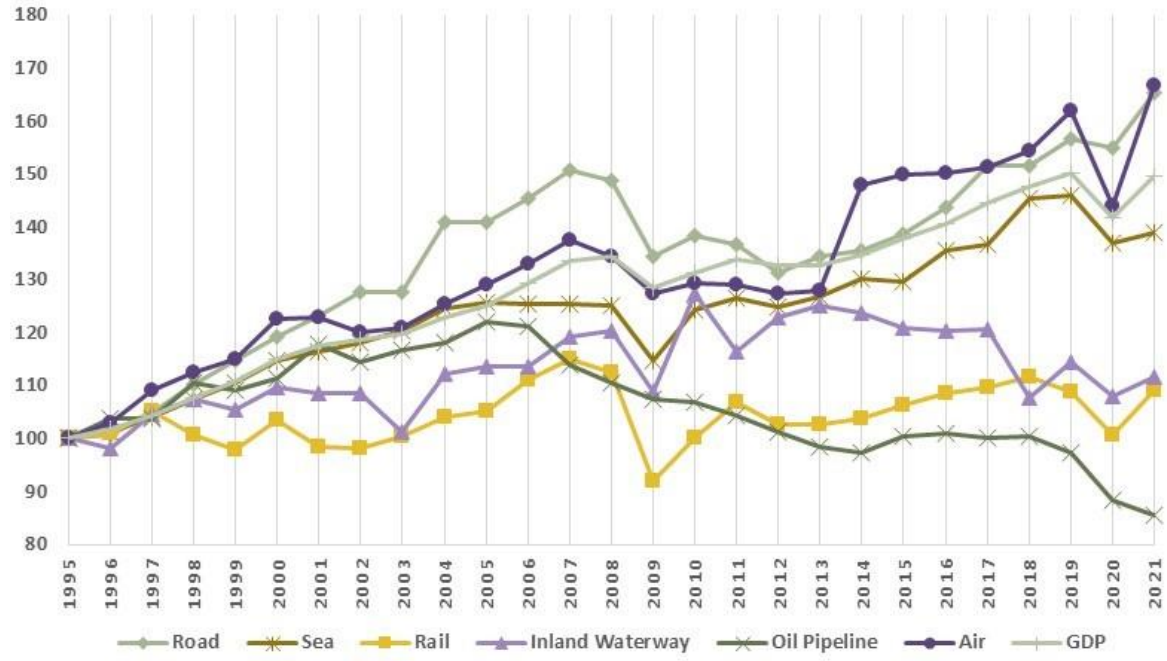
OVERALL MARKET TRENDS AND SECTOR DEVELOPMENTS

The data available from the EC DG MOVE/Eurostat (Statistical Pocketbook 2023 and Rail Market Monitoring Report) and from the Independent Regulators Group (IRG) (Rail Market Monitoring Reports) provide an overview of the development of the European rail freight sector since mid of the 1990s when the rail freight market liberalization started, allowing monitoring trends before and after the 2008 credit crunch, which is considered the second major financial crisis after the 1930s Great Depression, and which was followed by additional adverse events during the past 10-15 years when the 11 RFCs were gradually established and entered into operation. Key findings from the statistical analysis are as follows:

- The period since the entry into force of the rail freight regulation has indeed been marked by a number of socio-economic, health and geopolitical events, which negatively impacted trade and transport flows at the global and European scale. The statistical review shows that the above-mentioned 2008 financial crisis basically altered the economic and transport developments experienced by Europe over the

previous decades. EU27 long-term series over the past 30 years show that the effects of this crisis are persisting: albeit positive, the trend of GDP and most transport modes of the following period stands indeed at lower growth rates. Overall, the European rail freight market grew modestly over the last decade, contrasting with the strong development experienced between 2001 and 2008. The EU economy and transport markets were more recently further impacted by the 2020-2021 COVID-19 pandemic and by the current geopolitical crisis that started in 2022 with the Russian-Ukrainian war and deteriorated with the Israel-Gaza conflict and Red Sea crisis.

Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE – Statistical Pocketbook 2023

- Rail freight transport between 2013 and 2021 marginally grew in the EU27 from about 385 billion tkm to 410 billion tkm, i.e. 7%, which is only half of the rate of growth of total transport volumes and GDP. However, over the same period combined transport more than doubled from about 41 billion tkm to 100 billion tkm. Trends for the RFC RD countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In countries along the RFC RD rail freight transport grew from about 209 to 231 billion tkm, i.e. 10%;
- Most RFC RD countries are among the ones registering a higher rail modal share in the EU. Five out of seven countries are positioned within the ten first-ranking EU countries for rail modal share in 2022.

Share of rail in total freight transport in % (based on tkm)

	2008	2013	2015	2019	2022	Var. '19-'13	Var. '22-'13	Var. '22-'08
Lithuania	64.5	57.2	56.4	56.8	37.2	-0.4	-20	-27.3
Switzerland	35.3	36.0	37.2	34.1	33.4	-1.9	-2.6	-1.9
Slovakia	**40.0**	**38.6**	**36.3**	**30.7**	**30.1**	**-7.9**	**-8.5**	**-9.9**
Austria	**33.3**	**31.9**	**32.3**	**30.6**	**30.0**	**-1.3**	**-1.9**	**-3.3**
Slovenia	26.7	30.5	30.9	31.4	28.8	0.9	-1.7	2.1
Hungary	**24.9**	**30.3**	**29.1**	**26**	**26.3**	**-4.3**	**-4.0**	**1.4**
Latvia	47.9	43.1	42.3	37.4	26.0	-5.7	-17.1	-21.9
Czechia	**31.9**	**28.0**	**26.1**	**25.9**	**22.0**	**-2.1**	**-6.0**	**-9.9**
Romania	**19.9**	**23.3**	**25.0**	**20.5**	**21.0**	**-2.8**	**-2.3**	**1.1**
Poland	30.5	24.2	23.3	21.5	20.8	-2.7	-3.4	-9.7
Germany	**14.6**	**13.9**	**14.1**	**13.7**	**14.9**	**-0.2**	**1.0**	**0.3**
Bulgaria	10.3	7.5	8.7	8.5	11.2	1.0	3.7	0.9
Finland	13.1	12.7	10.9	11.8	10.8	-0.9	-1.9	-2.3
Sweden	10.3	9.6	8.6	9.4	10.5	-0.2	0.9	0.2
Belgium	8.2	6.8	6.9	7.2	7.3	0.4	0.5	-0.9
Luxembourg	9.8	7.2	7.0	6.8	6.1	-0.4	-1.1	-3.7
European Union - 27 countries (from 2020)	6.0	5.7	5.7	5.3	5.5	-0.4	-0.2	-0.5
Croatia	4.5	3.1	3.2	3.5	4.1	0.4	1.0	-0.4
France	**4.2**	**3.6**	**4.1**	**3.5**	**3.7**	**-0.1**	**0.1**	**-0.5**
Italy	2.6	2.4	2.6	2.3	2.7	-0.1	0.3	0.1
Estonia	10.4	7.6	4.5	3.3	2.4	-4.3	-5.2	-8.0
Norway	2.0	1.9	1.6	1.6	2.1	-0.3	0.2	0.1
Netherlands	2.0	1.7	1.8	1.8	1.9	0.1	0.2	-0.1
Denmark	1.4	1.8	1.9	1.7	1.6	-0.1	-0.2	0.2
Spain	0.8	0.8	0.9	0.8	0.8	0.0	0.0	0.0
Portugal	0.3	0.3	0.3	0.3	0.2	0.0	-0.1	-0.1
Ireland	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Greece	0.2	0.0	0.1	0.1	0.1	0.1	0.1	-0.1

Source: Eurostat

At the same time, Czechia, and Slovakia are also among the ones that have registered a high decline in rail modal share over time. This is a general trend at the EU27 scale that is likely related to the change in the commodity basket trade. At both EU 27 and RFC RD related country levels, there is an underlying stagnation or decline of dry and liquid bulk commodities (originating even from before the mid of the 1990s), associated with a growth of intermodal transport, a market segment that is apparently growing with the gradual opening of the rail freight market and greening of logistics chains;

- At the EU27 scale, the COVID-19 pandemic seems to have had different impacts on rail freight traffic measured in net tkm, with either increases or decreases in transport volumes between 2019 and 2021. The negative impact has been apparently significant in the Baltic States, Denmark, Luxembourg, Portugal, and Romania, whereas Bulgaria and Greece experienced about 20% growth. Most of the counties along RFC RD registered positive variations during the pandemic period. Baltic States, in particular, also experienced a significant drop in traffic since the start of the Russian-Ukrainian war in 2022. In fact, EU sanctions implemented with Belarus and Russia following the start of the Ukrainian conflict impacted rail freight traffic negatively in the Baltic States, whereas rail train

freight traffic between Ukraine/Moldova and the EU has increased, particularly through Poland and Romania;

- Since the start of the rail freight liberalisation process in the late 1990's and 2000's, the market share of the domestic incumbent RUs gradually declined in most EU Member States, whereas the market share of non-incumbents increased together with the operations of foreign incumbents. As a general pattern, common to the EU27 and countries along RFC RD, the trend of the market share of domestic incumbents continued to decline in the period between 2013-2021. In the countries along RFC RD, the market share of the domestic incumbents in 2021 was about 50% on average; the market share of national and international incumbents was about 60% on average.

ANALYSIS OF THE CURRENT AND FUTURE FREIGHT TRANSPORT MARKET ALONG THE 11 RFCS NETWORK

The total volume of international freight transport over land for the 11 RFCs Network catchment area is 1,439 million tonnes. The volume of international rail freight transport is 265 million tonnes (about 442 thousand international trains[1]), which is 18% of the total amount of transport to, from, and within the catchment area of the 11 RFCs Network. The share and volume of inland shipping (IWW) is 17% (240 million tonnes), and the share of road transport is 65% (934 million tonnes).

Concerning the cargo types[2], the category *Other* (general cargo, including intermodal transport and container) dominates the international freight transport for the 11 RFCs Network, by 845 million tonnes of volume. This is about 59% of all international freight transport. This cargo type is mostly transported by road (about 69%). *Dry bulk* is the second largest cargo type at 32% (465 million tonnes). *Liquid bulk* has as share of 9% (128 million tonnes) in the total volume of international freight transport over all land modes.

Estimated volume (million tonnes) and share of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network

Source: NEAC estimations

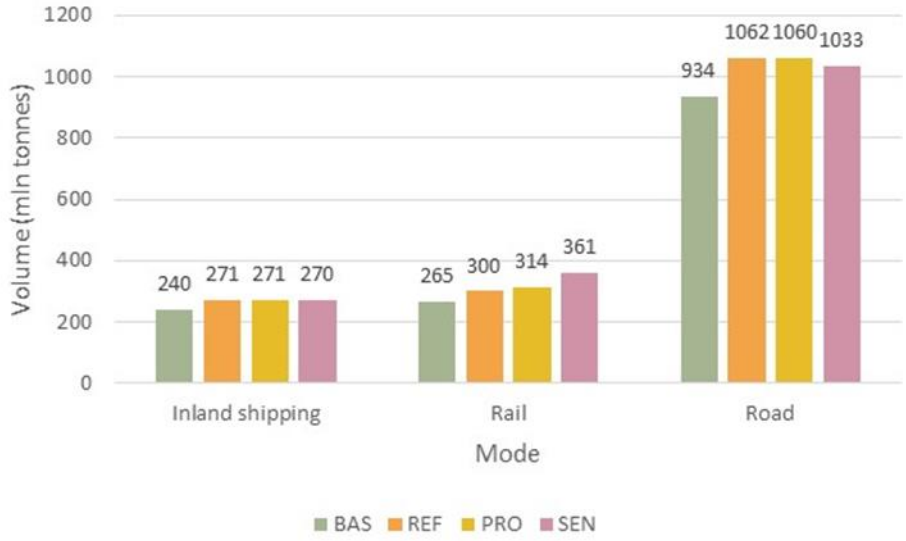
The three future scenarios (Reference, Projects and Sensitivity) show an increase in international freight transport in general. Within the 11 RFCs Network catchment area, due to economic growth (EU Reference

[1] Using an average of 600 tonnes per train

[2] We distinguish dry bulk, liquid bulk, and other (general cargo and container). Dry bulk comprises commodities such as sand, ores and coal. Liquid bulk comprises mainly oil(products) and liquid chemicals. General cargo concerns a broad range of products such as cars, machinery, and electronics. Containers concern intermodal transport. The content is often unknown.

and UN), the increase in general is about 18%. This is in line with the GDP growth for the EU27, which is 17%. Inland shipping shows a growth of 13% (from 240 to 271 million tonnes), road has a growth of 14% (from 934 to 1062 million tonnes) and rail transport of 13% (from 265 to 300 million tonnes). In the absence of further developments, the rail freight market is expected to grow at a slower pace compared to GDP and to the overall transport sector, therefore losing market share. This is due to the changing trends in the basket of transported commodities and differentiated geographic demand growth distribution. For all land freight transport, the projects scenario and the sensitivity scenario have a limited impact on the overall growth of international freight transport.

Development of volume (in million tonnes) by mode and scenario for the 11 RFCs Network catchment area



Source: NEAC estimations; Legend: BAS Base year scenario; REF Reference scenario, PRO Projects scenario; SEN: Sensitivity scenario

Focusing on international rail freight transport, the reference scenario expects a growth of 13%, which is approximately 35 million tonnes extra compared to the 2022 situation. Both the Projects scenario and the Sensitivity scenario show the impact of the different rail projects and rail measures. In the Projects scenario, rail transport grows an extra 4% compared to the reference scenario (300 million tonnes to 313 million tonnes) due to projects. In total this is approximately 13 million tonnes of extra international rail freight transport.

The hypothetical Sensitivity scenario shows that compared to the reference, there is a potential of 61 million tonnes extra rail freight transport due to longer trains, 22.5 t axle load, ERTMS, and standard gauge on the Iberian Peninsula. The total expected rail freight transport volumes in this scenario reaches 361 million tonnes, corresponding to a 20% growth compared to the Reference scenario.

Considering both economic and infrastructure developments, the Sensitivity scenario can be regarded as a potential maximum growth for rail transport across the 11 RFCs Network. Compared to the 2022 base year, transport volumes would increase from 265 to 361million tonnes i.e. by 36%, out of which around 1/3 is due to economic development and 2/3 to infrastructure investments.

As a result of the analysis performed, it is possible to conclude that the major planned projects along the 11 RFCs Network assumed to be completed by 2030, and the modernisation of railway lines and cross-border sections, are fundamental to removing infrastructure bottlenecks and reducing travel times and transport costs. Such initiatives are expected to increase competitiveness of rail transport on the 11 RFCs Network, and thus on each RFC, including the RFC RD. Further to these projects, completing the 11 RFCs Network in line with the TEN-T requirements is key to increase the rail market share.

With reference to the 50% growth set in the EU policies for the period 2015-2030, the observed growth for the period 2015-2022 and expected for the time frame 2023-2030 (+36%) still lags below the target. Therefore, the development of a high-quality and interoperable network does not seem to be sufficient to achieve the ambitious targets set in the relevant European transport policies, an outcome that would hardly change even assuming additional mega cross-border projects would be completed like Brenner and Turin-Lyon.

Such targets remain challenging to meet in the absence of a significant change in the structure of the costs of road and rail transport. Internalising external costs of road transport, and or incentives to reduce the costs of rail transport might be needed. The potentially negative impacts on rail market share of measures such as improving the efficiency of road transport shall also be considered, as also reported in a recent study by the Community of European Railway and Infrastructure Companies (CER) – *Study on Weights and Dimensions: Impacts of the Proposed Amendments to the Weights and Dimensions Directive on Combined Transport and Rail Freight Transport*[3]. Market opening appears also to be relevant in increasing the competitiveness of rail transport. A recent study by the European Rail Freight Association (ERFA) – *The European Rail Freight Market; Competitive Analysis and Recommendations*[4] – considers how non-incumbent operators, focussing on the fast-growing intermodal and logistics train segments, are likely to experience further growth in market share in the 2020s. According to the study, competition amongst railway undertakings has made rail more attractive compared with road, which can be partially explained by the business model of non-incumbents, more focused (i.e., intermodal and logistics, block trains, and international traffic), lean and agile, and cost competitive, able to offer better service levels consistently.

ANALYSIS OF THE CURRENT AND FUTURE FREIGHT TRANSPORT MARKET ALONG THE RFC RD

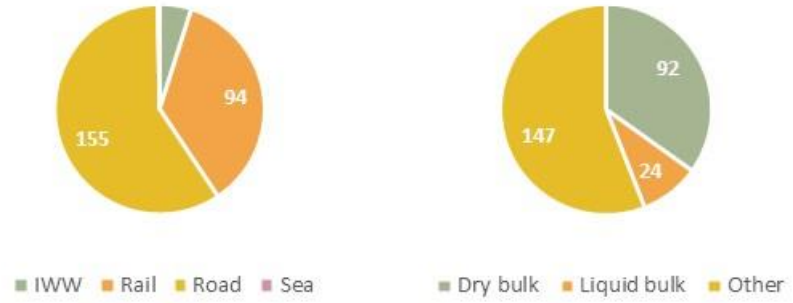
International freight transport across all modes in the catchment area of the RFC RD amounts to 263 million tonnes. The international rail freight transport volume in this area is estimated at 94 million tonnes (about 100.000 trains). This is 36% of the total amount of transport for the RFC RD. The share of inland shipping is 5%, the share of road transport 59%. Sea shipping does not play an important in this RFC (less than 1 million tonnes).

Concerning the cargo types, *Other* (General cargo, including intermodal transport and container) dominates the international freight transport within the catchment area of the RFC RD, with a volume of 147 million tonnes. This is about 56% of all international freight transport for the RFC RD. Dry bulk is the second largest

[3] https://www.cer.be/cer-reports/study-on-weights-and-dimensions
[4] https://erfarail.eu/news/the-european-rail-freight-market-competitive-analysis-and-recommendations

cargo type at 35%. Liquid bulk has a share of 9% in the total volume of international freight transport over all modes in the catchment area of the RFC RD.

Estimated volume (million tonnes) and share of *all* international freight transport by mode and cargo type in the *catchment* area of RFC RD



Source: NEAC estimations

On relations within the catchment area of RFC RD, rail freight transport has a share of 36% in the total amount of international freight transport. This is a volume of 94 million tonnes. The total amount of international rail freight transport of 94 million tonnes relates to approximately 100,000 trains within the corridor area of RFC RD.

The most important rail transport origins and destinations can be found in Germany, Austria, Slovakia and Hungary, in locations such as Munich and Linz. The most important relation is between East Slovakia and Ostrava (vv). Other important relations are Landshut -Linz and Munich-Linz.

The three future scenarios (Reference, Projects and Sensitivity) show an increase in international freight transport in the RFC RD in line with what expected at the European level. Mainly due to autonomous economic growth, the increase in general is about 13%, in the RFC RD growth is also 13%. This is in line with the GDP growth for the EU27 which is 17%. In the RFC RD, rail has a growth of 12%, inland shipping and sea shipping grow by 11%, and road has a growth of 14%. In the absence of further developments, the rail freight market is expected to grow a bit less compared to GDP and to the overall transport sector, therefore slightly losing market share. For all freight transport, the Projects scenario and the sensitivity scenario have an impact on the overall growth of international freight transport, especially in the RFC RD.

Development of volume (in million tonnes) by mode and scenario for the corridor area of RFC RD

Source: NEAC estimations; Legend: BAS Base year scenario; REF Reference scenario, PRO Projects scenario; SEN: Sensitivity scenario

In the RFC RD, for the Reference scenario, a growth of international rail transport is expected at 13%, which is approximately 11 million tonnes extra compared to the 2022 situation. This would be (rounded) 112,000 extra international freight trains in the RFC RD.

The Projects scenario shows the impact of the different rail projects and rail measures. In the Projects scenario rail transport grows an extra 1% compared to the reference scenario. In total it is estimated that this is approximately 1 million tonnes of extra international rail freight transport. This gives (rounded) 2,000 extra trains in the RFC RD. Together with the Reference scenario results, this would be approximately 114,000 trains for the RFC RD.

The Sensitivity scenario shows that there is another potential of 17 million tonnes extra rail freight transport mainly due to longer trains. The total number of unique international freight trains would then be around 115,000. Compared to the 100,000 unique trains in 2022, this is a growth of around 15%. This figure can be regarded as a potential maximum growth.

Overall, the sensitivity scenario can be regarded as a potential maximum growth for rail, considering both economic and infrastructure developments. Compared to the 2022 base year, transport volumes would increase from 94 to 123 million tonnes i.e. by 31%.

OCCURRED AND EXPECTED CHANGES DUE TO THE ESTABLISHMENT OF THE RFCS

The e-survey conducted to collect the opinion of the 11 RFCs RAGs and TAGs members on the occurred and expected impact of the establishment of the RFCs, involved 42 representatives of the RAGs and 30 members of the TAGs, who submitted valid questionnaires between September 2023 and January 2024. Whereas the

overall number of responses makes the survey outcome meaningful for the analysis of the occurred and expected changes at the 11 RFCs Network scale, an analysis specific to each individual RFC would not be statistically significant. The survey results are accordingly used in the 2024 11 RFCs Joint TMS Update for the 11 RFCs Network. It is worth noticing that the survey responses reflect the views of the respondents at the time of submission of the questionnaire (Autumn 2023/January 2024). They furthermore represent a partial view of the market as the sample of the respondents is not representative of the market universe; and may contrast with the findings from the statistical review presented in the previous section above, as the opinions relate to the RFCs and international trains, whereas national statistics refer to the whole country network and national as well as international traffic. The main findings from the survey are summarised in the following bullet points for each of the three investigated areas.

Occurred and expected impact of RFCs, in the areas of governance, operational efficiency and capacity management

- The opinion of the 11 RFCs RAGs and TAGs members about the changes within the governance area is positive, especially in terms of cooperation with the market, including but not limited to RUs and terminal operators, as well as concerning facilitation of discussion among Member States about the issues affecting the competitiveness of international rail freight transport. The opinion about the progress made regarding cooperation between RFCs and Core Network Corridors (CNCs)/ERTMS horizontal priority is less favourable. The market opinion is unfavourable about the progress made on harmonising international freight rail services' legislative, regulatory, procedural and operational aspects. The expectations of the market players concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all aspects. Respondents consider the cooperation between RFCs and an EU Network of Infrastructure Managers (ENIM) as assumed in the proposal for the new capacity regulation, to be the best governance solution for bringing issues forward;
- The stakeholders' opinion about the changes that occurred within the operational efficiency area is also generally positive, except for the progress made in the promotion of technical and operational harmonisation of the European railway transport system towards its interoperability. The respondents' expectations concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all the assessed issues related to operational efficiency. Cooperation between RFCs and an EU Network of Infrastructure Managers (ENIM) is also considered the best-fitting governance solution to bring operational efficiency issues forward;
- The respondents' opinions about the changes that occurred within the capacity management area are predominantly unfavourable. Notwithstanding the market's negative opinion of the progress made since the establishment of the RFCs in this area, the expectations on the future impact of the programmes and activities by the RFCs are rather positive with regard to all the investigated aspects related to capacity management. The best governance solution for capacity management improvements is deemed to be the cooperation between the RFCs and an EU network of Infrastructure Managers (IMs).

Occurred and expected market developments

- The vast majority of the e-survey respondents operated or still operate rail services or manage/operate terminals serving trains across at least one border crossing point on any of the RFCs. Most of them also operated or served international rail freight transport before the establishment of the RFCs. The majority of the respondents declare they experienced an increase in their operations since 2013, and most of them also have a positive expectation about the future, expecting overall market growth;

- The variation in traffic experienced by RUs and terminal operators since 2013 is positive for the RFC RD. The majority of the respondents declare they experienced market growth along the corridor.
- The prevailing type of international trains operated on the RFCs Network consists of intermodal trains, followed by conventional block trains and single-wagon load trains. Most RUs and terminal operators experienced growth in intermodal train operations in the past years, whereas the trend for conventional block and single-wagon load trains is predominantly stable. Most respondents have a positive expectation for the future in terms of traffic growth for all market segments;
- Concerning traffic between logistics nodes, most operations relate to Port to Rail-Road Terminal (RRT) transport, followed by RRT to RRT services and Port to Port operations. Experienced variations by RUs were mostly positive for the Port to RRT or RRT to RRT segments and stable for the Port to Port one. Terminal operators have predominantly experienced growing trends in all market segments in the past years. The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments;
- Regarding service distances, most operations cover distances between 300 km and 900 km, followed by services covering distances longer than 900 km and below 300 km. RUs experienced mostly positive variations for services covering distances longer than 300 km and declared the market is stable for operations below 300 km. Terminal operators have predominantly experienced growing trends in all market segments in the past years. The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments.

Market drivers

- RUs and terminal operators have very similar views about the effects of the main market drivers on the growth of international rail freight transport in the short term, i.e., up until 2030. Most identified drivers are expected to have positive effects as they are assumed to improve rail transport's competitiveness. At the same time, the geopolitical context and socio-economic outlook, as well as the shortfall of the labour force, are perceived as threats;
- The socio-economic outlook is ranked first by the market, followed by infrastructure development and interoperability, policy and economic incentives to promote shift to rail. Increased performance of rail freight services and harmonisation of procedures and national legislation to improve cross-border operations are the two most relevant market drivers, according to the respondents, if considering both first and second-ranking options;
- Although indicated as having a potential negative impact on the market, labour shortages and geopolitical context are not ranked among the most critical market drivers. Finally, technological improvements towards better integration and increased efficiency of multimodal logistics chains, better-integrated RFCs and terminal capacity management do not seem to be considered priority issues by the RUs and terminal operators.

RECOMMENDATIONS ON FACILITATING AND STRENGTHENING THE RAIL FREIGHT MARKET ALONG THE 11 RFCS AND THE RFC RD

In line with the overall study approach aimed at conducting the 2024 RFC RD TMS Update as part of a Joint TMS Update of the 11 RFCs, study recommendations are primarily formulated focussing on the short-term development of the 11 RFCs belonging to the European rail network for competitive freight. RFCs share indeed both infrastructure and market, and more importantly a same EU policy background and overall socio-economic and geopolitical challenges despite some differences between Eastern and Western as well as

Northern and Southern European countries. The 2024 11 RFCs Joint TMS Update allows for an estimation of the current market with reference to the RFCs catchment areas based on a common approach and tool, and for an overall assessment of the impact of the development of the 11 RFCs Network towards the development and completion of the TEN-T network at standard. In line with the methodology decided to be adopted for the 2024 11 RFCs TMS Update, no assessment of the current and future capacity was performed as part of the study and no detailed quantitative assessment of the current and future market operations by the operators along the individual RFCs and with reference to the expansion or new construction of individual projects and logistics nodes. The adopted approach albeit appropriate for an assessment of the market and modal share of the individual RFCs as part of the 11 RFCs Network, does not allow capturing RFCs specific market elements, especially the ones related to operational aspects. Study recommendations have been formulated around two main areas: market developments and targets and institutional and operational developments.

MARKET DEVELOPMENTS AND TARGETS

The simulations made in the study demonstrate that major projects, and particularly the completion of the TEN-T network at standard, would significantly increase the competitiveness of rail freight transport. The post-COVID recovery and the recent geopolitical crises caused delays in the implementation and completion of the projects needed to complete a high quality and interoperable TEN-T network. Price increases and shortages of construction materials particularly affected the advancement of ongoing and planned projects. A high-quality and interoperable network might, furthermore, not be sufficient to achieve the ambitious targets set in the relevant European transport policies, in the absence of a significant change in the structure of the costs of road and rail transport. The following recommendations are proposed to support market development towards the achievement of the EU policy targets:

- *Timely complete the development of a high-quality, interoperable network:*
    - *Building missing links and removing infrastructure bottlenecks* increasing infrastructure capacity by adding new tracks and lines where needed, increasing their speed and improving their gradient, can solve congestion problems, save energy and reduce transport costs as well as improve travel times. Such developments are relevant at the network level, but produce effects also at the individual corridor scale;
    - *Achieving the requirements set in the TEN-T Regulation towards a Single European Railway Area*, i.e. 740 meter long trains, ERTMS, 22.5 tonnes axle load, intermodal loading gauge, UIC gauge, electrification, is fundamental to support the development of a Single European Railway Area;
    - *Support intermodal and combined transport*. The intermodal market is the most promising international rail freight market segment, requiring improvement of interconnectivity between main railway lines and terminals, increasing the capacity of the existing terminal infrastructure, investing in technologies to facilitate and speed up transport and transhipment operations, and tracking and making more reliable the transport of intermodal units along logistics chains and within logistics clusters.
    - *Stronger cooperation between all involved parties for better effectiveness in the availability and use of funds and the definition of investment implementation strategies focussed on those sections of the network with higher market potential*. For over a decade, the sector has

benefited from a stronger TEN-T policy with a dedicated Connecting Europe Facility Fund. Among the different transport modes involved in the TEN-T network, rail and rail cross-border initiatives are treated as a priority. However, the available financial resources are limited overall compared to the financial needs that would be necessary to complete all projects. Investing in infrastructure might not be sufficient, e.g. to be operational, ERTMS also requires rolling stock to be equipped with onboard units.

- *Introduce market regulatory and policy measures to increase the competitiveness of rail freight transport*. Although not a specific subject of this study, regulatory and policy measures might be necessary to facilitate and foster the rail freight market in Europe towards the achievement of higher market shares and EU policy targets. Rail freight transport is generally more expensive and less flexible compared to road transport. Internalising external costs of road transport, and/or creating incentives to reduce the costs of rail transport would increase its competitiveness and support the achievement of the ambitious EU policy targets. In this respect, policymakers shall also consider the potential effects on the modal share of measures improving the efficiency of road transport. As emphasised in the above-mentioned study by ERFA[5] regulatory measures facilitating market opening appear also to be relevant in increasing the competitiveness of rail transport (e.g. enforcement of antitrust regulations; unbundling of subsidised public service operations from open market business; and ending direct subsidies to or recapitalization of state-owned freight railway undertakings).

INSTITUTIONAL AND OPERATIONAL DEVELOPMENTS

Recommendations on institutional and operational developments are formulated as follows, according to the findings from the market consultation (2023 11 RFCs Joint TMS Update Survey), conducted as part of the 2024 11 RFCS Joint TMS Update:

- *Improve capacity management*. Capacity management is considered by the market and also by the analyses and studies at the basis of the proposal for the new capacity regulation, a key area for improvement. Progress was made in the management of Temporary Capacity Restrictions, however capacity planning remains an issue. Digital Capacity Management as an integral part of the European program “Timetable Redesign (TTR) for Smart Capacity Management” is at the core of the proposal for the new capacity regulation, and it is paramount to reaching Green Deal targets for the transport sector and the rail freight segment within it.
- *Monitor operational performance*. The revised TEN-T regulation identifies new operational requirements, related to punctuality and dwell times at borders. Furthermore, some infrastructure requirements also depend on operations, such as 740 meter long trains. Investing in infrastructure, albeit needed, is long-lasting and capital-intensive. The competitiveness of international rail freight transport also depends on the improvement of cross-border operations and integrated/coordinated planning and management of the rail network at the European scale. An RFCs common KPI framework is already in place, and RNE is also already monitoring infrastructure KPIs. Such activities might be continued in light of the new set of requirements foreseen in the revised TEN-T Regulation (EU) 1679/2024 and RFC governance structure, also defined in the Art. 67 of this regulation.

[5] https://erfarail.eu/news/the-european-rail-freight-market-competitive-analysis-and-recommendations

- *Balance network and corridor governance approach*. The analysis of the RFC catchment areas shows that international trains using at least one corridor BCP may actually use more than one RFC. A network approach is more fitting to the planning and management of the network capacity. Geographical specificities and logistics clusters and chains exist that still make the corridor concept useful, especially to support discussion and coordination among IMs and Member States and for a customer-oriented approach aimed at involving RUs and Terminal Operators. This consideration also seems to be in line with the opinions expressed by the 11 RFCs RAGs and TAGs members in the survey conducted as part of this study.

1 INTRODUCTION

1.1 LEGAL BASIS AND PURPOSE OF THE TRANSPORT MARKET STUDY

Regulation (EU) 913/2010 concerning a *European rail network for competitive freight* (hereinafter referred to as Regulation) stipulates the implementation of Rail Freight Corridors (RFCs) and a package of measures to improve the competitiveness of rail freight services along these corridors. 11 RFCs have been established under the scope of this Regulation since it entered into force and are currently operational. According to Article 9.3 of the Regulation, the Management Board of the RFC shall carry out and periodically update a Transport Market Study (TMS) related to the observed and expected changes in the traffic on the freight corridor as a consequence of the RFC being established. Over the past decade, RFCs elaborated first TMSs and, in most cases, TMS updates. However, these studies were carried out without a common approach or a shared methodological framework.

To support the RFCs in achieving compliance with the above requirement in a coordinated and harmonised manner, the Management Boards of the 11 RFCs decided to execute a Joint TMS Update under the coordination of RailNetEurope.

This report provides the results of the 2024 TMS Update for the Rhine-Danube Rail Freight Corridor (RFC RD).

1.2 COMMON METHODOLOGY FOR A JOINT TMS UPDATE

For the analysis of the current and future transport markets along the 11 RFCs, a European-wide transport model has been used – the NEAC Model – which combines socio-economic, trade and transport statistics with traffic flows for different transport modes. The geographic scope of the model covers the European Union and the non-EU countries crossed by the 11 RFCs and involved in their catchment areas. The model has been calibrated to the year 2022 (Model Base Year). Future scenarios have been elaborated for the 2030 time horizon. A short overview of the model is provided in Annex 1 of this report.

The scope of the current market analysis covers the alignment of the RFCs in operation at the time of the start of this study update (June 2023). The future market analysis also considers any possible expected lines that are currently foreseen to be operational in 2030.

Due to the adoption of a common, network-wide approach and use of an EU-wide network model, the analysis of the individual RFCs is presented within the framework of the 11 RFCs network and overall European policy and market trends. This approach is also appropriate considering that the 11 RFCs share many infrastructure components, i.e. corridor lines, logistics nodes and border-crossing points, as well as their catchment areas. Also, regulatory, policy and economic backgrounds and developments, as well as most available statistics on the sector, generally concern the country or EU territorial scale.

1.3 REPORT STRUCTURE

Further to this introductory chapter, the present study includes six additional sections:

- Chapter 2, describing the RFC alignment and infrastructure, the existing bottlenecks and the ongoing and planned projects to solve current gaps with reference to the TEN-T requirements and capacity constraints, as well as an overview of the operational performance of the RFC with particular reference to the international trains and the managed capacity;
- Chapter 3, providing background information to the TMS update, including a summary of the main trends related to rail freight transport in Europe and along the RFC;
- Chapter 4, describing the current transport market along the RFC;
- Chapter 5, illustrating the analysis of the future transport market along the RFC;
- Chapter 6, results of the outcome of a market survey conducted as part of this joint TMS update, i.e. 2023 11 RFCs Joint TMS Update Survey;
- Chapter 7, summarising key findings and providing recommendations on facilitating and strengthening the rail freight traffic along the RFC.

1.4 LIST OF ACRONYMS

AB	Allocation Body
BCP	Border Crossing Point
CID	Customer Information Document
CIP	Customer Information Platform
CNC	Core Network Corridor
CRD	Central Reference File Database
EC	European Commission
EU	European Union
GDP	Gross Domestic Product
IM	(Railway) Infrastructure Manager
IRG	Independent Regulators' Group
km	Kilometre
KPI	Key Performance Indicator
ETCS	European Train Control System
ERTMS	European Rail Traffic Management System
PaP	Pre-allocated Path
PCS	Path Coordination System
RAG	Railway Undertaking Advisory Group
RFC	Rail Freight Corridor
RFC AMBER	Rail Freight Corridor Amber
RFC ATL	Rail Freight Corridor Atlantic
RFC AWB	Rail Freight Corridor Alpine-Western Balkan
RFC BA	Rail Freight Corridor Baltic-Adriatic
RFC MED	Rail Freight Corridor Mediterranean
RFC NS-B	Rail Freight Corridor North Sea-Baltic
RFC NSM	Rail Freight Corridor North Sea-Mediterranean
RFC OEM	Rail Freight Corridor Orient/East-Med
RFC RALP	Rail Freight Corridor Rhine-Alpine
RFC RD	Rail Freight Corridor Rhine-Danube

RFC SCANMED	Rail Freight Corridor Scandinavian-Mediterranean
RFP	Rail Facilities Portal
RINF	Register of Infrastructure
RIS	Railway Infrastructure System
RNE	RailNetEurope
RU	Railway Undertaking
TAG	Terminal Advisory Group
TCR	Temporary Capacity Restriction
TIS	Train Information System
tkm	tonne-kilometre
TMS	Transport Market Study
UIRR	International Union for Road-Rail Combined Transport

A general glossary which is harmonised over all RFCs is also available under the following link: https://rne.eu/downloads/.

2 CORRIDOR PRESENTATION

2.1 CORRIDOR CHARACTERISTICS

RFC RD crosses seven Member States of the EU, namely France, Germany, Czechia, Austria, Slovakia, Hungary, Romania. For the purposes of the joint TMS update, the description of the RFC RD lines focusses, in particular, on the principal and diversionary lines currently in operation, excluding the connecting lines A and B, as well as the expected lines currently not in operation. The total length of the RFC RD principal and diversionary lines is 7,555 km. Most of the network is located in Romania (about 2,282 km) and Germany (2,124 km), followed by Czechia (1,070 km), Austria (788 km), Hungary (736 km), Slovakia (549 km), and France (5 km).

Table 1 Corridor extent by Member State

Member State	Length in km
France	5.42
Germany	2,124.01
Czechia	1,070.39
Austria	787.96
Slovakia	548.85
Hungary	736.37
Romania	2,281.83
Total	**7,554.83**

Source: Data based on CIP, August 2023

2.1.1 CORRIDOR LINES

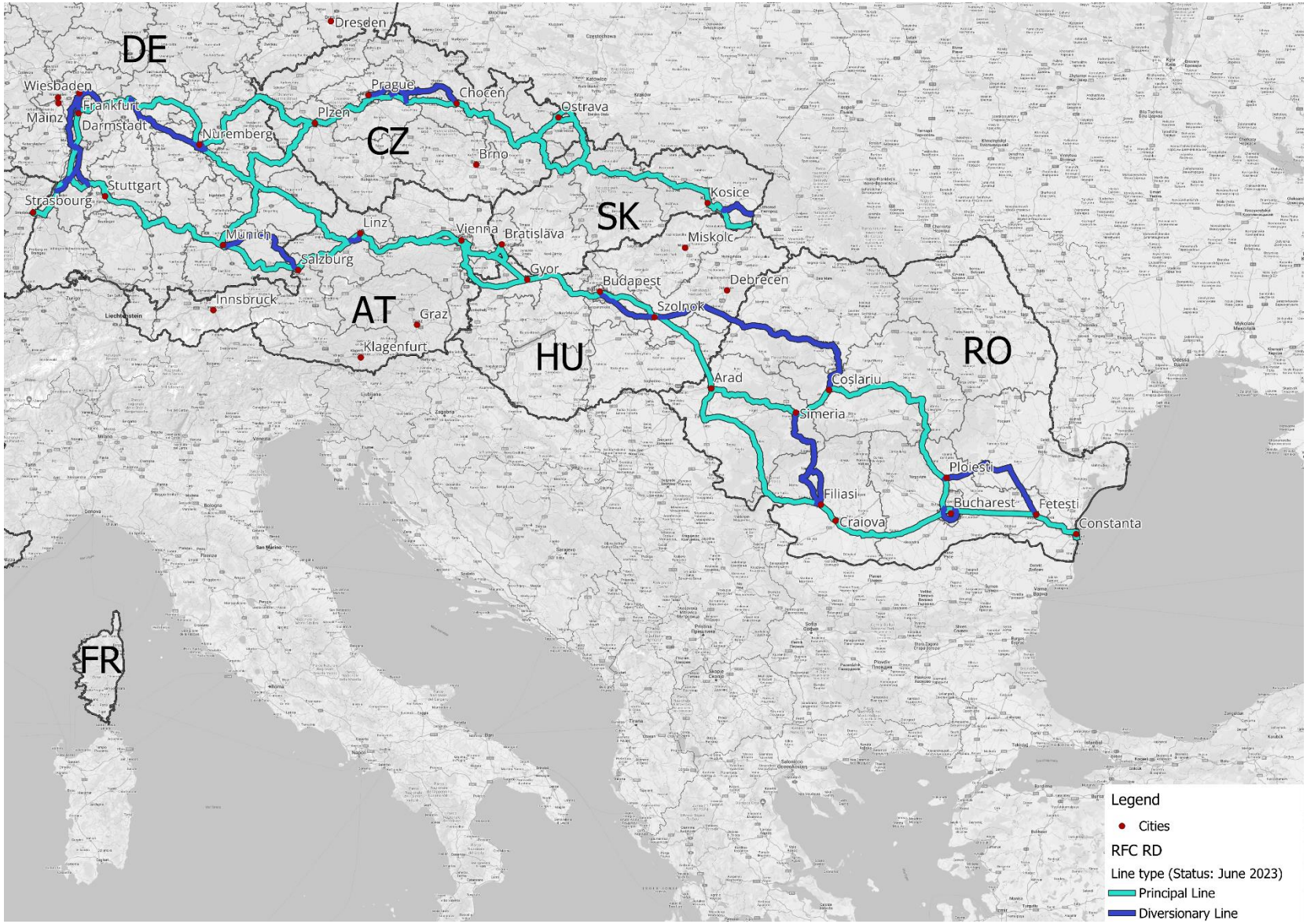
The following table summarises the length of the RFC RD lines by type of RFC line, i.e. principal and diversionary. Details are provided for the whole RFC and overlapping sections.

Table 2 RFC RD - Type of RFC lines and overlapping RFCs

Rail Freight Corridor	Principal Line	Diversionary Line	Total
Only RD	2,598.19	436.90	**3,035.09**
RALP	178.72	107.22	**285.94**
OEM	1,923.53	1,004.78	**2,928.31**
BA	98.34	0.00	**98.34**
ScanMed	109.71	147.43	**257.14**
Amber	81.92	0.00	**81.92**
NSM, ATL	4.53	0.00	**4.53**
MED, OEM	11.53	137.37	**148.90**
BA, OEM	251.61	0.00	**251.61**
MED, OEM, Amber	140.31	23.80	**164.11**
OEM, NS-B	3.59	0.00	**3.59**
AWB	38.70	20.91	**59.61**
BA, Amber	73.97	0.00	**73.97**
OEM, Amber	129.27	0.00	**129.27**
NS-B	0.00	32.50	**32.50**
Total	**5,643.92**	**1,910.91**	**7,554.83**

Source: Data based on CIP, August 2023

Figure 1 RFC RD - Type of RFC lines



Source: Data based on CIP

The RFC RD in June 2023 consists of 5,644 km of principal lines and about 1,910 km of diversionary lines.

The RFC RD shares its network with other RFCs such as RFC BA, RFC OEM, RFC Amber, RFC MED, RFC NS-B, RFC ATL, RFC RALP, RFC AWB, RFC ScanMed. The longest overlapping is with the RFC OEM.

2.1.2 CORRIDOR TERMINALS

A number of terminals are active along the RFC RD. The table below provides an indicative, not exhaustive list of active terminals along the RFC RD also indicating overlapping RFCs where applicable.

Table 3 List of terminals on the RFC RD

Name	Country	Common with other RFCs according to CIP
Hausbergen-Traige-Yard	France	NSM, ATL
Port Autonome de Strasbourg	France	NSM, ATL
baymodal Bamberg	Germany	
Container Depot München	Germany	SCANMED
Container Terminal Regensburg	Germany	
Container Yard Speyer Contargo	Germany	
Contargo Frankfurt-West	Germany	
Contargo Karlsruhe Rheinhafen	Germany	RALP
Contargo Mannheim	Germany	RALP, ATL
Contargo Wiesau	Germany	
Contargo Wörth	Germany	RALP
DP World Germersheim	Germany	
DP World Mannheim	Germany	RALP, ATL
DUSS Augsburg-Oberhausen	Germany	SCANMED
DUSS Frankfurt/Main-Ost	Germany	RALP
DUSS Karlsruhe	Germany	RALP
DUSS Landshut	Germany	
DUSS Regensburg-Ost	Germany	
DUSS Terminal Mannheim-Handelshafen	Germany	RALP, ATL
DUSS-Terminal Kornwestheim	Germany	
DUSS-Terminal München-Riem	Germany	SCANMED
DUSS-Terminal Stuttgart Hafen	Germany	
DUSS-Terminal Ulm	Germany	
ETK Euroterminal Kehl	Germany	RALP
Frankenbach Container Terminal Mainz	Germany	RALP
GUT-Terminal Gernsheim	Germany	
Kehl Klumpp + Müller	Germany	
Ludwigshafen KTL	Germany	RALP, ATL
Mannheim Rbf	Germany	RALP, ATL
Nürnberg Rbf	Germany	SCANMED
Railport Nürnberg	Germany	
TRANSLOG Schweinfurt	Germany	
TriCon Container-Terminal	Germany	SCANMED
Trimodal Container Terminal Aschaffenburg (TCA)	Germany	
Trimodales Container Terminal Aschaffenburg - TCA	Germany	
Contargo-Terminal Plzeň	Czechia	
Intermodal Terminal Lovosice	Czechia	OEM, NS-B
Port Mělník	Czechia	OEM, NS-B
RAIL HUB - Terminál ČESKÁ TŘEBOVÁ	Czechia	BA, OEM
Terminál Kopřivnice	Czechia	BA

Name	Country	Common with other RFCs according to CIP
Terminál Ostrava - Mošnov	Czechia	
Terminál Ostrava - Paskov	Czechia	BA
Terminál Ostrava - Šenov	Czechia	BA
Terminál Pardubice	Czechia	OEM
Terminál Plzeň - Nýřany	Czechia	
Terminál Praha - Uhříněves	Czechia	OEM, NS-B
Terminál Přerov - Horní Moštěnice	Czechia	BA
Terminál ZLÍN - Želechovice/Lípa	Czechia	BA
Container Terminal Enns	Austria	
Container Terminal LINZ AG	Austria	AMBER
Container Terminal Salzburg	Austria	AMBER
Terminal Krems an der Donau	Austria	
Terminal Lambach	Austria	AMBER
Terminal Wels (CCT)	Austria	AMBER
Terminal Wels (ROLA)	Austria	AMBER
Terminal Wien Freudenau Hafen	Austria	BA, OEM
Terminal Wien Süd (CCT)	Austria	BA, OEM
HUB Dunajská Streda	Slovakia	BA, OEM, AMBER
Rail Cargo Operator CSKD s.r.o (Žilina)	Slovakia	BA, AMBER
Rail Cargo Operator CSKD s.r.o (Bratislava)	Slovakia	BA, OEM, AMBER
Slovenská plavba a prístavy a.s. (Bratislava)	Slovakia	BA, OEM, AMBER
Terminál Košice	Slovakia	AMBER
TKD Dobrá	Slovakia	
Žilina-Teplička TIP	Slovakia	BA, AMBER
BI-KA Logistics Center	Hungary	MED, OEM
Budapest Szabadkikötő (port)	Hungary	MED, OEM, AMBER
Győr / ÁTI Depo	Hungary	MED, OEM, AMBER
Győr-Gönyű kikötő	Hungary	MED, OEM, AMBER
METRANS Terminal Budapest	Hungary	MED, OEM, AMBER
RailCargo Terminal - BILK Zrt.	Hungary	MED, OEM, AMBER
Railport Győr	Hungary	MED, OEM, AMBER
Szolnok Indust. Park and Logistics Service Center	Hungary	MED, OEM
Terminal GYSEV Sopron	Hungary	OEM, AMBER
Törökbálint DEPO Intermodal Logistic Centre	Hungary	MED, OEM, AMBER
Allianso Terminal	Romania	OEM
APM Terminal	Romania	OEM
DP World Constanța	Romania	OEM
Railport Arad	Romania	OEM
SOCEP Terminal	Romania	OEM
Terminal Bucureşti Sud	Romania	OEM
Terminal Cluj Napoca	Romania	OEM
Terminal Oradea	Romania	OEM
Terminal Turda	Romania	OEM
Tibbett Logistics	Romania	OEM
UMEX Terminal	Romania	OEM

Source: Data based on CIP

2.1.3 CORRIDOR BORDER-CROSSING POINTS

Border-crossing points (BCPs) are of particular relevance for RFCs as their remit is dedicated to the promotion of international rail traffic across the RFCs. Trains crossing BCPs are accordingly one of the monitored KPIs by

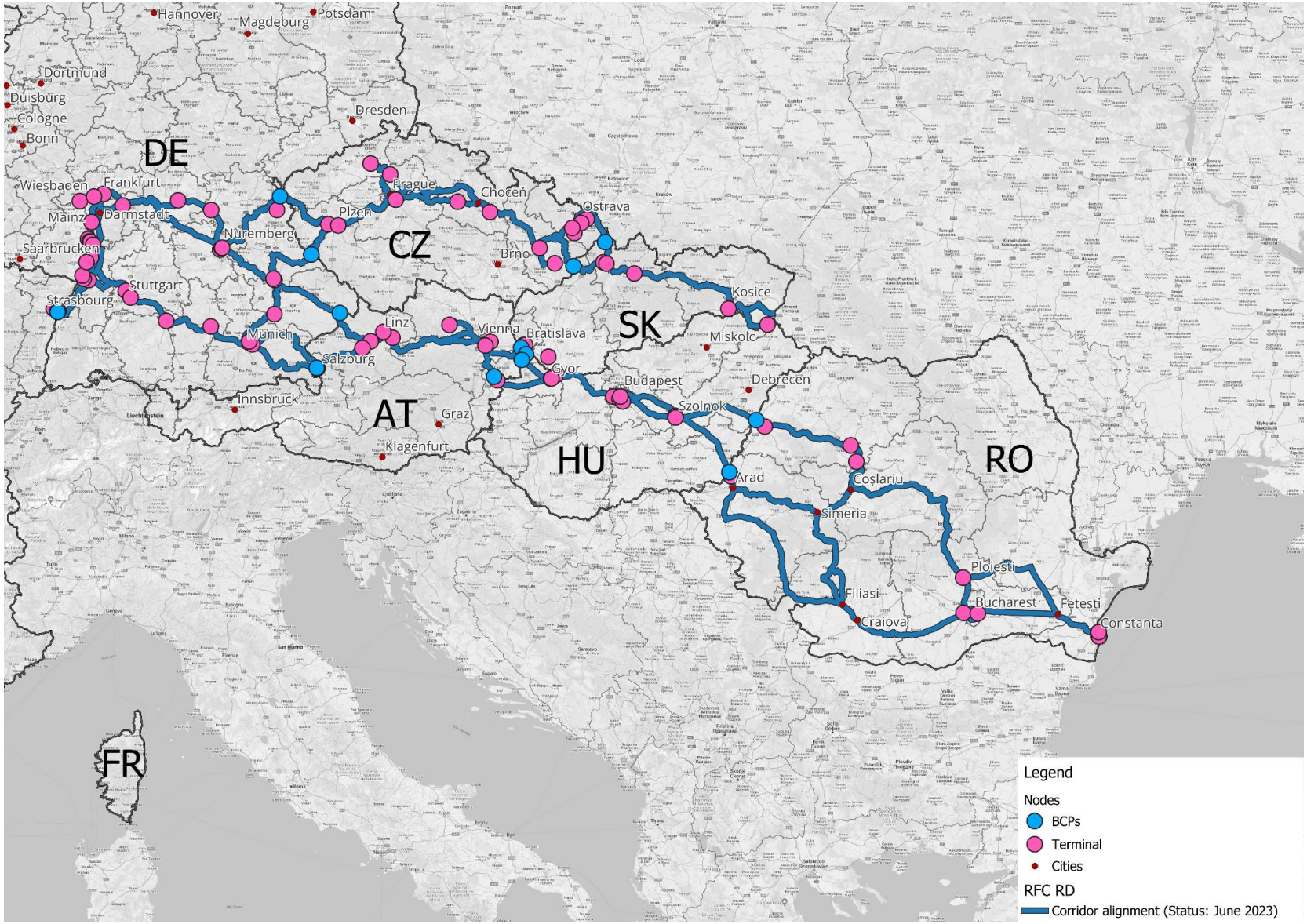
the RFCs. According to the current alignment of the RFC RD, there are 13 BCPs in total along the corridor as detailed in the following table.

Table 4 RFC RD BCPs

Neighbouring Member States		Border-Crossing Point
FR	DE	Strasbourg-Neudorf/Kehl
DE	CZ	Schirnding/Cheb
DE	CZ	Furth im Wald/Česká Kubice
AT	DE	Schärding/Passau
AT	DE	Salzburg Liefering/Freilassing
SK	CZ	Čadca/Mosty u J.
SK	CZ	Lúky p.M./H. Lideč
SK	AT	Bratislava-Petržalka št. hr./Kittsee
AT	HU	Nickelsdorf/Hegyeshalom
AT	HU	Baumgarten/Sopron
HU	SK	Rajka/Rusovce
RO	HU	Curtici/Lőkösháza
RO	HU	Episcopia Bihor/Biharkeresztes

The map in the figure overleaf illustrates the alignment of the RFC RD, its main terminals (as encoded in CIP) and BCPs also identifying the sections overlapping with other RFCs.

Figure 2 RFC RD alignment, terminal locations and BCPs



Source: Data based on CIP

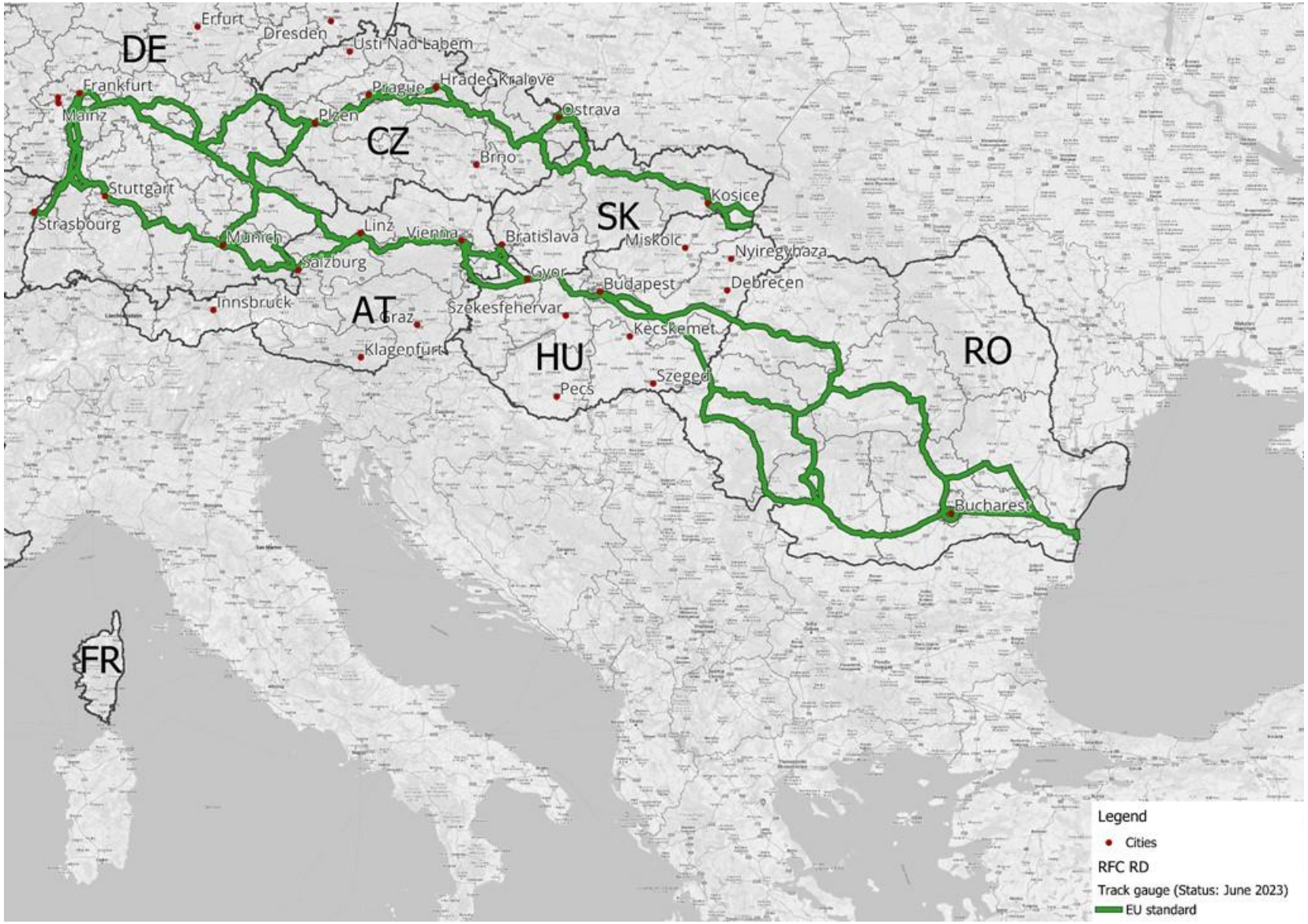
2.1.4 CORRIDOR INFRASTRUCTURE PARAMETERS

An analysis of the main characteristics of the corridor lines has been performed with reference to the rail infrastructure requirements set in Regulation (EU) 1315/2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, i.e. EU standard track gauge (1435 mm), electrification, maximum line speed (100 km/h), axle load (22.5 t), train length (740 m) and ERTMS (Class A or Class A+B). Such an exercise has been conducted, focussing on the principal and diversionary lines of the RFC. Data have been primarily sourced from the Customer Information Platform (CIP). The information was extracted in August 2023, and it reflects the status of the infrastructure in June 2023. For some sections, data from the CIP database have been integrated with information from the Network Statements of the participating Infrastructure Managers (IMs).

On the basis of this analysis, compliance maps have been elaborated, which are provided overleaf for each parameter:

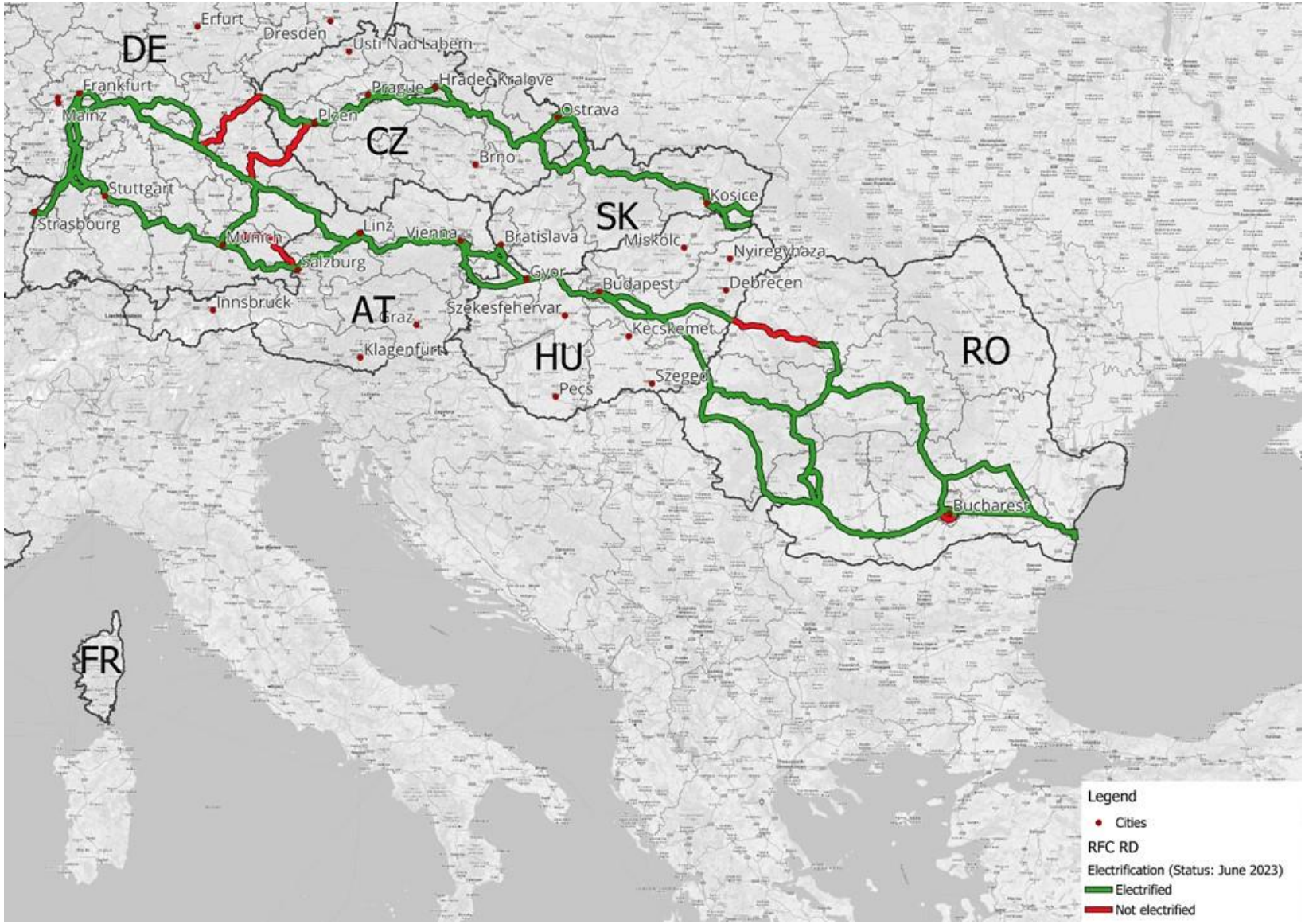
- The RFC RD is already at standard concerning the European track gauge;
- Issues in terms of electrification exist, particularly affecting cross-border itineraries between Germany and Czechia, Germany and Austria, Hungary and Romania, as well as some terminals' interconnecting lines and the Bucharest node;
- Speed restrictions are also present, which particularly affect the corridor network in Romania and some terminals' interconnecting lines;
- Axle load restrictions affect cross-border itineraries between Germany and Czechia, Austria and Hungary, Slovakia and Hungary and Hungary and Romania, as well as some terminals' interconnecting lines;
- The operation of 740 m long trains is not possible or possible subject to traffic conditions and permissions (operational compliance).
- ERTMS technology is installed on limited sections of the RFC RD.

Figure 3 RFC RD - Track gauge



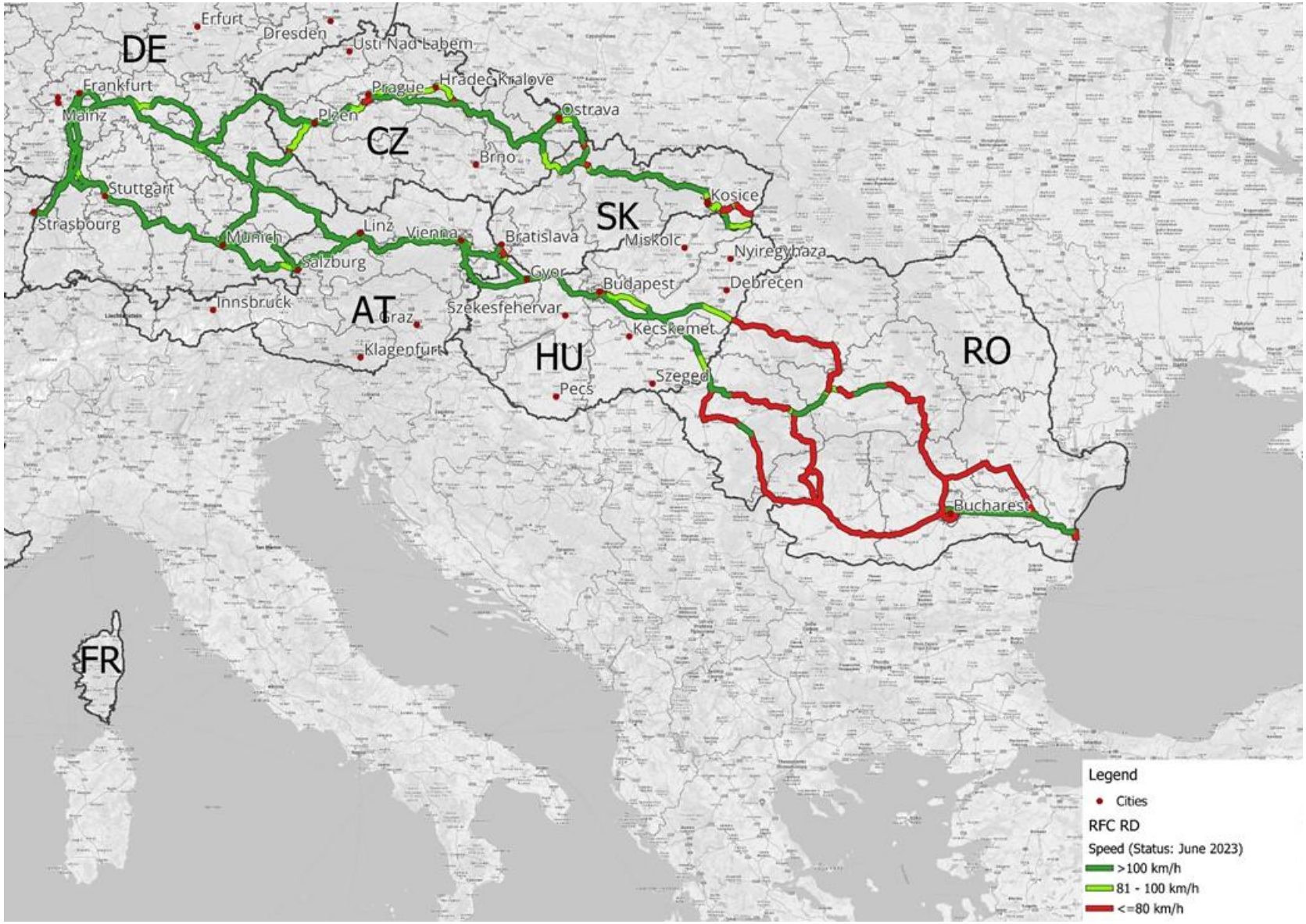
Source: Data based on CIP

Figure 4 RFC RD – Electrification



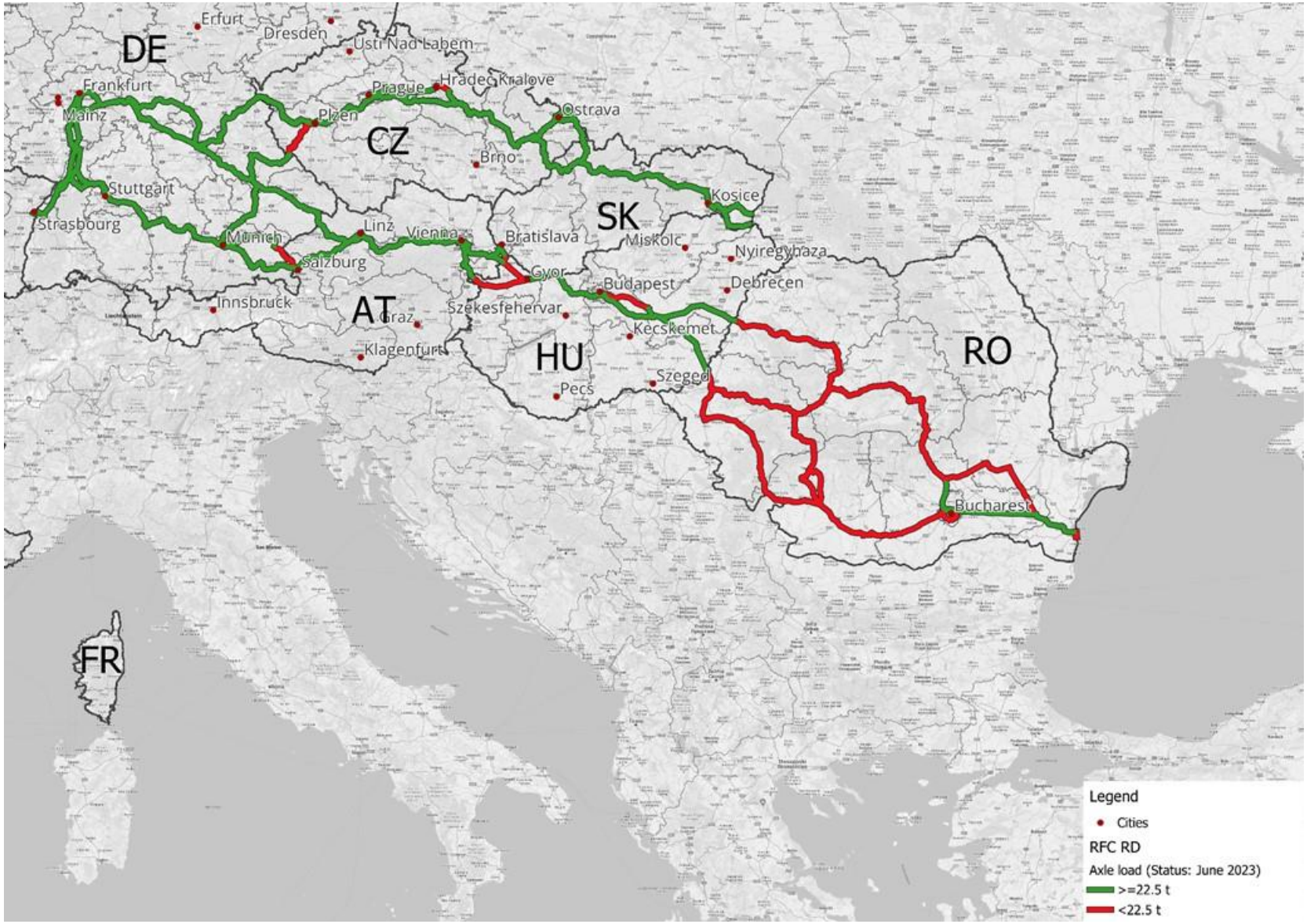
Source: Data based on CIP

Figure 5 RFC RD - Speed



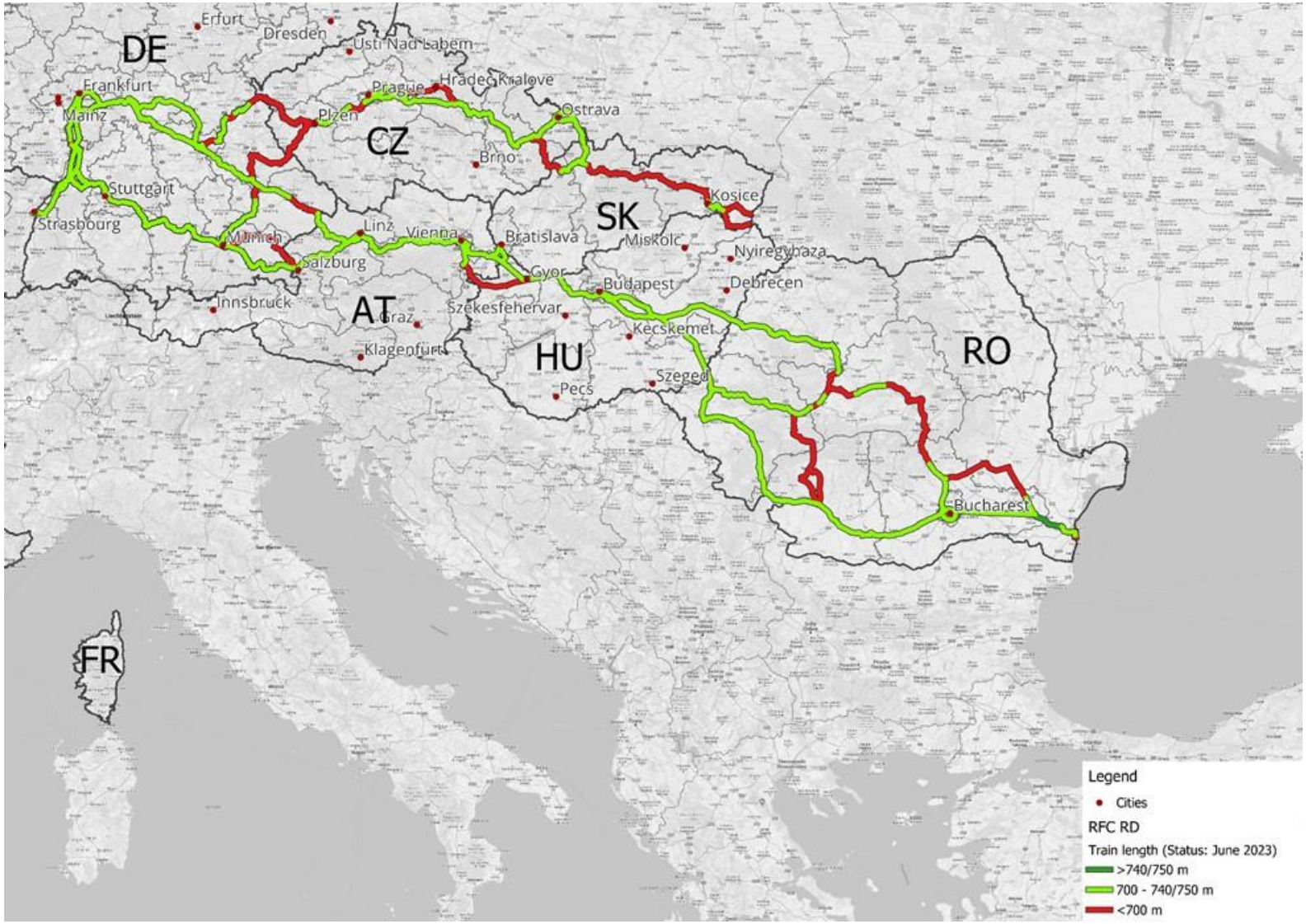
Source: Authors based on CIP

Figure 6 RFC RD – Axle load



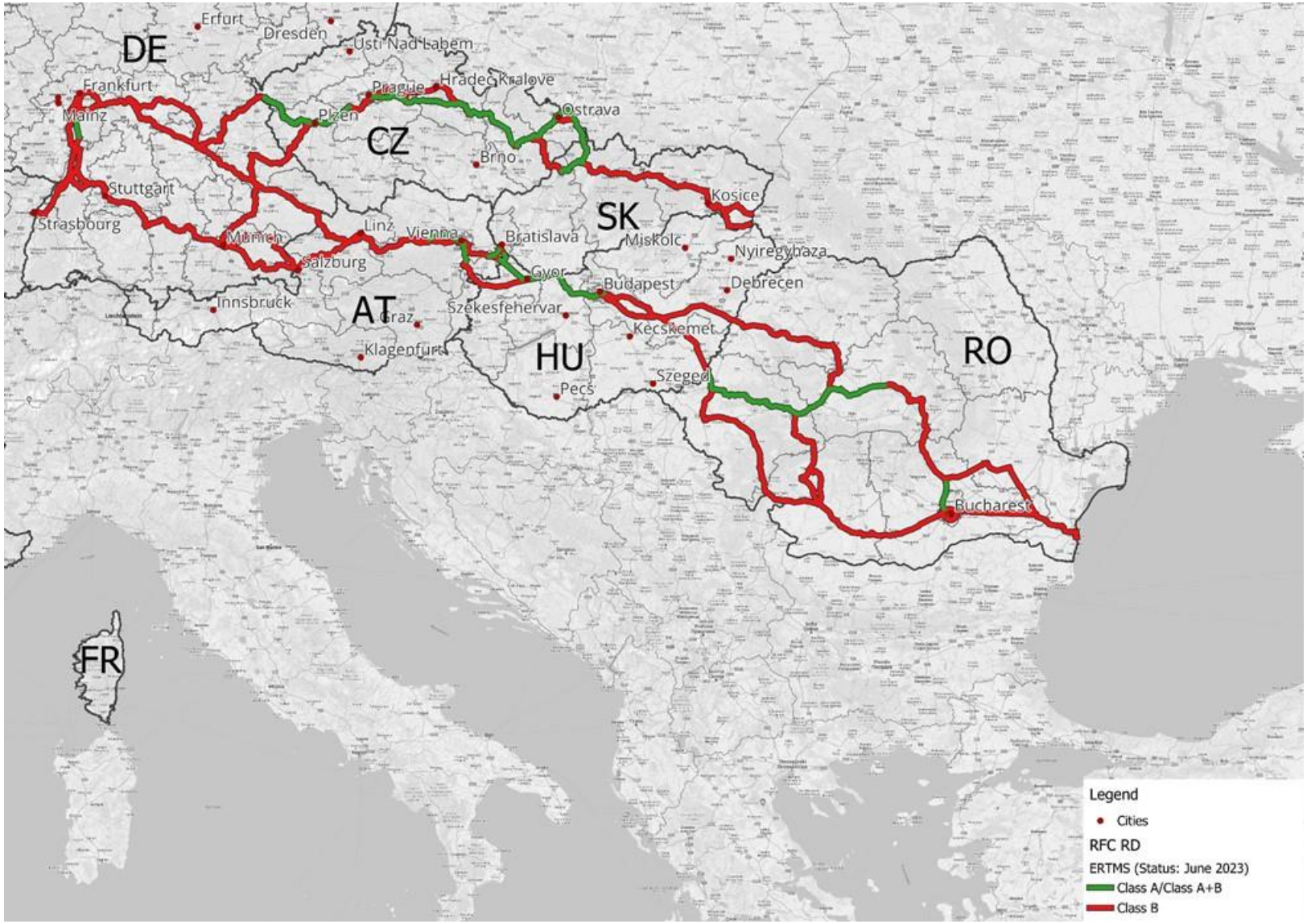
Source: Authors based on CIP

Figure 7 RFC RD - Train length



*Source: Authors based on CIP; Note: * Sections displayed in light green, also include lines where 740 meter long trains are possible to be operated based on traffic conditions and upon request*

Figure 8 RFC RD - ERTMS



Source: Authors based on CIP

2.1.5 INFRASTRUCTURE, OPERATIONAL BOTTLENECKS AND PROPOSED SOLUTIONS

The RFC RD classifies the issues which hinder smooth and competitive rail freight transport into the following categories:

- ***Infrastructure bottlenecks***: Sections which do not meet the TEN-T requirements specified in Article 39 (2a) of the Regulation (EU) No 1315/2013 of the European Parliament and of the Council;
- ***Operational bottlenecks***: Capacity and traffic management issues during the train run;
- ***Administrative bottlenecks***: Effects of non-harmonised rules and procedures;
- ***Capacity bottlenecks***: Issues in relation with capacity planning and path allocation. This includes the lack of multi-annual planning of works due to missing multi-annual financing environment.

An analysis was also recently elaborated by the RFC RD, i.e. *Capacity Improvement and Operational Bottleneck Study*. The following tables list the identified bottlenecks and proposed solutions per country.

Table 5 List of bottlenecks and proposed solutions for the RFC RD sections in Germany

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
DB InfraGO	Kehl	Appenweier	Travel time	Agreement between DE/FR to reduce travel time	ABS Kehl - Appenweier	2028	79	State budget
DB InfraGO	Wendlingen	Ulm	Capacity	More capacity for passenger and freight trains is needed in this relation	NBS Wendlingen - Ulm	2025	3959	State budget
DB InfraGO	Ulm	Augsburg	Capacity	More capacity for passenger and freight trains is needed in this relation	ABS/NBS Ulm - Augsburg	Beyond 2030	1907	State budget
DB InfraGO	Nürnberg	Schirnding	No electrification	Not electrified	ABS Nürnberg - Marktredwitz - Border DE/CZ (- Cheb)	on hold	1195	State budget
DB InfraGO	Markt Schwaben	Freilassing	Capacity	Not electrified and more capacity for freight trains is needed between Munich and AT	ABS Müchen - Mühldorf - Freilassing	Beyond 2030	2323	State budget

Source: RFC RD 2024 Implementation Plan

Table 6 List of bottlenecks and proposed solutions for the RFC RD sections in Austria

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
ÖBB Infrastruktur	Salzburg	Attnang-P.	Track length	Capacity optimization required	Attnang - Salzburg upgrade; 740m sidings in some stations	2029	160	State budget
ÖBB Infrastruktur	Salzburg	Steindorf bei Strasswalchen	2 track section on a predominant 4 track route	Timetable based capacity overload	4 track upgrade	Beyond 2030	154 (planning only)	State budget
ÖBB Infrastruktur	Wels	Linz	2 track section on a predominant 4 track route	Timetable based capacity overload	4 track upgrade	2030	1303	State budget
ÖBB Infrastruktur	Linz	Enns	Only a short 2 track section between Linz Hbf and Linz Kleinmünchen on a predominant 4 track route	Timetable based capacity overload	4 track upgrade	2032	402	State budget
ÖBB Infrastruktur	Wien	Bruck a. d. Leitha	Track length	Capacity optimization requiered	Gramatneusiedl; 740m sidings and quicker station entering/leaving	2024	86	State budget
ÖBB Infrastruktur	Wien	Bruck a. d. Leitha	Track length	Capacity optimization requiered	Himberg; 740m sidings	2027	53	State budget
ÖBB Infrastruktur	Parndorf	Kittsee	Single track line	Capacity optimization requiered	2 track upgrade	2038	215	State budget
ÖBB Infrastruktur	Wien	Ebenfurth	Handling capacity increase required	Less capacity	Wien Süd Terminal, Stage 2; handling	2025	21	State budget

					capacity increase ITE			
ÖBB Infrastruktur	Wien	Ebenfurth	Train movements in Ebenfurth necessary to reach GYSEV line	Missing connection link between Vienna and Sopron	Junction Ebenfurth	2029	229	State budget

Source: RFC RD 2024 Implementation Plan

Table 7 List of bottlenecks and proposed solutions for the RFC RD sections in Czechia

IM	Section		Bottleneck	Reasons	Suggestionshow to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
SZCZ	Praha	Česká Třebová	Line capacity consumption	5:00-20:00 capacity over 100 %	Modernisation of the line Velký Osek Kanín - Hradec Králové - Choceň, HSL project	2030	n/a	n/a
SZCZ	Velký Osek	Choceň	Capacity, max. speed 80 km/h between Újezd u Chocně – Choceň, Axle load C3 (20t) between Hradec Králové – Týniště nad Orlicí	Single track, level-crossings	Modernisation of the line Velký Osek Kanín - Hradec Králové - Choceň, HSL project	2030	n/a	n/a
SZCZ	Brodek u Přerova	Přerov	Capacity	Mutual interference of oncoming trains in the direction Olomouc -	Reconstruction of railway station Přerov	2027	n/a	n/a

IM	Section		Bottleneck	Reasons	Suggestionshow to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				Hranice na Moravě with trains Přerov - Olomouc				
SZCZ	Choceň	Uhersko	Unsatisfactory current state of the infrastructure	Unsatisfactory current state of the infrastructure	Removing selected bottlenecks on pre-identified sections on the Core Network Corridors	2031	n/a	Co-financed by the EIB
SZCZ	Lipník nad Bečvou	Drahotuše	Unsatisfactory current state of the infrastructure	Unsatisfactory current state of the infrastructure	Removing selected bottlenecks on pre-identified sections on the Core Network Corridors	2027	n/a	Co-financed by the EIB
SZCZ	Polom	Suchdol nad Odrou	Unsatisfactory current state of the infrastructure	Unsatisfactory current state of the infrastructure	Removing selected bottlenecks on pre-identified sections on the Core Network Corridors	2029	n/a	Co-financed by the EIB
SZCZ	Plzeň-Jižní Předm.	Furth im Wald/Česká Kubice	Axle load C3 (20t), not electrified, max.speed 80 km/h between Česká Kubice – st.border	n/a	Modernisation of the line Plzeň - Domažlice - Česká Kubice - st.border	2030	n/a	Co-financed by the EU
SZCZ	Poříčany	Nymburk st.3	Axle load C3 (20t), Max. speed 70	n/a	Modernisation and double track in line	2031	n/a	n/a

IM	Section		Bottleneck	Reasons	Suggestionshow to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
			km/h between Nymburk město – Nymburk st. 3		Poříčany - Nymburk (under HSR Praha-Běchovice - Poříčany project)			
SZCZ	Kolín	Pardubice	P/C 72/391	n/a	n/a	n/a	n/a	n/a
SZCZ	Hranice na Moravě	Horní Lideč/Lúky pod Makytou	P/C 67/391, max.speed <100 km/h in some segments	n/a	n/a	n/a	n/a	n/a
SZCZ	Schirnding/Cheb	Cheb	Not electrified	n/a	n/a	n/a	n/a	n/a
SZCZ	Odb Závodiště	Praha-Libeň/Praha-Běchovice	Max. speed 75-80 km/h, capacity	n/a	Doubling of the line Branický bridge - Praha-Krč - Spořilov, Doubling of the line odb. Spořilov - Praha-Zahradní Město, Modernisation of the line Praha-Libeň - Praha-Malešice	2028	n/a	n/a
SZCZ	Výh Polanka n.Odrou/Ostrava-Svinov	Ostrava-Kunčice	Max. speed 80 km/h	n/a	Optimization of line Ostrava-Svinov - Ostrava-Kunčice	2029	n/a	n/a

Source: RFC RD 2024 Implementation Plan

Table 8 List of bottlenecks and proposed solutions for the RFC RD sections in Slovakia

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
ŽSR	Žilina zr.st	Žilina	Reduced speed	Tracks	Modernisation of railway node Žilina	2025	n/a	CEF
ŽSR	Liptovský Mikuláš	Štrba	Reduced weight of the train, additional loco is required	Geological character of the landscape	Modernisation of railway line Žilina – Košice	2030	n/a	CEF
ŽSR	Štrba	Poprad-Tatry	Reduced weight of the train, additional loco is required	Geological character of the landscape	Modernisation of railway line Žilina – Košice, implementation phase Poprad-Tatry – Lučivná	2024	n/a	CEF
ŽSR	Košice	Košice nákl.st.	Reduced length of the trains	Character of the Košice nákl. st. station	n/a	Beyond 2030	n/a	n/a
ŽSR	Nižná Myšľa	Ruskov	Reduced weight of the train, additional loco is required	Geological character of the landscape	n/a	Beyond 2030	n/a	n/a
ŽSR	Ruskov	Kuzmice	Reduced weight of the train, additional loco is required	Geological character of the landscape	n/a	Beyond 2030	n/a	n/a
ŽSR	Čierna nad Tisou	Čop (UA)	Reduced Capacity	Customs inspections on the wide gauge track	Out of competence	Beyond 2030	n/a	n/a

Source: RFC RD 2024 Implementation Plan

Table 9 List of bottlenecks and proposed solutions for the RFC RD sections in Hungary

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
MÁV	Kelenföld	Ferencváros	Lack of capacity	Reconstruction, modernization of the track	Southern circle railway. In order to develop a railway connection between Kelenföld and Ferencváros stations, construction of three-tracks connection and new suburban stops	2025	n/a	Cohesion fund/IKOP
MÁV	Békéscsaba	Lőkösháza	Lack of capacity	Reconstruction, modernization of the track	Preparation of the construction of 2nd track between Békéscsaba and Lőkösháza	2025	5,23	CEF
GYSEV	Rajka	Hegyeshalom	Capacity, speed, axle load	Single track; max. 100 km/h track speed; max. 21 t axle load; track conditions deteriorating	Reconstruction, modernization of the track Preparation finished in Q4 2019, to be tendered	2028	n/a	EU (CEF, Coh. Found)
GYSEV	Sopron	Győr	Capacity, speed, axle load	Single track line; max. 100 km/h track speed; max. 21 t axle load; at least hourly regular interval commuter trains;	Reconstruction, modernization of the track Phase 0: Sopron - Harka 2nd track 2023 -2025, Phase 2B: Sopron - Harka	2027	n/a	EU (CEF, Coh. Found)

				every two hours Intercity trains; no ETCS/ERTMS	3rd track 2028 - 2033			
GYSEV	Sopron	Győr	Capacity, speed, axle load	Single track line; max. 100 km/h track speed; max. 21 t axle load; at least hourly regular interval commuter trains; every two hours Intercity trains; no ETCS/ERTMS	Reconstruction, modernization of the track Phase 2B: Sopron - Harka - Fertőboz new double track alignment	Beyond 2030	n/a	EU (CEF, Coh. Found)
GYSEV	Sopron	Győr	Capacity, speed, axle load	single track line; max. 120 km/h track speed; max. 21 t axle load; at least hourly regular interval commuter trains; every two hours InterCity trains; no ETCS/ERTMS	Reconstruction, modernization of the track Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	Beyond 2030	n/a	EU (CEF, Coh. Found)
GYSEV	Sopron	Győr	Capacity, speed, axle load	Single track line; max. 100 km/h track speed; max. 21 t axle load; at least hourly regular interval commuter trains; every two hours Intercity trains; no ETCS/ERTMS	Reconstruction, modernization of the track Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	Beyond 2030	n/a	EU (CEF, Coh. Found)

GYSEV	Sopron	Győr	Capacity, speed, axle load	Single track line; max. 100 km/h track speed; max. 21 t axle load; at least hourly regular interval commuter trains; every two hours Intercity trains; no ETCS/ERTMS	Reconstruction, modernization of the track Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	Beyond 2030	n/a	EU (CEF, Coh. Found)
GYSEV	Sopron	Győr	Capacity, speed, axle load	Single track line; max. 120 km/h track speed; max. 21 t axle load; high density of passenger trains at least hourly regular interval commuter trains; every hour Intercity trains; no ETCS/ERTMS	Reconstruction, modernization of the track Phase 1 of Győr - Sopron upgrade: prioirity project: single track, capacity problems, new 2nd track	Beyond 2030	n/a	EU (CEF, Coh. Found)

Source: RFC RD 2024 Implementation Plan

Table 10 List of bottlenecks and proposed solutions for the RFC RD sections in Romania

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
CFR	Border HU/RO	Curtici	- Rehabilitated corridor section equipped with ERTMS-ETCS Level 2/GSM-R, which is not in operation; - Long waiting time in Curtici station. - The double track open line does not continue in Hungary.	- Trains are not handed over on trust (ATTI); - The Curtici station is not fully equipped with electronic interlocking system; - The Curtici station is not equipped with an electronic gauge control gate; - The border crossing operational rules between CFR and MAV are not harmonized (e.g. the buffer wagons); - The Intergovernmental Railway Agreement Romania-Hungary is not updated (harmonization of the control performed by the state authorities); - Commissioning of ERTMS/GSM-R is under preparation.	Equipping of Curtici station with an electronic gauge control gate	Proposals	Proposals	Proposals
CFR	Border HU/RO	Curtici	- Rehabilitated corridor section	- Trains are not handed over on trust	Harmonization of the border crossing	Proposals	Proposals	Proposals

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
			equipped with ERTMS-ETCS Level 2/GSM-R, which is not in operation; - Long waiting time in Curtici station. - The double track open line does not continue in Hungary.	(ATTI); - The Curtici station is not fully equipped with electronic interlocking system; - The Curtici station is not equipped with an electronic gauge control gate; - The border crossing operational rules between CFR and MAV are not harmonized (e.g. the buffer wagons); - The Intergovernmental Railway Agreement Romania-Hungary is not updated (harmonization of the control performed by the state authorities); - Commissioning of ERTMS/GSM-R is under preparation.	operational rules between CFR and MÁV			
CFR	Border HU/RO	Curtici	- Rehabilitated corridor section equipped with ERTMS-ETCS Level 2/GSM-R, which is not in	- Trains are not handed over on trust (ATTI); - The Curtici station is not fully equipped with electronic	Updating of the Intergovernmental Railway Agreement between Romania and Hungary	Proposals	Proposals	Proposals

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
			operation; - Long waiting time in Curtici station. - The double track open line does not continue in Hungary.	interlocking system; - The Curtici station is not equipped with an electronic gauge control gate; - The border crossing operational rules between CFR and MAV are not harmonized (e.g. the buffer wagons); - The Intergovernmental Railway Agreement Romania-Hungary is not updated (harmonization of the control performed by the state authorities); - Commissioning of ERTMS/GSM-R is under preparation.				
CFR	Km 614 (Radna)	Simeria	Corridor section under rehabilitation, with ERTMS-ETCS Level 2/GSM-R under construction.	Rehabilitation of the railway line Border – Curtici – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h: Section 2: km 614 - Gurasada	Rehabilitation of Km 614 (Radna) - Simeria line section at corridor level	2025	1965,12 (Eligible costs are only for works)	LIOP 2014-2020 (Cohesion Funds) + State Budget

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				and Section 3: Gurasada - Simeria - The rehabilitation works are under execution; - Maximum train length (632 m - Deva station).				
CFR	Sighișoara	Brașov	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	Rehabilitation of the railway line Brașov – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h, Section Sighișoara - Brașov - The rehabilitation works are in the tendering/awarding stage; - Maximum train length (600 m); - Speed restrictions.	Rehabilitation of Sighișoara - Brașov line section at corridor level	2025	1285,81 (Eligible costs are only for works)	CEF (Cohesion Funds) + State Budget
CFR	Brașov	Predeal	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	Feasibility Study for the modernization of the railway infrastructure Predeal - Brașov - Maximum train length (640 m);	Rehabilitation of Brașov - Predeal line section at corridor level	2024	1046 (Eligible costs are estimated for works. The FS cost is 25,8 mil euro)	CEF (Cohesion Funds) + State Budget - for the feasibility study

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				- Maximum tonnage permitted on the line section; - Traffic restrictions for oversized transports due to existing tunnels.				TP 2021-2027 (Cohesion Funds) + State Budget - for works
CFR	Predeal	Constanța	Rehabilitated corridor section equipped with ERTMS-ETCS Level 1/GSM-R, which is not in operation.	Implementation of the measures necessary for the operation of the ERTMS system on the Predeal-Bucuresti-Constanța railway section and the extension of the GSM-R system on the primary railway transport network" - Feasibility study - The Feasibility Study for solution of commissioning ERTMS/GSM-R on Predeal-București-Constanța line section is on going; - Scarce capacity on Ploiești Triaj - Brazi line section; - Tonnage restrictions	Commissioning the ERTMS/GSM-R (ETCS Level 1 or possible migration to ETCS Level 2) on Predeal - București - Constanța line section	2028	200 (Costs are estimated for works. The FS cost is 0,89 mil euro)	LIOP 2014-2020 (Cohesion Funds) + State Budget - for the feasibility study Unidentified financing source for works

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				on Fetești - Saligny (2.200 t).				
CFR	Arad	Timișoara	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	Modernization of the railway line section Arad - Caransebeș - Detailed designs for works for the line rehabilitation (Lot Arad - Ronaț and Lot Ronaț - Timișoara Est) are ongoing - Single track line; - Speed restrictions.	Rehabilitation of Arad - Timișoara line section at corridor level	2026	681,85	NRRP + State Budget
CFR	Timișoara	Caransebeș	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	Modernization of the railway line section Arad - Caransebeș - Detailed design works for the line rehabilitation (lot Timisoara Est - Lugoj) is on going and 1 lot Lugoj - Caransebeș is in procurement phase; - Single-track line; - Speed restrictions.	Rehabilitation of Timișoara - Caransebeș line section at corridor level	2026	736,87	NRRP + State Budget
CFR	Caransebeș	Craiova	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	Rehabilitation of the railway line section Caransebeș - Craiova - Works are in procurement phase - Single track line	Rehabilitation of Caransebeș - Craiova line section at corridor level	2026	2188,36	TP + State Budget

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				(Caransebeș - Strehaia); - Speed restrictions; - Tonnage restrictions (Balota 1.000 t).				
CFR	Craiova	București (Pajura Hm) (Pajura Hm)	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The works contracts for removal of speed restrictions in punctual sections are on going; - Speed restrictions; - Track I closed on Malu Mare - Banu Mărăcine line section for rehabilitation works.	Removal of the speed restrictions on Craiova - București (Pajura Hm) line section	2026	85,48682563	NRPP
CFR	Craiova	București (Pajura Hm) (Pajura Hm)	Corridor section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The Feasibility Stady for rehabilitation is under elaboration; - Speed restrictions.	Rehabilitation of Craiova - București (Hm Pajura) line section at corridor level	2025	836 (Is an estimated cost for works)	CEF + State Budget
CFR	Ploiești Triaj	Buzău	Line section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The contract for the Feasibility study of the railway line Ploiesti - Buzău - Focșani is ongoing. Project preparation on going - Maximum train length permitted on the line section (Valea	Rehabilitation of Ploiești Triaj - Buzău - Focșani line section	2023	1612,55	Cohesion funds + State Budget

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
				Călugărească - Buzău 650 m).				
CFR	Buzău	Fetești	Line section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The project for rehabilitation has not been promoted yet; - Speed limitations and restrictions; - Maximum train length permitted on the line section (540 m).	Rehabilitation of Buzău - Fetești line section	2029	516	n/a
CFR	Simeria	Filiași	Line section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The works contracts for removal of speed restrictions in punctual sections are on going; - Single track line (Livezeni - Tg. Jiu); - Maximum train length permitted on the line section (600 m); - Tonnage restrictions (Tg, Cărbunești 2.000 t).	Rehabilitation of Simeria - Petroșani - Filiași line section	2026	11,3563969	NRPP
CFR	Coșlariu/Pod Mureș	Cluj	Line section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- The Feasibility Stady for rehabilitation is under elaboration.	Rehabilitation of Coșlariu/Pod Mureș - Teiuș - Cluj line section	2029	562 (Costs are estimated for works. The FS cost is 22,93 mil euro)	CEF (Cohesion Funds) + State Budget - for the feasibility study

IM	Section		Bottleneck	Reasons	Suggestions how to Remove Bottlenecks			
	From	To			Project Name and Description	End Date	Costs in mil. of Euro	Financial Sources
								unidentified financing sources - for works
CFR	Cluj	Border RO/HU	- Line section not rehabilitated and without ERTMS-ETCS Level 2/GSM-R.	- Detailed design for works for the line rehabilitation are in the tenders evaluation stage; - Single track line (Poieni - Aleșd); - Diesel traction (non-electrified line); - Stations equipped with SBW systems; - Lack of Automatic Block System in the open line.	Rehabilitation of Cluj - Episcopia Bihor - Border RO/HU line section	2026	1561,47 (costs are only for works)	NRRP + State Budget

Source: RFC RD 2024 Implementation Plan

2.1.6 ONGOING AND PLANNED PROJECTS

RFC RD updated its Implementation Plan and published it by the beginning of 2024, which includes a detailed list of investments foreseen for the development, modernisation, upgrade, and renewal of the railway infrastructure along the entire RFC. Such investments will be particularly useful to solve infrastructure bottlenecks primarily related to the interoperability issues described in the previous section, which on some sections of the RFC, particularly in Slovakia, Hungary and Romania also affect the capacity of the lines.

In addition to interoperability issues, the RFC is affected by congestion problems at some sections in Romania, which are listed in the table below. Congested infrastructure is declared by the concerned IMs according to the definition provided in Art. 47 of Directive 2012/34/EU.

Table 11 RFC RD congested sections in Romania

Section From	Section To
Vinţu de Jos	Coşlariu
Micăsasa	Coşlariu
Vinţu de Jos	Simeria
Simeria	Glogovăţ
Braşov	Sighişoara

The tables overleaf include the list of ongoing and planned investments on the RFC RD infrastructure.

ERTMS deployment

The list of ongoing and planned investments also includes ERTMS projects, as the basis of the RFC RD ERTMS deployment plan described in Section 6.3 of the RFC RD 2024 Implementation Plan and related annexes.

Table 12 List of projects in Germany

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters							
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Planned	DB InfraGO	Kehl	Appenweier	Principal line	ABS Kehl - Appenweier	ETCS Implementation	Speed increase	n/a	n/a	n/a	2028	79	state budget	160	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Under Construction	DB InfraGO	Karlsruhe	Offenburg	Principal line	Line upgrade / new line Karlsruhe – Basel (StA 1)	Other	Construction of a new tunnel near Rastatt incl. ETCS	n/a	n/a	n/a	2025	1332	state budget	200	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Mannheim	Karlsruhe	Principal line	New line / Line upgrade Mannheim – Karlsruhe	Other	New construction of 2 new tracks	n/a	n/a	n/a	Beyond 2030	open	state budget	300	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Frankfurt	Mannheim	Diversionary line	New line Frankfurt - Mannheim	Other	New line	n/a	n/a	n/a	Beyond 2030	2183	state budget	250	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Under Construction	DB InfraGO	Wendlingen	Ulm	Principal line	NBS Wendlingen - Ulm	Other	New construction of this line increases capacity on the existing freight traffic line between Stuttgart and Ulm	n/a	n/a	n/a	2026	3959	state budget	250	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Ulm	Augsburg	Principal line	ABS/NBS Ulm - Augsburg	Other	Partly new construction	n/a	n/a	n/a	Beyond 2030	1907	state budget	250	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Nürnberg	Schirnding	Principal line	ABS Nürnberg - Marktredwitz - Border DE/CZ (- Cheb)	Electrification	n/a	n/a	n/a	n/a	on hold	1195	state budget	160	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Markt Schwaben	Freilassing	Diversionary line	ABS Müchen - Mühldorf - Freilassing	Electrification	Double tracks	n/a	n/a	n/a	Beyond 2030	2323	state budget	160	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	München - Trudering	Rosenheim	Principal line	München - Rosenheim (- Kiefersfelden - Border DE/AT)	Other	Partly 2 new tracks	n/a	n/a	n/a	Beyond 2030	open	state budget	250	22,5	740	Electrified	Level 2	1435 mm	P/C 410/80
Under Construction	DB InfraGO	dto.	dto.	Principal line	740 m-program	Other	Single projects to increase capacity on the Corridor	n/a	n/a	n/a	Should be mainly completed until 2030	839	state budget	n/a	n/a	740	n/a	n/a	n/a	n/a
Planned	DB InfraGO	Siegelsdorf	Fürth	Principal line	ABS Burgsinn – Gemünden – Würzburg – Nürnberg	Other	Third track between Siegeldorf - Fürth	n/a	n/a	n/a	Beyond 2030	223	BVWP	n/a	22,5	740	n/a	Level 2	1435 mm	P/C 410/80
Planned	DB InfraGO	Regensburg	Grenze D/CZ	Principal line	ABS Nürnberg – Schwandorf/München – Regensburg – Furth im Wald – Grenze D/CZ	Electrification	Speed increase	n/a	n/a	n/a	Beyond 2030	706	BVWP	160	22,5	740	n/a	Level 2	1435 mm	P/C 410/80

Source: RFC RD 2024 Implementation Plan

Table 13 List of projects in Austria

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Under construction	ÖBB Infrastruktur	Salzburg	Steindorf bei Strasswalchen	Principal line	Attnang-P. - Salzburg; upgrade	740m sidings in some stations	Capacity raise	n/a	n/a	n/a	2029	160	State budget	160	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
planned	ÖBB Infrastruktur	Steindorf bei Strasswalchen	Attnang-P.	Principal line	Neumarkt K. - Salzburg; 4 track upgrade; (planning only)	reconstruction, modernization of the track	Speed raise, capacity raise	n/a	n/a	n/a	Beyond 2030	154 (planning only)	State budget	250	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
Under construction	ÖBB Infrastruktur	Wels	Linz	Principal line	Wels Terminal	Train formation yard redesign	n/a	n/a	n/a	n/a	2027	47	State budget	n/a	n/a	n/a	n/a	n/a	GA, G1, G2	n/a
Under construction	ÖBB Infrastruktur	Wels	Linz	Principal line	Linz - Wels; 4 track upgrade	reconstruction, modernization of the track	Speed raise, capacity raise	n/a	n/a	n/a	2030	1303	State budget	230	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
Under construction	ÖBB Infrastruktur	Linz	Enns	Principal line	Linz Kleinmünchen - Linz Hbf; 4 track upgrade	reconstruction, modernization of the track	Capacity raise	n/a	n/a	n/a	2032	402	State budget	160	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
Under construction	ÖBB Infrastruktur	Wien	Bruck a. d. Leitha	Principal line	Gramatneusiedl; station upgrade	740m sidings, station entering and leaving faster	Capacity raise	n/a	n/a	n/a	2024	86	State budget	140	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
Under construction	ÖBB Infrastruktur	Wien	Bruck a. d. Leitha	Principal line	Himberg; station upgrade	740m sidings	Capacity raise	n/a	n/a	n/a	2027	53	State budget	140	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
planned	ÖBB Infrastruktur	Parndorf	Kittsee	Principal line	2 track upgrade	Double track upgrade	Capacity raise	n/a	n/a	n/a	2038	215	State budget	160	22,5 / D4	740	15 kV AC	Level 2	GA, G1, G2	P/C 80/410
planned	ÖBB Infrastruktur	Wien	Ebenfurth	Principal line	Junction Ebenfurth	Bypass	Connection optimization	n/a	n/a	n/a	2029	229	State budget	100	22,5 / D4	740	15 kV AC	Level 2	n/a	P/C 80/410

Source: RFC RD 2024 Implementation Plan

Table 14 List of projects in Czechia

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Estimated Financial Requirements [mil. of EUR]	Financial Sources	Reached parameters						
		From	To					Month	Year	Month	Year			Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Planned	SZCZ	Praha-Libeň	Praha-Hostivař	Principal line	Modernisation of the line Praha-Libeň - Praha-Malešice, Doubling of track Praha-Malešice – Praha-Hostivař	Reconstruction, modernization of the track	Line modernisation, construction of a 2nd track and of a new tunnel, which will allow a higher capacity.	n/a	2025	n/a	2028	n/a	n/a	61-80	D3	695	3 kV DC	-	GC	P/C 80/410
Under construction	SZCZ	Odb Tunel (Praha-Radotín)	Beroun	Principal line	New double-track line Praha-Smíchov - Beroun	Reconstruction, modernization of the track	Construction of a new double-track line and a 24,7km long tunnel that will also be connected to HSL in the future.	n/a	2028	n/a	2035	n/a	n/a	61-80	D3	680	3 kV DC	-	GC	P/C 78/402
Planned	SZCZ	Ejpovice	Plzeň	Principal line	Higher speed in line Ejpovice (except) - Plzeň (except)	Reconstruction, modernization of the track	Modification of traction and interlocking equipment,	n/a	2027	n/a	2027	n/a	n/a	>120	D4	700	25 kV AC	-	GC	P/C 78/402

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Estimated Financial Requirements [mil. of EUR]	Financial Sources	Reached parameters						Interm. Code
		From	To					Month	Year	Month	Year			Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	
							higher max.speed.													
Planned	SZCZ	Plzeň	Česká Kubice - st.border	Principal line	Modernisation of the line Plzeň - Domažlice - Česká Kubice - st.border	Reconstruction, modernization of the track	The existing line will be optimized and electrified. The current lines Stod - Holýšov and Blížejov - Domažlice will be replaced by a new double-track line counting with max. speed 200 km/h.	n/a	2024	n/a	2030	n/a	Co-financed by the EU	61-80	C3	660	-	-	GC	P/C 78/402
Under construction	SZCZ	Praha Vysočany	Čelákovice	Diversionary line	Optimization of line Praha Vysočany – Mstětice – Čelákovice	Reconstruction, modernization of the track	The project will improve technologic state of the line and therefor max. speed.	n/a	2020	n/a	2025	n/a	Co-financed by the EU	81-100	D3	729	3 kV DC	-	GC	P/C 80/410
Planned	SZCZ	Lysá nad Labem	Kolín	Diversionary line	Modernisation of the line Kolín - Všetaty - Děčín (Kolín - Nymburk hl.n. - Lysá nad Labem - Mělník)	Reconstruction, modernization of the track	Complex line reconstruction will include a construction of 3rd track between Libice nad Cidlinou and Odb. Babín, Nymburk hl.n. and Lysá nad Labem, and Všetaty and Mělník, a prolongation of tracks for freight trains of 740m in some stations, and a construction of direct connection to Hradec Králové.	n/a	2025	n/a	2033	n/a	n/a	101-120	D4	680	3 kV DC	-	GC	P/C 80/410
Planned	SZCZ	Poříčany	Nymburk	Diversionary line	Modernisation and double track in line Poříčany - Nymburk (under HSR Praha-Běchovice - Poříčany project)	Reconstruction, modernization of the track	2nd track will be constructed between Poříčany and Nymburk.	n/a	2026	n/a	2031	n/a	n/a	81-100	C3	689	3 kV DC	-	GC	P/C 80/410
Planned	SZCZ	Velký Osek-Kanín	Choceň	Diversionary line	Modernisation of the line Kanín - Chlumec nad Cidlinou - Hradec Králové - Týniště nad Orlicí - Choceň	Reconstruction, modernization of the track	Diversionary line between Velký Osek and Choceň is a single-track line. A second track will be constructed, 5 level-crossings will be	n/a	2026	n/a	2030	n/a	n/a	61-80	C3	680	3 kV DC	Level 2	GC	P/C 80/410

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Estimated Financial Requirements [mil. of EUR]	Financial Sources	Reached parameters						Interm. Code
		From	To					Month	Year	Month	Year			Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	
							replaced by alternatives. This will allow higher capacity and higher max. speed.													
Planned	SZCZ	Choceň	Ústí nad Orlicí	Principal line	Construction of a new line Choceň - Ústí nad Orlicí	Reconstruction, modernization of the track	Construction of a new line between Choceň and Ústí nad Orlicí parallel to the existing line in order to increase capacity. The line will be shorter and counts with max. speed 200 km/h.	n/a	2030	n/a	2034	n/a	n/a	>120	D4	700	3 kV DC	Level 2	GC	P/C 80/410
Under construction	SZCZ	Pardubice	Pardubice	Principal line	Modernisation of the Pardubice railway junction	Reconstruction, modernization of the track	The project's scope is mainly an increase of max. speed up to 160 km/h and an improvement of conditions for passage of 740 m long trains. Traction, signalling and interlocking equipment will be modernized.	n/a	2020	n/a	2024	n/a	Co-financed by the EU	>120	D4	700	3 kV DC	-	GC	P/C 80/410
Under construction	SZCZ	Pardubice	Choceň	Principal line	Reconstruction of the line Pardubice - Uhersko - Choceň	Reconstruction, modernization of the track	Max. speed will increase up to 200 km/h.	n/a	2029	n/a	2034	n/a	n/a	>120	D4	700	3 kV DC	Level 2	GC	P/C 80/410
Planned	SZCZ	Česká Třebová	Česká Třebová	Principal line	Modernisation of the Česká Třebová railway junction	Reconstruction, modernization of the track	The project will allow an increase of the max. speed, traction and signalling and interlocking equipment will be reconstructed.	n/a	2024	n/a	2031	n/a	n/a	<=60	D4	678	3 kV DC	Level 2	GC	P/C 80/410
Planned	SZCZ	Brodek u Přerova	Výh. Dluhonice	Principal line	Reconstruction of railway station Přerov	Reconstruction, modernization of the track	An off-grade crossing will eliminate mutual interference of oncoming trains in the direction Olomouc - Hranice na Moravě with trains Přerov - Olomouc.	n/a	2025	n/a	2027	n/a	n/a	>120	D4	700	3 kV DC	Level 2	GC	P/C 80/410

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Estimated Financial Requirements [mil. of EUR]	Financial Sources	Reached parameters						Interm. Code
		From	To					Month	Year	Month	Year			Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	
Planned	SZCZ	Ostrava-Svinov	Ostrava-Kunčice	Principal line	Optimization of line Ostrava-Svinov - Ostrava-Kunčice	Reconstruction, modernization of the track	Max. speed will increase up to 120 km/h.	n/a	2026	n/a	2029	n/a	n/a	120	D4	700	3 kV DC	-	GB,GC	P/C 80/410
Planned	SZCZ	Ostrava-hl.n.	Ostrava-Svinov	Principal line	Modernization of the Ostrava railway junction	Reconstruction, modernization of the track	Complex line reconstruction, 3rd track between Ostrava hl.n. and Ostrava-Svinov, a new crossing → higher capacity.	n/a	2028	n/a	2034	n/a	n/a	>120	D4	700	3 kV DC	Level 2	GC	P/C 80/410
Planned	SZCZ	Havířov	Český Těšín	Principal line	Optimization of line Havířov -Albrechtice u Českého Těšína - Český Těšín	Reconstruction, modernization of the track	Complex line modernisation, max. speed will increase up to 140 km/h between Albrechtice u Českého Těšína and Český Těšín.	n/a	2023	n/a	2030	n/a	n/a	140	D4	700	3 kV DC	-	GB	P/C 80/410
Planned	SZCZ	Praha-Vysočany	Lysá nad Labem	Diversionary line	ETCS Milovice - Praha hl.n.	ETCS Implementation	ETCS deployment in line Milovice - Lysá nad Labem - Praha-Vysočany - Praha hl.n.	n/a	2024	n/a	2026	n/a	Co-financed by the EU	81-100	D3	729	3 kV DC	-	GC	P/C 80/410

Source: RFC RD 2024 Implementation Plan

Table 15 List of projects in Slovakia

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Estimated Financial Requirements [mil. of EUR]	Financial Sources	Reached parameters						Interm. Code
		From	To					Month	Year	Month	Year			Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	
Planned	ŽSR	Čadca	Krásno nad Kysucou (outside)	Principal line	Modernisation of railway corridor State border CZ/SK – Čadca – Krásno nad Kysucou, section Čadca - Krásno nad Kysucou (outside)	Modernization - project documentation phase	n/a	1	2022	3	2025	n/a	n/a	140	22,5	740	25 kV AC	Level 2	n/a	P/C 70/400
Under construction	ŽSR	Čadca	Krásno nad Kysucou (outside)	Principal line	Modernisation of railway corridor State border CZ/SK – Čadca – Krásno nad Kysucou, section CZ/SK border - Svrčinovec	Modernization	n/a	03	2022	12	2029	65	EU funds	Up to 160	22,5	740	25 kV AC	Level 2	n/a	P/C 70/400
Planned	ŽSR	Bratislava	Bratislava	Principal line	Rail Node Bratislava - Works	Reconstruction, modernization of the track	Complex solution for rail node Bratislava	1	2026	12	Beyond 2030	TBD	n/a	n/a	n/a	n/a	n/a	n/a	n/a	P/C 70/400

Under construction	ŽSR	Žilina	Čierna nad Tisou	Principal line	GSM-R Implementation	GSM-R	Improving parameters		2017		2025	30	EU funds	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Under construction	ŽSR	Žilina zr.st	Varín	Principal line	Žilina Node	Modernization	Improving parameters		2020		2025	300	EU funds	160	22,5	740	25 kV AC	Level2	n/a	P/C 70/400
Under construction	ŽSR	Poprad-Tatry	Vydrník	Principal line	Modernisation of section Žilina - Košice	Implementation phase Poprad-Tatry - Vydrník	Modernisation		2024		2027	368	EU funds	160	22,5	740		Level 2	n/a	P/C 70/400

Source: RFC RD 2024 Implementation Plan

Table 16 List of projects in Hungary

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Under preparation	MÁV	Almásfűzítő	Komárom	Principal line	Elimination of bottlenecks on the MÁV network. Almásfüzitő - Komárom railway line section. Implementation project.	160 km/h speed and 225 kN axle load on the whole line section (including curve correction at Szőny). Upgrading of passenger service facilities. Upgrading of catenary, power and interlocking system.	Preparation is in progress. The date of implementation is an estimation, it depends on the availability of EU funding.	01	2025	12	2026	N.A	Cohesion fund/CEF	160	22,5	750	25 kV, 50 Hz	Level 1	GC	P/C 80/410
Under Construction	MÁV	Kelenföld	Budaörs	Principal line	Preparing for elimination of bottlenecks on the MÁV network. Kelenföld - Budaörs railway line section. Preparatory project.	Construction of tracks 3 and 4 between Kelenföld and Törökbálint stations, reconstruction and modernisation of passenger service facilities, construction of new platforms at Kelenföld station, design of a new connecting track to the railway line to Kelenföld station - Déli pu., construction of a new stop: Budaörs-Szilvás (IMCS)	Preparation is in progress	2	2020	12	2024	N.A	Cohesion fund/IKOP	120/140	22,5	750	25 kV, 50 Hz	Level 1	GC	P/C 80/410
Under Construction	MÁV	Szajol	Debrecen	Principal line	ETCS 2 installation between Szajol and Debrecen. Implementing project.	Implementation of ETCS L2 system.	Ongoing	10	2019	12	2024	N.A	Cohesion fund/IKOP	160	22,5	750	25 kV, 50 Hz	Level 2	GC	P/C 80/410
Under Construction	MÁV	Kelenföld	Ferencváros	Principal line	Southern Circular Railway project. Construction of a third track, safety equipment and	Construction of a third track between Kelenföld and Ferencváros	Ongoing	12	2021	12	2027	N.A	CEF	80	22,5	750	25 kV, 50 Hz	Level 2	GC	P/C 80/410

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
					overhead line upgrades. Implementation project.	stations. Design of the Közvágóhíd and Nádorkert stations, design of a four-track section on the Buda side (one section length), covering all kind of profesional works.														
Under Construction	MÁV	Püspöladány	Biharkeresztes border	Diversionary line	Elimination of bottlenecks and electrification. Implementing project.	Electrification, new signallng and KÖFI system. Track construction on the section Püspökladány (incl.) - Berettyóújfalu (exl.) (additional section rebuilt by MÁV)	Ongoing	9	2020	12	2023	185,4	Cohesion fund/IKOP	160	22,5	750	25 kV, 50 Hz	N.A	GC	P/C 80/410
Under Construction	MÁV	Nagykáta	Újszász	Principal line	Nagykáta - Újszász railway track section. Preparatory project.	Reconstruction, modernization of the track. 120 km/h speed, axle load increase, sub- and superstructure renewal, catenary and power supply system upgrades;	Completed	7	2020	6	2023	N.A	Cohesion fund/IKOP	120	22,5	750	25 kV, 50 Hz	N.A	GC	P/C 80/410
Under Construction	MÁV	Gyoma	Békéscsaba	Principal line	Gyoma (excl.) - Békéscsaba (incl.) railway line section, signaling and telecommunication works and installation of ETCS system. Implementing project.	Modernisation of signaling system between Gyoma and Békéscsaba and Békéscsaba railway station, installation of Ferencváros - Lőkösháza ETCS L2 - phased project	Under construction	10	2013	12	2023	51,4	Cohesion fund/IKOP	120	22,5	750	25 kV, 50 Hz	Level 2	GC	P/C 80/410
Under Construction	MÁV	Békéscsaba	Lökösháza	Principal line	Contruction of 2nd track between Békéscsaba and Lőkösháza, upgrading the signaling and catenary system. Implementing project.	225 kN axle load, speed of 160 km/h, upgrading of the entire catenary and power supply system, two stations renewal with barrier-free access, ETCS L2 deployment.	Preparation is in progress	9	2021	6	2025	5,23	CEF	160	22,5	750	25 kV, 50 Hz	Level 2	GC	P/C 80/410
planned	GYSEV	Rajka s.b.	Hegyeshalom	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	CEF 2 proposal under evaluation	n/a	2026	n/a	2028	n/a	EU (CEF, Coh. Found)	100/120	22,5	750	25 kV AC	Level 1	n/a	P/C 70/400

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
planned	GYSEV	Sopron-Rendező	Harka	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 0: Sopron - Harka 2nd track 2025 -2027	n/a	n/a	n/a	n/a	n/a	EU (CEF, Coh. Found)	80/100	22,5	750	25 kV AC	n/a	n/a	P/C 70/400
planned	GYSEV	Harka	Pinnye	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 2B: Sopron - Harka - Fertőboz new double track alignment	n/a	n/a	n/a	Beyond 2030	n/a	EU (CEF, Coh. Found)	160	22,5	750	25 kV AC	Level 2	n/a	P/C 70/400
planned	GYSEV	Pinnye	Fertőszentmiklós	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	n/a	n/a	n/a	Beyond 2030	n/a	EU (CEF, Coh. Found)	160	22,5	750	25 kV AC	Level 2	n/a	P/C 70/400
planned	GYSEV	Fertőszentmiklós	Petőháza	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	n/a	n/a	n/a	Beyond 2030	n/a	EU (CEF, Coh. Found)	160	22,5	750	25 kV AC	Level 2	n/a	P/C 70/400
planned	GYSEV	Petőháza	Csorna	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 2A: (Fertőboz) - Pinnye - Csorna partially double track	n/a	n/a	n/a	Beyond 2030	n/a	EU (CEF, Coh. Found)	160	22,5	750	25 kV AC	Level 2	n/a	P/C 70/400
planned	GYSEV	Csorna	Győr	Principal line	Modernization, upgrade of railway infrastructure	Reconstruction, modernization of the track	Phase 1 of Győr - Sopron upgrade: prioirity project: single track, capacity problems, new 2nd track	n/a	n/a	n/a	Beyond 2030	n/a	EU (CEF, Coh. Found)	160	22,5	750	25 kV AC	Level 2	n/a	P/C 70/400
Under construction	GYSEV	Sopron	Győr	Principal line	Modernization, upgrade of railway infrastructure	GSM-R implementation	Phase II of Hungarian GSM-R network	n/a	n/a	n/a	n/a	n/a	EU	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source: RFC RD 2024 Implementation Plan

Table 17 List of projects in Romania

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Under construction	CFR	Km 614 (Radna)	Bârzava	Principal line	Rehabilitation of the railway line Border – Curtici – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h: Section 2: km 614 - Gurasada and Section 3: Gurasada - Simeria	Modernization of the existing conventional electrified double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Works for infrastructure and suprastructure	7	2017	4	2024	434,45	LIOP 2014-2020 (Cohesion Funds) + State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Bârzava	Ilteu	Principal line	Rehabilitation of the railway line Border – Curtici – Simeria, component part of the IV	Modernization of the existing conventional electrified double track for increased speed;	Works for infrastructure and suprastructure	7	2017	5	2025	453,35	LIOP 2014-2020 (Cohesion Funds) + State Budget	120 km/h for freight trains and 160 km/h for	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
					European corridor for the trains circulation with a maximum speed of 160 km/h: Section 2: km 614 - Gurasada and Section 3: Gurasada - Simeria	Implementation of electronic interlocking, ETCS-Level 2 and GSM-R								passenger trains							
Under construction	CFR	Ilteu	Gurasada	Principal line	Rehabilitation of the railway line Border – Curtici – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h: Section 2: km 614 - Gurasada and Section 3: Gurasada - Simeria	Modernization of the existing conventional electrified double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Works for infrastructure and suprastructure	12	2017	9	2025	403,20	LIOP 2014-2020 (Cohesion Funds) + State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Gurasada	Simeria	Principal line	Rehabilitation of the railway line Border – Curtici – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h: Section 2: km 614 - Gurasada and Section 3: Gurasada - Simeria	Modernization of the existing conventional electrified double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Works for infrastructure and suprastructure	9	2017	1	2024	674,13	LIOP 2014-2020 (Cohesion Funds) + State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Sighișoara	Cața	Principal line	Rehabilitation of the railway line Brașov – Simeria, component part of the IV European corridor for the trains circulation with a maximum speed of 160 km/h, Section Sighișoara - Brașov	Modernization of the existing conventional electrified double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Works for infrastructure and suprastructure	4	2020	12	2025	676,62	CEF (Cohesion Funds)+ State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Apața	Brașov	Principal line																
Under construction	CFR	Cața	Apața	Principal line	Rehabilitation of the railway line Brașov – Simeria, component part of the IV European corridor for the trains circulation with a maximum	Modernization of the existing conventional electrified double track for increased speed; Implementation of electronic interlocking,	Works for infrastructure and suprastructure	11	2020	12	2025	609,19	CEF (Cohesion Funds)+ State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
					speed of 160 km/h, Section Sighișoara - Brașov	ETCS-Level 2 and GSM-R														
Under tendering	CFR	Constanța	Constanța Port	Principal line	Modernization of the railway infrastructure in Constanța Port - stage I, Valu lui Traian	Modernization of the railway infrastructure in Valu lui Traian Marshalling Yard and in the related railway station, including infrastructure modernization, electrification, introducing the centralized electronic signalization and other auxiliary works	The works are in procurement phase.	n/a	n/a	n/a	n/a	86,97	CEF (Cohesion Funds)+ State Budget	100 km/h for freight trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Constanța	Constanța Port	Principal line	Modernization of the railway infrastructure in Constanța Port - stage II	Improving the local railway connections of the Port of Constanta, consisting of: o Valu lui Traian - Palas connection line, including crossing bridge; o Doubling the access line to Constanta Port Ferry Boat; o Modernization of the railway station related to Agigea Lock on Danube-Black Sea Channel.	The application for financing investment is under evaluation phase at CINEA.	n/a	n/a	n/a	n/a	189,52	CEF + State Budget (proposal under evaluation)	100 km/h for freight trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/376
Under construction	CFR	Constanța	Constanța Port	Principal line	Modernization of the railway infrastructure in Constanța Port - stage III	Modernization of the line device in the Constanța Port Zone A, Constanța Port Zone B, Constanța Port Mol V, Constanța Port Ferry Boat stations, access line to Constanța Port Ferry Boat, Agigea Sud station	Is under preparation the application for financing the investment	n/a	n/a	n/a	n/a	695,00	CEF (Cohesion Funds) + State Budget (to be proposed)	100 km/h for freight trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/377
Under construction	CFR	Arad	Rontaț Marshalling Yard	Principal line	Modernization of the railway line section Arad - Caransebeș	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	12	2022	12	2026	292,29	NRRP+State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
Under construction	CFR	Rontaț Marshalling Yard	Timișoara Est	Principal line	Modernization of the railway line section Arad - Caransebeș	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	12	2022	12	2026	389,56	NRRP+State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Timișoara Est	Lugoj	Principal line	Modernization of the railway line section Arad - Caransebeș	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	12	2022	12	2026	292,84	NRRP+State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under tendering	CFR	Lugoj	Caransebeș	Principal line	Modernization of the railway line section Arad - Caransebeș	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	The contract for design and works execution is under re-evaluation phase (the procurement procedure was contested)	n/a	n/a	12	2026	444,04	NRRP+State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
In procurement	CFR	Caransebeș	Craiova	Principal line	Rehabilitation of the railway line section Caransebeș - Craiova	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	The tender documentation for the acquisition of works is in preparation.	12	2023	12	2030	2188,36	TP 2021-2027 (Cohesion Funds) + State Budget	120 km/h for freight trains and 160 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GB + GC	P/C 45/375
Under construction	CFR	Cluj-Napoca	Aghireș	Diversionary line	Electrification and rehabilitation of the railway line section Cluj - Oradea - Episcopia Bihor - Border RO/HU	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	1	2023	12	2026	327,61	NRRP + State Budget	80 km/h for freight trains and 120 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Aghireș	Poieni	Diversionary line	Electrification and rehabilitation of the railway line section Cluj - Oradea - Episcopia Bihor - Border RO/HU	Modernization of the existing conventional electrified single/double track for increased speed; Implementation	Detailed design under preparation. After its approval works will start	1	2023	12	2026	312,10	NRRP + State Budget	80 km/h for freight trains and 120 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375

Status	IM	Section		Category	Project name	Specification	Note	Start		End		Reached parameters								
		From	To					Month	Year	Month	Year	Estimated Financial Requirements [mil. of EUR]	Financial Sources	Maximum speed [km*h-1]	Axle load [t] / Line category	Maximum Train Length [m]	Traction power	ETCS Level	Track clearance	Interm. Code
						of electronic interlocking, ETCS-Level 2 and GSM-R														
Under construction	CFR	Poieni	Aleșd	Diversionary line	Electrification and rehabilitation of the railway line section Cluj - Oradea - Episcopia Bihor - Border RO/HU	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	1	2023	12	2026	430,41	NRRP + State Budget	80 km/h for freight trains and 120 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Aleșd	Border RO/HU	Diversionary line	Electrification and rehabilitation of the railway line section Cluj - Oradea - Episcopia Bihor - Border RO/HU	Modernization of the existing conventional electrified single/double track for increased speed; Implementation of electronic interlocking, ETCS-Level 2 and GSM-R	Detailed design under preparation. After its approval works will start	1	2023	12	2026	491,34	NRRP + State Budget	80 km/h for freight trains and 120 km/h for passenger trains	22,5 / C4	750	25 kV AC	Level 2	GC	P/C 45/375
Under construction	CFR	Simeria	Filiași	Diversionary line	Speed restrictions removal (quick wins) on Livezeni - Simeria line section	Removal of speed restrictions	Works for bottllenecks elimination (quick-wins)	11	2022	11	2024	11,49	NRRP + State Budget	100 km/h for freight trains	22,5 / C4	750	25 kV AC	-	n/a	n/a

Source: RFC RD 2024 Implementation Plan

2.2 CORRIDOR OPERATIONAL PERFORMANCE

2.2.1 KEY PERFORMANCE INDICATORS

According to Article 19 (2) of Regulation (EU) 913/2010, the Management Boards of the RFCs are requested to monitor the performance of rail freight services on the freight corridor and publish the results of this monitoring once a year.

The RFCs are free to choose their own Key Performance Indicators (KPIs) to fulfil this requirement. However, in order to facilitate data provision for the calculation of the KPIs and the processing of such data, a common approach and set of KPIs applicable to all RFCs was developed and adopted under the coordination of RNE.

The KPI framework includes capacity management, operations and market development indicators. The most relevant indicators are described below for the years 2021 and 2022.

Table 18 provides the number of freight trains per BCP along the RFC RD (i.e. the number of commercial freight trains crossing selected border points), whereas Table 19 includes the total number of freight trains crossing any BCP along the RFC (freight trains crossing more than one BCP are only counted once).

Table 18 Number of freight trains per BCP along the RFC RD

			Number of freight trains		
Country		BCP	2021	2022	2023
FR	DE	Strasbourg-Neudorf/Kehl	2,278	1,951	1910
DE	CZ	Schirnding/Cheb	2,240	2,916	2,499
DE	CZ	Furth im Wald/Česká Kubice	135	137	154
AT	DE	Schärding/Passau	27,414	36,438	30,239
AT	DE	Salzburg Liefering/Freilassing	13,744	15,838	14,893
SK	CZ	Čadca/Mosty u J.	13,418	13,520	12,418
CZ	SK	H.Lideč/Lúky p.M.	1,047	750	1,308
SK	AT	Bratislava-Petržalka št. hr./Kittsee	8,582	8,604	9,580
AT	HU	Nickelsdorf/Hegyeshalom	17,026	17,745	16,346
AT	HU	Baumgarten/Sopron	3,263	2,889	2,588
HU	SK	Rajka/Rusovce	1,618	1,884	4,604
RO	HU	Curtici/Lökösháza	10,665	8,688	7,923
RO	HU	Episcopia Bihor/Biharkeresztes	1,228	2,216	2,494

Source: RFC RD KPIs

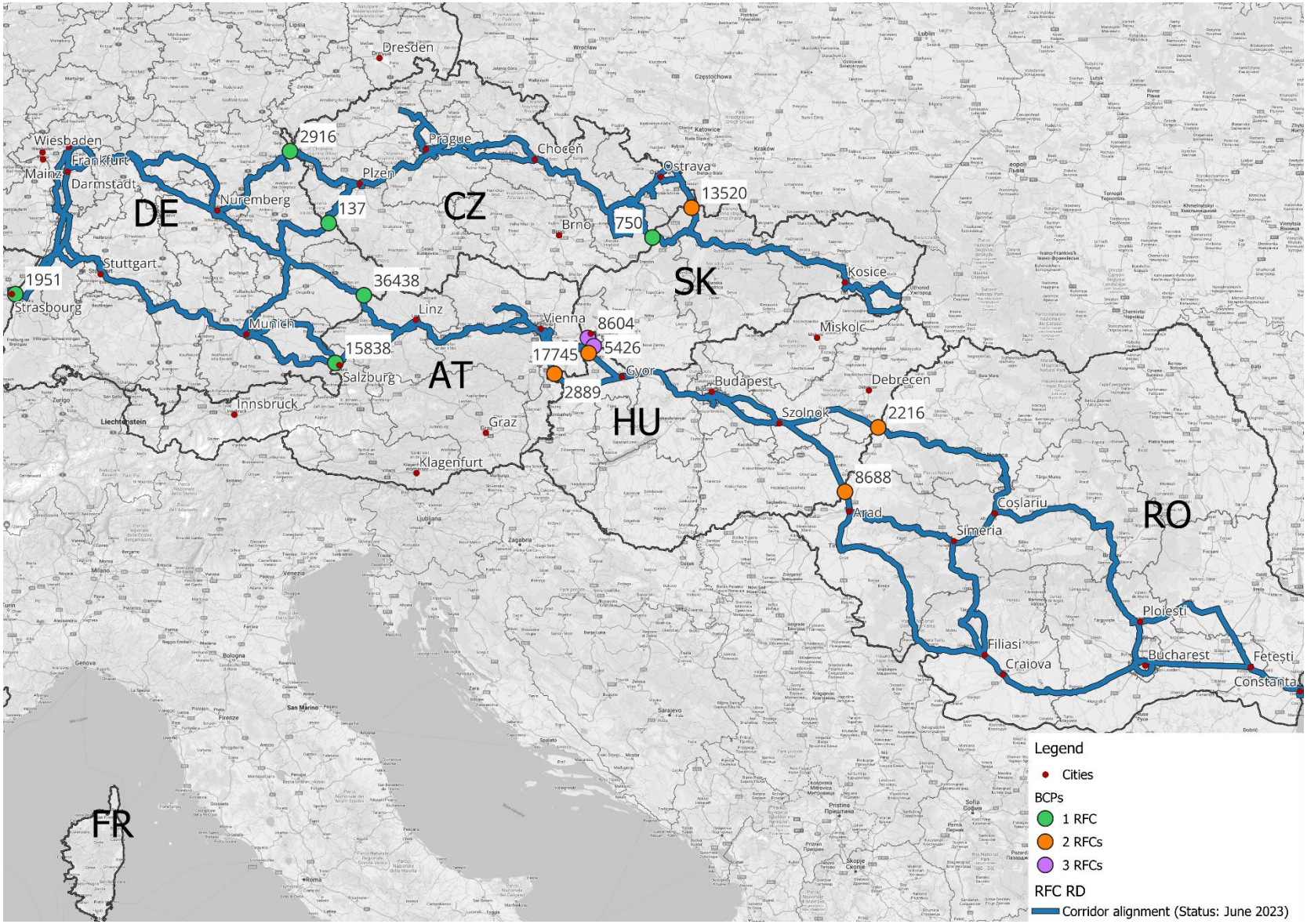
According to the available data, the highest traffic was registered during the last three years at Schärding/Passau, between Austria and Germany, followed by Nickelsdorf/Hegyeshalom, between Austria and Hungary, Salzburg Liefering/Freilassing, between Austria and Germany, and Cadca/Mosty u J., between Slovakia and Czechia. During last two years the rapid increase of traffic was registered at Strasbourg-Neudorf/Kehl between France and Germany.

Table 19 Number of freight trains crossing at least one RFC RD BCP

	2021	2022	2023
Number of freight trains crossing a BCP along RFC RD	102,970	94,427	87,504

Source: RFC RD Commonly applicable RFC KPIs

Figure 9 RFC RD – Trains at BCPs along the RFC RD (2022)



Source: Data based on CIP and RFC RD Commonly applicable RFC KPIs

Train traffic data/trends at BCPs include all international freight trains crossing a border along the RFC and may vary according to traffic management solutions and traffic conditions on the accessing/interconnected lines, as well as traffic capacity restrictions on these lines, due to temporary/permanent maintenance and/or construction works. In particular, temporary capacity restrictions (TCRs) affecting the border-crossings between Hungary and Romania could lead to a lower number of trains than before. Furthermore, the COVID Pandemic first and Russian aggression to Ukraine later also affected traffic on the European network for competitive rail transport. The number of trains reported in Table 19 shows a lower number of trains in 2022 compared to 2021, which might also be an effect of the Russian aggression to Ukraine.

Further to the number of trains at BCPs, the set of common indicators also includes capacity management related KPIs, for which data are collected and provided for all RFCs. Figures for the RFC RD are provided in Table 20 below.

Table 20 Capacity Management KPIs

Parameter	TT 2022	TT 2023	TT 2024	TT 2025
	2021	2022	2023	2024
Volume of offered capacity – PaPs (at X-11), mio (path) km	7.9	8.2	6.5	7
Volume of requested capacity – PaPs (at X-8), mio (path) km	0.7	4.1	1.7	2.1
Number of requests – PaPs (at X-8)	46	59	24	24
Number of conflicts – PaPs (at X-8)	0	2	0	0
Volume of pre-booked capacity– PaPs (at X-7.5), mio (path) km	0.7	4.1	1.7	21
Ratio of pre-booked capacity (to the volume of capacity offered at x-11)	8.5%	50.2%	26.2%	30.10%
Volume of offered capacity – Reserve Capacity (at X-2), mio (path) km	2.6	2.6	2.6	N/A
Number of requests – Reserve Capacity (at X+12) (number of PCS dossiers)	0	0	0	N/A
Volume of requested capacity – Reserve Capacity (at X+12), mio (path) km	0	0	0	N/A

Source: RFC RD Commonly applicable RFC KPIs

The commonly adopted KPI framework additionally includes indicators to measure the average planned speed of the offered Pre-arranged Paths) and punctuality of freight services along the RFCs (Table 21).

Table 21 Punctuality

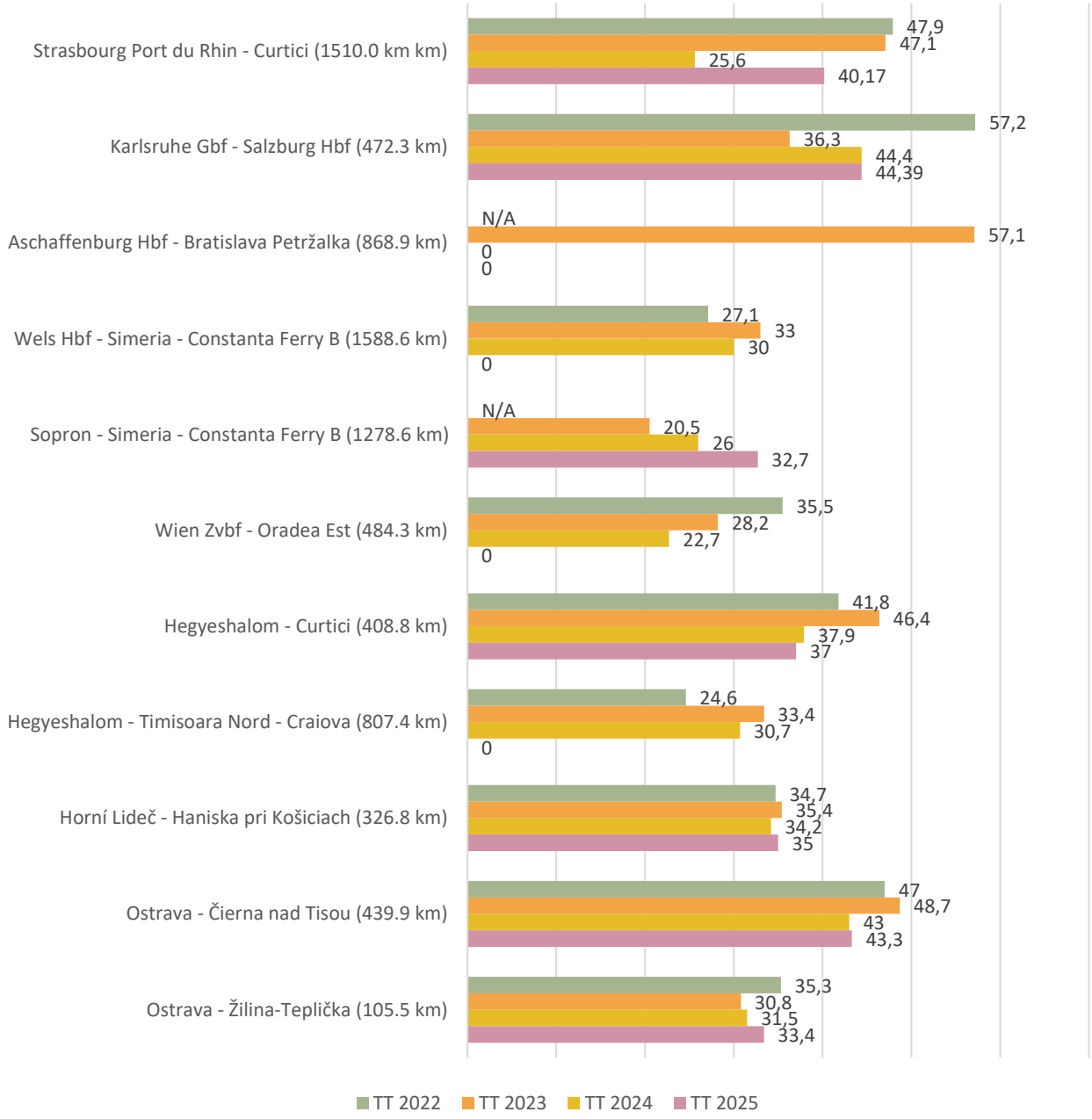
			(delay ≤ 30 minutes)
	2021	2022	2023
Punctuality at origin (RFC entry)	55.0%	51.0%	51.0%
Punctuality at destination (RFC exit)	47.0%	41.0%	41.0%
			(delay ≤ 15 minutes)
Punctuality at origin (RFC entry)	49.0%	45.0%	44.0%
Punctuality at destination (RFC exit)	42.0%	37.0%	37.0%

Source: RFC RD Commonly applicable RFC KPIs

The figures for the past years show a steady trend in terms of capacity management and slight decrease for punctuality, particularly at destination, which is also related to construction works along single-track RFC

lines, and traffic diversion via longer routes. The COVID Pandemic, reducing traffic of passenger trains, might also have had a positive impact in terms of punctuality, resulting in better performance of the RFC in 2021. Average planned speed of PaPs for TT2025 generally shows a stable improved trend compared to TT 2024.

Figure 10 Average planned speed of PaPs, km/h



Source: RFC RD Commonly applicable RFC KPIs

2.2.2 SPECIFIC PERFORMANCE OBJECTIVES AND TARGETS

Further to the monitoring activities associated with the common KPIs applicable to all RFCs, specific objectives have been also adopted by the RFC RD, associated with quantified targets. The following paragraphs provide a description of the identified specific objectives and related targets. Similarly to other RFCs, RFC RD also undertakes Train Performance Management tasks. The specific objectives of the RFC RD described below

have been harmonised with the ones of RFC Orient/East-Med and the two corridors are closely cooperating with each other in order to achieve them.

In general, the objectives of the RFC RD are as follows:

- Increasing the modal share of rail freight;
- Improving procedures and facilitating accessibility of railways; and
- Providing better, more reliable services.

The RFC RD aims to reach these objectives by:

- Attracting customers with the services of the C-OSS, providing easier access for customers in order to reduce the drawback of different national systems;
- Facilitating solving issues that need higher level attention especially when out of the transport sector;
- Continuous improvement of processes concerning the operation of the railway infrastructure.

In particular, the objectives specific to the core processes capacity management and train performance management concern:

- ***Punctuality***. Improving the punctuality of freight trains running on the Corridor is essential in order to increase the modal share of rail transport. Punctuality is measured and monitored as part of the common KPIs adopted for all corridors as described in the previous section, which is calculated as the percentage of punctual trains out of the total number of trains for two thresholds: 30 minutes and 15 minutes. The punctuality objective set by the RFC RD (30 min threshold) is to reach at least 60 % at origin and 60 % at destination. The codified reasons for delay, in accordance with UIC leaflet 450-2, will be used for continuous and systematic monitoring;
- ***Dwell time***. Besides punctuality, another factor requiring high attention is the dwell time of international freight trains at the borders and the reduction of this dwell time, with special regard to the critical border sections – facing both long dwell time and a high number of trains. In order to facilitate the objective of operational efficiency and seamless crossing of the borders, this particular factor needs continuous cooperation between both IMs and RUs in removing operational barriers. The target set by the RFC RD is 120 minutes on average where the current performance is above this target; and further decrease annually where the current performance is below 120 minutes;
- ***Strengthening cross-border cooperation***. In order to facilitate the above objectives regarding punctuality and dwell time, the Corridor promotes cross-border cooperation groups comprising neighbouring IMs, RUs, and eventually terminals regarding the critical border sections;
- ***Capacity***. There is a strong need from the market for more and better flexible and ad-hoc capacity products in order to ensure the competitiveness of rail compared to road transport. Meeting this requirement makes it necessary to develop an appropriate strategy for offering such kind of capacity products. Initiatives like the Timetable Redesign project of RNE may lead to a satisfactory solution of this issue.

To measure the corridor performance towards the above objectives and steer performance, the RFC RD has adopted the set of KPIs presented in the previous section above, which are commonly applicable to all other RFCs. The following table summarises the targets set for the identified objectives.

Table 22 Corridor objectives and monitoring approach

Name of KPI	Calculation formula	Source of data	Timing of calculation	Target
Volume of requested capacity (PaPs)	Km*days requested	PAMT report in PCS	At X-8	Increase four-year moving average by 4.5% each year
Volume of pre-booked capacity (PaPs)	Km*days (pre-booking phase)	PAMT report in PCS	At X-7.5	Increase four-year moving average by 4.5% each year
Ratio of pre-booked capacity – PaPs (to the volume of capacity offered at x-11)	Km*days offered	PAMT report in PCS	At X-7.5	Increase ratio each year
Average planned speed of PaPs	Average of the planned commercial speed of the PaPs on the O/D pair concerned per direction	PAMT report in PCS	At X-11	When classified into four categories (divided by 30, 40 and 50 km/h), at least one category step-up each year
Punctuality at origin	The share of all RFC-related trains at RFC entry with a delay less than, or equal to, the threshold compared to all RFC-related trains at RFC entry	TIS	At the end of January after the timetable year concerned	Difference of the two not exceeding 10%
Punctuality at destination	The share of all RFC-related trains at RFC exit with a delay less than, or equal to, the threshold compared to all RFC-related trains at RFC exit	TIS	At the end of January after the timetable year concerned	
Number of Trains crossing a border along the RFC	Total number of train runs having a RA on selected pairs of border points	TIS	At the end of January after the timetable year concerned	Annual increase of 4.5%
Train kilometres of Trains crossing a Border along the RFC	Sum of O/D distances of all trains crossing a border along the RFC	TIS	At the end of January after the timetable year concerned	Annual increase of 4.5%

Name of KPI	Calculation formula	Source of data	Timing of calculation	Target
Dwell times in border sections – planned dwell	Average planned dwell time of all international freight trains crossing the RFC border in the main measuring points, where border crossing related procedures usually occurs	TIS	At the end of January after the timetable year concerned	- 120 minutes on average where currently above this target: - further decrease annually where below 120 minutes
Dwell times in border sections – real dwell	Average real dwell time of all international freight trains crossing the border along the RFC in the main measuring points, where border crossing related procedures usually occurs	TIS	At the end of January after the timetable year concerned	- 120 minutes on average where currently above this target: - further decrease annually where below 120 minutes

Source: RFC RD 2024 Implementation Plan

2.2.3 RAILWAY UNDERTAKINGS OPERATING FREIGHT SERVICES ALONG THE 11 RFCS AND RFC RD

The Train Information System (TIS) tool developed by RNE includes a detailed database of train operations. An analysis of the TIS dataset for the year 2022 has been made as part of this study aimed at producing statistical information on train operations along the RFCs. However, train operations encoded in TIS do not correspond to individual trains by Origin and Destination as more Railway Undertakings (RUs) can be involved in the operation of international trains. For the analysis presented in this section, RUs belonging to the same group of companies have been aggregated into a single unit of analysis. This specified, according to the TIS database, 166 RUs/groups of RUs have been identified which were involved in the operation of international rail freight services along the RFCs in 2022. About half of them operated more than 1,000 trains, whereas one-fourth of them operated more than 5,000 trains.

Table 23 RUs operating international freight trains in 2022 on all 11 RFCs

No. of trains	No. of of RUs
> 15,000	18
> 10,000 < 14,999	11
> 5,000 < 9,999	12
> 2,000 < 4,999	27
> 1,000 < 1,999	16
> 500 and 999	24
> 200 < 499	31
> 100 < 199	14
< 100	13
Total	**166**

Source: RNE – TIS

The number of RUs operating international freight trains along the RFCs in 2022 varied from a minimum of 27 on the RFC ATL to 134 on the RFC RD. Overall, the number of RUs operating along each RFC and the number of trains they operate align with the market size and shares of rail transport in the countries crossed by the RFCs as illustrated in Sections 3.1 and **Hiba! A hivatkozási forrás nem található.** below. Not surprisingly, more operations, particularly by large RUs/Groups of RUs, are concentrated along the RFCs crossing Central and Eastern-European countries.

Table 24 RUSs using RFCs in 2022 by class of number of operated trains

No. of trains	RALP	NSM	SCANMED	ATL	BA	MED	OEM	NSB	RD	AWB	AMBER
> 5,000	7	5	6	1	**8**	2	9	10	9	2	4
> 1,000 < 4,999	18	5	6	6	**13**	9	24	19	19	1	6
< 1,000	61	23	49	20	**96**	40	99	79	106	49	66
Total	**86**	**33**	**61**	**27**	**117**	**51**	**132**	**108**	**134**	**52**	**76**

Source: RNE - TIS

Referring to the entire 11 RFCs network, most RUs operate trains on more than one RFC: 55% of the RUs operate trains on 4 to 7 RFCs, whereas about 25% of them operate trains on up to 3 RFCs and another 20% operate trains on 8 or more RFCs. Only 4 RUs operate trains on all RFCs, and 12 RUs operate trains on only one RFC.

Table 25 RUs using RFCs in 2022 by number of RFCs where they operate

N. of RFCs where RUs operate	N. of operating RUs by RFC											
	RALP	NSM	SCANMED	ATL	BA	MED	OEM	NSB	RD	AWB	AMBER	11 RFCs
1	1	1	1	2	1	1	2	0	3	0	0	**12**
2	6	0	0	1	2	1	3	7	3	1	0	**12**
3	3	2	2	4	6	2	12	7	11	1	4	**18**
4	5	2	3	1	13	4	17	8	17	3	11	**21**
5	9	5	6	2	21	4	23	18	24	4	14	**26**
6	19	4	11	4	28	10	30	25	30	8	17	**31**
7	10	1	11	0	13	4	13	12	13	6	8	**13**
8	14	4	9	3	14	8	14	13	14	11	8	**14**
9	10	7	9	3	10	8	9	9	10	9	6	**10**
10	5	3	5	3	5	5	5	5	5	5	4	**5**
11	4	4	4	4	4	4	4	4	4	4	4	**4**
Total	86	33	61	27	117	51	132	108	134	52	76	166

134 RUs operated trains on the RFC RD in 2022. Most of them operated trains on more RFCs and registered up to 1,000 operations. Still, 9 RUs operated more than 5,000 trains along the RFC RD in 2022.

2.2.4 PASSENGER TRAIN OPERATIONS ALONG THE RFC RD

As part of the study, a high-level recognition of the passenger train operations was performed based on the information available from the TIS. Given that the database is not fully complete, the analysis is limited to identifying the main Origins and Destinations (O/Ds) of international passenger traffic along the 11 RFCs network.

The following table lists the main train relations for the year 2022, i.e. the O/Ds with more than 1,000 registered international trains per direction. All other relations present a number of international trains lower than this threshold. It shall be noted that these O/D relations may be part of trips over longer O/D (e.g. train services between Wien and Deutschkreutz may originate in/extend to Bratislava-Petržalka).

Table 26 Main international cross-border relations of passenger trains encoded in TIS and using RFC RD in 2022

Involved RFC	Origin		Destination	
RFC BA; RFC OEM; RFC RD	Bratislava	SK	Wien	AT
RFC OEM; RFC RD	Wien	AT	Deutschkreutz	AT
RFC RD	Linz	AT	Passau Hbf	DE
RFC RD	Offenburg	DE	Strasbourg-Ville - Bât Voyageurs	FR
RFC RD	Hof	DE	Marktredwitz	DE
RFC OEM; RFC RD	Győr	HU	Bruck a.d.Leitha	AT
RFC BA; RFC RD	Čadca	SK	Mosty u Jablunkova	CZ
RFC OEM; RFC RD; RFC AMBER	Rajka	HU	Bratislava-Petržalka	SK
RFC OEM; RFC RD	Budapest	HU	Wien	AT
RFC OEM; RFC RD	Sopron	HU	Wien	AT
RFC OEM; RFC RD	Budapest	HU	München	DE
RFC RD	Púchov	SK	Praha	CZ

RFC OEM; RFC RD	Győr	HU	Wien	AT
RFC RD	Stuttgart	DE	Paris	FR

Source: RNE - TIS

Detailed historical data are not available to assess the impact of the establishment of the RFCs on passenger operations and vice versa. Most of the above-listed O/Ds relate to cross-border regional mobility, and commuters' traffic is likely to concentrate in peak hours, when limitations may affect freight operations, particularly long freight trains, rather than restricting passengers' train operations. There seems to be no evidence of the negative impacts of the establishment and operations of the RFCs on passenger traffic.

3 2024 TMS UPDATE BACKGROUND INFORMATION

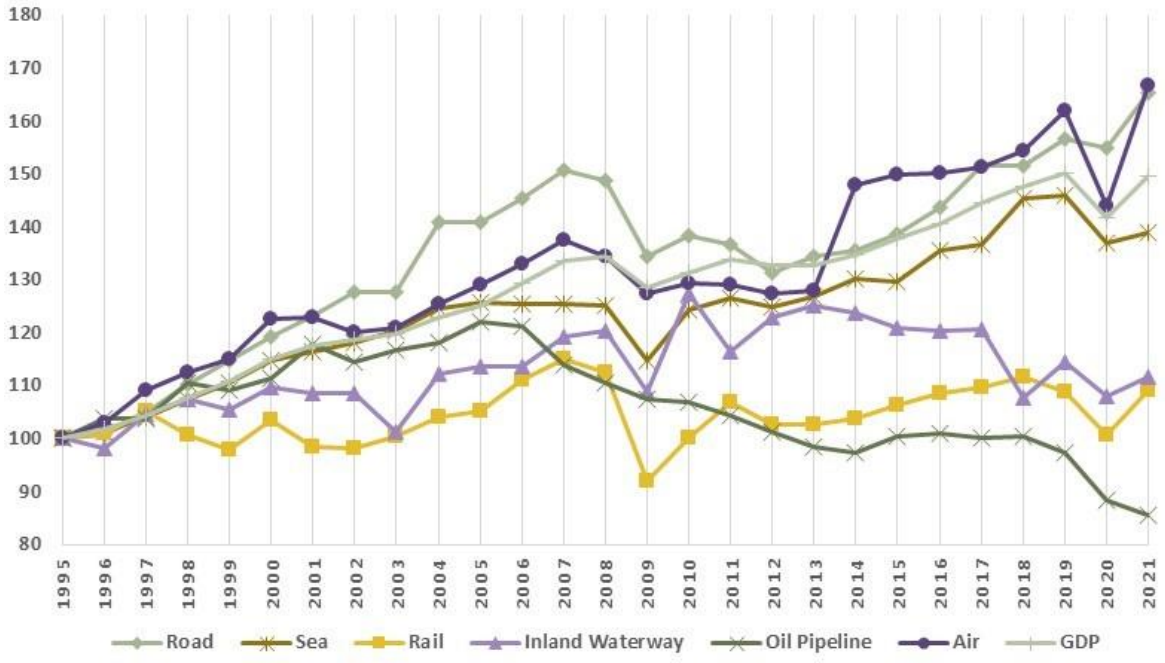
The first section of this chapter provides a statistical framework on the main socio-economic and transport developments on a European scale over the past decades. The second section reports on the main indicators monitored at the European level regarding the rail transport market and its liberalization process. The last section concerns the scenarios considered for elaborating future market estimates as part of the 2024 TMS Update, including the presentation of the main socio-economic assumptions and infrastructure developments.

Given that the rail freight market and international freight train operations across EU Member States and between the EU and its neighbouring countries are shared among the different corridors, and considering that most statistics are available at the country level, and some of them only at the EU level, the analysis in this chapter is presented for the entire 11 RFCs Network, covering the entire EU and the relevant neighbouring countries for which data are collected and available from EU institutions. Whenever possible, data have been elaborated for the RFC concerned countries. Corridor countries have also been highlighted in the exhibits. Allowing for an understanding of the market trends along the RFCs within the wider EU context, such a solution is also more in line with the adopted approach of developing a market analysis using an EU-wide network model.

3.1 TRANSPORT MARKET TRENDS IN THE EU

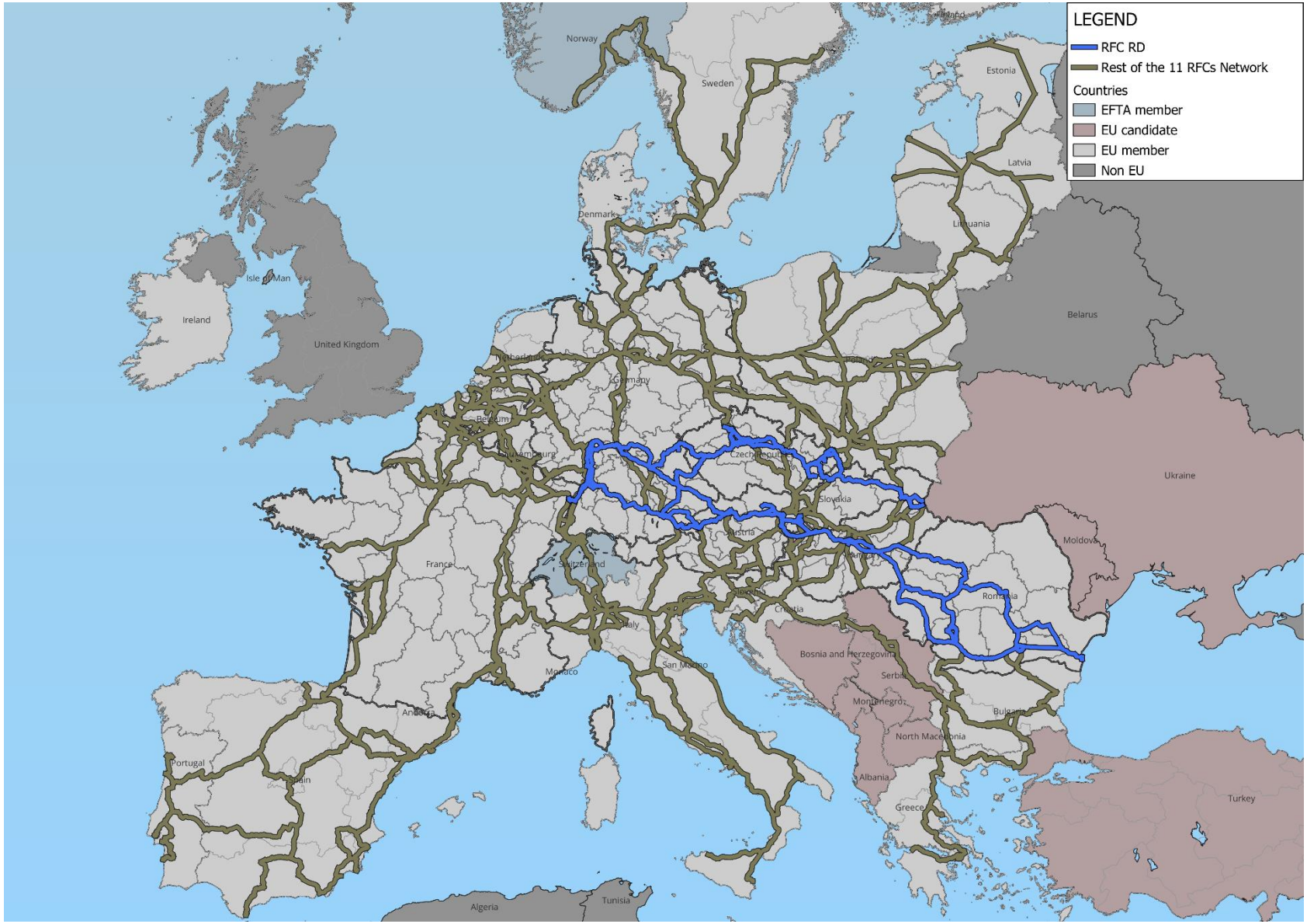
This section briefly reports the main transport statistics from the Statistical Pocketbook 2023, produced by the EC – DG MOVE and Eurostat. The analysis provides an overview of the development of the European rail freight sector since the middle of the 1990s when the rail freight market liberalization started, allowing monitoring trends before and after the 2008 credit crunch, which is considered the second major financial crisis after the 1930s Great Depression, and which was followed by additional adverse events during the past 10-15 years when the 11 RFCs were gradually established and entered into operation.

Figure 11 Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE and Eurostat – Statistical Pocketbook 2023

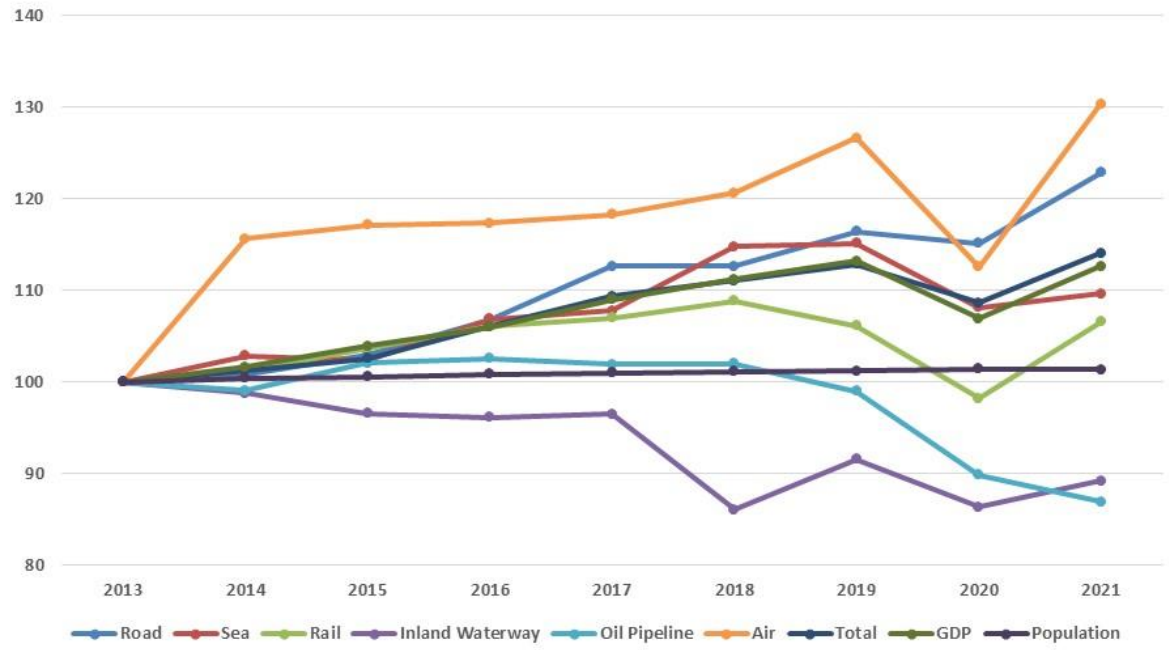
Figure 12 The RFC RD within the 11 RFCs Network



Source: Authors based on CIP

The period since the entry into force of the Regulation (EU) 913/2010 has indeed been marked by a number of socio-economic, health and geopolitical events which negatively impacted trade and transport flows at the global and European scale. As visible from the available statistics, the above-mentioned 2008 financial crisis basically altered the economic and transport developments experienced by Europe over the previous decades. Long-term series over the past 30 years show that the effects of this crisis are persisting, which were more recently further impacted by the 2020-2021 COVID-19 pandemic and by the current geopolitical crisis that started in 2022 with the Russian-Ukrainian war and deteriorated with the Israel-Gaza conflict and Red Sea crisis. Notwithstanding the recurrent negative events and persisting economic uncertainties, most socio-economic and transport developments show overall positive trends, although the curves of the period after 2008 stand at lower growth rates. This is particularly true for the primary economic variable – Gross Domestic Product (GDP) – and freight traffic for all transport modes.

Figure 13 EU-27 performance by mode for freight transport 2013-2021 (billion tkm) (2013=100)



Source: EC – DG MOVE– Statistical Pocketbook 2023

Freight transport volumes in the EU have grown from about 2,400 billion tkm in 1995 to about 3,000 billion tkm in 2013 — when six of the first 9 RFCs in the Regulation 913/2010 were established — to over 3,400 billion tkm in 2021. Aviation is the only mode for which growth levels returned close to the previous pattern from 2014 until the COVID-19 pandemic, which negatively affected all transport modes' performance. Compared to 1995, all transport modes, except oil pipelines, showed higher levels of traffic volumes expressed in tkm in 2021. All transport modes except inland waterways and oil pipelines also show overall growing trends for the past decade – up until the COVID-19 pandemic – although they are lower for rail transport than for aviation, maritime and road transport.

About 425 million inhabitants lived in the EU27 in 1995, 441 million in 2013, and 447 million in 2021. Over 5,600 tkm of goods per inhabitant were transported in the EU27in 1995, growing to 6,800 tkm in 2013 and 7,700 tkm in 2021.

Table 27 EU-27 performance by mode for freight transport 2013-2019 and 2019-2021 (billion tkm)

	2013	2019	2021	CAGR '19-'13	CAGR '21-'13	Var. '21-'19
GDP	106.1	120.1	119.5	2.1%	1.5%	-0.5%
Population	441.3	446.4	447.2	0.2%	0.2%	0.2%
Air	1.8	2.3	2.4	4.0%	3.4%	2.9%
Inland Waterway	152.6	139.7	136.1	-1.5%	-1.4%	-2.6%
Rail	384.3	407.9	409.6	1.0%	0.8%	0.4%
Combined transport	40.7	83.5	100.2	12.7%	11.9%	19.9%
Oil Pipeline	102.1	101.0	88.7	-0.2%	-1.7%	-12.2%
Road	1,516.4	1,764.8	1,862.5	2.6%	2.6%	5.5%
Sea	851.0	979.5	932.7	2.4%	1.2%	-4.8%
Total	**3,008.1**	**3,395.3**	**3,431.9**	**2.0%**	**1.7%**	**1.1%**

Source: EC – DG MOVE – Statistical Pocketbook 2023

Looking at the differences between the 2013-2019 and 2019-2021 periods, the impact of the COVID-19 pandemic seems particularly damaging for oil pipelines and maritime transport. During lockdowns, growth/decline rates were higher for all transport modes, except for air and rail transport.

Notwithstanding the marginal increase of rail freight transport between 2013 and 2021, compared to other transport modes, particularly road (see Figure 13), combined transport more than doubled from about 41 billion tkm to 100 billion tkm (Table 27).

Table 28 Combined transport traffic based on data from the members of UIRR

Year	tkm				Traffic% of consignments		
	billion	% of which:			Semi-trailers	Rolling motorway	Swap bodies and containers
		below 300 km	between 300 and 900 km	more than 900 km			
1990	18.7	1%	68%	31%	20%	18%	61%
2000	35.2	2%	71%	27%	9%	23%	68%
2010	42.4	5%	58%	37%	10%	15%	75%
2015	55.0	1%	50%	49%	13%	5%	82%
2020	90.3	1%	49%	50%	15%	5%	80%
2021	100.2	1%	48%	51%	14%	5%	80%
2022	88.8	1%	52%	46%	16%	4%	80%

Source: EC – DG MOVE – Statistical Pocketbook 2023

Trends for the RFC RD countries are similar to the EU ones, whereas rail grew at higher rates in the corridor countries than at the EU level, during the COVID-19 pandemic, and inland waterways remained stable over the same period.

Table 29 RFC RD countries performance by mode of freight transport 2013-2019 and 2019-2021 (billion tkm)

	2013	2019	2021	CAGR '19-'13	CAGR '21-'13	Var. '21-'19
Road	803.6	918.5	953.1	2.3%	2.2%	3.8%
Railways	209.2	223.1	231.0	1.1%	1.2%	3.5%
Inland waterways	86.8	77.7	73.2	-1.8%	-2.1%	-5.8%
Oil pipelines	48.5	48.2	42.5	-0.1%	-1.6%	-11.9%
Total	**1,148.2**	**1,267.6**	**1,299.8**	**1.7%**	**1.6%**	**2.5%**

Source: EC – DG MOVE – Statistical Pocketbook 2023

The share of rail in total freight transport based on tkm varies significantly across the EU. Data in Table 30 show that rail share is generally higher in Eastern and Central-European countries than in Western-Europe.

Austria and Switzerland are among the top ten countries, also due to the support these countries give to rail transport to reduce the impact of freight transport on the environment, with a focus on the Alpine crossings.

Table 30 Share of rail in total freight transport in % (based on tkm)

	2008	2013	2015	2019	2022	Var. '19-'13	Var. '22-'13	Var. '22-'08
Lithuania	64.5	57.2	56.4	56.8	37.2	-0.4	-20	-27.3
Switzerland	35.3	36.0	37.2	34.1	33.4	-1.9	-2.6	-1.9
Slovakia	**40.0**	**38.6**	**36.3**	**30.7**	**30.1**	**-7.9**	**-8.5**	**-9.9**
Austria	**33.3**	**31.9**	**32.3**	**30.6**	**30.0**	**-1.3**	**-1.9**	**-3.3**
Slovenia	26.7	30.5	30.9	31.4	28.8	0.9	-1.7	2.1
Hungary	**24.9**	**30.3**	**29.1**	**26**	**26.3**	**-4.3**	**-4.0**	**1.4**
Latvia	47.9	43.1	42.3	37.4	26.0	-5.7	-17.1	-21.9
Czechia	**31.9**	**28.0**	**26.1**	**25.9**	**22.0**	**-2.1**	**-6.0**	**-9.9**
Romania	**19.9**	**23.3**	**25.0**	**20.5**	**21.0**	**-2.8**	**-2.3**	**1.1**
Poland	30.5	24.2	23.3	21.5	20.8	-2.7	-3.4	-9.7
Germany	**14.6**	**13.9**	**14.1**	**13.7**	**14.9**	**-0.2**	**1.0**	**0.3**
Bulgaria	10.3	7.5	8.7	8.5	11.2	1.0	3.7	0.9
Finland	13.1	12.7	10.9	11.8	10.8	-0.9	-1.9	-2.3
Sweden	10.3	9.6	8.6	9.4	10.5	-0.2	0.9	0.2
Belgium	8.2	6.8	6.9	7.2	7.3	0.4	0.5	-0.9
Luxembourg	9.8	7.2	7.0	6.8	6.1	-0.4	-1.1	-3.7
European Union - 27 countries (from 2020)	6.0	5.7	5.7	5.3	5.5	-0.4	-0.2	-0.5
Croatia	4.5	3.1	3.2	3.5	4.1	0.4	1.0	-0.4
France	**4.2**	**3.6**	**4.1**	**3.5**	**3.7**	**-0.1**	**0.1**	**-0.5**
Italy	2.6	2.4	2.6	2.3	2.7	-0.1	0.3	0.1
Estonia	10.4	7.6	4.5	3.3	2.4	-4.3	-5.2	-8.0
Norway	2.0	1.9	1.6	1.6	2.1	-0.3	0.2	0.1
Netherlands	2.0	1.7	1.8	1.8	1.9	0.1	0.2	-0.1
Denmark	1.4	1.8	1.9	1.7	1.6	-0.1	-0.2	0.2
Spain	0.8	0.8	0.9	0.8	0.8	0.0	0.0	0.0
Portugal	0.3	0.3	0.3	0.3	0.2	0.0	-0.1	-0.1
Ireland	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Greece	0.2	0.0	0.1	0.1	0.1	0.1	0.1	-0.1

Source: Eurostat

Compared to 2013, the share of rail in total freight transport based on tkm seems to have generally declined. The most significant drops can be seen in the Baltic States and Eastern-Europe, whereas in the other countries, positive and negative variations are marginal. The rail share is particularly low in so-called "isolated networks" like Portugal, Spain, and Ireland. Greece also shows a low modal share for rail transport.

The RFC RD countries are among the ones registering a higher rail modal share in the EU. Five out of seven RFC RD countries are indeed positioned within the ten first-ranking EU countries for rail modal share in 2022. However, Austria, Czechia, Slovakia, Hungary, Romania and France are also among the ones that are registering a high decline in rail modal share over time. A trend that is likely related to the change in the commodity basket trade.

Table 31 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes '000) in the EU 27

Main group of commodities	Transported goods in Tonnes ('000)				Variations in Tonnes ('000)			Share in total in %			
	2008	2013	2019	2022	2019-2008	2019-2013	2022-2019	2008	2013	2019	2022
Unidentifiable goods: goods which for any reason cannot be identified and therefore cannot be assigned to groups 01-16	187,740	248,671	316,077	345,593	128,337	67,406	29,516	12.5%	16.3%	20.2%	23.5%
Metal ores and other mining and quarrying products; peat; uranium and thorium	241,294	254,245	254,355	217,994	13,061	110	-36,361	16.0%	16.7%	16.2%	14.8%
Products of agriculture, hunting, and forestry; fish and other fishing products	70,094	79,243	88,030	94,987	17,936	8,787	6,957	4.7%	5.2%	5.6%	6.5%
Chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel	99,803	102,438	108,291	85,334	8,488	5,853	-22,957	6.6%	6.7%	6.9%	5.8%
Basic metals; fabricated metal products, except machinery and equipment	169,705	146,343	135,089	127,790	-34,616	-11,254	-7,299	11.3%	9.6%	8.6%	8.7%
Coke and refined petroleum products	206,442	179,497	154,412	141,855	-52,030	-25,085	-12,557	13.7%	11.8%	9.9%	9.7%
Coal and lignite; crude petroleum and natural gas	267,461	266,949	213,421	182,566	-54,040	-53,528	-30,855	17.8%	17.5%	13.6%	12.4%
Other goods	262,695	248,962	297,904	272,329	35,209	48,942	-25,575	17.5%	16.3%	19.0%	18.5%
Total transported goods	**1,505,234**	**1,526,348**	**1,567,579**	**1,468,448**	**62,345**	**41,231**	**-99,131**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat

Table 32 Goods transported by group of goods - from 2008 onwards based on NST 2007 (tkm '000.000) in the EU 27

Main group of commodities	Transported goods in tkm ('000.000)				Variations in tkm ('000.000)			Share in total in %			
	2008	2013	2019	2022	2019-2008	2019-2013	2022-2019	2008	2013	2019	2022
Unidentifiable goods: goods which for any reason cannot be identified and therefore cannot be assigned to groups 01-16	72,621	81,257	101,632	113,203	29,011	20,375	11,571	19.0%	21.3%	25.0%	29.0%
Products of agriculture, hunting, and forestry; fish and other fishing products	19,100	21,513	23,723	25,601	4,623	2,210	1,878	5.0%	5.6%	5.8%	6.6%
Chemicals, chemical products, and man-made fibers; rubber and plastic products ; nuclear fuel	29,933	30,682	31,347	23,744	1,414	665	-7,603	7.8%	8.0%	7.7%	6.1%
Metal ores and other mining and quarrying products; peat; uranium and thorium	50,565	49,328	49,966	45,058	-599	638	-4,908	13.2%	12.9%	12.3%	11.6%
Coal and lignite; crude petroleum and natural gas	43,281	44,928	38,063	33,768	-5,218	-6,865	-4,295	11.3%	11.8%	9.4%	8.7%
Basic metals; fabricated metal products, except machinery and equipment	42,766	35,939	34,740	31,185	-8,026	-1,199	-3,555	11.2%	9.4%	8.6%	8.0%
Coke and refined petroleum products	51,691	47,259	41,087	38,087	-10,604	-6,172	-3,000	13.5%	12.4%	10.1%	9.8%
Other goods	73,243	70,606	85,507	79,055	12,264	14,901	-6,452	19.1%	18.5%	21.1%	20.3%
Total transported goods	**383,200**	**381,512**	**406,065**	**389,701**	**22,865**	**24,553**	**-16,364**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat

Table 33 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes '000) in the RFC RD countries

Main group of commodities	Transported goods in Tonnes ('000)				Variations in Tonnes ('000)			Share in total in %			
	2008	2013	2019	2022	2019-2008	2019-2013	2022-2019	2008	2013	2019	2022
Unidentifiable goods: goods which for any reason cannot be identified and therefore cannot be assigned to groups 01-16	92,026	133,150	166,642	203,174	74,616	33,492	36,532	12.6%	17.1%	21.1%	25.5%
Metal ores and other mining and quarrying products; peat; uranium and thorium	112,554	110,315	100,489	101,536	-12,065	-9,826	1,047	15.4%	14.2%	12.7%	12.8%
Products of agriculture, hunting, and forestry; fish and other fishing products	26,972	38,771	41,395	50,325	14,423	2,624	8,930	3.7%	5.0%	5.2%	6.3%
Chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel	55,027	53,756	48,304	43,673	-6,723	-5,452	-4,631	7.5%	6.9%	6.1%	5.5%
Basic metals; fabricated metal products, except machinery and equipment	107,400	100,970	85,909	85,906	-21,491	-15,061	-3	14.7%	13.0%	10.9%	10.8%
Coke and refined petroleum products	84,057	83,472	81,130	77,840	-2,927	-2,342	-3,290	11.5%	10.7%	10.3%	9.8%
Coal and lignite; crude petroleum and natural gas	110,708	109,125	74,844	66,318	-35,864	-34,281	-8,526	15.1%	14.0%	9.5%	8.3%
Other goods	144,046	148,028	190,751	166,637	46,705	42,723	-24,114	19.7%	19.0%	24.2%	20.9%
Total transported goods	**732,790**	**777,587**	**789,464**	**795,409**	**56,674**	**11,877**	**5,945**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat

Table 34 Goods transported by group of goods - from 2008 onwards based on NST 2007 (tkm '000.000) in the RFC RD countries

Main group of commodities	Transported goods in tkm ('000.000)				Variations in tkm ('000.000)			Share in total in %			
	2008	2013	2019	2022	2019-2008	2019-2013	2022-2019	2008	2013	2019	2022
Unidentifiable goods: goods which for any reason cannot be identified and therefore cannot be assigned to groups 01-16	45,479	50,689	63,798	78,581	18,319	13,109	14,783	22.3%	24.7%	29.4%	34.1%
Products of agriculture, hunting, and forestry; fish and other fishing products	24,141	23,200	20,943	23,689	-3,198	-2,257	2,746	11.9%	11.3%	9.7%	10.3%
Chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel	9,446	10,762	11,510	14,013	2,064	748	2,503	4.6%	5.2%	5.3%	6.1%
Metal ores and other mining and quarrying products; peat; uranium and thorium	16,832	16,127	13,916	13,095	-2,916	-2,211	-821	8.3%	7.8%	6.4%	5.7%
Coal and lignite; crude petroleum and natural gas	26,661	22,559	19,735	19,915	-6,926	-2,824	180	13.1%	11.0%	9.1%	8.6%
Basic metals; fabricated metal products, except machinery and equipment	21,758	21,131	20,330	20,402	-1,428	-801	72	10.7%	10.3%	9.4%	8.8%
Coke and refined petroleum products	16,221	16,610	12,102	11,871	-4,119	-4,508	-231	8.0%	8.1%	5.6%	5.1%
Other goods	43,172	44,404	54,414	49,073	11,242	10,010	-5,341	21.2%	21.6%	25.1%	21.3%
Total transported goods	**203,710**	**205,482**	**216,748**	**230,639**	**13,038**	**11,266**	**13,891**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat

The above-described trends, including market and market share reduction in Eastern-European countries and growth of combined transport, are indeed associated with changes in the type and quantities of goods transported across Europe (see Table 31 and Table 32). Products such as *chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel, and particularly metal ores and other mining and quarrying products; peat; uranium and thorium; coal and lignite; crude petroleum and natural gas; basic metals; fabricated metal products, except machinery and equipment; and coke and refined petroleum products;* are gradually declining, whereas unidentifiable goods, i.e. goods which for some reason cannot be identified and therefore cannot be assigned to groups 01-16 of the NST 2007 (Standard goods classification for transport statistics abbreviated as NST), are growing, which are usually transported as unitised cargo and moved across intermodal logistics chains. Such trends are also visible in the countries along RFC RD (see Table 33 and Table 34), specified that the total volumes of transported goods in the EU27 grew between 2008 and 2022, whereas it declined in the RFC NSM concerned countries..

3.2 RAIL MARKET MONITORING INDICATORS

In line with Article 56 (paragraph 2) of Directive 2012/34/EU, foreseeing that regulatory bodies have the power to monitor the competitive situation in the railway market, national regulatory bodies started collecting and producing statistics on the rail market, delivering IRG-Rail's Market Monitoring Reports on an annual basis[6]. The first report was released in 2013, the latest one in 2023.

Since 2007, the EC (DG MOVE) has also started collecting data on rail market developments in Member States via the Rail Market Monitoring (RMMS) Questionnaires. The recast of the first Railway package (Directive 2014/34/EU) finally created a legal base for RMMS reporting and data harmonisation. Accordingly, in July 2015, after thorough consultation with Member States and stakeholders, the Commission adopted an implementing Regulation (EU) 2015/1100 on the reporting obligations of the Member States in the framework of rail market monitoring. Since 2016, EU Member States and Norway have been providing input to the Commission's rail market monitoring in line with the format and content defined in the Regulation. The latest RMMS report was released in 2023[7].

This section combines data from the above two market monitoring reports by IRG-Rail and the EC, providing data for 2013 and 2021, where available, to comment on the trends after the entry into force of Regulation (EU) 913/2010 and subsequent establishment of the RFCs. It shall be noted that data are not consistently available for all Member States and EU neighbouring countries and for considered years.

The first relevant information analysed in the above-mentioned market monitoring reports relates to market opening and liberalisation in the EU Member States. Table 35 provides information on the year of introduction of the legislation on the liberalisation of the rail freight market and the year of operation of the first new entrant. Additionally, the number of freight railway undertakings (RUs) is indicated for 2013 and 2021. Whereas the liberalisation of the rail market started in the EU well before 2013, the number of RUs operating in the EU further increased in many Member States and particularly in Poland (35), Germany (21), Austria (18), Croatia (13) and the Netherlands (11).

[6] https://irg-rail.eu/irg/documents/market-monitoring?page=0
[7] https://transport.ec.europa.eu/transport-modes/rail/market/rail-market-monitoring-rmms_en

Focusing on the RFC MED-concerned countries, over 100 active RUs were registered in 2021, nearly 15% of the total number of active RUs registered in the monitored countries.

Table 35 Market liberalisation and number of operating freight RUs

Country	Legal liberalisation freight	First new freight entrant	Number of freight RUs		
			2013	2021	var. 2021-2013
AT - Austria	**1998**	**2001**	**28**	**46**	**18**
BE - Belgium	-	-	13	10	-3
BG - Bulgaria	2002	2005	10	15	5
HR - Croatia	2009	2014	1	14	13
CZ - Czechia	**-**	**-**	**-**	**97**	**-**
DK - Denmark	1997	1997	5	8	3
EE - Estonia	2003	1999	-	2	-
FI - Finland	2007	2012	1	3	2
FR - France	**2003**	**2005**	**20**	**23**	**3**
DE - Germany	**1994**	**1995**	**226**	**247**	**21**
EL - Greece	2007	-	2	2	0
HU - Hungary	**2006**	**2007**	**21**	**29**	**8**
IE - Ireland	-	-	-	1	-
IT - Italy	2001	2001	-	25	-
XK - Kosovo*	2011	2015	1	2	1
LV - Latvia	1998	2003	-	4	-
LT - Lithuania	-	-	-	2	-
LU - Luxembourg	2010	-	-	1	-
MK - North Macedonia	-	-	-	1	-
NL - Netherlands	1995	1998	19	30	11
NO - Norway	2007	2007	8	12	4
PL - Poland	2003	2003	61	96	35
PT - Portugal	2007	2008	-	2	-
RO - Romania	**2001**	**2001**	**-**	**24**	**-**
RS - Serbia	-	-	-	13	-
SK - Slovakia	**2006**	**2006**	**42**	**46**	**4**
SI - Slovenia	2007	2009	3	7	4
ES - Spain	2003	2007	8	10	2
SE - Sweden	1996	1997	13	11	-2
CH - Switzerland	1999	1999	-	25	-
UK - United Kingdom	1994	1996	11	10	-1

*Source: EC – DG MOVE and IRG-Rail; Notes: * This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence*

Since the start of the liberalisation process, the market share of the domestic incumbent RUs gradually declined in most EU Member States (Table 36), whereas the market share of non-incumbents increased together with the operations of foreign incumbents. As a general pattern, the trend of the market share by domestic incumbents continued to decline in the period 2013-2021.

In the RFC RD countries, the market share of the domestic incumbent in 2021 was over 50% on average, over 60% considering national and international incumbents.

Table 36 Market shares of freight railway undertakings (based on net tkm)

Country	Market share of domestic incumbent	Market share of foreign incumbent	Market share of non-incumbent	Market share of domestic incumbent		
	2021	2021	2021	2013	2021	var. 2021-2013
AT - Austria	**63.4%**	**7.7%**	**28.9%**	**81%**	**63%**	**-18%**
BE - Belgium	58.2%	24.4%	17.4%	81%	58%	-23%
BG - Bulgaria	45.3%	0.0%	54.7%	55%	45%	-10%
HR - Croatia	54.1%	2.7%	43.2%	100%	54%	-46%
CZ - Czechia	**65.4%**	**7.6%**	**27.0%**	**-**	**65%**	**-**
DK - Denmark	0.0%	0.0%	100.0%	77%	0%	-77%
EE - Estonia	0.0%	0.0%	100.0%	-	0%	-
FI - Finland	95.6%	0.0%	4.4%	100%	96%	-4%
FR - France	**68.7%**	**18.8%**	**12.5%**	**64%**	**69%**	**5%**
DE - Germany	**42.4%**	**18.9%**	**38.8%**	**67%**	**42%**	**-25%**
EL - Greece	0.0%	96.6%	3.4%	100%	0%	-100%
HU - Hungary	**45.1%**	**1.8%**	**53.1%**	**67%**	**45%**	**-22%**
IE - Ireland	100.0%	0.0%	0.0%	-	100%	-
IT - Italy	39.7%	26.6%	33.7%	-	40%	-
XK - Kosovo*	100.0%	0.0%	0.0%	100%	100%	0%
LV - Latvia	70.3%	0.0%	29.7%	77%	70%	-7%
LT - Lithuania	99.9%	0.0%	0.1%	-	100%	-
LU - Luxembourg	100.0%	0.0%	0.0%	-	100%	-
MK - North Macedonia	100.0%	0.0%	0.0%	-	100%	-
NL - Netherlands	0.0%	47.0%	53.0%	48%	0%	-48%
NO - Norway	44.9%	18.2%	36.9%	48%	45%	-3%
PL - Poland	46.4%	8.1%	45.5%	66%	46%	-20%
PT - Portugal	0.0%	0.0%	100.0%	86%	0%	86%
RO - Romania	**19.9%**	**11.9%**	**68.2%**	**-**	**20%**	**-**
RS - Serbia	77.7%	0.0%	22.3%	-	78%	-
SK - Slovakia	**70.9%**	**0.0%**	**29.1%**	**87%**	**71%**	**-16%**
SI - Slovenia	77.8%	0.0%	22.2%	91%	78%	-13%
ES - Spain	57.8%	24.0%	18.2%	77%	58%	-19%
SE - Sweden	48.1%	6.7%	45.2%	-	48%	-
CH - Switzerland	65.8%	0.0%	34.2%	-	66%	-
UK - United Kingdom	4.7%	34.5%	60.8%	45%	5%	-40%

*Source: EC – DG MOVE and IRG-Rail; Notes: * This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence*

Rail traffic expressed in million train-km, including passenger and freight services, remained stable or even increased in most EU Member States. However, some countries – including one country on RFC RD -, such as **France**, Spain, and the United Kingdom, also experienced a decline (**Hiba! A hivatkozási forrás nem található.**). The share of freight services is also stable overall, with either marginal increases or decreases in the production of million train-km. The most relevant variations in the period 2013-2021 were registered by Croatia (+11%) and Latvia (-26%). It is noticed that 12 countries register a share of freight services expressed in train-km of about or over 30%, including two countries on RFC RD: **Austria**, Bulgaria, Croatia, Finland, Kosovo, Latvia, Lithuania, North Macedonia, Poland, Serbia, **Slovakia**, and Slovenia. Rail freight services account for over 50% of the total train-km produced in Lithuania and Slovenia.

Table 37 Rail traffic in million train-km (passenger and freight services) and share of freight services

Country	Total rail traffic			Share of freight services		
Year	2013	2021	var. 2013-2021	2013	2021	var. 2013-2021
AT - Austria	**149**	**174**	**25**	**26.8%**	**29.1%**	**2.2%**
BE - Belgium	97	98	1	13.4%	12.3%	-1.1%
BG - Bulgaria	28	31	3	25.0%	30.7%	5.7%
HR - Croatia	22	21	-1	22.7%	33.7%	11.0%
CZ - Czechia	**-**	**173**	**-**	**-**	**21.8%**	**-**
DK - Denmark	85	92	7	4.7%	3.3%	-1.4%
EE - Estonia	-	7	7	-	18.8%	-
FI - Finland	50	47	-3	28.0%	31.0%	3.0%
FR - France	**492**	**425**	**-67**	**15.0%**	**14.0%**	**-1.1%**
DE - Germany	**1,055**	**1,140**	**85**	**24.5%**	**23.7%**	**-0.9%**
EL - Greece	12	9	-3	8.3%	12.8%	4.4%
HU - Hungary	**98**	**108**	**10**	**17.3%**	**17.7%**	**0.4%**
IE - Ireland	-	16	16	-	1.7%	-
IT - Italy	-	358	-	-	15.4%	-
XK - Kosovo*	-	-	-	-	31.2%	-
LV - Latvia	19	10	-9	68.4%	41.8%	-26.6%
LT - Lithuania	-	15	-	-	61.1%	-
LU – Luxembourg	-	8	-	-	5.4%	-
MK - North Macedonia	-	2	-	-	41.2%	-
NL - Netherlands	154	163	9	6.5%	6.2%	-0.3%
NO - Norway	46	46	0	17.4%	18.6%	1.2%
PL - Poland	211	259	48	35.5%	31.6%	-4.0%
PT - Portugal	-	35	-	-	15.7%	-
RO - Romania	**-**	**83**	**-**	**-**	**26.7%**	**-**
RS - Serbia	-	14	-	-	42.9%	-
SK - Slovakia	**46**	**50**	**4**	**30.4%**	**30.5%**	**0.1%**
SI - Slovenia	20	22	2	50.0%	51.8%	1.8%
ES - Spain	187	156	-31	13.4%	15.4%	2.0%
SE - Sweden	151	156	5	25.2%	23.1%	-2.1%
CH - Switzerland	-	233	-	-	11.7%	-
UK - United Kingdom	541	494	-47	7.2%	6.7%	-0.5%

*Source: EC – DG MOVE and IRG-Rail; Notes: * This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence*

The analysis of rail freight traffic operations based on tkm (Table 38) aligns with the one concerning train-km. The COVID-19 pandemic seems to have had different impacts on rail freight traffic measured in net tkm, with

either increases or decreases in transport volumes between 2019 and 2021. The impact has been apparently significant in the Baltic States, Denmark, Luxembourg, and Portugal, whereas Bulgaria and Greece experienced about 20% growth in the same period. Except Belgium and Luxembourg, the RFC NSM concerned countries seem to have also registered positive variations during the pandemic period.

Table 38 Rail freight traffic in billion net tkm

Country	Freight traffic			Evolution of tkm	
Year	2013	2021	var. 2013-2021	2019-2021	2020-2021
AT - Austria	**21**	**23**	**2**	**1%**	**9%**
BE - Belgium	7	7	-0.1	-7%	2%
BG - Bulgaria	3	5	2	20%	3%
HR - Croatia	2	3	1	9%	-3%
CZ - Czechia	**-**	**16**	**-**	**1%**	**7%**
DK - Denmark	2	2	0.0	-22%	-19%
EE - Estonia	-	1	-	-56%	-46%
FI - Finland	9	11	2	5%	6%
FR - France	**32**	**36**	**4**	**5%**	**14%**
DE - Germany	**113**	**139**	**26**	**8%**	**13%**
EL - Greece	<1	1	-	19%	5%
HU - Hungary	**9**	**11**	**2**	**-2%**	**-5%**
IE - Ireland	-	0.1	-	-2%	-5%
IT - Italy	-	27	-	8%	16%
XK - Kosovo*	<1	0.0	-	-9%	60%
LV - Latvia	20	7	-13	-50%	-6%
LT - Lithuania	-	15	-	-10%	-8%
LU - Luxembourg	-	0.2	-	-10%	9%
MK - North Macedonia	-	0.4	-	8%	10%
NL - Netherlands	6	7	1	2%	8%
NO - Norway	4	5	1	5%	3%
PL - Poland	51	56	5	0%	7%
PT - Portugal	-	2	-	-15%	-1%
RO - Romania	**-**	**14**	**-**	**-2%**	**-14%**
RS - Serbia	-	3	-	8%	13%
SK - Slovakia	**9**	**9**	**0.3**	**4%**	**13%**
SI - Slovenia	4	5	1	-2%	6%
ES - Spain	9	10	1	-2%	9%
SE - Sweden	21	23	2	3%	6%
CH - Switzerland	-	12	-	3%	9%
UK - United Kingdom	22	17	-5.3	-1%	10%

*Source: EC – DG MOVE and IRG-Rail; Notes: * This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence*

The share of international freight services in total freight services generally increased over the period 2010-2020, except in Estonia, Luxembourg, Latvia, Romania, Sweden and Slovakia (**Hiba! A hivatkozási forrás nem található.**. Except for Slovakia and Romania, the countries along RFC RD have shown a stable/ positive growth.

Table 39 Network usage intensity (trains per day per route km)

Country	Network usage intensity for freight services			Network usage intensity for total services			Network usage intensity for total services on electrified routes (electrified train-km only)
Year	2013	2021	var. 2013-2021	2013	2021	var. 2013-2021	2021
AT - Austria	19	25	6	72	84	12	103
BE - Belgium	10	9	-1	74	75	1	81
BG - Bulgaria	5	6	1	19	21	2	25
HR - Croatia	5	7	2	22	22	-0	35
CZ - Czechia	-	11	-	0	50	-	-
DK - Denmark	4	3	-1	88	103	15	-
EE - Estonia	-	3	-	0	13	-	24
FI - Finland	7	7	0	24	22	-2	34
FR - France	7	6	-1	45	42	-3	59
DE - Germany	18	19	1	74	79	5	112
EL - Greece	1	1	0	15	10	-5	25
HU - Hungary	7	7	0	37	39	2	70
IE - Ireland	-	0	-	0	26	-	-
IT - Italy	-	8	-	0	53	-	71
XK - Kosovo*	1	0	-1	3	1	-2	-
LV - Latvia	8	5	-3	24	13	-11	39
LT - Lithuania	-	13	-	0	22	-	24
LU - Luxembourg	-	4	-	0	79	-	80
MK - North Macedonia	-	3	-	0	6	-	-
NL - Netherlands	9	9	0	138	145	7	-
NO - Norway	6	6	0	33	32	-1	-
PL - Poland	10	12	2	29	37	8	48
PT - Portugal	-	6	-	0	37	-	45
RO - Romania	-	6	-	0	21	-	32
RS - Serbia	-	5	-	0	12	-	18
SK - Slovakia	11	12	1	35	38	3	-
SI - Slovenia	22	25	3	45	49	4	-
ES - Spain	5	4	-1	34	27	-7	36
SE - Sweden	9	9	0	37	39	2	51
CH - Switzerland	-	14	-	0	120	-	-
UK - United Kingdom	-	6	-	0	83	-	126

*Source: EC – DG MOVE and IRG-Rail; Notes: * This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence*

3.3 2030 FUTURE MARKET SCENARIOS

As part of the 2024 TMS Update, future market estimates were elaborated for different scenarios at the short term (2030) time horizon. A scenario represents a narrative or framework that outlines a set of assumptions regarding future developments affecting the rail freight corridors. These assumptions can cover a wide range of factors, including economic growth, technological advances, policy changes, environmental conditions, or infrastructure developments. The main purpose of using scenarios is to assess how different conditions or decisions may affect rail freight transport, which in turn impacts infrastructure requirements and rail system performance.

In general, a scenario consists of different components, each of which serves to detail the assumptions and parameters that define the future. These components include:

- *Economic conditions*: Assumptions about future economic conditions, such as GDP growth rates, trade volumes and industrial production. These conditions have an impact on freight demand by influencing production and consumption patterns.
- *Infrastructure developments*: Details of expected changes in transport infrastructure, such as expansion of rail networks, missing links in road and rail infrastructure, development of new ports or logistics hubs, and improvements in rail and intermodal facilities. Infrastructure developments are important in determining the capacity and efficiency of freight transport systems.
- *Policies and regulations*: Specific changes in policies and regulations that affect freight transport, such as environmental regulations, transport policies, tariffs, and trade agreements. These factors can change transport costs, modal choices, and operational practices.
- *Technological innovations*: Assumptions regarding the adoption and impact of new technologies within the freight transport sector. This includes advances in vehicle technologies, automation, digitalisation of supply chains and energy-efficient practices. Technological innovations can improve efficiency, lower costs, and reduce environmental impacts.
- *Environmental conditions and sustainability goals*: Assumptions regarding environmental conditions and sustainability goals, including climate change impacts and emission reduction targets. These components are becoming increasingly important in planning resilient and sustainable freight transport systems.
- *Social and demographic trends*: Reflections on social and demographic changes that may affect freight transport demand, such as urbanisation patterns, population growth and shifts in consumer behaviour.

By integrating these components, scenarios provide a comprehensive and multifaceted framework for exploring the future of transport. They enable examining the possible effects of various assumptions and support decision making regarding infrastructure investments, policy interventions, or strategic planning. Scenarios serve as an important tool in the management of transport systems and facilitate the development of strategies that are robust and flexible to future uncertainties.

For the purposes of the 2024 Joint TMS Update, future scenarios have been built only considering socio-economic and infrastructure developments. This solution reflects the decision to develop only short-term forecasts up to 2030 and adopt a pragmatic and as far as possible, concrete approach, thus omitting the simulation of the possible effects associated with policy developments such as:

- The proposed weights and dimensions directive and electrification of Heavy Goods Vehicles;
- The internalization of external costs of road transport (road pricing);

- Incentives to rail/combined transport operations;
- Technological/operational improvements of intermodal transport solutions and logistics chains;
- Market sensitivity to climate and energy transition.

In line with this approach, the following scenarios have been defined, all of them at the 2030 time horizon:

- *Reference or background scenario*: It describes the economic developments (in terms of GDP changes), that have the most important impact on the future of rail transport. The base for this is the EU Reference Scenario 2020-2050 and the World Economic Outlook 2023. The economic projections are described in more detail in Section 3.3.1.
- *Projects scenario*: It provides an overview of the impact resulting from the expected developments in the rail transport system. These concern projects related to, ERTMS deployment, missing links, upgrades, and improvements of the rail network belonging to the 11 RFCs, expected to be implemented by 2030, according to the project completion dates defined in the available project lists by December 2023. In Section 3.3.2 an overview of the projects that are being considered is given, which is a subset of the most relevant projects that are ongoing or planned to be implemented and completed by 2030 on the 11 RFCs Network.
- *Sensitivity scenario: an 11 RFCs network at TEN-T standard*: It provides an overview of what would happen if – in addition to the investments included in the projects scenario - ERTMS is fully introduced, 740 meter long trains are allowed to operate anywhere on the whole network, 22.5 t axle load is achieved on the entire network, intermodal loading gauge is also possible along the RFCs and if the rail gauge in Spain and Portugal meets the European track gauge standards (the Rail Baltica initiative, providing interconnectivity of the three Baltic States to Europe is already considered in the *Projects scenario*). This scenario can be regarded as a hypothetical exercise as the projects needed to achieve these standards are not fully defined. Additionally, the TEN-T legislation allows Member States to apply for derogation to achieve compliance without achieving the TEN-T requirements in those cases where the cost of the investment may not be supported by sufficient economic benefits. Section 3.3.3 further describes the assumptions underlying this scenario.

All the above scenarios were analysed using the NEAC model (see Annex 1 to this report) to assess the impact of economic developments, infrastructural improvements, and further general changes for the sensitivity analysis.

3.3.1 ECONOMIC PROJECTIONS TOWARDS 2030

To create the projections for international rail transport, the EU Reference Scenario 2020-2050 (EC, 2021) and the World Economic Outlook (IMF, 2023) were considered. The EU Reference Scenario is used for projections in Europe, while the World Economic Outlook provides input for the rest of the world. This section focuses first on the EU Reference Scenario 2020-2050 and then on the World Economic Outlook.

EU Reference Scenario 2020-2050

This scenario has been used as a common ground, because it covers the EU and makes it a consistent background framework for each of the individual 11 RFCs and their combined network.

The EU Reference Scenario 2020-2050 projects the impact of macro-economic developments, fuel price, technology trends, and policies on the evolution of EU transport. It provides a model-based simulation of a possible future outlook until 2050, given the insights and policy context, based on certain framework conditions, assumptions, and historical trends, notably in the light of the most recent statistical data.

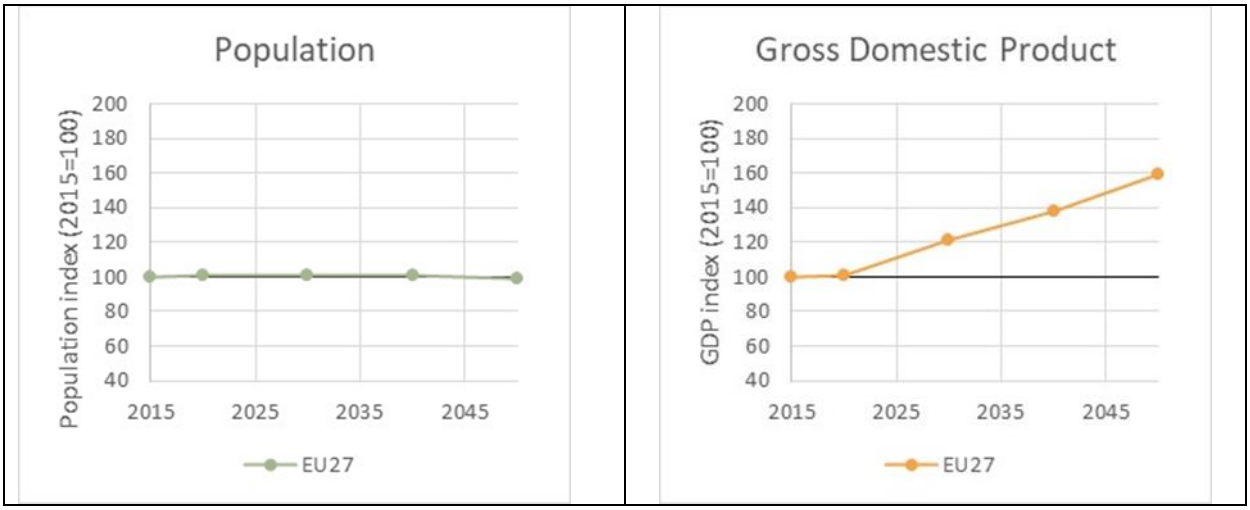
For a complete list of included transport and energy policies, we refer to the report on the EU Reference Scenario published by the EC[8]. The central model behind the EU Reference Scenario is the PRIMES model, an energy system model that produces projections for energy, transport, and CO_2 emissions.

Figure 14 and Figure 15 show the indexed trends for population, GDP, and road and rail freight transport according to the EU Reference Scenario (*The impacts of the COVID-19 pandemic are considered in the EU Reference Scenario. However, the pandemic effects seem to be negligible for the long-term trends*).

The growth of the EU27 population is expected to stagnate between 2030 and 2050. After 2040, it even goes into negatives. GDP levels, however, are projected to keep increasing until 2050.

Figure 15 shows the indexed trends for transport by road and rail, based on performance (tkm), relating to both international and domestic transport. The impacts of the COVID-19 pandemic are visible in transport levels for 2020. However, as of 2025 the transport forecasts seem to be following the pre-COVID trend. Hence, the pandemic effects seem to be negligible for the longer term. The growth rates for rail freight are, in general, higher than those for road transport, although this can differ per country. For freight transport by rail, the largest increases are projected between 2025 and 2040. The growth of transport is not evenly distributed across Europe. Some areas or countries show a moderate growth rate.

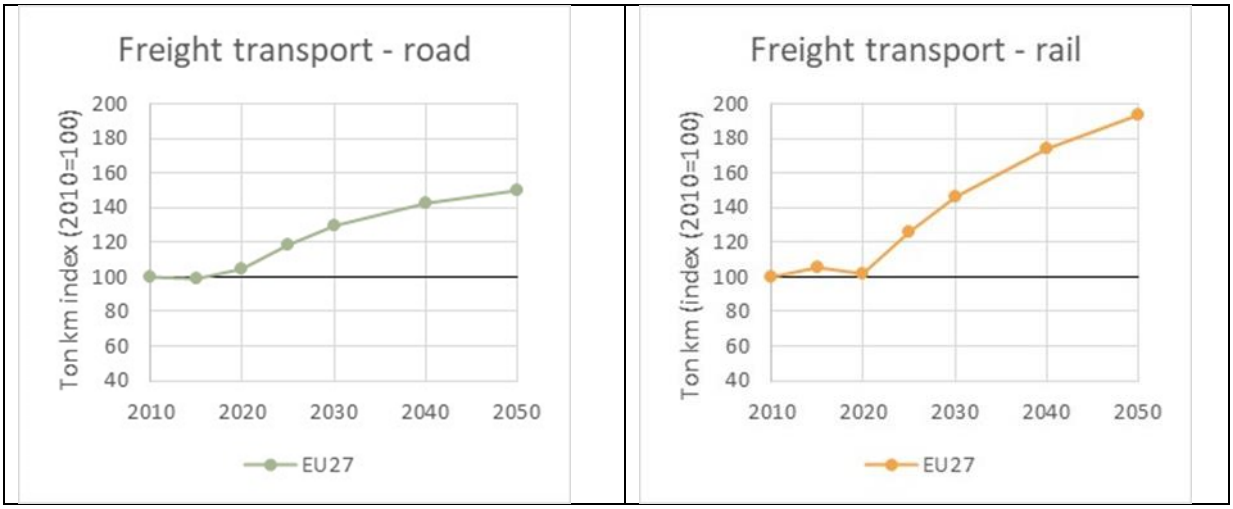
Figure 14 Forecasts population and GDP development in the EU27 between 2015 and 2045



Source: EC (2021)

[8] European Commission, Directorate-General for Climate Action, Directorate-General for Energy, Directorate-General for Mobility and Transport, De Vita, A., Capros, P., Paroussos, L., et al., EU Reference Scenario 2020 : energy, transport and GHG emissions : trends to 2050, Publications Office, 2021, https://data.europa.eu/doi/10.2833/35750

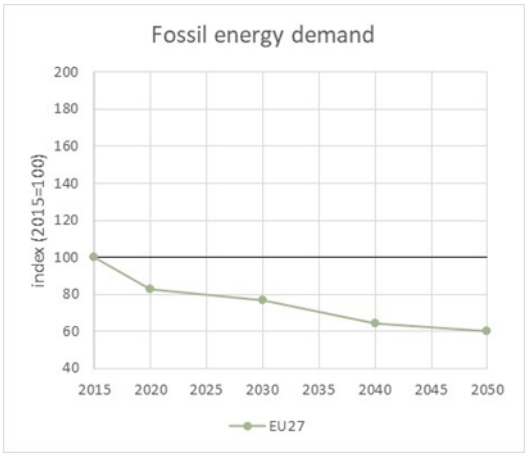
Figure 15 Forecasts on freight transport by road and rail (tkm, index 2010=100) for the EU27



Source: EC (2021)

Figure 16 shows the energy demand for fossil fuels (solid, petroleum products and natural gas) according to the EU Reference Scenario. The scenario predicts for the EU a decrease of 40% in 2050. This has an impact on the development of transport of dry and liquid bulk in the EU. Growth might be less or even negative.

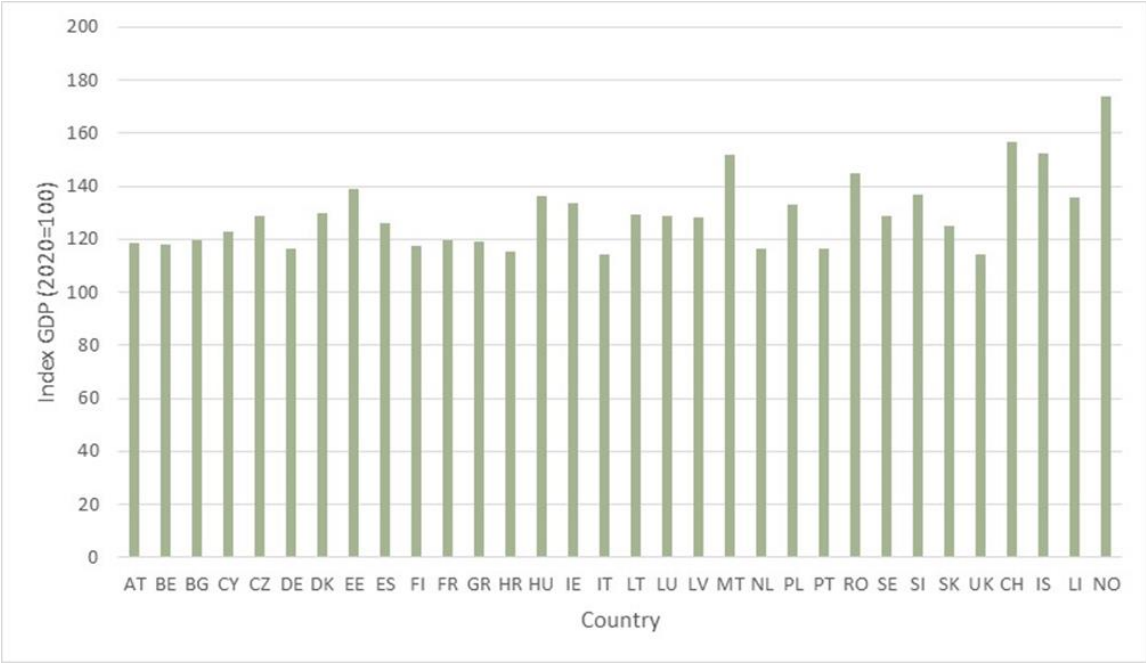
Figure 16 Forecasts on fossil energy demand for the EU27



Source: EC (2021)

The GDP figures from the EU Reference Scenario are used to make projections for 2030 for international rail transport in Europe. The next figure shows the economic development in GDP as an index (2020=100) by country, as provided by the EU Reference Scenario. The index ranges from 114 (Italy and the United Kingdom) to 174 (Norway). On average, the weighted growth index for the EU27 is about 117.

Figure 17 Development of GDP (Index 2020=100) for European countries according to the EU Reference Scenario



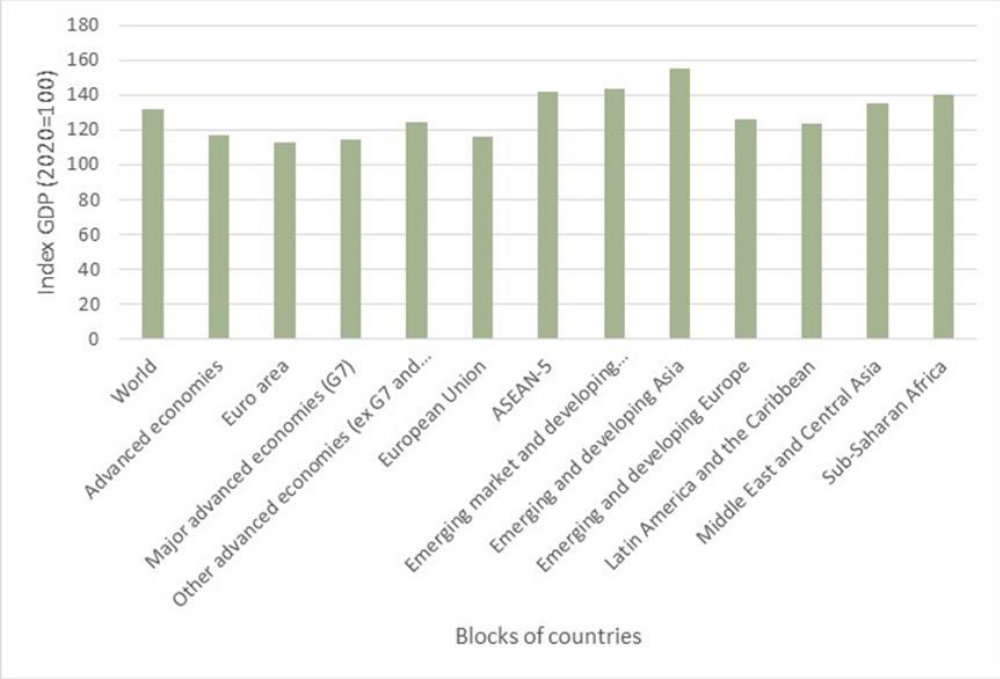
Source: EC (2021)

World Economic Outlook

Concerning the World Economic Outlook[9], the outlook for the GDP in constant prices for the period 2023-2028 was used in this study. Some historical figures are provided as well. Based on the 5-year period 2023-2028, an extrapolation was made for the remaining years until 2030. The figure below shows the GDP developments for blocks of countries. Worldwide, the GDP development between 2020 and 2030 is estimated at 32%. For the period 2022-2030, this is approximately 24%. The different blocks of countries show different growth patterns. Growth in the Euro area is, according to the IMF, the lowest at about 13% between 2020 and 2030, while the growth in the emerging and developing countries in Asia is the highest at about 54% between 2020 and 2030.

[9] IMF (2023). *World Economic Outlook. Navigating Global Divergences. October 2023*. Washington DC: International Monetary Fund.

Figure 18 Development of GDP between 2020 and 2030 in IMF economic blocks of countries



Source: IMF (2023), additional calculations Panteia

Road projects

Different road projects across Europe which are planned to be ready by 2030 are included in the reference Scenario. This includes projects such as the Rotterdam Blankenburgtunnel or the A281 missing link in Bremen. These projects have an impact on road freight transport demand, which will increase.

3.3.2 RAIL PROJECTS FINISHED BY 2030

The Projects scenario is used to assess the impact of the different projects expected to be completed by 2030 along the 11 RFCs network. Time, distance, and costs are important bases for calculating the changes in transport demand until 2030. These variables are also important for determining where shifts between modes will occur. The NEAC model was used to assess the impact of the Projects scenario (see Annex 1 to this report).

Actually, a number of projects are ongoing and/or planned for the improvement of the railway infrastructure belonging to the 11 RFCs network. A selection of projects was considered for forecasting purposes according to the following criteria:

- The projects need to be implemented before or in 2030;
- Projects should be able to 'translate' into a time gain or cost reduction.

The table below shows the projects implemented in the project scenario. The selected projects reflect the purpose of the study and nature of the model, limited to freight market analysis and thus modal share estimation, excluding network capacity simulation and assessment, and looking at the 2030 time-horizon. It is worth noting that given the uncertainties related to the completion by 2030 of the dual-gauge/UIC gauge network in the Iberian Peninsula, as well as the deployment of ERTMS and the possibility of operating 740-meter trains and achievement of the 22.5 tonnes axle load and P400 loading gauge standards, a sensitivity scenario has been developed as part of this study for the simulation of the completion of such an

interoperable network. This network-wide solution was deemed more appropriate than implementing individual projects within the Projects scenarios 2030 as the presence of gaps in the completion of interoperable networks makes the impact of those investments negligible.

Table 39 Rail projects considered in the Projects scenario 2030

Project	End date	RFC
Follobanen	03/2023	SCANMED
Rehabilitation and upgrade of Corridor Section Aveiro - Vilar Formoso	12/2024	ATL
ABS Hoyerswerda–Horka–Border DE/PL	12/2024	NS-B
Rehabilitation of the railway line Border – Curtici, Section Gurasda – Simeria	12/2025	OEM
Upgrade Stadlau-Marchegg (Marchegger Ast)	12/2025	BA, OEM
Graz-Klagenfurt; Koralm line	12/2025	BA
Second Track Divaça-Koper	10/2025	BA, MED, AMBER
Future Development of Railway Infrastructure: increase of capacity: Biasca, Chiasso, Arth-Goldau, Brig-Iselle, Basle PB, Basle-Luzern, Rothrist, noise protection Gotthard and Lötschberg axes	12/2025	RALP
EuroCap-Rail: modernization of the Brussels-Luxembourg axis	12/2026	NSM
ABS/NBS Karlsruhe - Basel Phase 2, No 1	12/2026	RALP, RD
Construction of double-track railway from Sandbukta to Såstad.	08/2026	SCANMED
Modernisation of Vidin - Medkovets railway section	12/2026	AWB
ABS Angermünde - Border DE/PL	12/2026	NS-B
ABS Berlin – Frankfurt (Oder) – Border (DE/PL)	12/2027	NS-B
Works on main passenger lines (E 30 and E 65) in Śląsk area, phase I: line E 65, section Będzin – Katowice – Tychy – Czechowice Dziedzice – Zebrzydowice, lots A, A1	06/2027	BA
Works on railway line E 75, section Białystok – Suwałki – Trakiszki (state border), Stage I, sub-section Białystok - Ełk, phase II	12/2027	NS-B
Rehabilitation of the railway line Cluj – Episcopia - Border	12/2027	OEM, RD
Upgrading of Alexandroupoli-Ormenio/BG border railway line	12/2027	OEM
Rehabilitation of the railway line Brasov - Simeria	12/2027	OEM
Upgrading Gallarate-Rho line 0294	11/2028	RALP
Upgrade of Brno - Breclav line as a High-speed Rail line	12/2029	OEM
Modernisation of the railway line Bucharest - Giurgiu	12/2029	OEM
Upgrade of the railway access line to the Fehmarn Belt Fixed Link - Section Ringsted - Rødby	06/2029	SCANMED
Southern access line to Brenner; Lotto/lot 1: Fortezza/Franzenfeste - Ponte Gardena/Waidbruck 0292A	12/2029	SCANMED
ABS/NBS Hamburg - Lübeck - Puttgarden (Hinterland connection to Fehmarn Belt Fixed Link)	12/2029	SCANMED
Rail Baltica	12/2030	NS-B
New Rail Line Dresden - Praha (Section Heidenau - State Border DE/CZ)	12/2030	NS-B, OEM
ABS/NBS München - Rosenheim - Kiefersfelden - Grenze D/A (--> Kufstein)	12/2030	SCANMED, RD
Upgraded line (ABS) (Amsterdam) - DE/NL border - Emmerich - Oberhausen (1. + 2. Phase)	12/2030	RALP, NS-B

Project	End date	RFC
Y Basque High-speed Rail (freight and passenger traffic): all sections + access to cities Bilbao and Vitoria + implementation of UIC between Astigarraga-border + ERTMS + electrification + systems	12/2030	ATL
ABS Kehl–Appenweier (POS-Süd)	12/2030	RD
ABS München-Mühldorf-Freilassing	12/2030	RD
ABS Nürnberg – Passau	12/2030	RD
ABS Hof - Marktredwitz - Regensburg - Obertraubling (Ostkorridor Süd)	12/2030	RD
Semmering base tunnel	12/2030	BA
Modernisation/ Rehabilitation and Electrification of Craiova-Calafat railway section (107 km)	12/2030	OEM
Upgrade Nordbahn Wien Süßenbrunn - Bernhardsthal	12/2030	BA, OEM
Modernization of the Radomir - Gyueshevo railway section	12/2030	OEM
ABS Nürnberg – Marktredwitz – Reichenbach/BGr DE/CZ (–Prag)	12/2030	RD
ABS Nürnberg - Schwandorf/München - Regensburg - Furth im Wald - Grenze D/CZ	12/2030	RD
Modernization of the line Plzeň - Česká Kubice, section Stod (excl.) - State border D	12/2030	RD
Rehabilitation of the railway line Caransebes – Craiova	12/2030	OEM
Kanin – Hradec Kralove – Chocen, second track increase speed	12/2030	OEM

3.3.3 SENSITIVITY ANALYSIS: AN 11 RFCS NETWORK IN LINE WITH TEN-T STANDARDS

The Sensitivity scenario helps to understand the impact of completing the 11 RFCs Network according to TEN-T standards[10]. This scenario concerns the availability of European standard rail gauge in Spain and Portugal, the introduction of ERTMS on the entire rail network, and the introduction of 740-meter trains along the 11 RFCs. This scenario can be regarded as a hypothetical exercise as the projects needed to achieve these standards are by no means all ready to be implemented in 2030. Additionally, the TEN-T legislation allows Member States to apply for derogation to achieve compliance without achieving the TEN-T requirements in those cases where the cost of the investment may not be supported by sufficient economic benefits. Despite being theoretical, this scenario provides insights into what would happen with rail transport demand if the TEN-T standards would be achieved in full scale along the 11 RFCs Network. The scenario has been implemented as follows:

- ***ERTMS***. The European Rail Traffic Management System (ERTMS) is important to enhance the interoperability of rail transport through a single European signalling system. ERTMS is designed to replace the multitude of incompatible safety systems currently in use across European railways, thereby facilitating cross-border rail traffic and improving the competitiveness of the rail sector. It is expected that the implementation of ERTMS will lead to safety enhancements, operational efficiency, and environmental benefits. Despite the investments and the challenges faced during its deployment, the long-term benefits of ERTMS can be substantial. To simulate the improvements in safety and efficiency, the **speed on the entire network is increased by 3%**.

[10] According to Article 39 of Regulation (EU) 1315/2013 on Union guidelines for the development of the trans-European transport network

- ***Introduction of 740-meter trains***. The introduction of longer freight trains (740 meters) will further enhance the efficiency and capacity of rail freight transport. The 740 meter adjustments represent a significant increase over the standard length of freight trains, which traditionally varies by country often ranging around 400 to 600 meters. The transition to 740-meter trains is part of broader efforts to make rail freight a more competitive and sustainable alternative to road transport. The impact of deploying such long trains within the rail freight sector is multifaceted, encompassing operational, economic, and environmental perspectives. However, realizing these benefits fully necessitates significant investments in infrastructure and operational adjustments. The strategic move towards longer trains reflects a commitment to enhancing the competitiveness of rail freight and its role in a sustainable transport system, despite the challenges involved. From a study carried out for the Ministries of Transport in The Netherlands, Belgium, and Germany[11], it was found that, on average, **the average train volume will increase by 15%,** leading to a reduction in rail freight transport costs of approximately 5%. It is assumed that the 15% increase will take place **between *all* origins and destinations in Europe**. The increase will not always be possible, but as this scenario is hypothetical, we neglect these details for reasons of efficiency.
- ***European standard gauge in the Iberian Peninsula.*** The Projects scenario already includes the development of the Rail Baltica Project, which among others integrate the rail system of the Baltic Member States into the EU one, with reference to the European standard track gauge. The sensitivity scenario complement the Projects scenario in simulating the impact of the transition to European gauge of all the RFC lines crossing Spain and Portugal, thus assuming the whole 11 RFCs Network would be in line with the TEN-T standards in terms of track gauge. Whereas the effects of such a scenario on the international traffic between the two Iberian countries might be marginal, international traffic between these two countries and other EU countries across the Pyrenees would be smoother and more efficient. Whereas the implementation of the EU track gauge network in the Iberian peninsula (and similarly in the Baltic States) may be challenging under the socio-economic point of view, as costs may exceed possible benefits especially upon accurate consideration of investments, resources and time needed to change not just the rail infrastructure, but also the rolling stock, and the terminals equipment and facilities along the whole logistics chain, the availability of an EU track gauge network reduces in principle logistical complexities, times and costs associated with gauge changeovers between different gauge systems. Taking into consideration the difficulties in assessing the impact of the migration of the Iberian network belonging to the RFCs to the EU standard track gauge, to the purposes of this study the transition has been simulated by a reduction of the waiting time by **4 hours**. We acknowledge that this approach is simple and that not all details or costs associated with the transition are considered. Nevertheless, some positive effects on demand are expected.
- ***22.5 t axle load and P400 intermodal loading gauge***. The above-quantified effects are assumed to generally capture also the benefits potentially attributable to the TEN-T axle load requirement and P400 intermodal gauge as conditions for an 11 RFCs Network in line with TEN-T standards, specifying that both elements are crucial for the competitiveness of rail freight transport in Europe, although their direct effects on transport costs and travel times are difficult to be quantified on the entire network.

[11] TML, Panteia, ViaCon (2023). Cost-benefit analysis 3RX. Leuven: TML.

The simulated measures provide insights into the potential impact that rail freight transport may have on transport demand. A shift from road and inland shipping to rail transport is expected.

4 ANALYSIS OF THE CURRENT RFC RD TRANSPORT MARKET

This chapter provides an overview of the analysis of the current freight transport market (2022) along the RFC RD. The analysis of both the current and future market has been done using an EU-wide NEAC model, combining transport and economic statistics from Eurostat with train traffic data available from the RNE TIS database. The analysis focusses on the international trains, i.e. those trains crossing at least one BCP. In this respect, it is noticed that in national train databases and in the TIS dataset, trains logged as national ones might actually operate along international itineraries. The use of the NEAC model made it possible to partially overcome the limitations of the current structure of the datasets. Nonetheless, the results presented in this report might be conservative in the estimation of the international flows along the RFCs.

For the correct assessment and understanding of the current RFC RD market, a top-down approach has been adopted. Before exploring the specificities of the RFC RD, an overview of the European international (rail) freight market is given. This is appropriate as on one hand the RFC RD is used by trains with origins and destinations outside the RFC concerned countries; on the other hand, the RFC RD overlaps with other RFCs. The analysis of the current market is presented as follows:

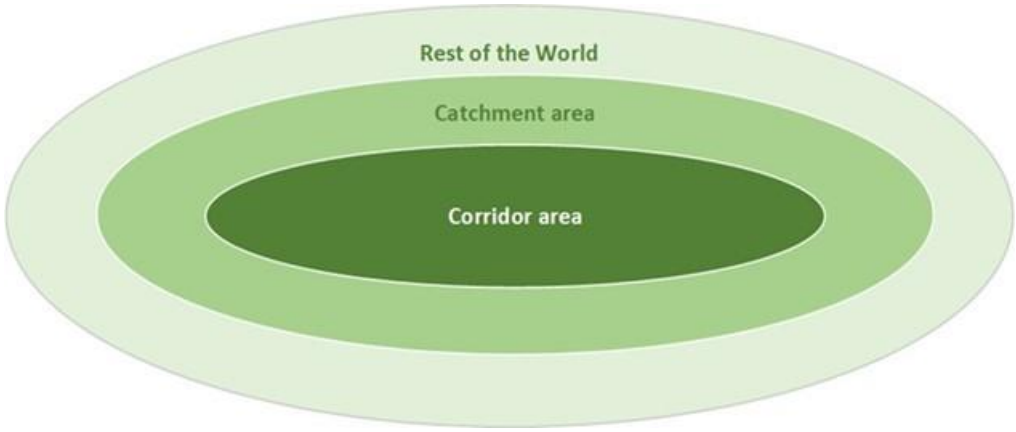
- Section 4.1 presents the Definition of catchment area and corridor areaHiba! A hivatkozási forrás nem található. It shows the importance of both definitions and lays a basis for the rest of the chapter.
- Section 4.2 presents **International freight transport in the 11 RFCs network**:
  - Section 4.2.1 gives an overview of the **Corridor and catchment areas of the 11 RFCs Network**;
  - Section 4.2.2 provides a general overview of the **ALL International freight transport for the 11 RFCs network catchment AREA**. This includes total volumes by mode and cargo type. Furthermore, we present the volumes by main origin and destination countries, as well as the main relations for all freight transport. Finally, a volume-distance distribution by mode is presented;
  - Section 4.2.3 describes the **International rail freight transport in the 11 RFCs network catchment area** This provides a general overview of the origins and destinations of rail freight in Europe;
  - Section 4.2.4 presents the **International rail freight transport flows in the 11 RFCs network catchment area**.
- Section 4.3 provides the **International (rail) freight transport along the RFC RD catchment area**:
  - Section 4.3.1 gives an overview of the Corridor and catchment area of RFC RDHiba! A hivatkozási forrás nem található.;
  - Section 4.3.2 provides a general overview of **ALL International freight transport in the RFC RD catchment area**. This includes total volumes by mode and cargo type. Furthermore, the volumes by main origin and destination countries are described, as well as the main relations for all freight transport. Finally, a volume-distance distribution by mode is presented.
  - Section 4.3.3 illustrates the **International rail freight transport** in the RFC RD catchment area. This provides a general overview of the origins and destinations of rail freight for the RFC RD.
  - Section 4.3.4 describes the International rail freight transport flows On the RFC RD catchment area.

4.1 DEFINITION OF CATCHMENT AREA AND CORRIDOR AREA

The presentation of the results for an RFC necessitates a brief definition of the corridor area and of the corridor catchment area. The definition of both can be approached from two perspectives: the supply perspective, focusing on the railway network within a corridor, and the demand perspective, centred on the volume of goods transported via an RFC. The **corridor area** refers to the geographic area that is crossed by the railway freight lines. The **catchment area** encompasses regions that use the RFC for international goods transportation by rail, often extending beyond the boundaries of the corridor area. The corridor area is (by definition) part of the catchment area.

The differentiation between these two types of areas is important, as various origins and destinations within a corridor area of an RFC area may currently not receive or use rail services. However, they may be served by rail transport in the future. Furthermore, understanding the current origins and destinations served by an RFC is essential. This is where the catchment area comes in. It comprises all NUTS2[12] regions that are being served by a specific RFC. Figure 19 shows the differences between the corridor area and the catchment area, as well as the rest of the world. As can be seen, the corridor area has the smallest coverage of all areas.

Figure 19 Schematic concept of the geographic coverage of the market analysis



The **corridor area** of an RFC is defined as NUTS 2 zones which are being crossed by railway freight lines of this RFC. Regarding the **catchment area**, a more precise definition is applied. To qualify, rail transport between an origin and destination must traverse *at least* one border-crossing point (BCP) associated with the respective RFC.

4.2 INTERNATIONAL FREIGHT TRANSPORT IN THE 11 RFCS NETWORK

The rail freight market for the individual RFCs can be appropriately understood only within the rail freight market across the whole European rail network. Each RFC has connections or overlaps with other RFCs. Also, trains using a RFC often have an origin or destination outside of a corridor area. Furthermore, by looking at

[12] A NUTS 2 zone refers to a level within the Nomenclature of Territorial Units for Statistics (NUTS), a hierarchical system developed by the European Union to divide the economic territory of the EU into territorial units for the purpose of collecting, developing, and harmonising statistical information. NUTS 2 forms basic regions for the application of regional policies, often used for regional development and structural funding. These zones are generally composed of regions with a population between 800,000 and 3 million people, although there can be exceptions. The precise structure and the number of NUTS 2 zones can vary between countries, depending on national administrative structures and the size and population of the country.

the entire network, the 'double counting' risk is mitigated. Therefore, a good knowledge of the European rail freight market forms a basis for the analysis of the individual RFCs' markets.

This section starts with a description of the catchment and corridor areas for the 11 RFCs network It then first focusses on all international freight transport of the corridor area of the 11 RFCs Network. After that, it presents the results at an aggregate level, before describing the volumes for origin and destination countries and the top 10 relations for the land transport modes, i.e. road, rail, and IWW (inland shipping).

4.2.1 CORRIDOR AND CATCHMENT AREAS OF THE 11 RFCS NETWORK

Figure 20**Hiba! A hivatkozási forrás nem található.** provides an overview of the *corridor areas* of the 11 RFCs network. It covers a vast part of Europe, but excludes countries such as UK, Ireland, Finland, Northern Scandinavia, and parts of the Balkan. Those countries or parts of countries that have no railway lines that belong to an RFC. The 11 RFCs Network *catchment area* [13] covers a much wider area. Besides the excluded countries, it also includes countries such as Ukraine, Moldova, Kazakhstan, and China. For rail transport this catchment area seems vast, but the number of rail relations is limited when compared to road transport. This is due to the character of road transport which can reach any location in Europe, while rail transport only serves areas with a rail connection.

[13] Not shown here, it will be shown later when presenting the international rail freight transport results.

Figure 20 Corridor area and rail network of the 11 RFCs Network

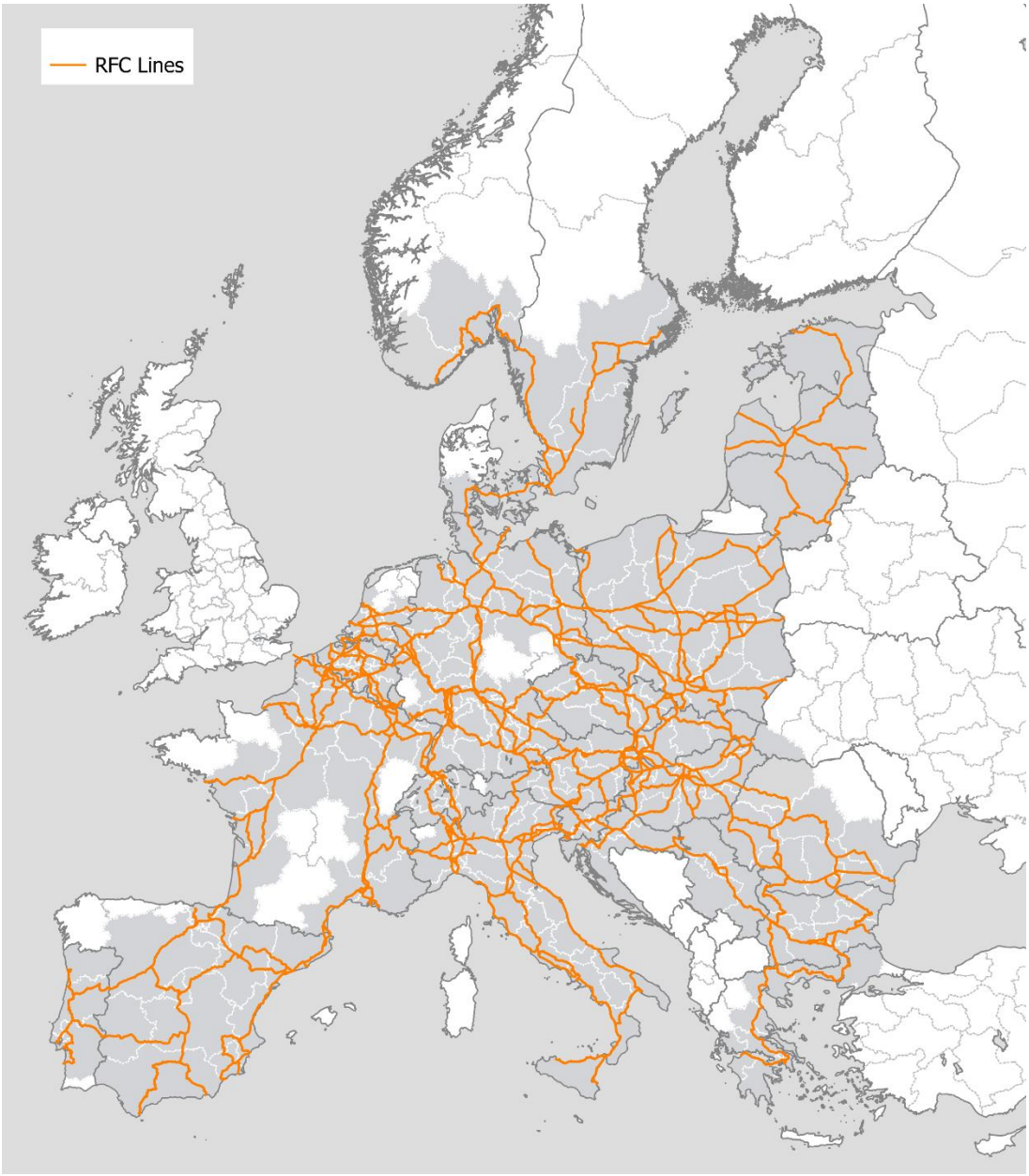
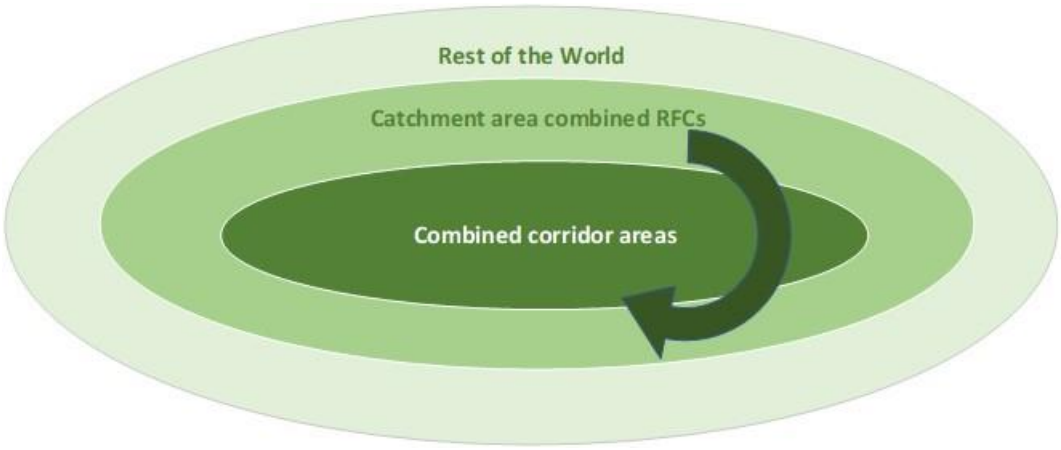


Figure 24**Hiba! A hivatkozási forrás nem található.** shows which results for the international freight transport for the 11 RFCs Network are presented in this section. It includes *all* international freight transport within the joint RFCs Network corridor and catchment area. The latter includes all international freight transport to and from locations such as China, Ukraine, Moldova Kazakhstan, the UK, or Northern Scandinavia as these countries and regions are part of the 11 RFCs Network catchment area. However, it excludes international freight transport from Africa, the US, or South America, as these are not part of the catchment areas of the

11 RFCs network. The analysis focuses on land modes that compete within the catchment area, i.e. road, rail, and IWW[14]. For the RFC specific part, also sea transport receives attention.

Figure 21 Schematic concept of the geographic coverage of the results presented in this section



4.2.2 ALL INTERNATIONAL FREIGHT TRANSPORT FOR THE 11 RFCS NETWORK CATCHMENT AREA[15]

The total volume of international freight transport over land in the 11 RFCs network catchment area is 1,439 million tonnes. The volume of international rail freight transport is 265 million tonnes (about 442,000 international trains[16]), which is 18% of the total amount of transport to, from, and within the catchment area of the 11 RFCs Network. The share and volume of IWW is 17% (240 million tonnes), and the share of road transport is 65% (934 million tonnes).

Concerning the cargo types[17], the category *Other* (general cargo, including intermodal transport and container) dominates the international freight transport for the 11 RFCs network, by 845 million tonnes of volume. This is about 59% of all international freight transport. This cargo type is mostly transported by road (about 69%). *Dry bulk* is the second largest cargo type at 32% (465 million tonnes). *Liquid bulk* has as share of 9% (128 million tonnes) in the total volume of international freight transport over all modes.

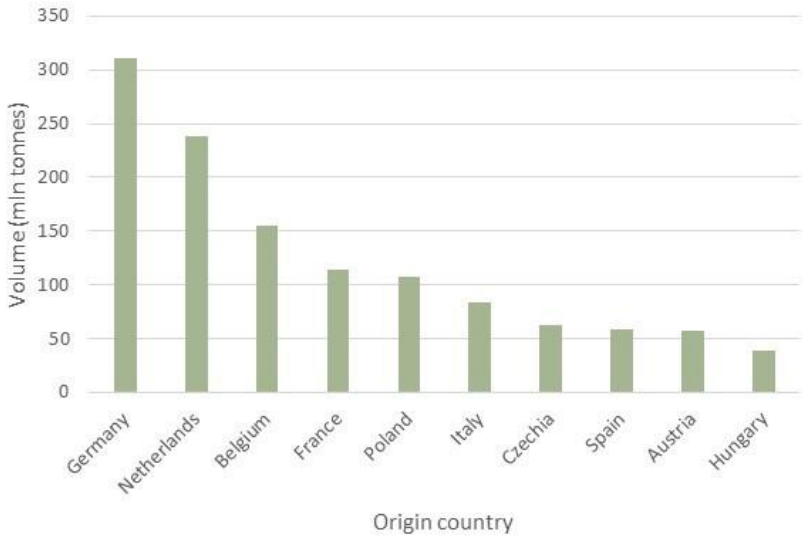
[14] Maritime transport is left out, as it makes the interpretation of the results challenging. As we only consider the rail catchment area, several other maritime relations are not considered, which might easily lead to misinterpretations. Therefore, we only consider land modes in the rail transport market study, also because these are the main sources for modal shift.
[15] This chapter is a copy of section 4.2.2 of the RFCs joint transport market study.
[16] Using an average of 600 tonnes per train
[17] We distinguish dry bulk, liquid bulk, and other (general cargo and container). Dry bulk comprises commodities such as sand, ores and coal. Liquid bulk comprises mainly oil(products) and liquid chemicals. General cargo concerns a broad range of products such as cars, machinery, and electronics. Containers concern intermodal transport. The content is often unknown.

Figure 22 Estimated volume (million tonnes)[18] and share of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network in 2022

Source: *NEAC estimations*

Figure 23**Hiba! A hivatkozási forrás nem található.** and Figure 24**Hiba! A hivatkozási forrás nem található.** show the top 10 origin and destination countries of all international freight transport within the 11 RFCs Network catchment area. The top 3 origin and destination countries for international freight transport over land in the 11 RFCs Network catchment area are Germany, the Netherlands and Belgium. This concerns transport by road, rail, and inland shipping. A volume of 311 million tonnes of international freight transport has its origin in Germany, while 352 million tonnes have Germany as a destination in 2022. Due to the ports in the Rhine-Scheldt delta (such as Port of Rotterdam, Port of Amsterdam, North Sea Ports (Ghent-Terneuzen) and Port of Antwerp-Bruges), both the Netherlands and Belgium are important origin and destination countries for international freight transport. The top 10 countries for origin cover 85% of all international freight transport for the catchment area of the 11 RFCs Network, while the top 10 destination countries cover 84% of all international freight transport.

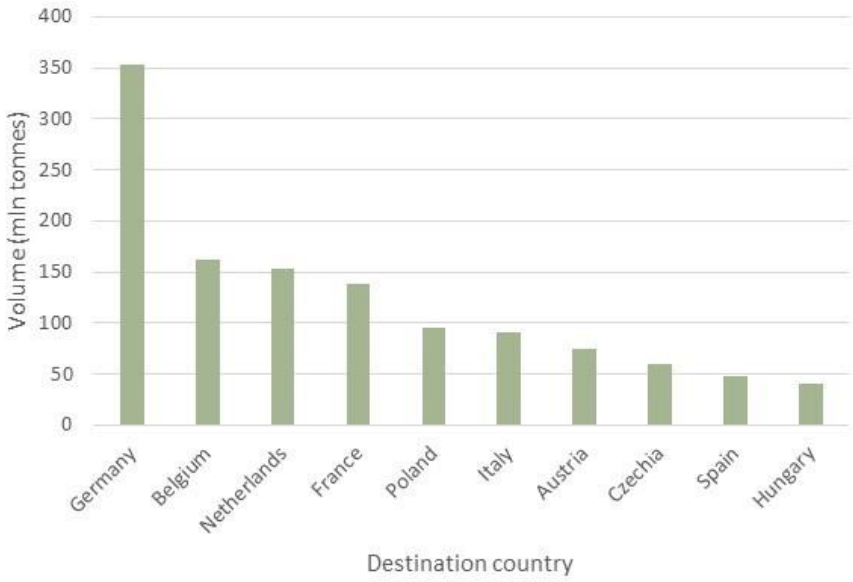
Figure 23 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 for the top 10 origin countries in the 11 RFCs Network catchment area.



[18] The volumes for 2022 are based on a combination of observed values from Eurostat, RNE (TIS) and estimated values from NEAC at a detailed NUTS2 level. Therefore, the results are called estimation. Detailed observed values are not available.

Source: NEAC estimations

Figure 24 Estimated volume (million tonnes) of *all* international freight transport over land by *destination* in 2022 for the top 10 destination countries in the 11 RFCs network catchment area.



Source: NEAC estimations

Table 40 shows international freight volumes transported between the 15 most important origin countries and the 15 most important destination countries within the catchment area of the 11 RFCs Network. The total freight volume for these countries is 1,266 million tonnes, which is 85% of all international freight transport in the combined 11 RFCs network catchment area. The most important freight transport relation is between The Netherlands and Germany at 123 million tonnes of freight transport by all land modes. Other big relations concern Netherlands-Belgium (79 million tonnes), Germany-Netherlands (67 million tonnes), Belgium-Netherlands (58 million tonnes), and Belgium-Germany (42 million tonnes). Together the freight transport relations between these 3 countries show once more the importance of the ports in the Rhine-Scheldt delta for their hinterlands. Some 27% of all international freight transport in the 11 RFCs Network catchment area concerns the relationship between these 3 countries.

Table 40 Freight volume (million tonnes) between the 15 most important origin and destination countries in the catchment area of the 11 RFCs network.

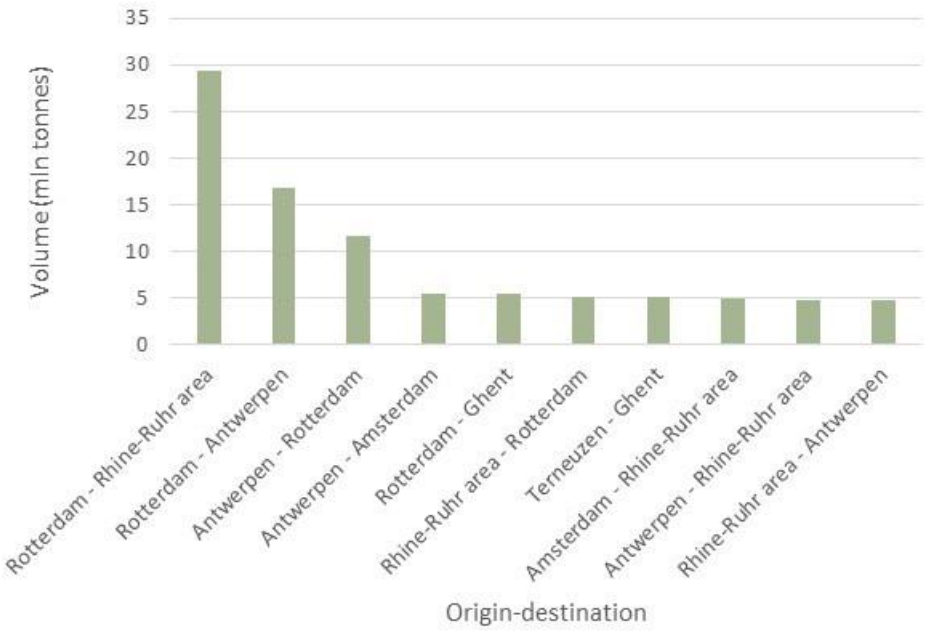
From/To	AT	BE	CH	CZ	DE	ES	FR	HU	IT	NL	PL	PT	RO	SI	SK	Total
AT		1	2	3	25	0	1	4	9	1	2	0	1	5	2	**56**
BE	1		1	2	42	2	35	1	3	58	5	0	0	0	0	**150**
CH	1	0		0	7	1	4	0	4	1	0	0		0	0	**18**
CZ	5	1	0		23	0	2	3	3	2	12		0	1	8	**61**
DE	33	38	17	18		8	31	7	28	67	36	1	2	2	5	**292**
ES	0	2	1	1	8		26	0	4	2	2	12	0	0		**58**
FR	1	30	7	1	25	20		0	11	10	3	1	0	0	0	**110**
HU	6	1	0	2	7	0	1		5	1	3	0	3	2	4	**34**
IT	8	2	7	2	25	4	12	3		3	5	0	1	4	1	**79**
NL	2	79	3	2	123	2	13	1	4		5	0	0	0	0	**235**
PL	3	3	1	17	41	1	4	3	5	4			3	1	6	**93**
PT	0		0		1	9	1	0	0	0	0			0		**12**
RO	1	0		0	2	0	1	3	2	1	2			0	1	**13**
SI	8	0	0	1	2	0	0	3	5	0	1	0	0		1	**21**
SK	4	0	0	9	6	0	0	7	2	0	5		1	1		**35**

Total	**73**	**158**	**39**	**58**	**336**	**48**	**133**	**35**	**86**	**150**	**81**	**14**	**11**	**15**	**29**	**1,266**

Source: NEAC estimations

The main origins and destinations for all land modes in international freight transport are depicted in Figure 25 below. As can be seen, these concern relations between the Netherlands, Belgium, and Germany mainly (with ports such as Rotterdam, Amsterdam, Ghent (North Sea Ports) and Antwerp (Port of Antwerp-Bruges), and inland locations such as the Rhein-Ruhr area).

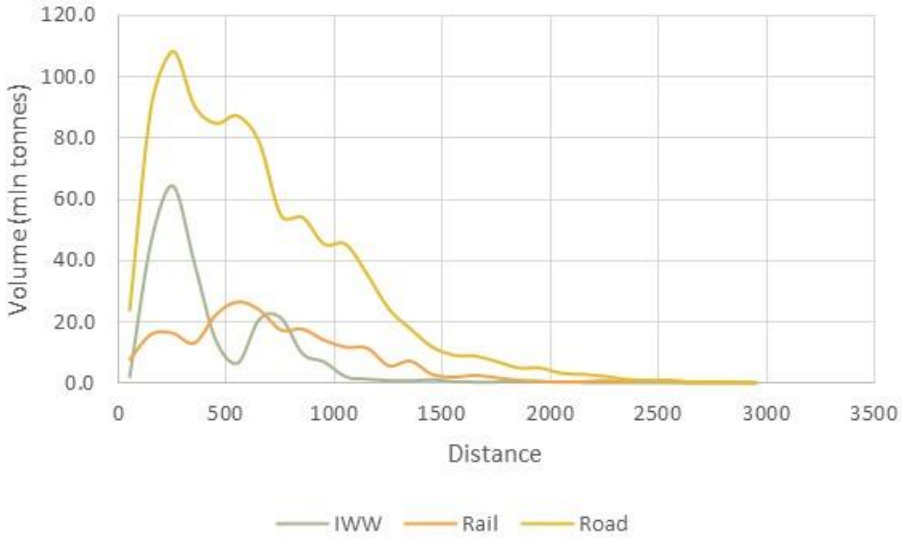
Figure 25 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of all international freight transport over land in 2022 within the 11 RFCs network catchment area



Source: NEAC estimations

The 'trip' length distribution for international freight transport in Europe in the catchment area of the 11 RFCs Network is shown in Figure 26. This graph shows the volume (in million tonnes) by distance (in km). The peak for road (107 million tonnes) and inland shipping (64 million tonnes) is in both cases around 250 km. For international rail transport this is around 550 and 750 km at 27 million tonnes.

Figure 26 Volume distribution (million tonnes) by distance (km) in the catchment area of the 11 RFCs network area in 2022



Source: NEAC estimations

4.2.3 INTERNATIONAL RAIL FREIGHT TRANSPORT IN THE 11 RFCS NETWORK CATCHMENT AREA

Figure 20**Hiba! A hivatkozási forrás nem található.** (see page 87) provides an overview of the *corridor area* of the 11 RFCs Network. The corridor area of the 11 RFCs Network covers a vast part of Europe, but excludes countries and regions such as the UK, Ireland, Finland, Northern Scandinavia, and parts of the Balkan. The 11 RFCs Network catchment area covers a much wider area. It includes the previously mentioned countries, as well as countries east of Europe such as Ukraine, Kazakhstan, and China.

The rail freight transport *catchment* area for the 11 RFCs Network is shown in Figure 27**Hiba! A hivatkozási forrás nem található.** and Figure 28**Hiba! A hivatkozási forrás nem található.**. Figure 27**Hiba! A hivatkozási forrás nem található.** provides an overview of the volumes by origin, while **Hiba! A hivatkozási forrás nem található.** shows the volumes by destinations. As can be seen, international rail freight transport is clearly generated or destinated outside the corridor area of the 11 RFCs network area (in countries such as Ukraine, Finland and UK). The 11 RFCs Network catchment area for international rail freight transport is thus wider than the corridor area of the 11 RFCs Network area. Note that some areas are white coloured. These do not generate or receive international rail freight transport.

Important NUTS2[19] origins for rail freight transport are Rotterdam, Hamburg, the Rhein-Ruhr area, Linz, Ostrava, Katowice, Koper, and Milan. On the destination side, we see similar locations such as Rotterdam, Hamburg, Rhein-Ruhr area, Saarland, Ostrava, Katowice, Linz, Turin, Milan, and Budapest. Typically, land-locked regions in countries such as Austria, Czechia, Hungary, Poland and Slovakia rely upon rail transport for larger quantities of transport volumes. This is expressed in the maps presented below.

[19] We present the NUTS2 regions by mentioning the main cities in these regions, to make it easier to understand the results.

Figure 27 Origins of international rail freight transport (in million tonnes) for the 11 RFCs network catchment area

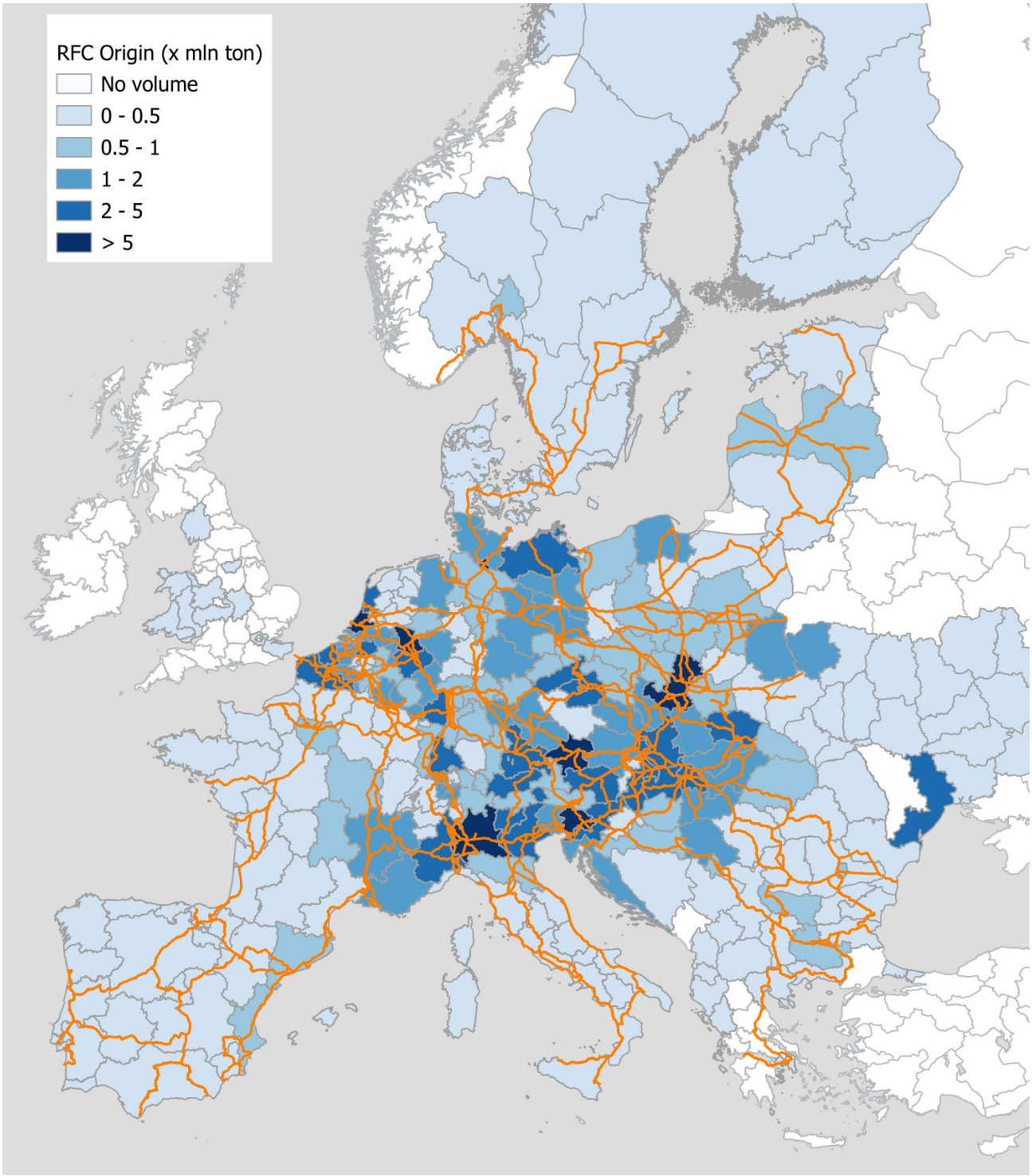


Figure 28 Destinations of international rail freight transport (in million tonnes) for the 11 RFCs network catchment area

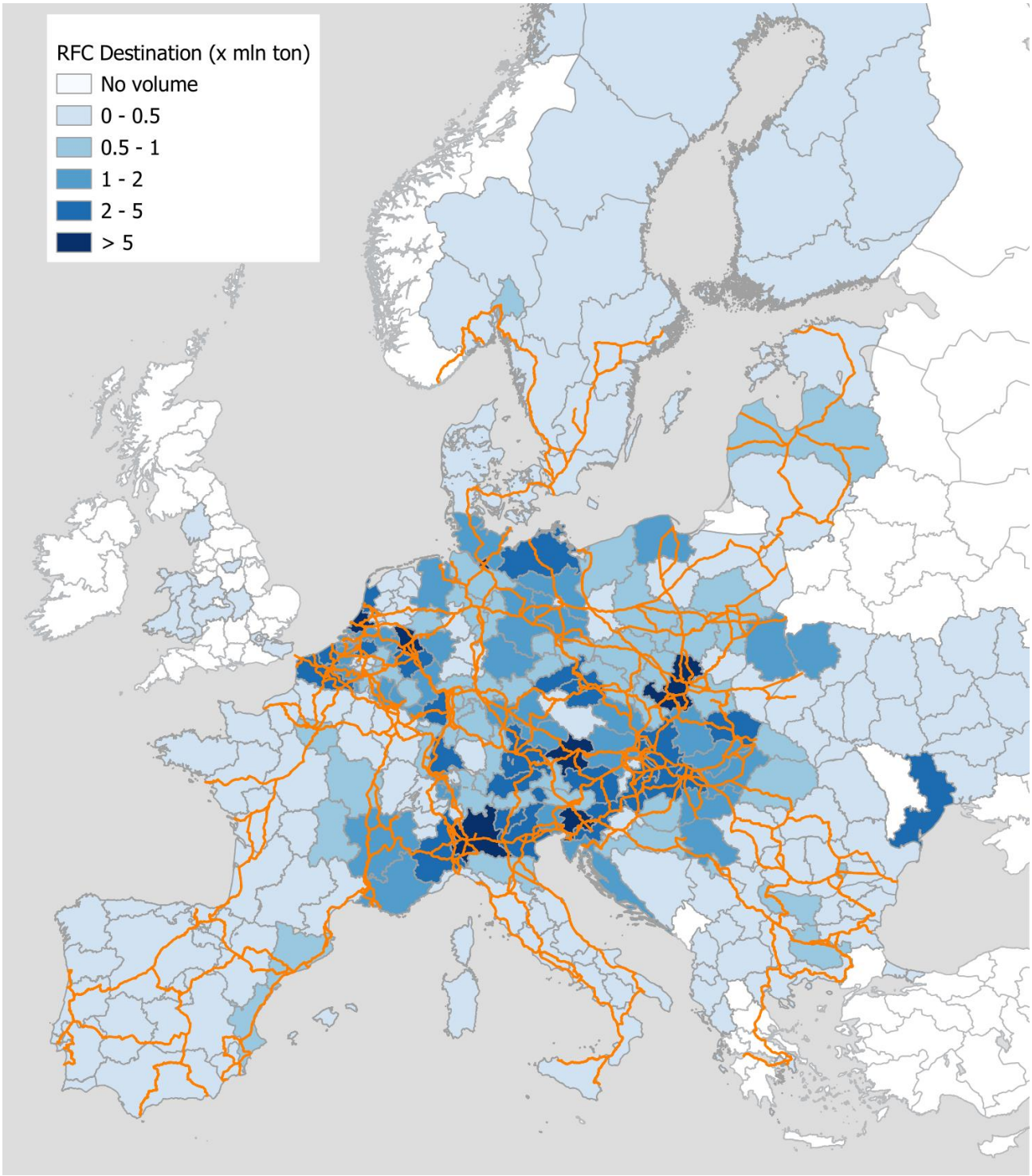
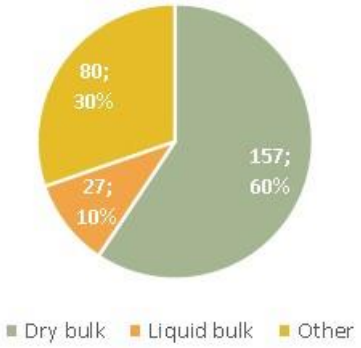


Figure 29 shows the volumes of international rail freight transport by cargo type in the 11 RFCs network catchment area. Dry bulk is the most important cargo type for international rail freight transport. It has a share of 59%, which is equivalent to 157 million tonnes. The cargo type *Other* (general cargo, including intermodal transport and container) has a share of 30% (80 million tonnes), and liquid bulk of 10% (27 million tonnes) in the total volumes of international rail freight transport.

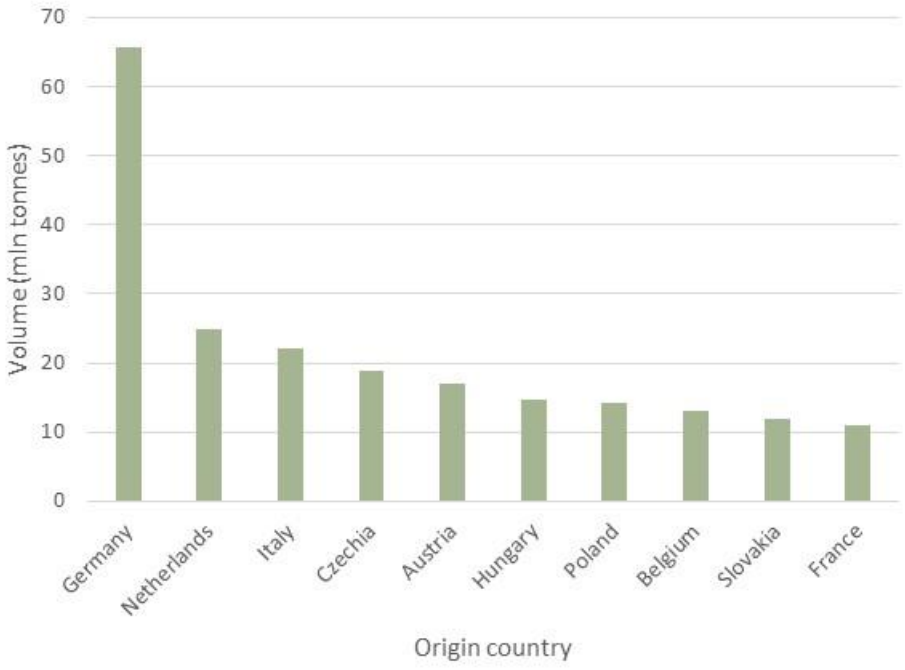
Figure 29 Estimated Volume and share of international rail freight transport (million tonnes and %) by cargo type in 2022, in the 11 RFCs network catchment area



Source: NEAC estimations

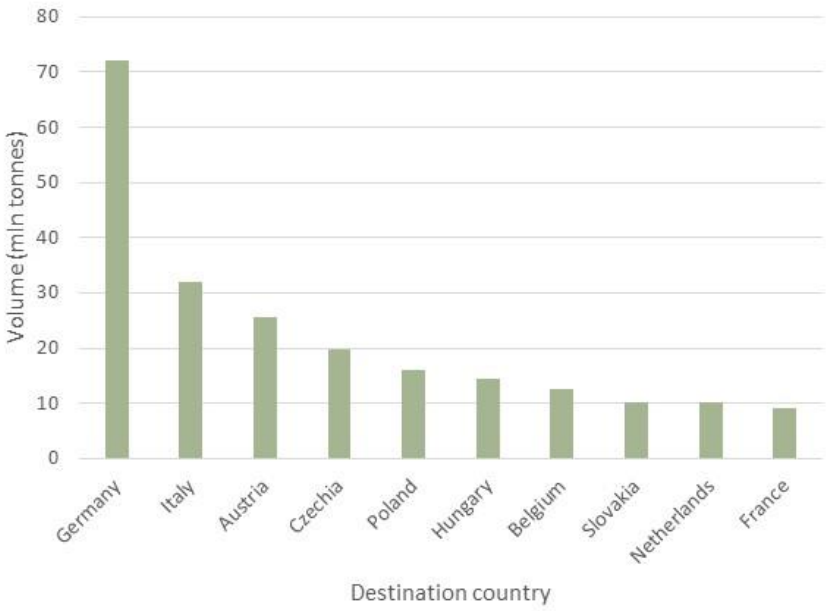
The most important origin and destination countries for rail transport are provided in Figure 30 and Figure 31. Concerning both origin and destination, Germany is the country with the highest international rail freight transport volumes. As an origin country it ships 66 million tonnes, while as a destination it receives 72 million tonnes of international rail freight transport. Other important origin countries are The Netherlands and Italy (25 and 22 million tonnes). Concerning destination, Italy and Austria are number 2 and 3 with respectively 32 and 26 million tonnes of international rail freight transport.

Figure 30 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the 11 RFCs network catchment area



Source: NEAC estimations

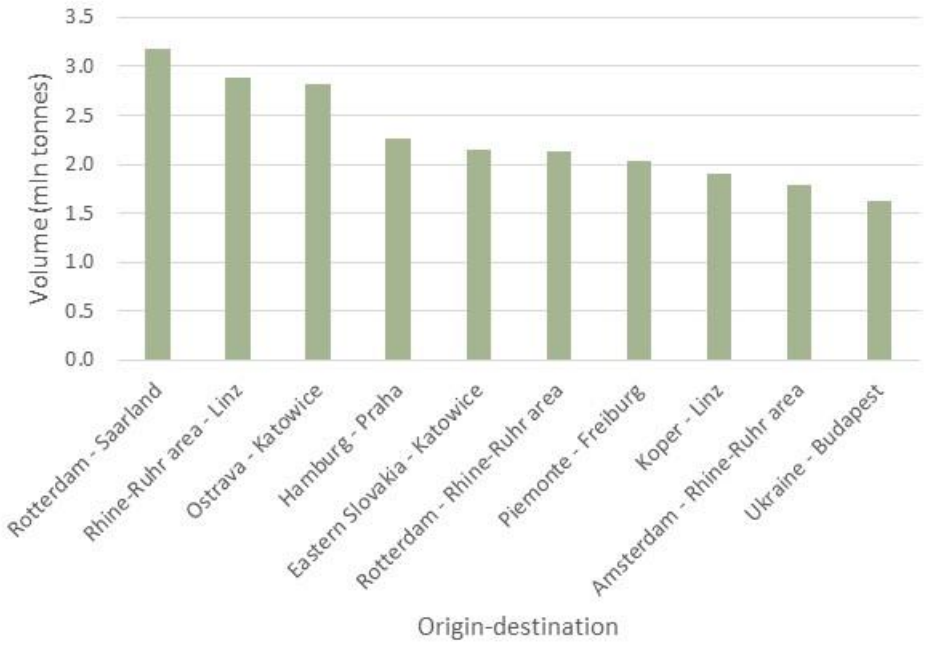
Figure 31 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the 11 RFCs network catchment area



Source: NEAC estimations

Figure 32 shows the 2022 top 10 international rail freight transport relations in the 11 RFCs Network catchment area. The relation between Rotterdam and Saarland is the most important one, with a volume of 3.2 million tonnes. This concerns the transport of dry bulk (coal). Second comes the relation between the Rhein-Ruhr area and Linz, at 2.9 million tonnes. This concerns mostly liquid bulk transport. In third place we see the relation between Katowice and Ostrava, which is mostly dry bulk. The relation between Hamburg and Prague (Praha) comes in fourth place. This rail transport relation is mostly about the transport of general cargo. There is not a single relation that dominates the international rail freight transport market.

Figure 32 Estimated volume of international rail freight transport (million tonnes) on the top 10 most important relations in 2022 in the combined 11 RFCs network catchment area



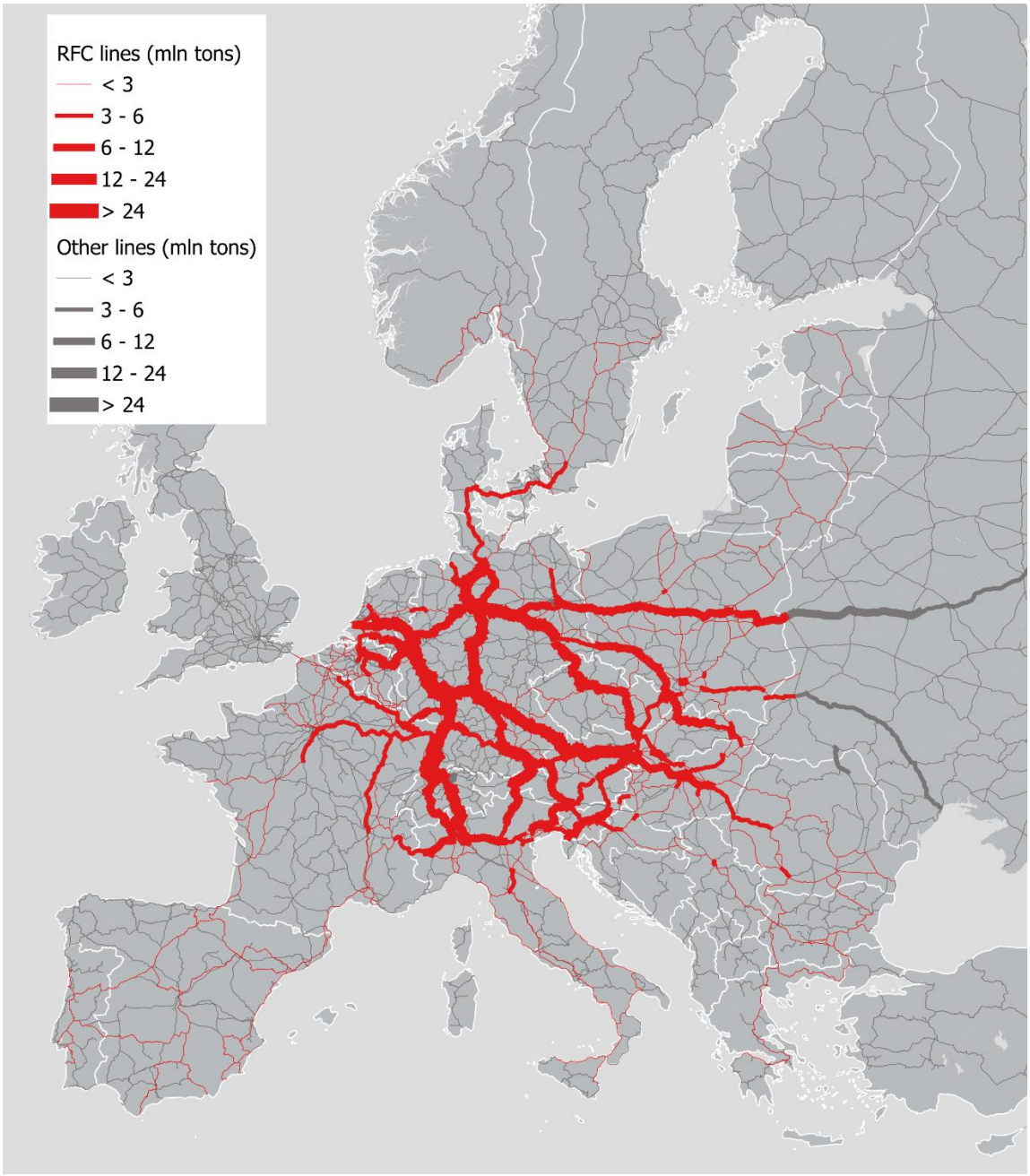
Source: NEAC estimations

4.2.4 INTERNATIONAL RAIL FREIGHT TRANSPORT FLOWS IN THE 11 RFCS NETWORK CATCHMENT AREA

Figure 33 shows the estimated international rail freight flows (in tonnes) for the 11 RFCs Network catchment area. This provides a general overview of the main rail lines in Europe. As can be seen, Germany comprises the most utilised rail tracks for international rail freight transport. Important relations between Germany and its neighbouring countries are also clearly depicted. Furthermore, a large amount of rail transport can be seen between Poland and Czechia. At the different border-crossing points the volumes are consistent with the number of trains observed. Also important to note is the transport to/from Ukraine and China.

Another thing to notice is the relatively small amount of international rail freight transport in Spain, Portugal, the Balkans, Mid and South Italy, South of France, Greece, Sweden, Norway and the Baltic States. The international rail freight volumes in these areas are limited compared to the larger volumes in the centre of Europe.

Figure 33 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022



Source: NEAC estimations

4.3 INTERNATIONAL (RAIL) FREIGHT TRANSPORT ALONG THE RFC RD CATCHMENT AREA

After the presentation of the European international freight transport market, this section provides further details on the international (rail) freight transport along the RFC RD. The structure of this section is as follows:

1. Presentation of the catchment and corridor areas of the RFC RD;
2. Description of the results for all international freight transport for the RFC RD corridor area;
3. Results of the international rail freight transport in the RFC RD catchment area;
4. Flows of rail freight on the RFC RD.

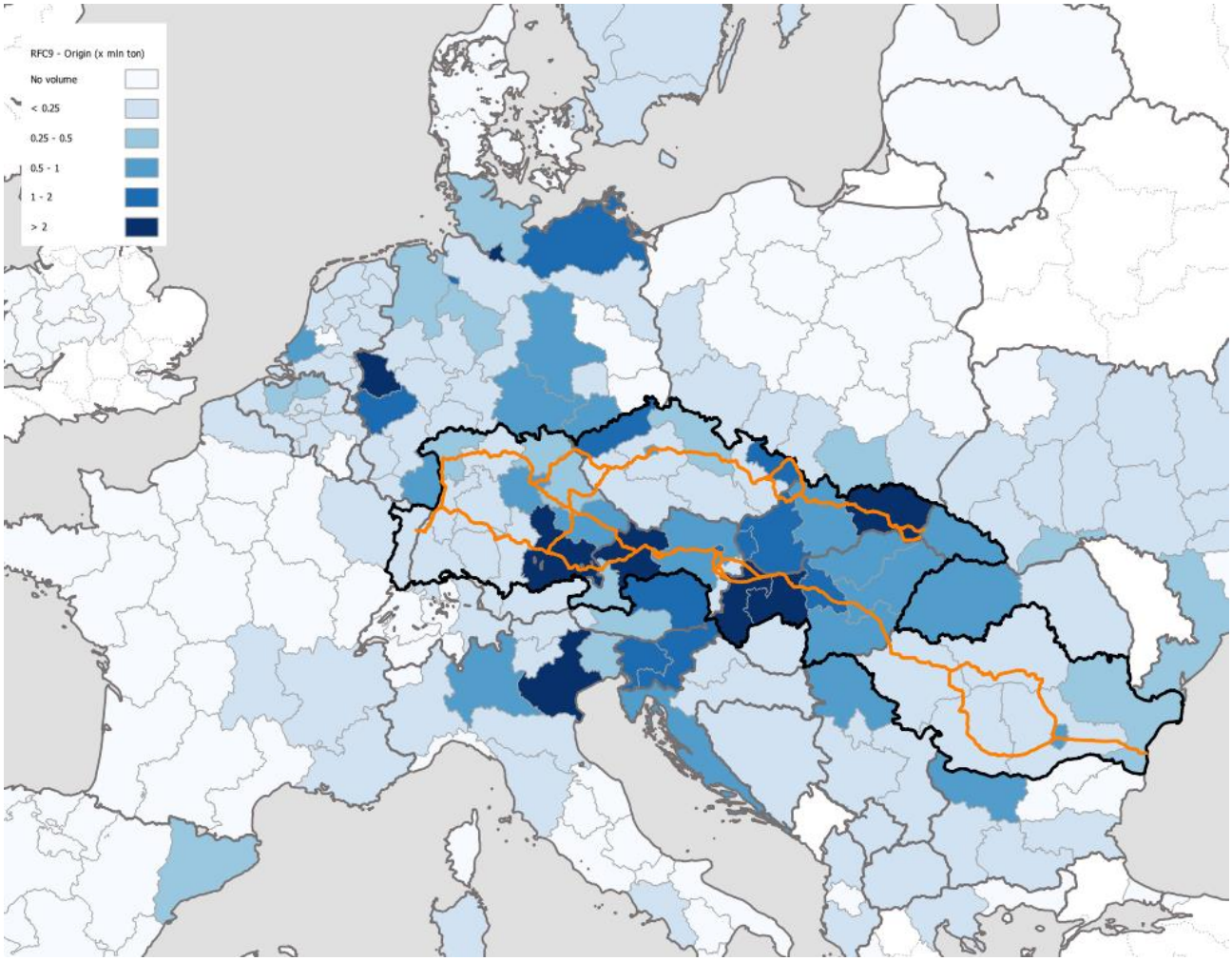
4.3.1 CORRIDOR AND CATCHMENT AREA OF RFC RD

In section **Hiba! A hivatkozási forrás nem található.**, a definition of corridor and catchment areas is given. This section details the corridor and catchment area for the RFC RD. Figure 34**Hiba! A hivatkozási forrás nem található.** provides an overview of the RFC RD network and railway lines within its corridor area. The RFC RD network and corridor area serves as a basis for the estimation of the international rail freight volumes transported between the different origins and destinations. It is worth noticing that international rail transport within the RFC RD is also dependent upon rail transport to and from locations outside the corridor area of the RFC RD, as further elaborated in later sections.

Figure 34 Corridor area and rail network of the RFC RD

The catchment area for international rail freight transport of the RFC RD exceeds the corridor area. The corridor area captures (large parts of) Germany, Austria, Czechia, Slovakia, Hungary, and Romania. A large proportion of the rail freight transport uses the RFC RD, and its border-crossing points to ship freight by rail from different origins to different destinations (see overview in the next figures). The picture below shows the origins of the RFC RD, with important origins such as Munich, Linz, Vienna, Eastern Slovakia, and Western Hungary. Outside the corridor area different zones can be seen that contribute to the RFC RD, such as the rest of Germany (Rhine-Ruhr area, Hamburg), France, Italy, Poland, Serbia, Greece, and Ukraine (see map).

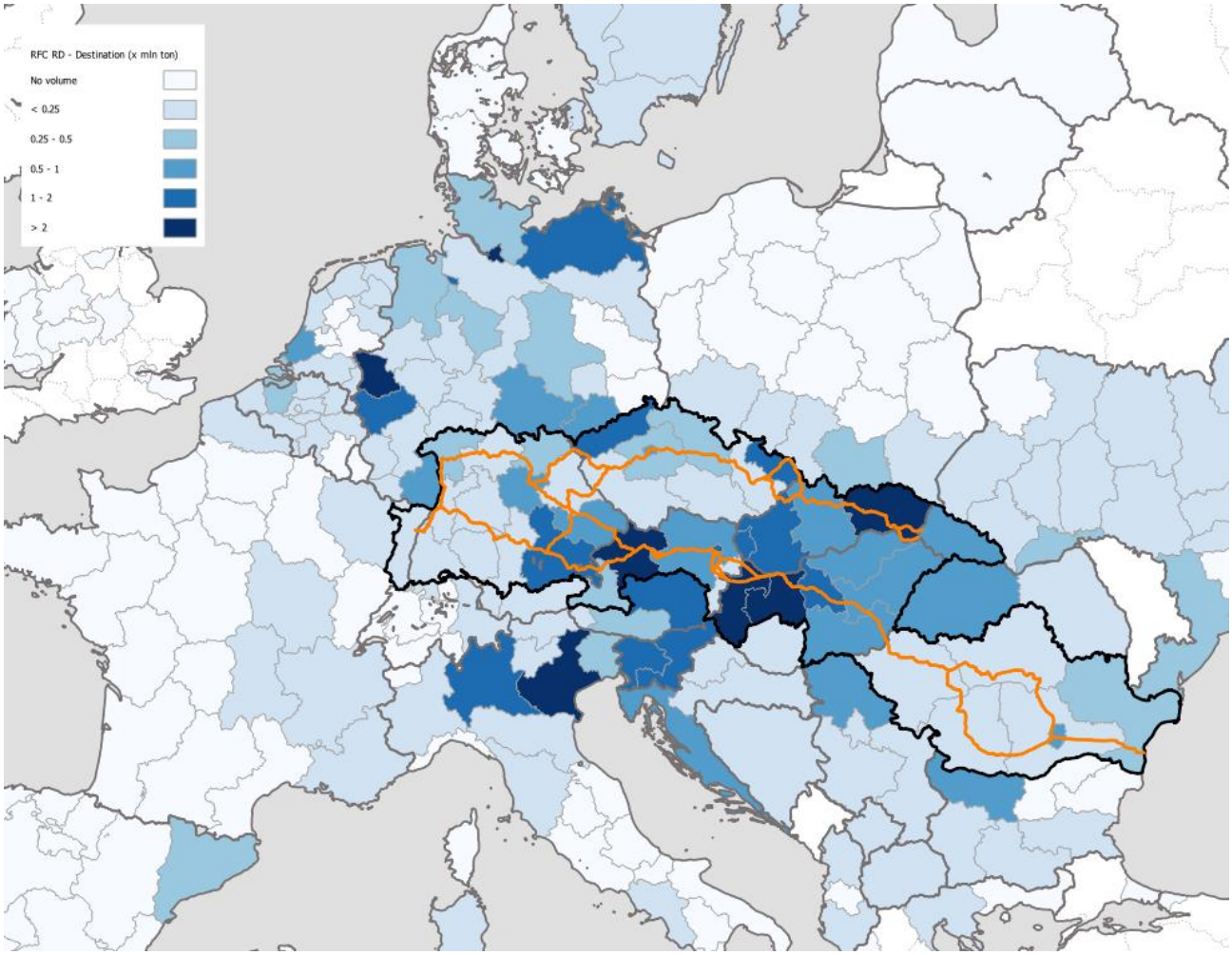
Figure 35 Origins of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area



Legend: Orange = rail tracks of RFC RD. Blue = Volume by origin. Black = Delineation of corridor area.
Source: NEAC estimations

The next figure presents the destinations within the RFC RD catchment area. The figure highlights that zones in Austria (Linz), Slovakia (East), Hungary (West and Budapest) exhibit the highest freight volumes to those destinations. It is evident from the figure that numerous zones benefiting from RFC RD's services fall outside the corridor area, such as areas in the rest of Germany (Rhine-Ruhr, Hamburg), Italy (Veneto), Serbia, Croatia and Bulgaria.

Figure 36 Destinations of international rail freight volume (in million tonnes) in the RFC RD rail network catchment area



Legend: Orange = rail tracks of RFC RD. Blue = Volume by origin. Black = Delineation of corridor area.
Source: NEAC estimations

4.3.2 ALL INTERNATIONAL FREIGHT TRANSPORT IN THE RFC RD CATCHMENT AREA

The total volume of international freight transport in the *catchment* area of the RFC RD is estimated at 263 million tonnes, transported by road, rail, inland shipping and sea shipping. The international rail freight transport volume in this area is estimated at 94 million tonnes (about 100.000 trains). This is 36% of the total amount of transport for the RFC RD. The share of inland shipping is 5%, the share of road transport 59%. Sea shipping does not play an important in this RFC (less than 1 million tonnes).

Concerning the cargo types, *Other* (General cargo, including intermodal transport and container) dominates the international freight transport within the catchment area of the RFC RD, with a volume of 147 million tonnes. This is about 56% of all international freight transport for the RFC RD. Dry bulk is the second largest cargo type at 35%. Liquid bulk has a share of 9% in the total volume of international freight transport over all modes in the corridor area of the RFC RD.

Figure 37 Estimated volume (million tonnes) and share of *all* international freight transport by mode and cargo type in the *catchment* area of RFC RD

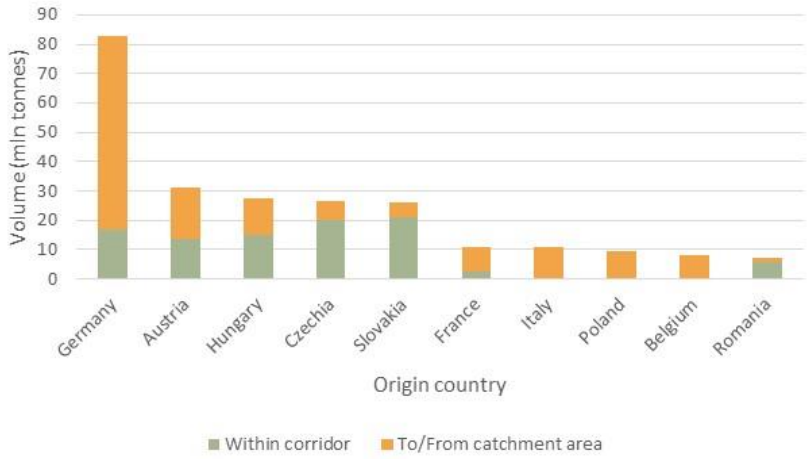
Source: NEAC estimations

Figure 38**Hiba! A hivatkozási forrás nem található.** and Figure 39**Hiba! A hivatkozási forrás nem található.** show the origin and destination countries for all international freight transport within the catchment area (which includes the corridor area) of the RFC RD. The green colour shows the origin and destination within the corridor area of the RFC RD. The orange colour shows the international freight transport to and from the rest of the catchment area. As can be seen, only the RFC RD countries (DE, AT, HU, CZ, SK, FR, RO) have green-coloured bars beside the orange ones, as these are the corridor countries.

The main origin countries for international freight transport in the RFC RD are Germany, Austria, and Hungary. This concerns transport by road, rail, and inland shipping. A volume of 83 million tonnes of international freight transport has its origin in Germany. Of this volume, 21% (17 million tonnes) is transported to other countries within the RFC, such as Austria or Hungary. Austria comes in second place with 31 million tonnes originating from locations in this country. In this case, 14 million tonnes (44%) go to other countries within the RFC. Hungary is the third country with 27 million tonnes. This country ships 15 million tonnes to other countries in the RFC RD. The volume stemming from Austria and Hungary, going to other RFC RD countries, show the importance of the locations in these countries for transport within the RFC RD.

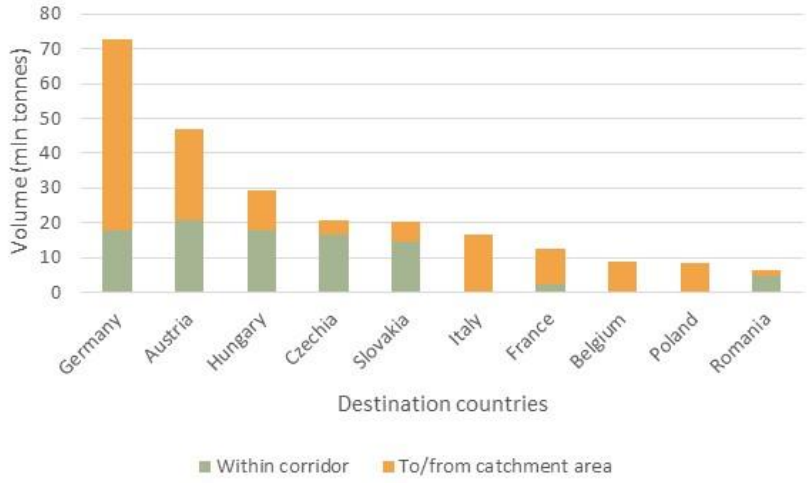
The main destination countries are also Germany, Austria and Hungary. Germany receives 73 million tonnes, of which 18 million tonnes stem from other RFC RD countries. Austria is second, with a volume of 47 million tonnes, of which 21 million tonnes have their origin in other RFC RD countries. Hungary receives 29 million tonnes, with 18 million tonnes coming from other RFC RD countries.

Figure 38 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 within the catchment and corridor area of RFC RD



Source: NEAC estimations

Figure 39 Estimated volume (million tonnes) of *all* international freight transport over land by *destination* in 2022 within the catchment and corridor area of RFC RD



Source: NEAC estimations

The following table shows all international freight volume between the countries *within the corridor area* of RFC RD for the *land* modes. The total amount of international freight volume is 95 million tonnes within the corridor area. The most important freight transport relation is between locations in the Slovakia and Czechia at 9 million tonnes of freight transport by all land modes. The reverse direction has 8 million tonnes. Another important relation concerns Germany-Austria (8 million tonnes) and its reverse direction (6 million tonnes). Also, the volume on the relation Slovakia-Hungary (v.v.) is substantial. The zero's indicate a small amount of volume.

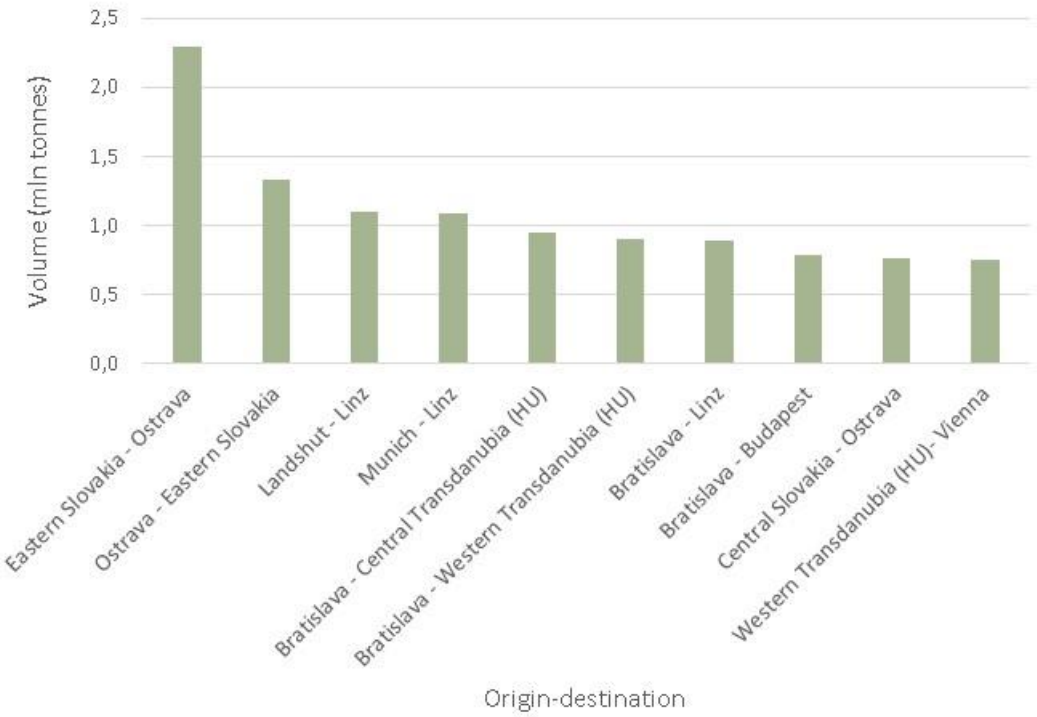
Table 42 Total freight volume (million tonnes) between the countries for land modes within the corridor area of the RFC RD

From/To	AT	CZ	DE	FR	HU	RO	SK	Total
AT		2	6	0	3	1	1	14
CZ	4		6	0	2	0	8	20
DE	8	4		2	2	0	1	17
FR	0	0	2		0	0	0	3
HU	4	2	2	0		2	4	15
RO	1	0	1	0	3		1	6
SK	3	9	1	0	7	1		21
Total	21	17	18	2	18	5	15	95

Source: NEAC estimations

The chart below depicts the main origins and destinations for all *land* modes. The most important relation is Eastern Slovakia-Ostrava, at 2.3 million tonnes. The reverse direction is in second place, at 1.3 million tonnes, followed by Landshut (at 1.1 million tonnes). Note that all relations are between inland locations.

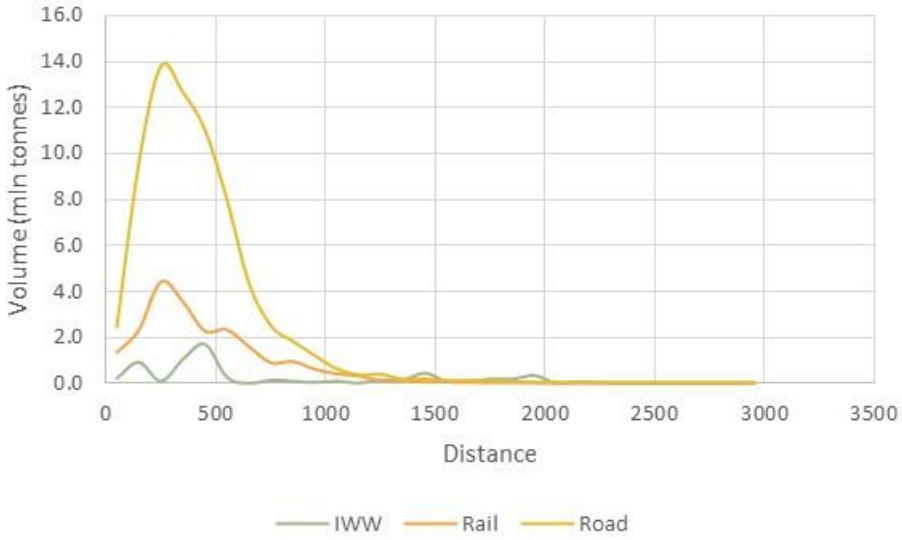
Figure 40 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of *all* international freight transport over land in 2022 within the corridor area of RFC RD



Source: NEAC estimations

The 'volume' distance distribution for international freight transport within the corridor area of RFC RD is shown in the figure below (in million tonnes) by distance (in km). The peak for road (14 million tonnes) is around 250 km. Inland shipping also peaks at around 450 km (2 million tonnes). For international rail transport the peak is around 250 km at 4 million tonnes. As can be seen, after 1500 km the volume of rail and road transport is small. This notion is important as it shows there might be a potential for a shift from road to rail on longer distances.

Figure 41 Volume distribution (million tonnes) by distance (km) within corridor area of RFC RD in 2022

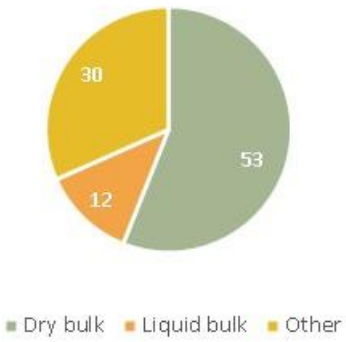


Source: NEAC estimations

4.3.3 INTERNATIONAL RAIL FREIGHT TRANSPORT IN THE RFC RD CATCHMENT AREA

Looking at the volumes of international rail freight transport by cargo type within the catchment (and corridor) area of the RFC RD, *Dry bulk* is the most important cargo type. It has a share of 56%, with 56 million tonnes of rail freight. The category *Other* has a share of 32% and liquid bulk of 12% in the total volumes of international rail freight transport in the RFC RD.

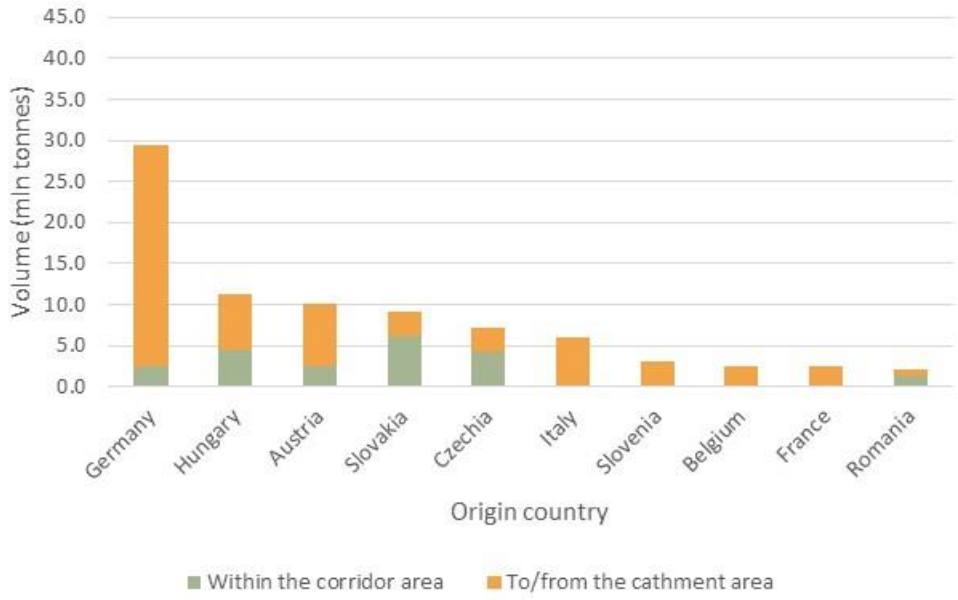
Figure 42 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 within the catchment (and corridor) area of the RFC RD



Source: NEAC estimations

The origin and destination countries for international rail freight transport in the catchment and corridor area are provided in the graphs below. Concerning origin, Germany is the country with the highest international rail freight transport volume. As an origin country, it ships 30 million tonnes. This country is an important origin for countries *outside* of the RFC RD, 92% of the rail freight is transported to locations outside of the RFC RD countries, using the RFC RD network. In second place comes the Austria at 12 million tonnes. Third comes Hungary at 10 million tonnes of international rail freight transport volume. Note that the share of rail freight transport *within* the corridor area of the RFC RD is about 25% (which relates to the green bars in the graph). Also note flows from non-RFC RD countries such as Italy, Belgium and Slovenia. Although moderate compared to other RFC RD countries, the flows are still important.

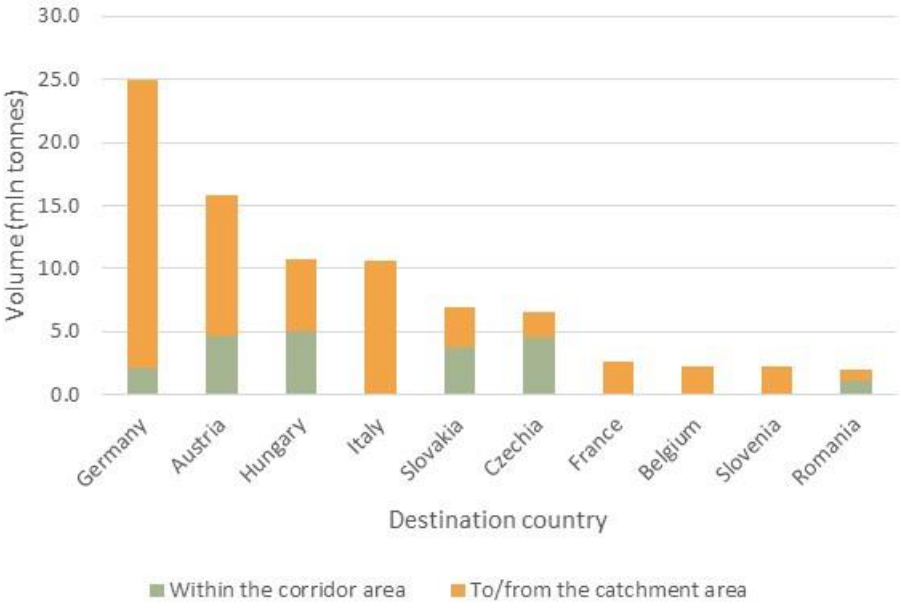
Figure 43 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the catchment and corridor area of the RFC RD



Source: NEAC estimations

The most important destination country is Germany. It receives 25 million tonnes of rail transport. Other important destination countries are Austria (16 million tonnes), Italy, and Hungary (both 11 million tonnes). The volume stemming from other countries in the RFC RD is 25%. It shows that the RFC RD is a RFC with an important international position as 75% of the relations outside the RFC RD uses the rail network of the RFC RD.

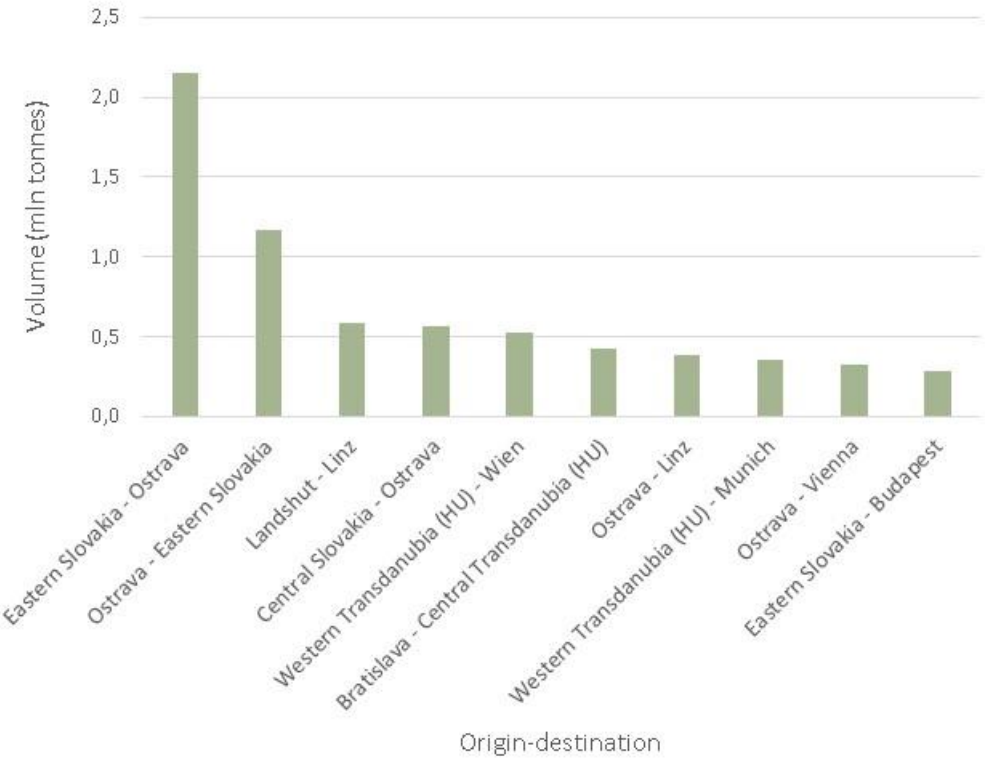
Figure 44 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the catchment and corridor area of the RFC RD



Source: NEAC estimations

The figure below shows the top 10 most important international rail freight transport relations within corridor area of the RFC RD. The relation between Eastern-Slovakia and Ostrava is the most important one, at 2.2 million tonnes. This concerns mostly dry bulk transport. The reverse direction comes in second place, which is also mostly dry bulk (1.2 million tonnes). Landshut-Linz comes in third place at 0.6 million tonnes of international rail freight transport. Note that these relations are centred around Austria and Slovakia.

Figure 45 Estimated volume of international rail freight transport (million tonnes) on the top 10 most important relations in 2022 in the corridor area of the RFC RD

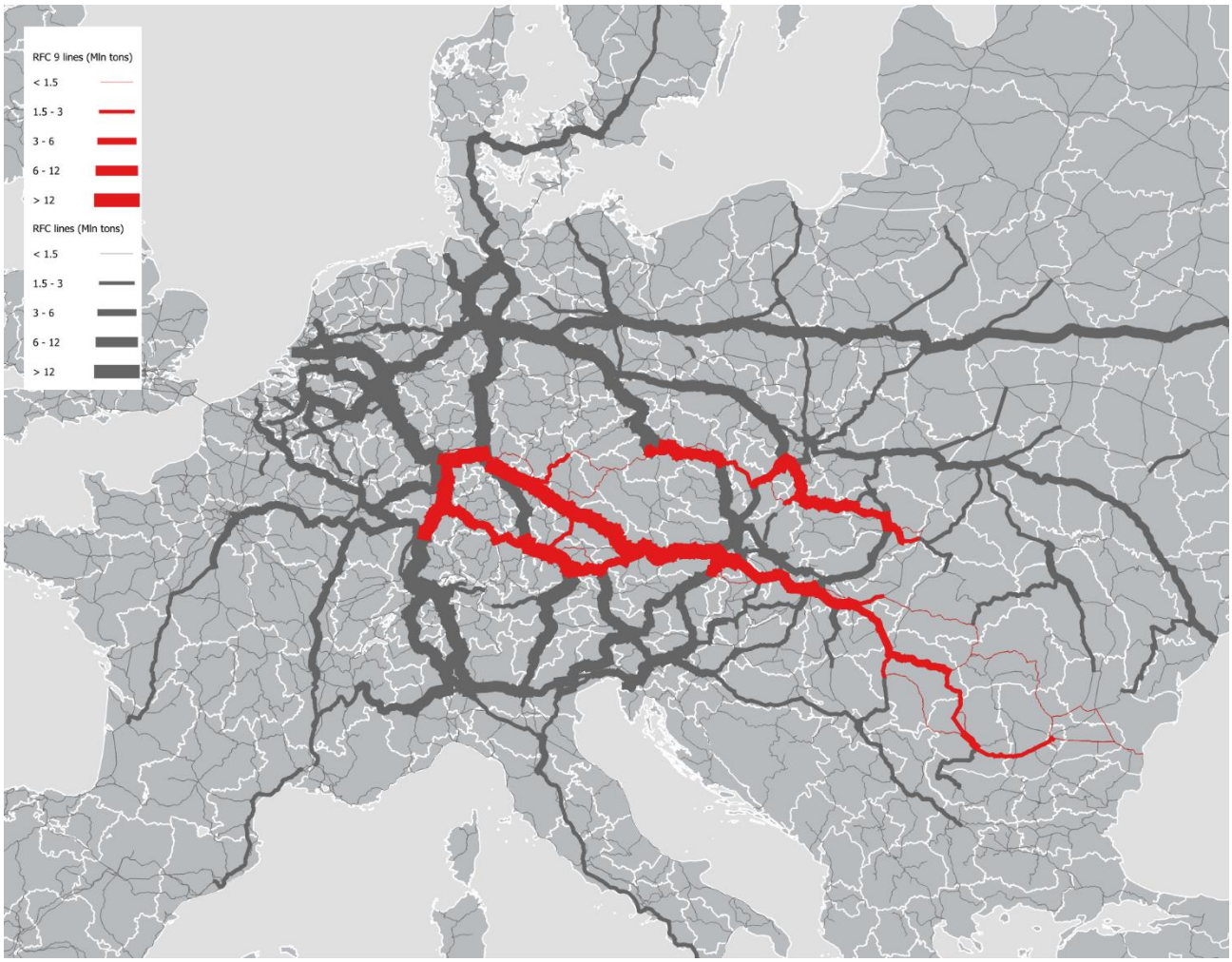


Source: NEAC estimations

4.3.4 INTERNATIONAL RAIL FREIGHT TRANSPORT FLOWS ON THE RFC RD CATCHMENT AREA

The figure below shows the estimated international rail freight flows (in tonnes) for the RFC RD. This provides a general overview of the use of the main rail lines in the corridor area. The volumes on the RFC RD cannot be understood if we present them isolated. The rail volumes on the different tracks of the RFC RD often have an origin or destination elsewhere in Europe. Looking at the map, we see the 2 flows with higher volumes in the RFC RD, via a northern route and a southern route. In the western part of the RFC RD there is also partly a north-south flow along the Rhine River between Frankfurt and Karlsruhe. Also note that flows to and from Romania are less prominent. On one hand because of domestic rail transport from the port of Constanţa into Romania. However, international flows to and from this port seem to be limited.

Figure 46 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022



Source: NEAC estimations

5 ANALYSIS OF THE FUTURE TRANSPORT MARKET

The future market analysis has been performed for the three scenarios described in Section 3.3 above, i.e. the Reference scenario, the Projects scenario and the Sensitivity scenario. The results for these three scenarios have been produced for 2030. The future freight transport is presented in steps to help understand the importance of international freight transport in general and rail freight transport specifically. Results for the 11 RFCs network catchment and corridor area are presented first, then the results for the RFC RD catchment and corridor area follow:

- Section 5.1 presents the Hiba! A hivatkozási forrás nem található.:
  - Section 5.1.1 provides a general overview of the **Future of *all* international freight transport for the 11 RFCs network catchment area**. This includes total volumes by mode and cargo type. Furthermore, the volumes by main origin and destination countries are illustrated, as well as the main relations for all freight transport. Finally, a volume-distance distribution by mode is given;
  - Section 5.1.2 presents the **Future of international rail freight transport for the 11 RFCs Network catchment area**, with the volume by cargo type, the flows on the rail network, the rail volumes by origin and destination countries and the top 10 relations for international rail freight transport.
- Section **Hiba! A hivatkozási forrás nem található.** provides the Hiba! A hivatkozási forrás nem található**..**
  - Section **Hiba! A hivatkozási forrás nem található.** provide a general overview of the Hiba! A hivatkozási forrás nem található.Hiba! A hivatkozási forrás nem található.. This includes total volumes by mode and cargo type. Furthermore, we present the volumes by main origin and destination countries, as well as the main relations for all freight transport. Finally, a volume-distance distribution by mode is presented;
  - Section 5.1.3 describes the Future of international *rail* freight transport on the RFC RDHiba! A hivatkozási forrás nem található**.** This provides a general overview of the origins and destinations of rail freight for the RFC RD. We present the volume by cargo type, the flows on the railway lines, the rail volumes by origin and destination countries and the top 10 relations for international rail freight transport;
  - Section 5.1.4 presents the Development of the most important BCPs on the RFC RDHiba! A hivatkozási forrás nem található..

5.1 FUTURE TRANSPORT MARKET IN THE 11 RFCS NETWORK AREA

This section describes the results of the future market analysis in the 11 RFCs network area. As explained in the previous chapter on the current market analysis, the market analysis of the individual RFCs is more appropriately assessed in the framework of the 11 RFCs network, as the RFCs do not function in isolation.

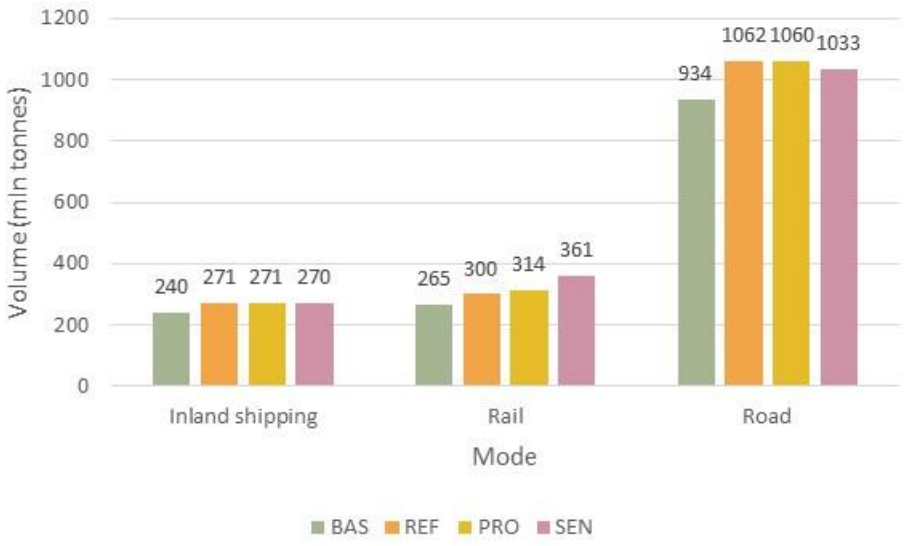
5.1.1 FUTURE OF *ALL* INTERNATIONAL FREIGHT TRANSPORT FOR THE 11 RFCS NETWORK CATCHMENT AREA

Due to the economic developments, all modes grow in the Reference scenario between 2022 and 2030. Inland shipping and rail grow by 13%, road by 14%. In absolute terms, international road freight transport grows most, by 126 million tonnes (from 934 to 1,062 million tonnes). Inland shipping grows by 31 million tonnes (from 240 to 271 million tonnes) and rail transport by 35 million tonnes (from 265 to 300 million tonnes). **Hiba! A hivatkozási forrás nem található.** shows the overall developments by mode and scenario within the 11 RFCs Network catchment area. The implementation of different rail projects across Europe (Projects scenario) leads to an extra growth of 5% for rail transport compared to the Reference scenario,

which is 14 million tonnes. Large projects across Europe such as Rail Baltica, Fehmarn Belt, the Koralm railway line and tunnel, the Semmering tunnel, the second track Koper-Divača, or Rijeka-Zagreb-Koprivncica, account for this growth. The volume for IWW (inland shipping) remains the same and road transport decreases a bit. Although not shown in the graph, a small shift in sea transport also causes extra growth.

The third scenario (Sensitivity) shows a hypothetical development for rail transport, assuming the completion of infrastructure interoperability with reference to the TEN-T requirements. Compared to the base year situation, a growth of 36% is calculated (+23% compared to the Reference scenario). The introduction of longer trains (740 meters) has an important effect on this result. This scenario can be regarded as a maximum potential for rail transport. Compared to the Reference, both inland shipping and road transport decrease, inland shipping by 1 million tonnes and road transport by 29 million tonnes. Keep in mind that the increase of rail transport (61 million tonnes) is not fully covered by a shift from inland shipping and road. This is due to the use of road transport for the first and last mile and a shift to shortsea transport.

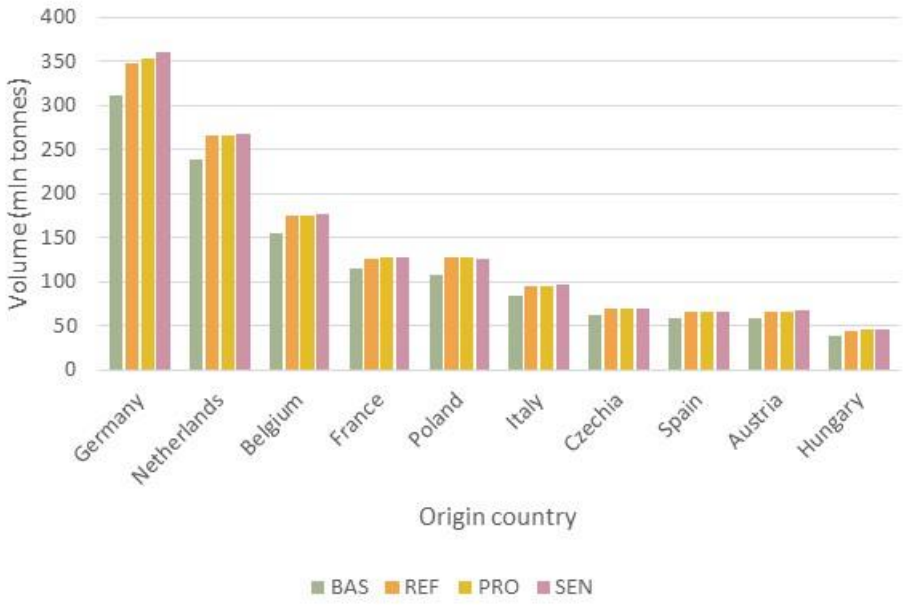
Figure 47 Development of volume (in million tonnes) by mode and scenario for the combined 11 RFCs Network catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Figure 48 and Figure 49 show the development of the volume of international freight transport for all modes for the top 10 countries and per scenario. The most prominent growth stems from the Reference scenario for both origins and destinations. The Projects scenario and the Sensitivity scenario show only small differences compared to the Reference scenario; the largest differences can be seen in Germany. The top 10 origin countries remain the same as presented earlier for 2022. Germany, the Netherlands, and Belgium constitute the 3 largest origin countries for international freight transport. The total amount of volume for Germany increases by 12% between the 2022 Base year and 2030 Reference scenario from 311 to 348 million tonnes. Similar growth can be found in the Netherlands (+12%, from 238 to 265 million tonnes) and Belgium (+13% from 155 to 175 million tonnes). The largest growth between the 2022 Base year and the 2030 Reference scenario can be found in Poland (+20%, from 107 to 128 million tonnes) and Hungary (+18%, from 38 to 45 million tonnes).

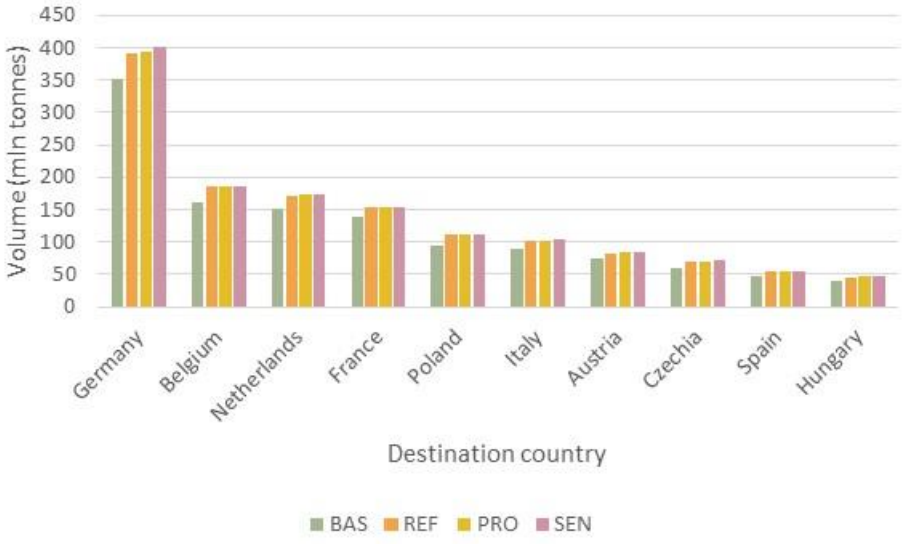
Figure 48 Development of volume (in million tonnes) of all international freight transport by the top 10 origin countries in the 11 RFCs Network catchment area.



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Similar growth rates can be found for the destination countries. Also, the top three countries for international freight transport consists of Germany (+11% from 352 to 392 million tonnes), Belgium (+14% from 163 to 185 million tonnes), and The Netherlands (+13% from 152 to 172 million tonnes). As with the origin countries, the ranking of the destination countries does not change in 2030 compared to 2022.

Figure 49 Development of volume (in million tonnes) of *all* international freight transport by the top 10 destination countries in the 11 RFCs Network catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

5.1.2 FUTURE OF INTERNATIONAL RAIL FREIGHT TRANSPORT FOR THE 11 RFCS NETWORK CATCHMENT AREA

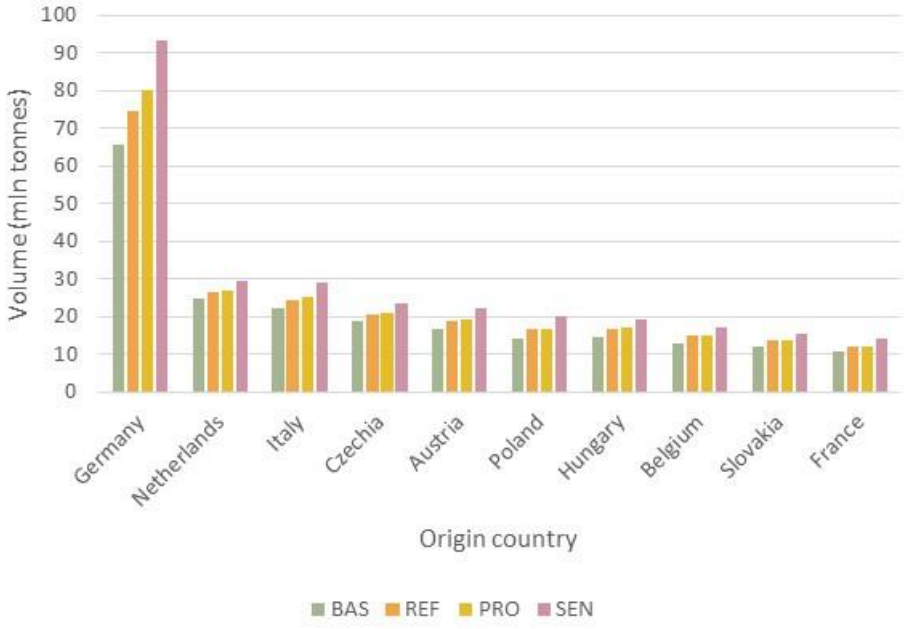
Figure 50 and Figure 51 show the development of volume in international rail freight transport for origins and destinations in the top 10 countries within the catchment area of the 11 RFCs network. The changes are more prominent than for international rail freight transport than for *all* international rail freight transport as shown in the previous section.

In the *Reference scenario*, growth from 2022 on for international rail freight transport is the highest in Germany for both origin (+14% from 65 to 75 million tonnes) and destination (+11% from 72 to 80 million tonnes). In the top 10 origin countries, the overall growth varies per country from 7% (The Netherlands from 25 to 27 million tonnes) to 19% (Poland from 14 to 17 million tonnes). For the destination countries, similar growth patterns are forecasted.

The *Projects scenario* has a limited impact on international rail freight transport volume, except for Germany. On average, the growth in international rail volume for the top 10 countries is 4%, compared to the Reference scenario. The lowest extra growth for the Projects scenario compared to the Reference scenario is reported for Poland at 0%, the highest for Germany at 6% (from 75 to 80 million tonnes). For the destination top 10 countries the growth is 3%. The smallest growth is found in Czechia (+1% from 22 to 23 million tonnes), the largest growth can be found in Slovakia (+15%, from 12 to 14 million tonnes).

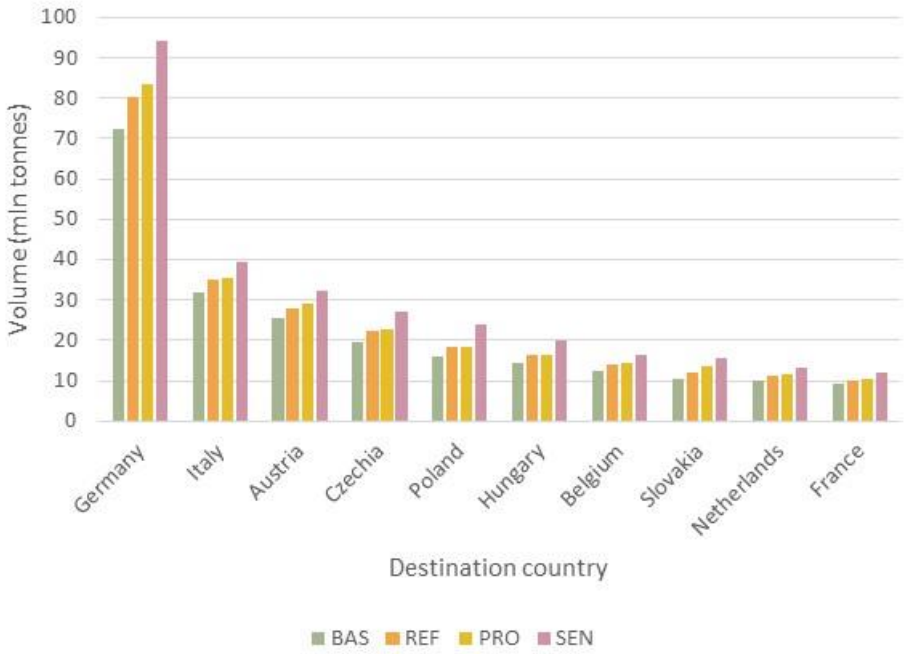
The potential extra volume in the top 10 origin countries, as shown by the *Sensitivity scenario*, is overall 18% (from 239 to 283 million tonnes), compared to the Reference scenario. The lowest growth compared to the Reference scenario can be seen for the Netherlands (+10% from 27 to 29 million tonnes), the highest growth for Germany (+25% from 75 to 93 million tonnes). For the destination countries the growth is 19% (from 247 to 293 million tonnes) compared to the Reference scenario. Italy has the lowest growth at +12% (from 35 to 39 million tonnes) and Poland shows the largest growth at +33% (from 18 to 24 million tonnes).

Figure 50 Development of volume (in million tonnes) of all international rail freight transport by the top 10 origin countries within the 11 RFCs Network catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Figure 51 Development of volume (in million tonnes) of all international rail freight transport by the top 10 destination countries within the 11 RFCs Network catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Looking at the top 10 relations *within the corridor area* of the 11 RFCs Network, the main one is between Rotterdam (NL) and Saarland (DE). The second most important relation is between Katowice (PL) and Ostrava (CZ). Both relations concern the transport of coal which is important for the steel production in Saarland and Ostrava. Another important relation concerns transport from the Rhein-Ruhr area to Linz. In this case, the type of cargo is more varied, but the transport of liquid bulk (oil products and chemicals) is important in this relation. Between Hamburg and Prague, the cargo comprises mainly general cargo.

Interesting to see is the impact of the Projects scenario between Katowice and Ostrava. It shows that new projects have a significant impact on international rail freight transport also on this relation. The same can be seen on the relation Eastern Slovakia – Ostrava.

The Sensitivity scenario shows, compared to the Reference scenario most growth between Hamburg and Prague (+25% from 2.3 to 3.0 million tonnes compared to the Reference). The general measures such as extra train length, function as a multiplier and add extra growth.

Between the 2022 Base year and the 2030 *Reference scenario*, all modes grow due to economic developments. Rail transport grows by 12% (11 million tonnes) from 94 to 105 million tonnes. Inland shipping and sea shipping grows by 11%, and road by 14%. In absolute terms, international road freight transport grows most, by 22 million tonnes (from 155 to 177 million tonnes). Inland shipping increases in volume from 13 to 14 million tonnes.

The *Projects scenario* does not lead to a significant growth of rail transport on the RFC RD compared to the Reference scenario. There is some modal shift between road and rail. Different projects across the RFC RD rail network account for this shift. Also, infrastructure projects outside the RFC RD, such as Fehmarn Belt, lead to mode shift or rerouting. Road transport decreases a bit, while rail transport grows by 1 million tonnes.

The *Sensitivity scenario* shows the impact of a hypothetical development for rail transport. Compared to the 2022 Base year, a growth of 17% in volume across *all modes* (46 million tonnes, from 263 to 309 million tonnes) is estimated. The introduction of longer trains (740 meters) has an important impact on this result. This scenario can be regarded as a maximum potential for rail transport. The growth has different causes, such as rerouting, modal shift, or splitting freight transport from one mode into transport by two modes (for example, splitting road transport into road and rail transport). In the Sensitivity scenario, rail transport on the RFC RD grows by 31% compared to the base situation (from 95 to 123 million tonnes). This is a substantial achievement compared to the 12% forecasted for the Reference scenario.

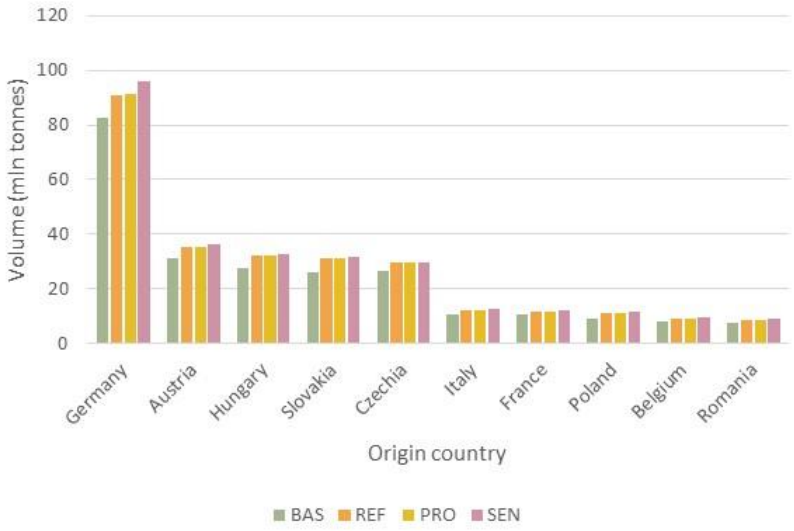
Figure 52 Development of volume (in million tonnes) by mode and scenario for the catchment area of RFC RD

Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Figure and Figure show the development of the volume of international in freight transport by *all modes* for the top-10 origin and destination countries in the catchment area of the RFC RD for their respective scenarios. In general, the most prominent growth stems from the economic development (REF). The Projects (PRO) scenario and the Sensitivity (SEN) scenario show small differences. Concerning the Projects scenario variations are primarily due to modal shifts, where the total volume does not really change. The Sensitivity scenario for all land modes shows a bit more volume compared to the Reference and Projects scenarios. The total volumes are almost equal between the different scenarios. The reason is mainly due to a shift between the land modes.

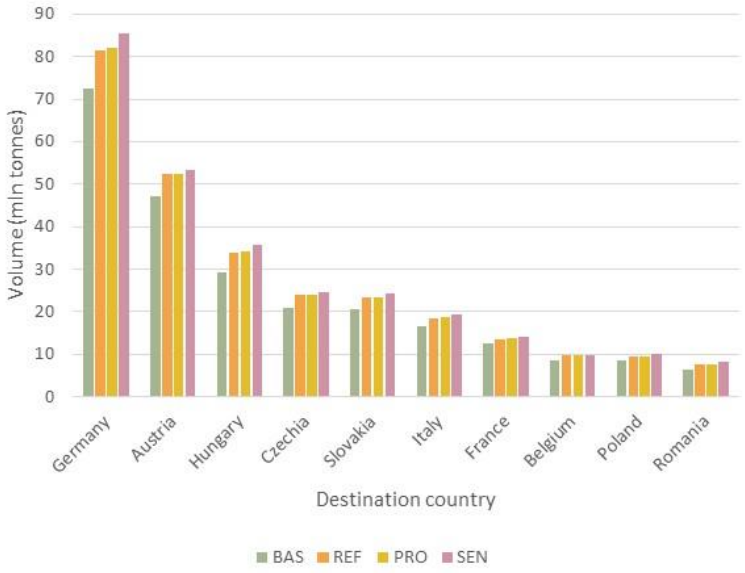
Concerning the top 10 origins, these are the same as for the base year. The growth for the Reference scenario varies from 8% (France) to 19% (Slovakia and Poland). Germany, Austria, and Hungary are the top 3 origin countries on the RFC RD. Concerning the Projects scenario, in general the average growth rate does not deviate from the Reference scenario. Concerning the Sensitivity scenario, a slightly higher volume is calculated/estimated.

Figure 53 Development of volume (in million tonnes) of all international freight transport by origin countries in the catchment area of the RFC RD



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Figure 54 Development of volume (in million tonnes) of all international freight transport by the destination countries in the catchment area of the RFC RD



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

The picture for the destination countries is like the one for the origin countries. The overall growth in the top 10 countries is approximately 13% for both the Reference and Projects scenarios. The growth between the 2022 Base year and the Reference scenario varies from 9% to 20%. The growth for the Sensitivity scenario ranges from 13% (Austria) to 30% (Romania).

5.1.3 FUTURE OF INTERNATIONAL *RAIL* FREIGHT TRANSPORT ON THE RFC RD

As concerns the RFC RD, we see a growth from 94 million tonnes to 105 million tonnes in the Reference situation. Expressed in trains, this would mean a growth from about 100,000 international trains to about 112,000 trains. The Projects scenario adds another 1 million tonnes to the total volume leading to a total number of trains of 114.000. The sensitivity scenario will finally lead to a volume of 123 million tonnes, which

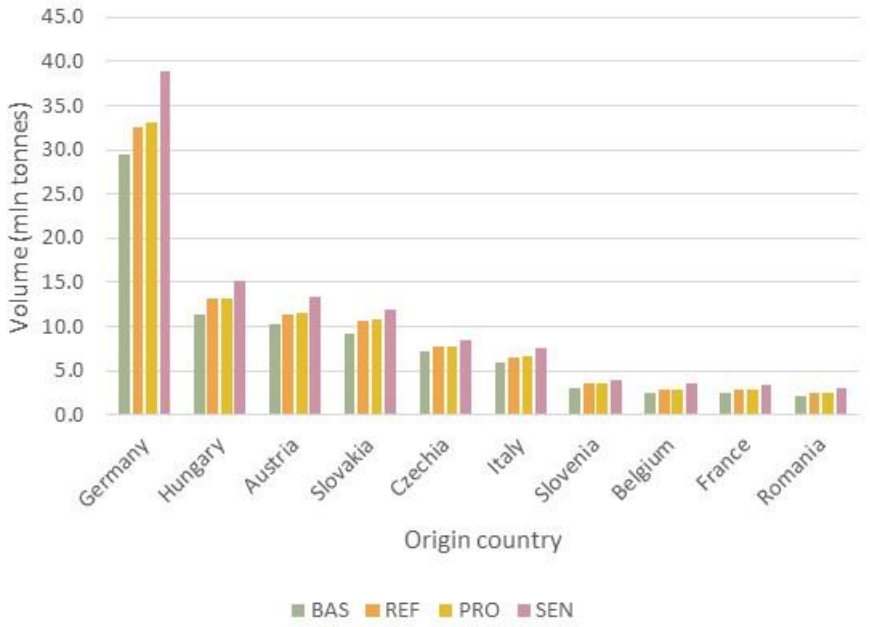
is about 115.000 trains. The slightly higher number of trains compared to the project scenario is because the volume is transported by longer trains.

Figure and Figure show the development of volume in international rail freight transport for origin countries for the RFC RD. International rail freight transport is highest in Germany (32 million tonnes in the Reference scenario). Hungary and Austria come in second and third place (at 13 and 11 million tonnes).

The Projects scenario shows a limited impact on the volume of international rail freight transport. Overall, the growth in international rail volume for the countries is about 1% compared to the Reference scenario. The potential extra volume as shown by the Sensitivity scenario is overall 19% on the total volume compared to the Reference scenario. In Romania and Hungary, we see a more substantial growth (45% and 33% respectively). The Sensitivity scenario shows more growth of international rail freight transport. This is mainly due to the increase of train length up to 740 m.

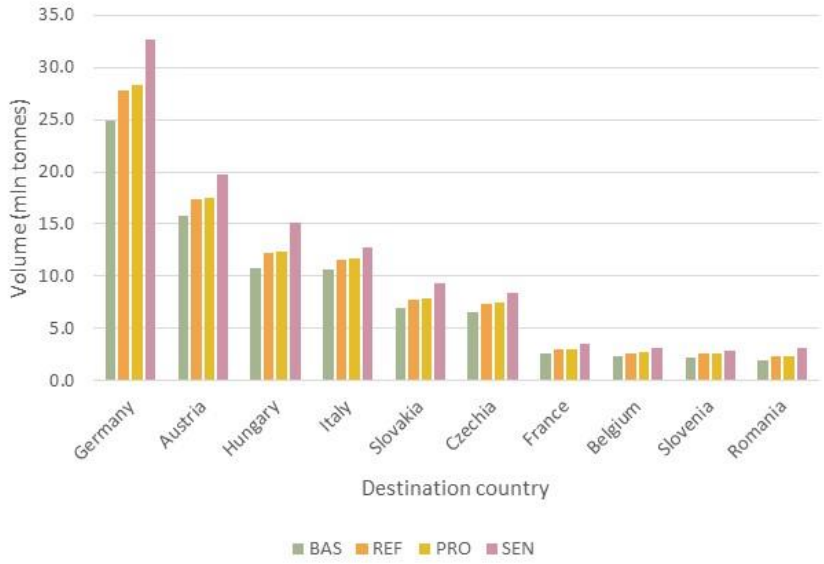
For destinations, a similar picture can be noticed. In this case, Germany shows a number 1 position in international rail freight transport on RFC RD. Hungary and Austria are ranked 2 and 3 for international rail freight transport. The impact of the Projects scenario is limited, whereas the Sensitivity scenario shows higher effects. Compared to the 2022 Base year situation, the growth varies from 24% (Austria) to 58% (Romania), although in the latter case the absolute growth is limited.

Figure 55 Development of volume (in million tonnes) of all international rail freight transport by the origin countries on the RFC RD catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

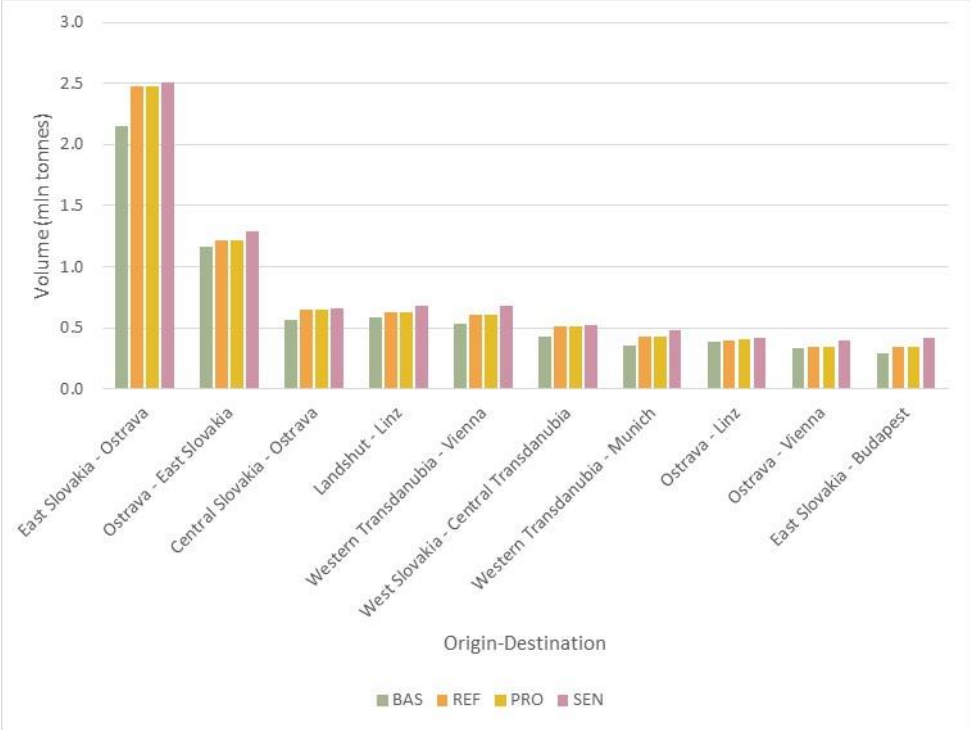
Figure 56 Development of volume (in million tonnes) of all international rail freight transport by destination countries on the RFC RD catchment area



Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

Looking at the top 10 relations *within the corridor area* RFC RD, the main relation is between East-Slovakia and Ostrava. This relation is important for dry bulk. In second place comes the reverse direction, also with dry bulk as main cargo type. Another important relation concerns Central-Slovakia to Ostrava. In this case the type of cargo is varied, but the transport of dry bulk is also important. The other relations show similar volumes of around 0.5 million tonnes of volume. As can be seen Ostrava is an important origin or destination on the RFC RD.

Figure 57 Development of volume (in million tonnes) of all international rail freight transport by the top 10 relations within the corridor area of RFC RD



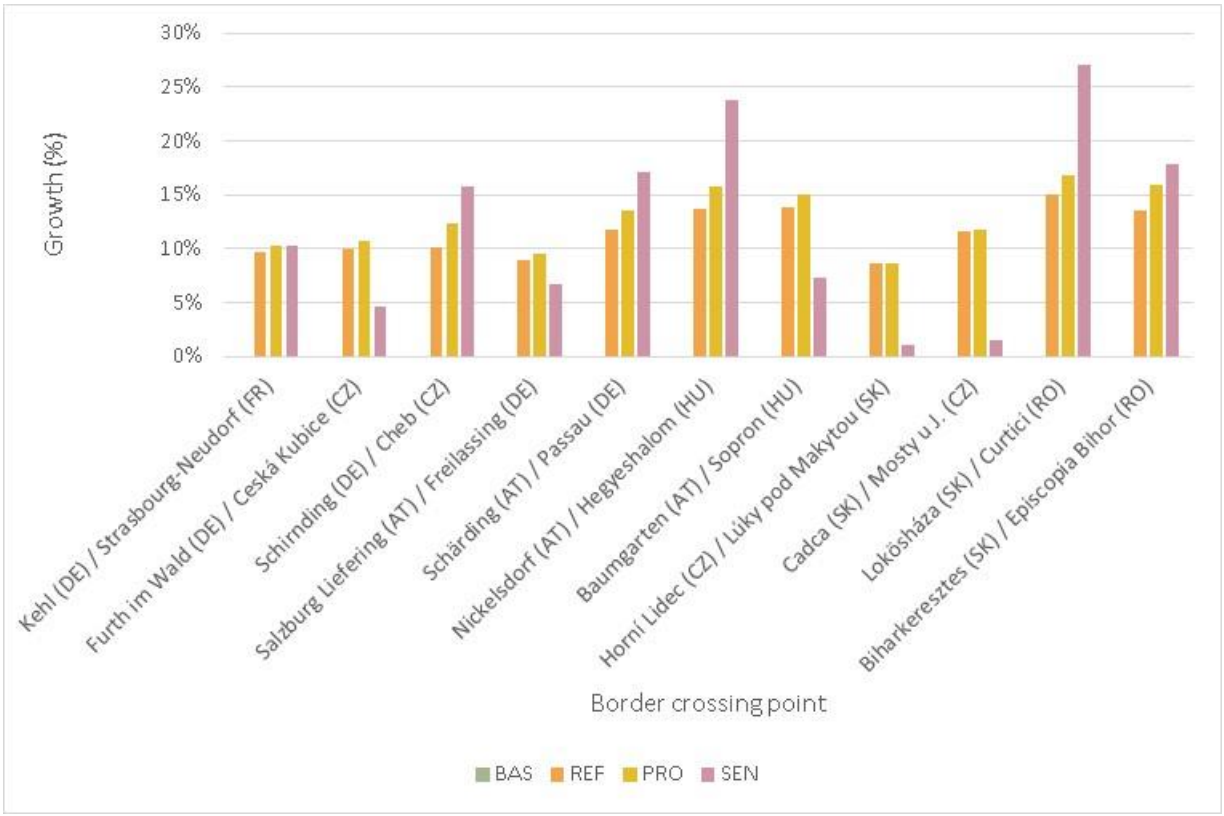
Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

5.1.4 DEVELOPMENT OF THE MOST IMPORTANT BCPS ON THE RFC RD

Each BCP on the RFC RD shows different growth between the 2022 Base year and 2030 Reference, Projects and Sensitivity scenarios. Overall, the Reference shows growth in the volume of 12%. This is in line with the general growth for rail transport between the 2022 Base year and 2030 Reference scenarios. The completion of different projects by 2030 leads to different growth patterns; on average, the growth in relation to the base is 15% more volume, which translates into 15% more trains on average. The sensitivity scenario leads to 35% more volume, which is 13% more trains compared to 2022. Due to the extra train length, there is less growth in number of trains. Furthermore, interesting is the fact that the growth differentiates per BCP.

The total amount of trains on the BCPs in the graph below is estimated at 112,000 trains for the Reference scenario. In the Projects scenario this is 114,000 trains and in the Sensitivity scenario 115,000 trains.

Figure 58 Development of volume (in million tonnes) of international rail freight transport on important of the RFC RD

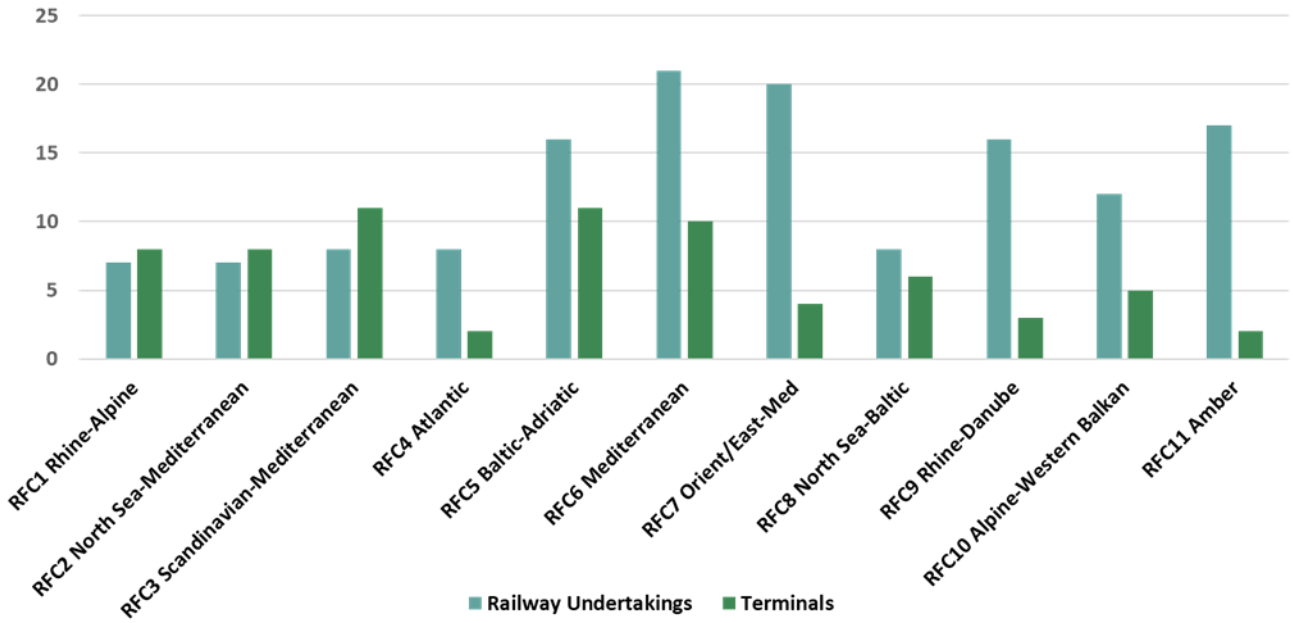


Legend: REF=Reference, PRO=Projects, SEN=Sensitivity (Interoperability)

6 OCCURRED AND EXPECTED CHANGES ASSOCIATED WITH THE ESTABLISHMENT OF THE RFCS: 2023 11 RFCS JOINT TMS SURVEY

No relevant time series data are available supporting a consistent appraisal of the occurred and expected changes associated with the establishment of the 11 RFCs. It's worth adding that the current 11 RFCs started operating in different years, 5 in 2013, 3 in 2015 and 3 after 2018, and their alignment was adjusted over time to market needs. To assess the occurred and expected changes associated with their establishment, an e-survey (2023 11 RFCs Joint TMS Update Survey) has been conducted, submitting a questionnaire to the members of the Railway Undertaking Advisory Groups (RAGs) and the Terminal Advisory Groups (TAGs) of the 11 RFCs. Questionnaires were collected via the EUSurvey platform of the European Commission (DG DIGIT) between September 2023 and January 2024. Forty-two members of the RAGs and thirty members of the TAGs participated in the survey, for a total of seventy-two respondents, operating services/terminals along the alignment of all 11 RFCs (**Hiba! A hivatkozási forrás nem található.**).

Figure 59 RFCs usage by respondents operating or serving trains at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 3.R and 3.T

The survey was conducted to collect the opinion of the 11 RFCs market players on three main areas:

1. Occurred and expected changes due to the establishment of the RFCs;
2. Occurred and expected market developments along the RFCs; and
3. Market drivers.

This chapter summarises the main outcome of the survey with reference to these three areas. The full set of responses is provided in Annex 2 of this report.

Whereas the total number of responses for all RFCs makes the outcome of the survey meaningful from the 11 RFCs Network perspective, a presentation of the results by individual RFC would lose significance due to the limited number of answers. As a result, the outcome of the survey is presented in this report for all RFCs together /for the RFC Network as a whole.

Especially regarding the opinion of the 11 RFCs RAGs and TAGs members on the occurred and expected market developments, it is worth noticing that: it reflects their views at the time of submission of the questionnaire (Autumn 2023/January 2024). Additionally, survey responses represent a partial view of the market as the sample of the respondents is not representative of the market universe. Furthermore, differences may exist between RFCs as they were established and entered into operation in different years. Finally, the survey outcome may partially diverge from the findings from the statistical review presented in the previous section above, as the opinions relate to the RFCs and international trains, whereas national statistics refer to the whole country network and national as well as international traffic.

6.1 CHANGES OCCURRED SINCE THE ESTABLISHMENT OF THE RFCS AND EXPECTED CHANGES CONCERNING THE FACILITATION OF INTERNATIONAL RAIL FREIGHT TRANSPORT

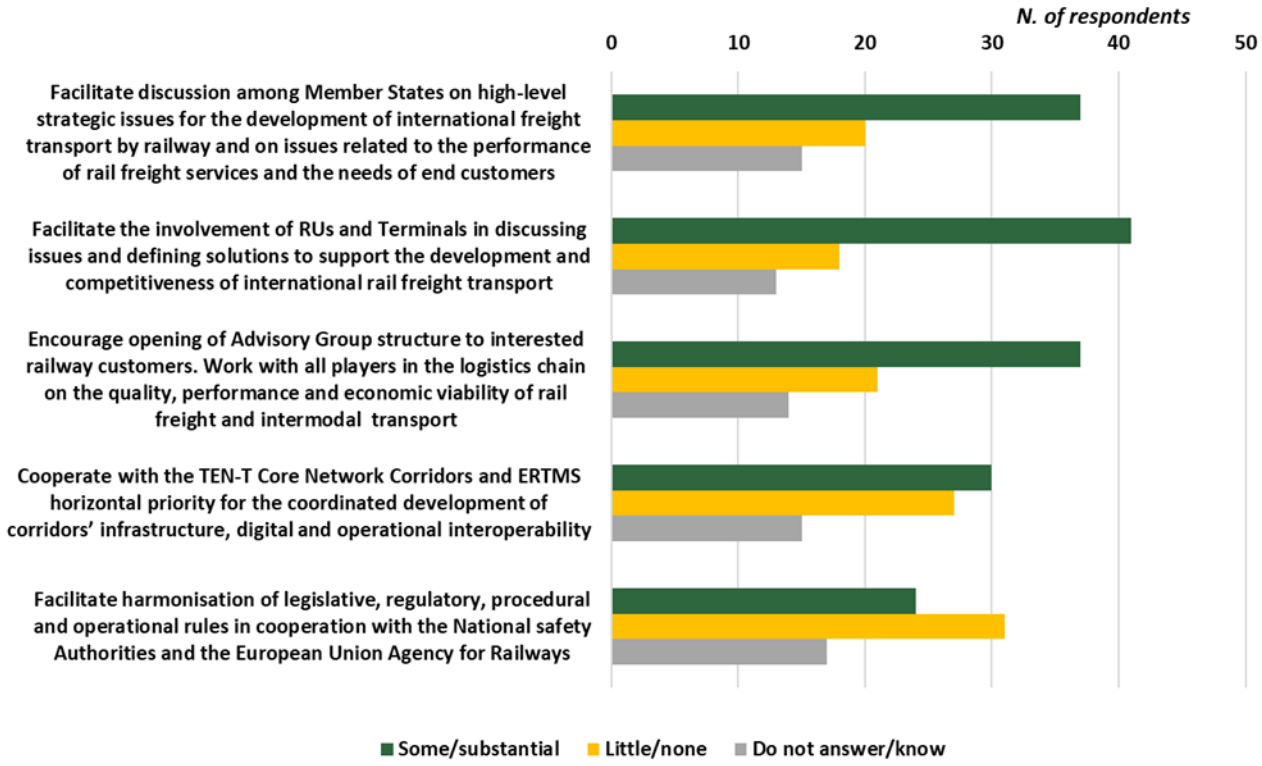
Occurred and expected changes have been investigated as part of the survey around three main areas of activity of the Rail Freight Corridors, which are of relevance for the facilitation of international rail freight transport, and namely: governance, operational efficiency and capacity management. For each area, questions have been made to assess:

- Changes occurred since the establishment of the RFCs;
- Expected changes assuming continuation of the activities by the RFCs; and
- The best fitting governance to address the issues identified for each of the three investigated areas, also considering the proposed termination of the RFCs activities in the Proposal for a Regulation of the European Parliament and of the Council on the use of railway infrastructure capacity in the single European railway area, amending Directive 2012/34/EU and repealing Regulation (EU) No 913/2010[20]

[20] https://ec.europa.eu/transparency/documents-register/detail?ref=SEC(2023)443&lang=en

6.1.1 GOVERNANCE ISSUES

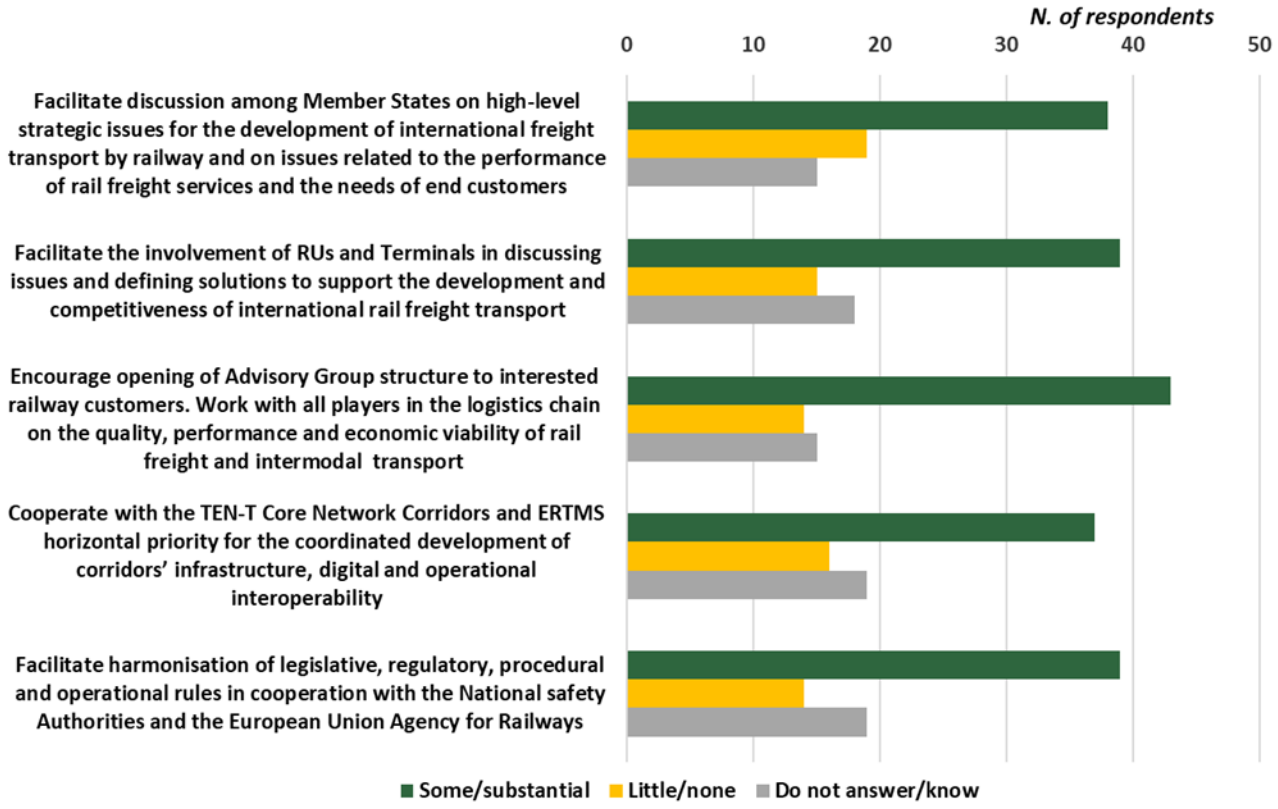
Figure 60 Progress made to date since the establishment of the RFCs - Governance Issues



Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 1.RT

The respondents' opinion about the changes within the governance area is positive, especially in terms of cooperation with the market, including but not limited to RUs and terminal operators, as well as concerning facilitation of discussion among Member States about the issues affecting the competitiveness of international rail freight transport (Figure 60). The opinion about the progress made regarding cooperation between RFCs and Core Network Corridors (CNCs)/ERTMS horizontal priority is less favourable. The market opinion is negative about the progress made on harmonising international freight rail services' legislative, regulatory, procedural and operational aspects.

Figure 61 Expected changes based on current programmes/initiatives - Governance Issues

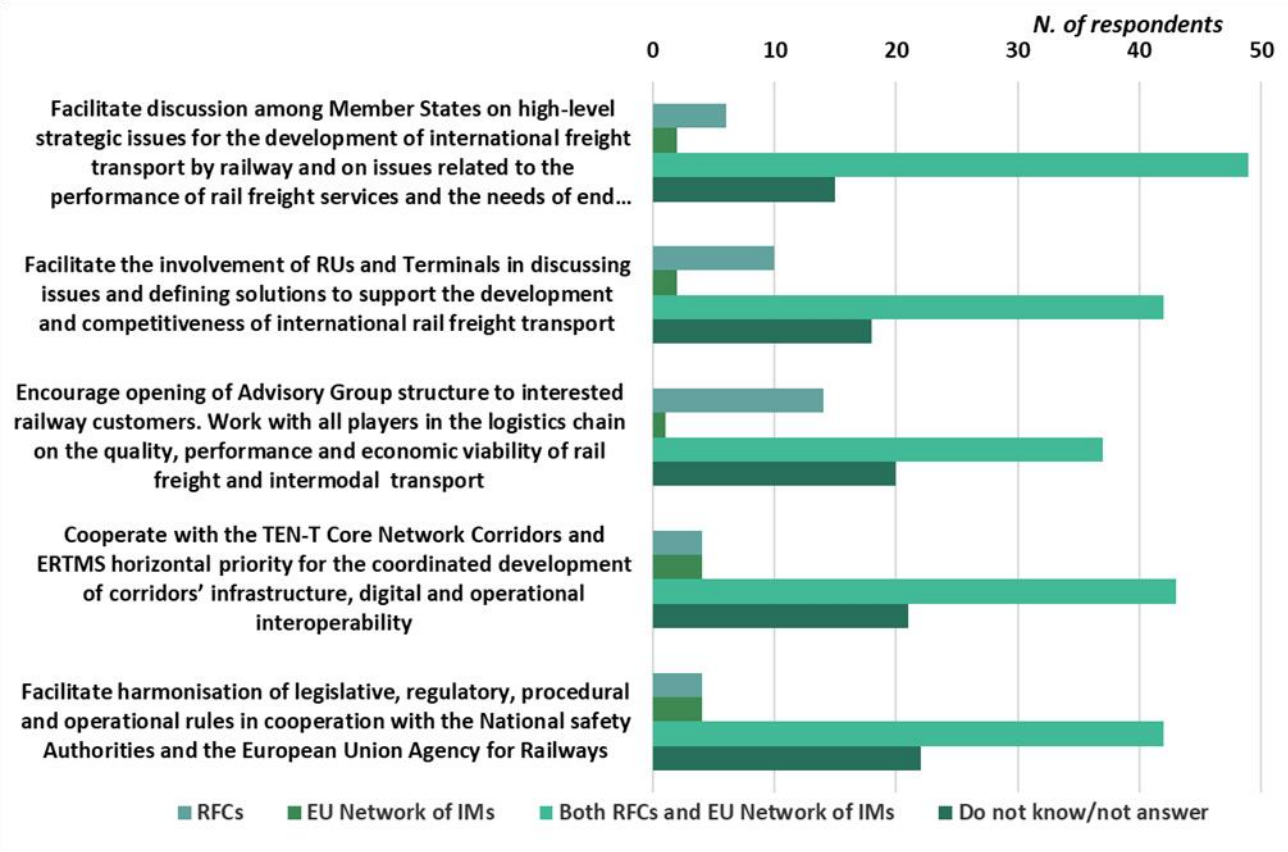


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 1.RT

The expectations of the market players concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all issues (Figure).

Respondents consider the cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) to be the best governance solution for bringing issues forward (Figure)

Figure 62 Best fitting governance to bring the issue forward - Governance Issues

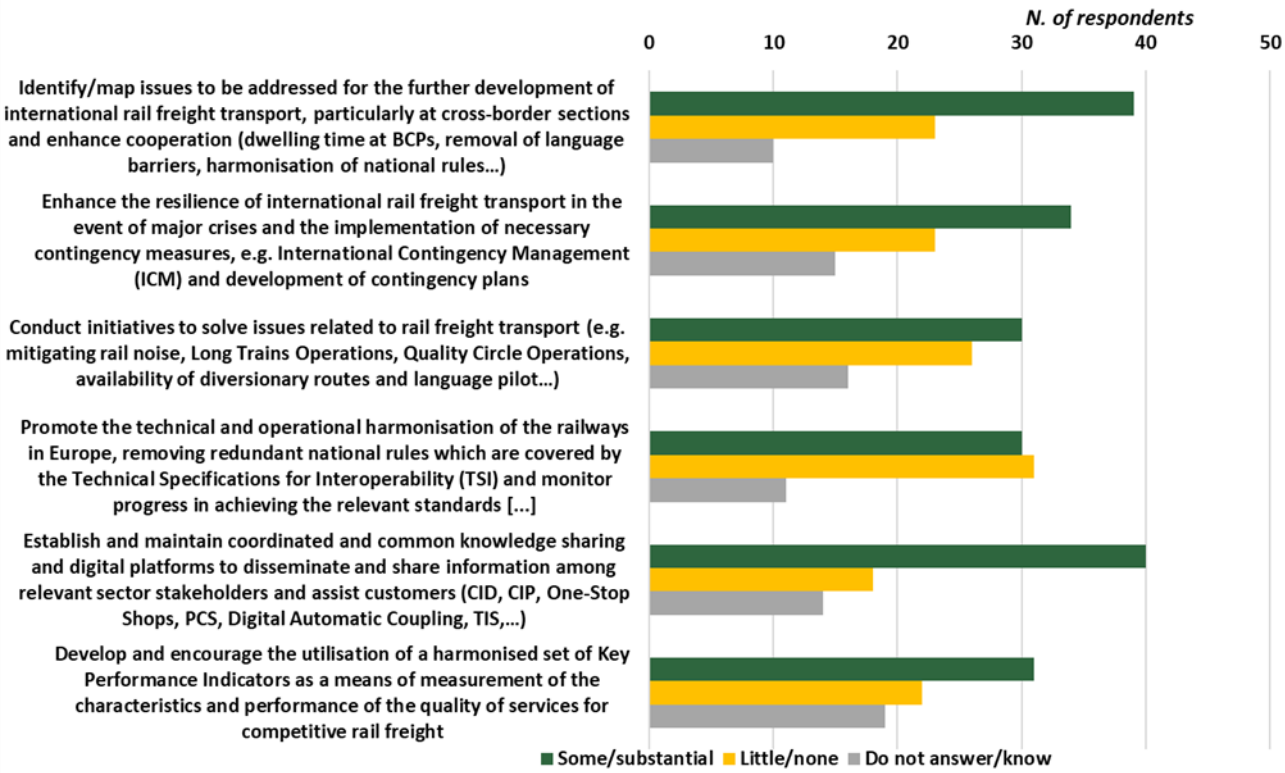


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 1.RT

6.1.2 OPERATIONAL EFFICIENCY ISSUES

The market opinion about the changes that occurred within the operational efficiency area is also generally positive, except for the progress made in the promotion of technical and operational harmonisation of the European railway transport system towards its interoperability (Figure).

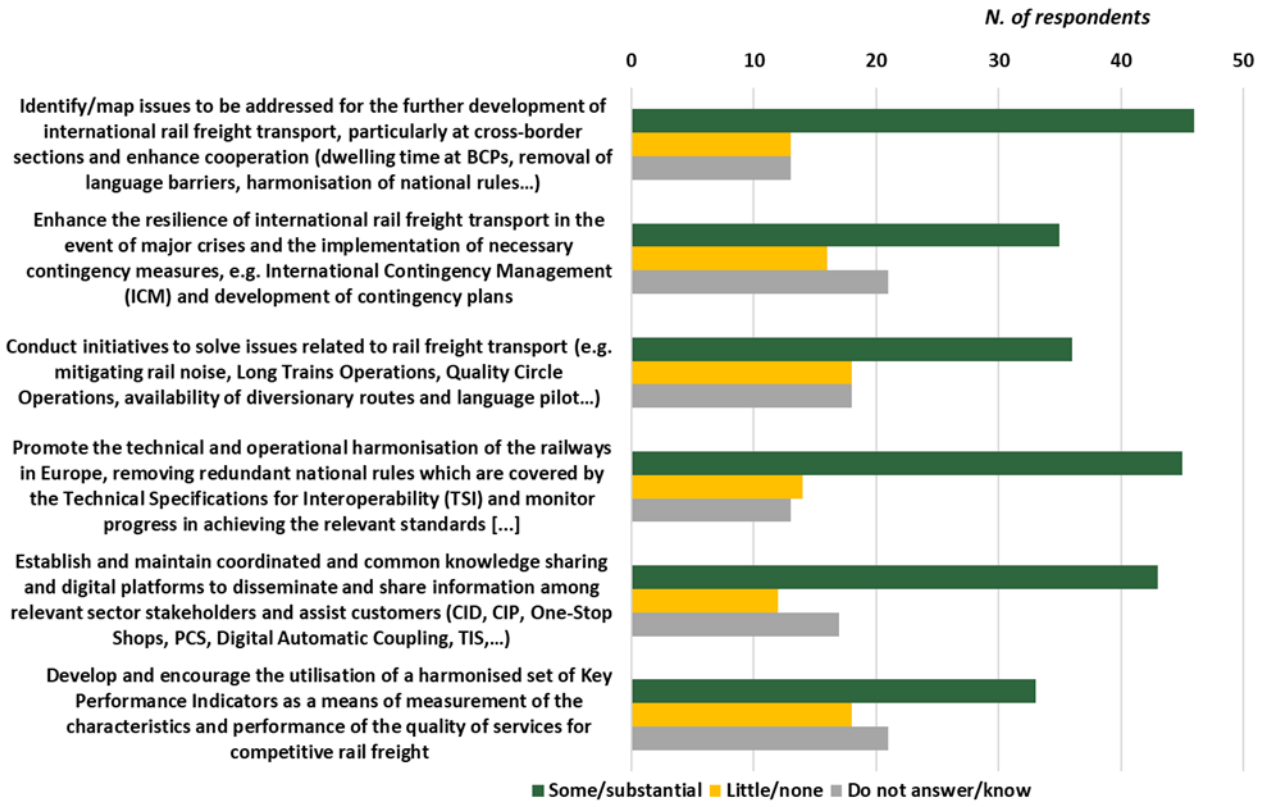
Figure 63 Progress made to date since the establishment of the RFCs - Operational Efficiency Issues



Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 2.RT

The respondents' expectations concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all issues (Figure).

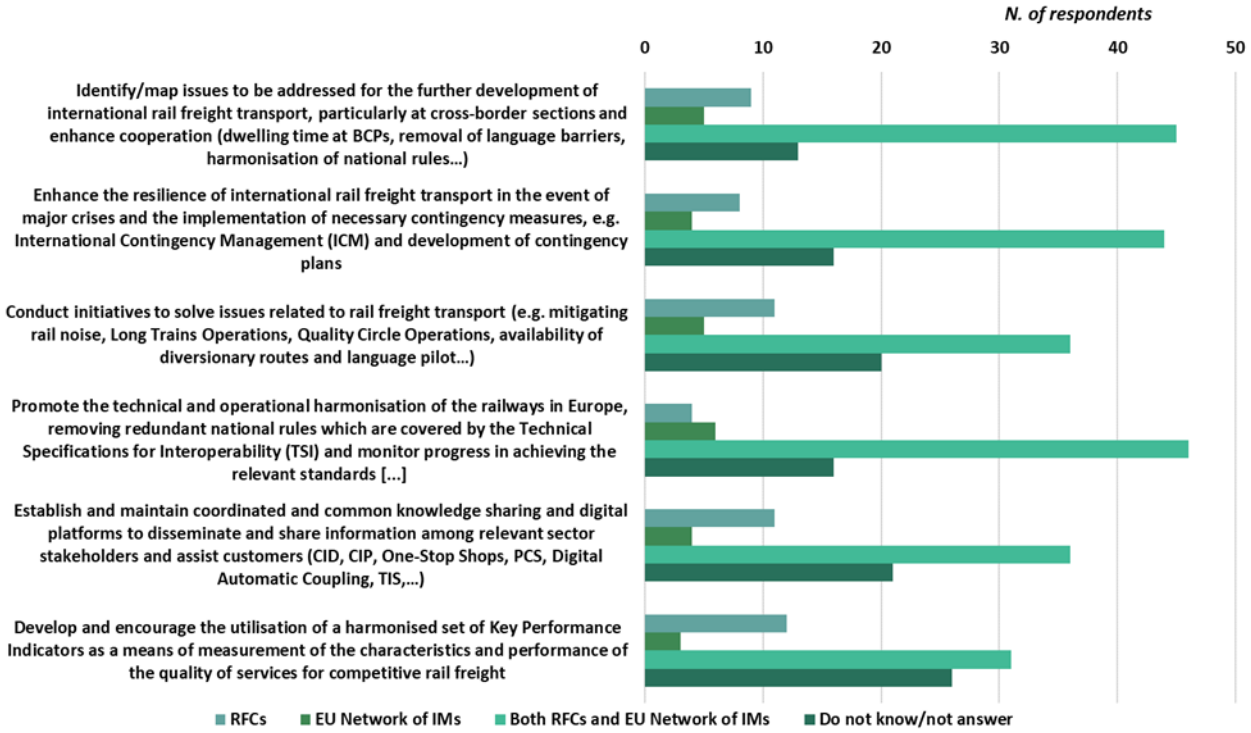
Figure 64 Expected changes based on current programmes/initiatives by RFCs - Operational Efficiency Issues



Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 2.RT

Cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) is also considered the best-fitting governance solution to bring operational efficiency issues forward (Figure).

Figure 65 Best fitting governance to bring the issue forward - Operational Efficiency Issues

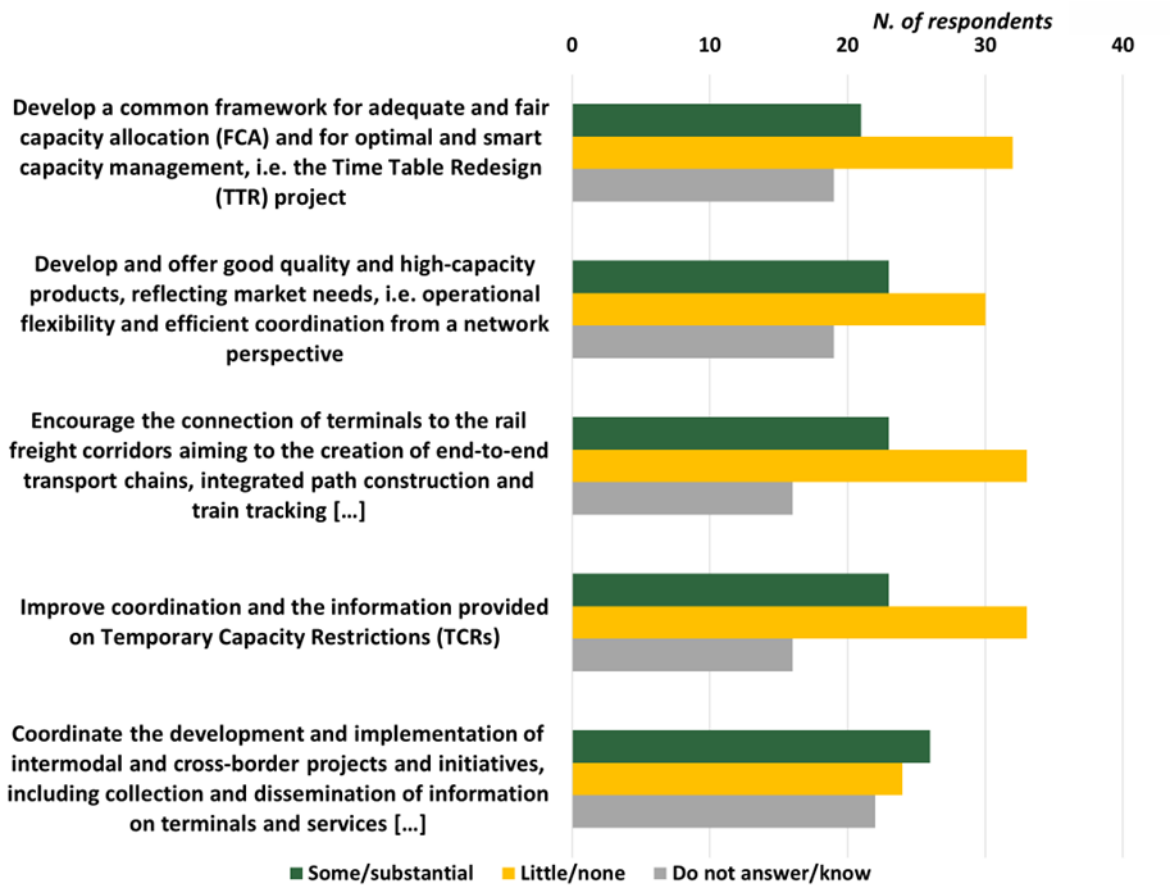


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 2.RT

6.1.3 CAPACITY PLANNING ISSUES

The respondents' opinions about the changes that occurred within the capacity management area are predominantly negative, except for the coordination of the development and implementation of cross-border projects and initiatives (Figure).

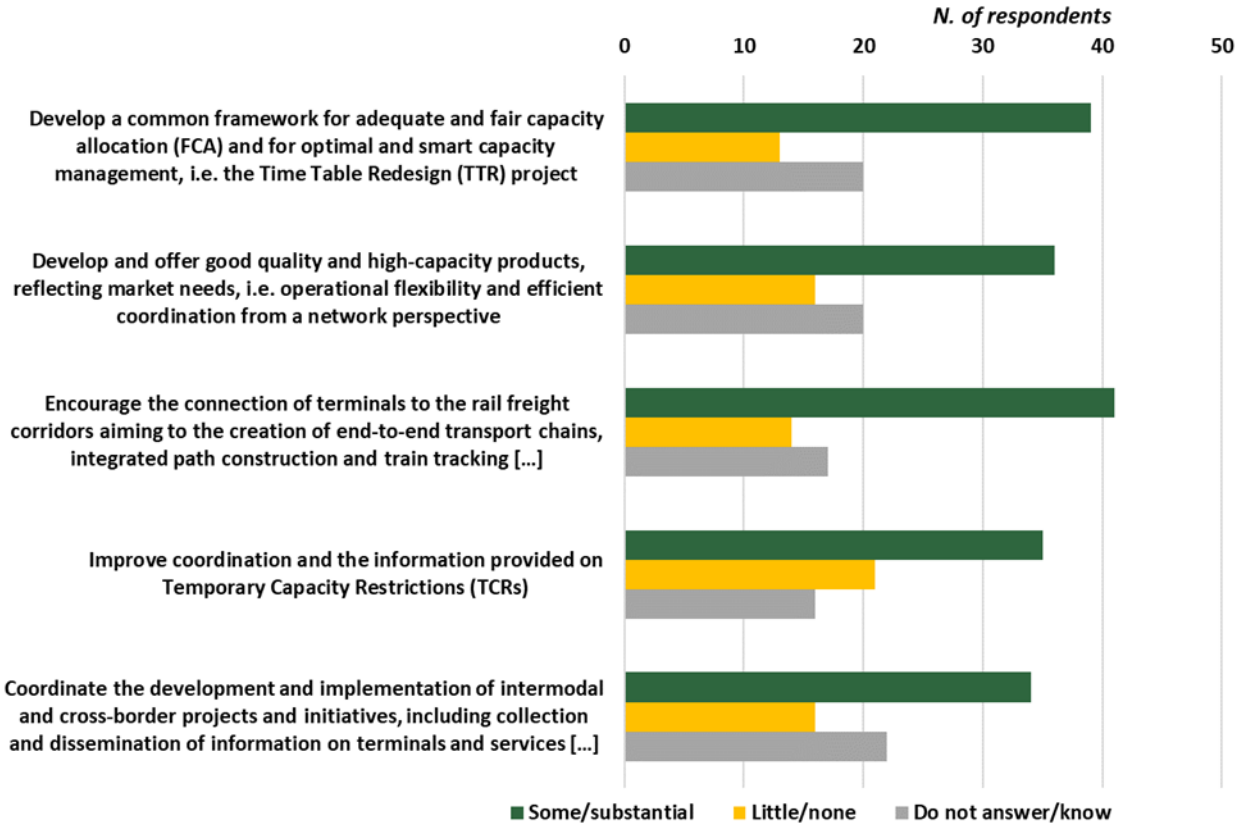
Figure 66 Progress made to date since the establishment of the RFCs - Capacity Planning Issues



Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 3.RT

Notwithstanding the market's opinion that little or no progress made since the establishment of the RFCs, the expectations on the future impact of the programmes and activities by the RFCs are rather positive with regard to all issues (Figure).

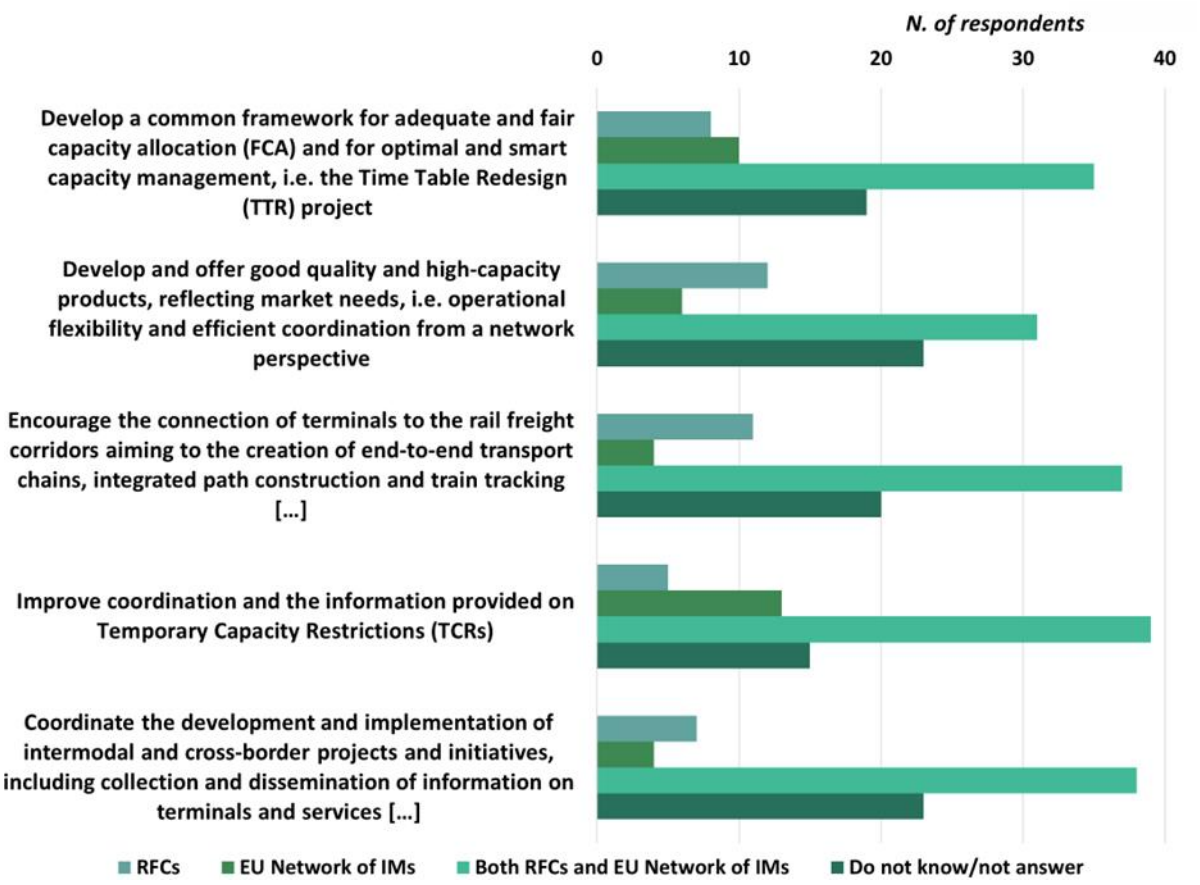
Figure 67 Expected changes based on current programmes/initiatives - Capacity Planning Issues



Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 3.RT

Also, for the improvement of capacity management-related issues, the best governance solution is deemed to be the cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) (Figure).

Figure 68 Best fitting governance to bring the issue forward - Capacity Planning Issues

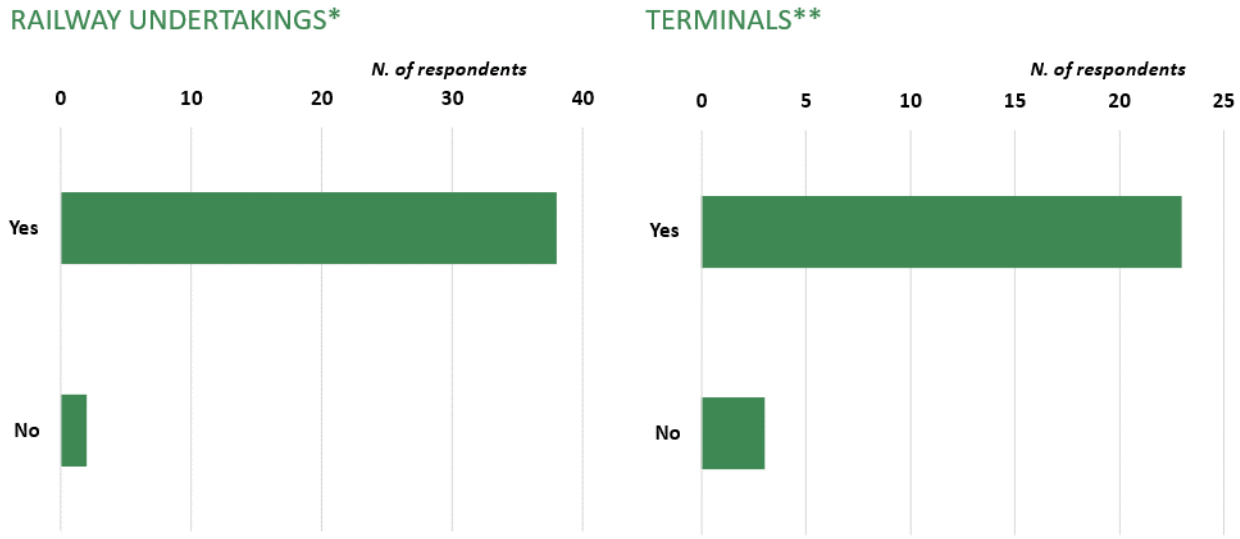


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 3.RT

6.2 EXPERIENCED AND EXPECTED MARKET DEVELOPMENTS

Experienced and expected variations in the market have also been investigated as part of the 2023 11 RFCs Joint TMS Survey, which is further described in this section.

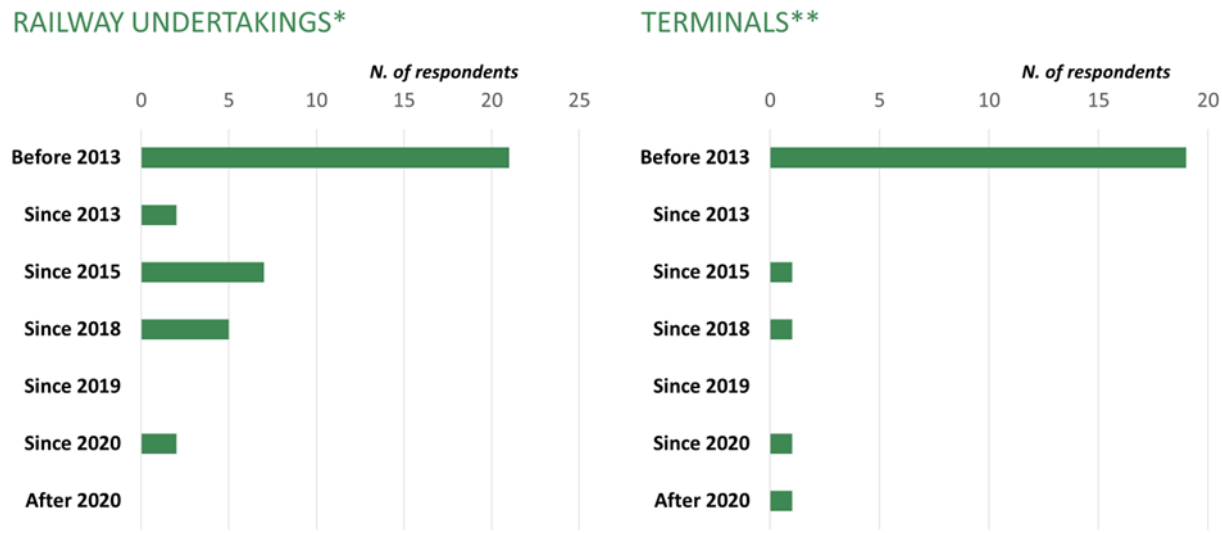
Figure 69 Respondent has operated/operates rail services or manages/operates terminals serving trains across at least one border crossing point(s) on any RFC



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 1.R and 1.T,
**40 out of 42 respondents, **26 out of 30 respondents*

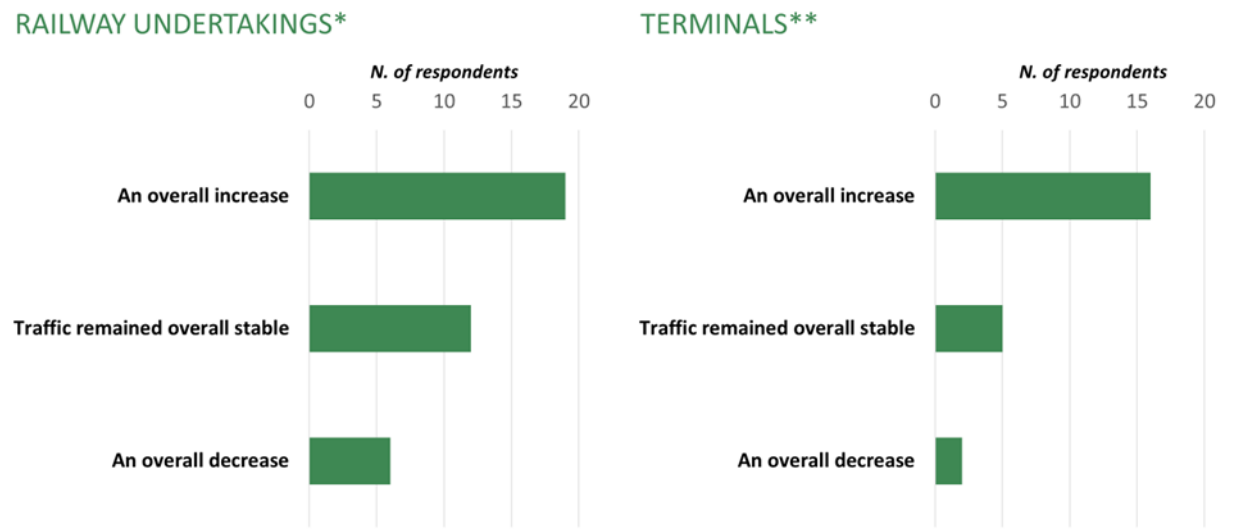
The vast majority of the respondents who participated in the survey operated or still operates rail services or manage/operate terminals serving trains across at least one border crossing point(s) on any RFC. Most of them also operated or served international rail freight transport before the establishment of the RFCs.

Figure 70 Respondent has operated/operates rail services or manages/operates terminals serving trains across at least one border crossing point(s) on any RFC



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 1.1R and 1.1T,
**37 out of 42 respondents, ** 23 out of 30 respondents*

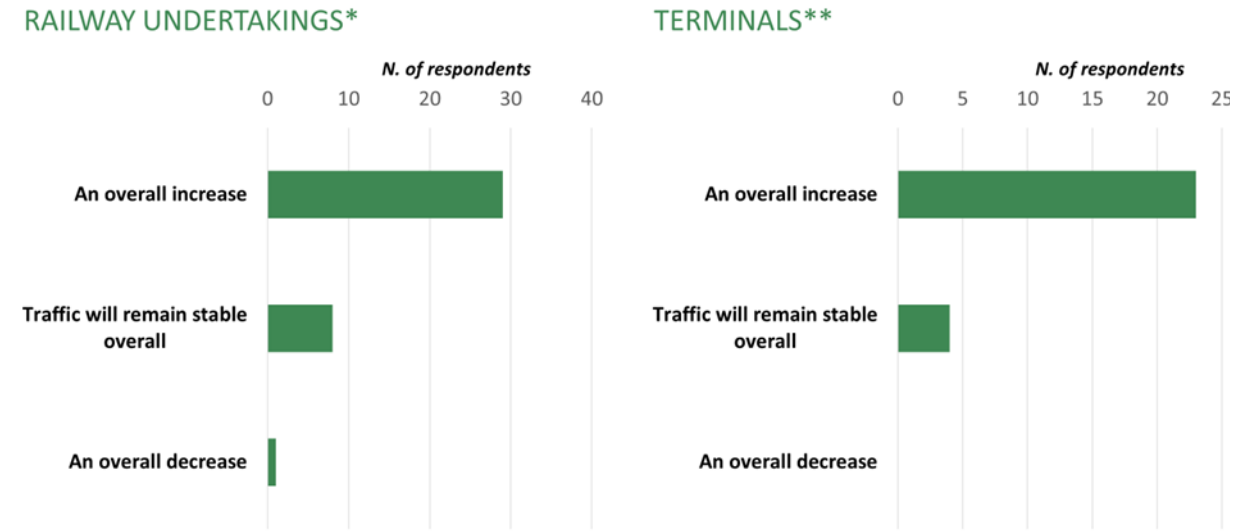
Figure 71 Variation in the operation of trains and in serving trains crossing at least one border crossing point(s) on any RFC since 2013



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 1.2R and 1.2T,
**37 out of 42 respondents, ** 23 out of 30 respondents*

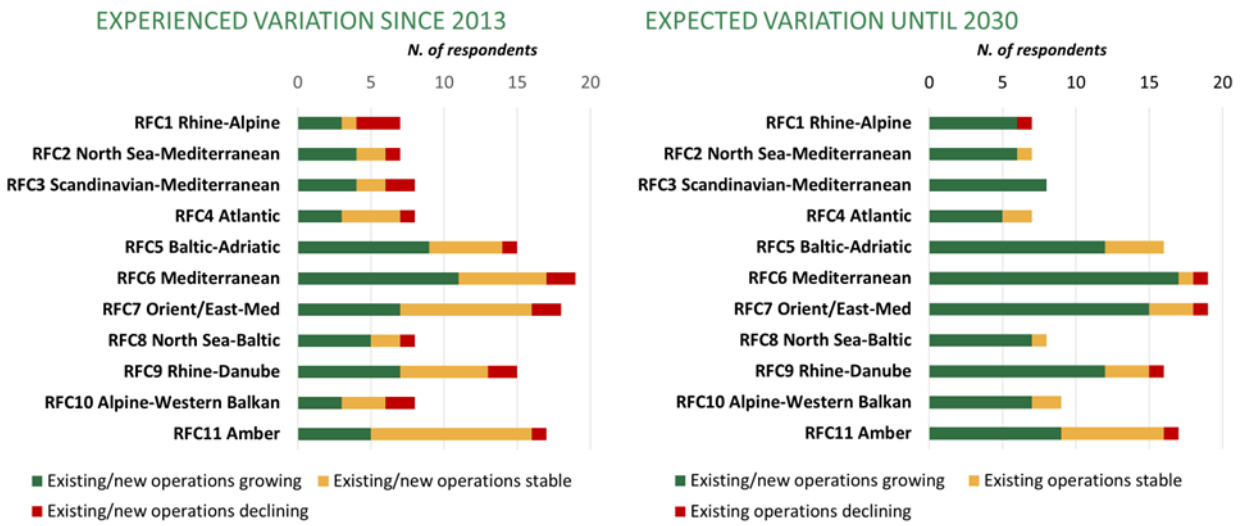
The majority of the respondents declare they experienced an increase in their operations since 2013 (Figure), and most of them also have a positive expectation about the future, expecting overall market growth (Figure).

Figure 72 Variation in the operation of trains and in serving trains crossing at least one border crossing point(s) on any RFC in the short term until 2030



*Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 2.R and 2.T, *38 out of 42 respondents, ** 23 out of 30 respondents*

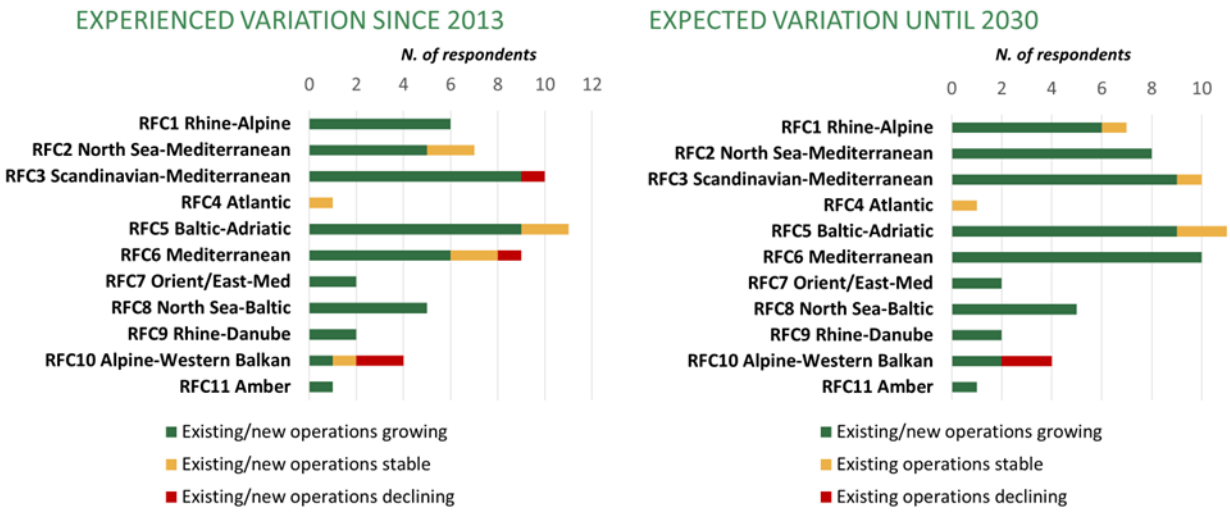
Figure 73 Experienced and expected traffic trends according to the trains operated by RUs, crossing at least one border crossing point(s) on any RFC



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 3.R

The variation in traffic experienced by RUs since 2013 differs from RFC (Figure). The majority of the respondents declare they experienced market growth along the NSM, SCAN-MED, BA, MED, NSB, and RD RFCs, whereas a prevailing stable trend is registered for the ATL, OEM, AWB, and Amber RFCs. The expectation for the future (2030) is generally positive for all RFCs.

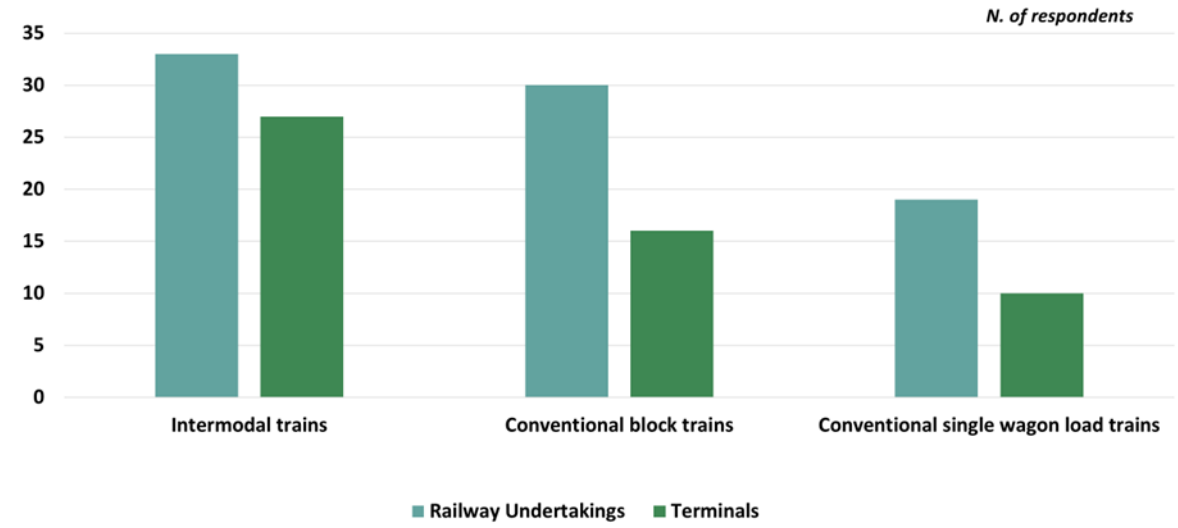
Figure 74 Experienced and expected traffic trends on corridors according to the trains served at terminals, crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 3.T

The variation in traffic experienced by terminal operators since 2013 and the expected growth are generally positive, except for the ATL and AWB RFCs (Figure).

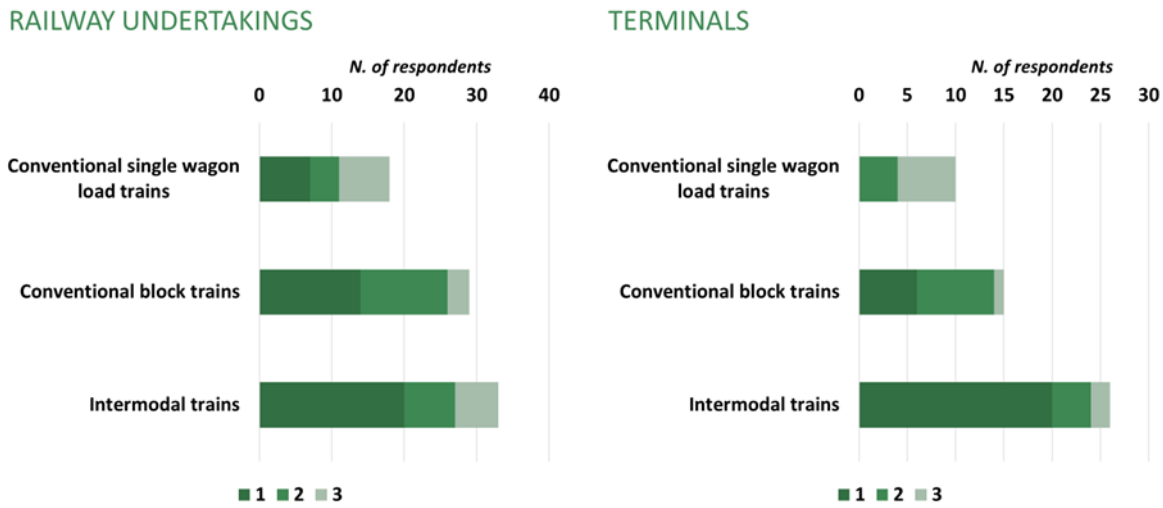
Figure 75 Type of trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 4.R and 4.T

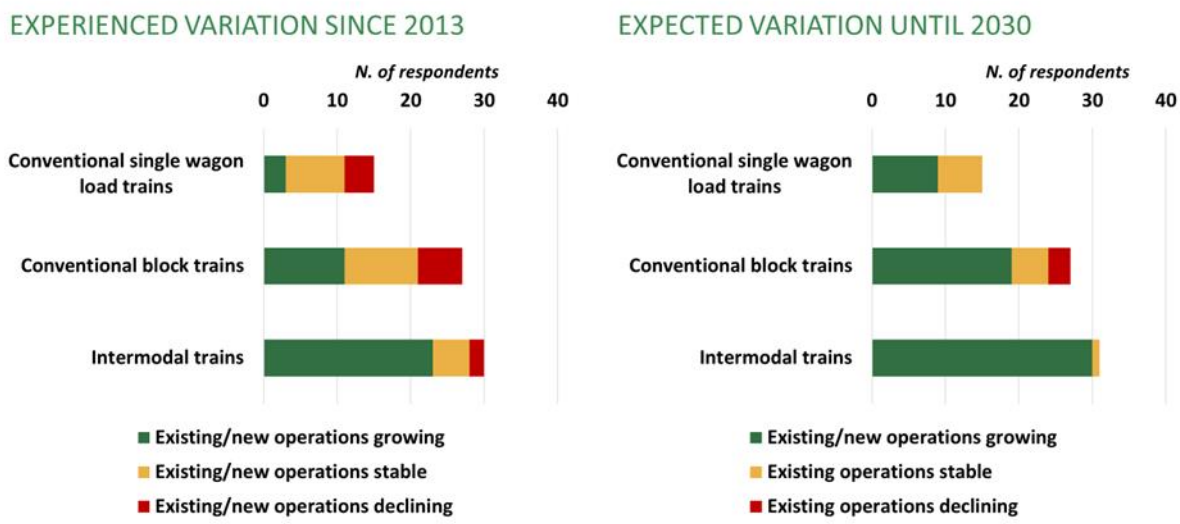
The prevailing type of international trains operated on the 11 RFCs Network consists of intermodal trains, followed by conventional block trains and single wagonload trains (Figure and Figure 52).

Figure 52 Ranking of type of trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) on any RFC



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 4.R and 4.T; Note: 1= first, 2=second, 3= third

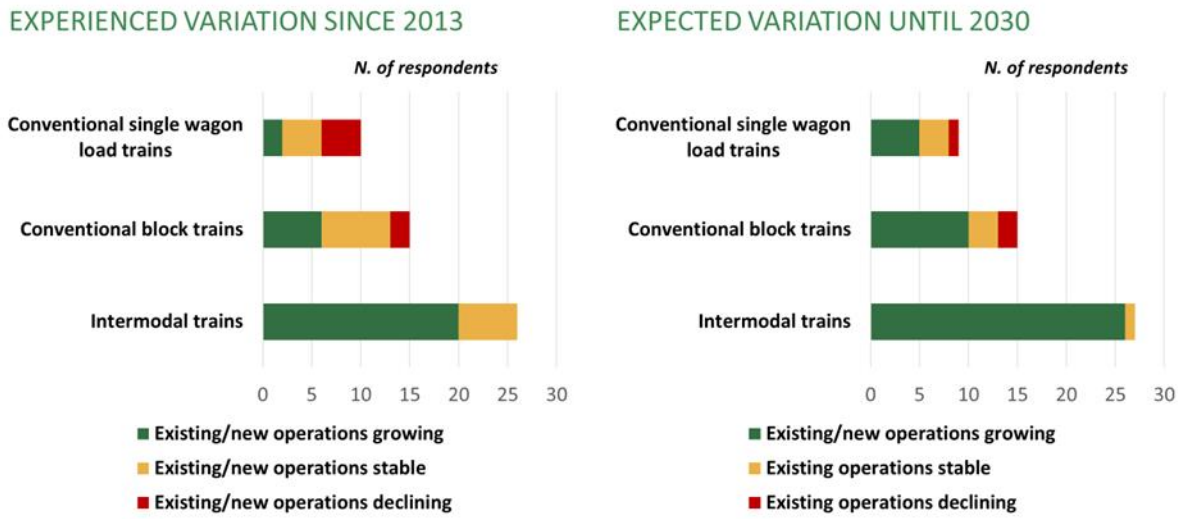
Figure 77 Experienced and expected traffic trend on the type of trains operated by RUs crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 4.R

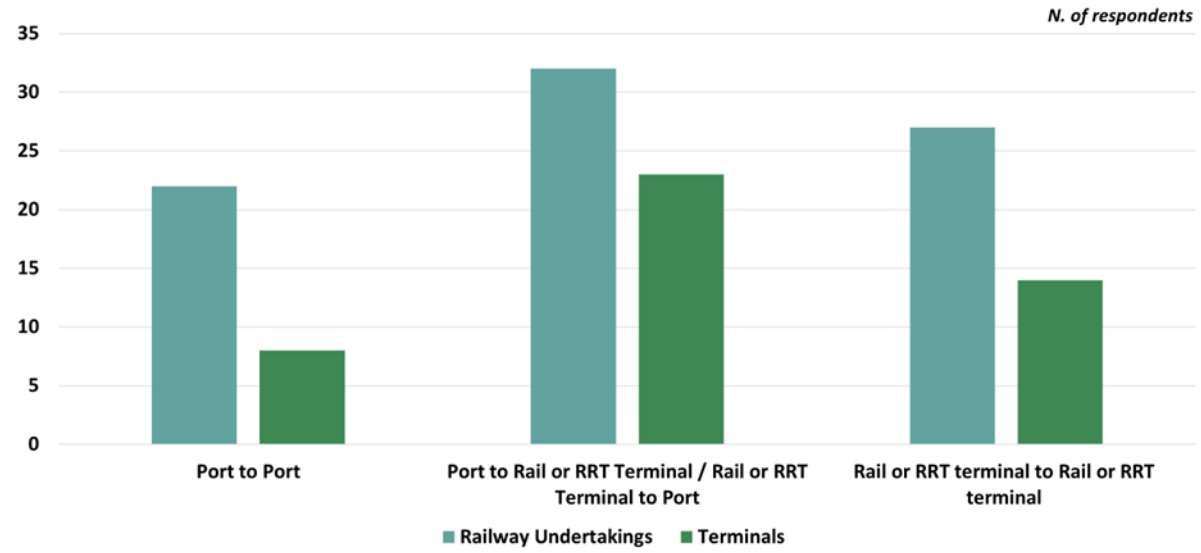
Most RUs and terminal operators experienced growth in intermodal train operations in the past years (Figure and Figure), whereas the trend for conventional block and single wagonload trains is predominantly stable. Most respondents have a positive expectation for the future in terms of traffic growth for all market segments.

Figure 78 Experienced and expected traffic trend on the type of trains served at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 4.T

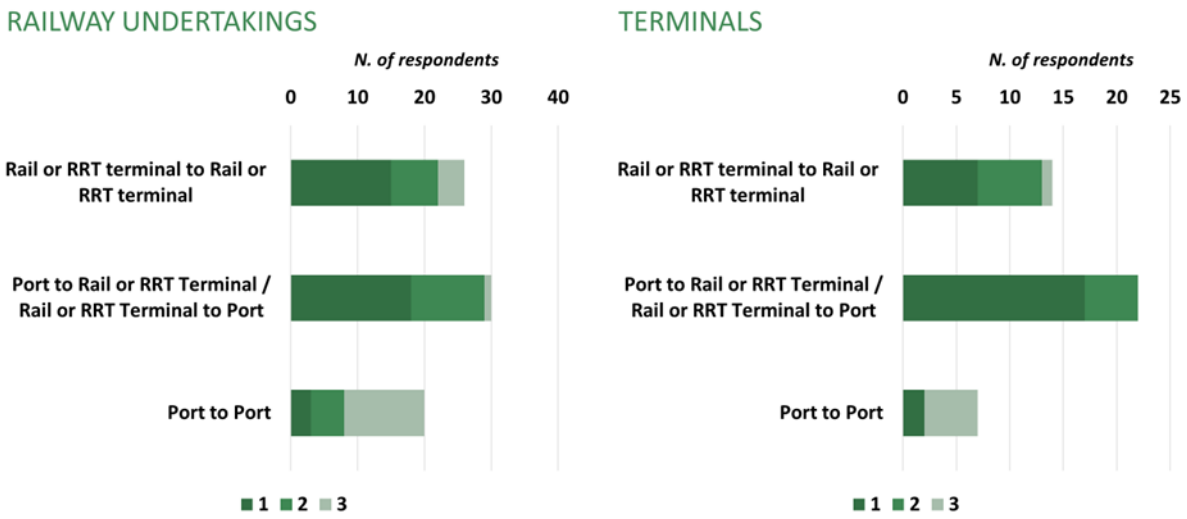
Figure 79 The type of O/Ds of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) on any RFC



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 5.R and 5.T

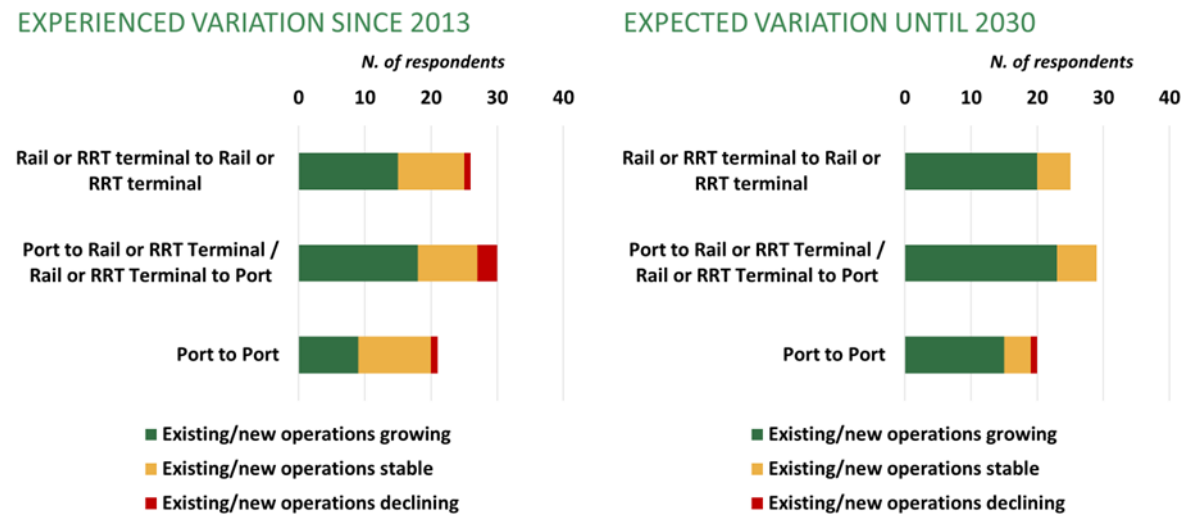
Most operations relate to Port to Rail-Road Terminal (RRT) transport, followed by RRT to RRT services and Port to Port operations (Figure and Figure).

Figure 80 Ranking of the types of O/Ds of the trains operated by RUs or served at terminals crossing at least one border crossing point(s) on any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 5.R and 5.T; Note: 1= first, 2=second, 3= third

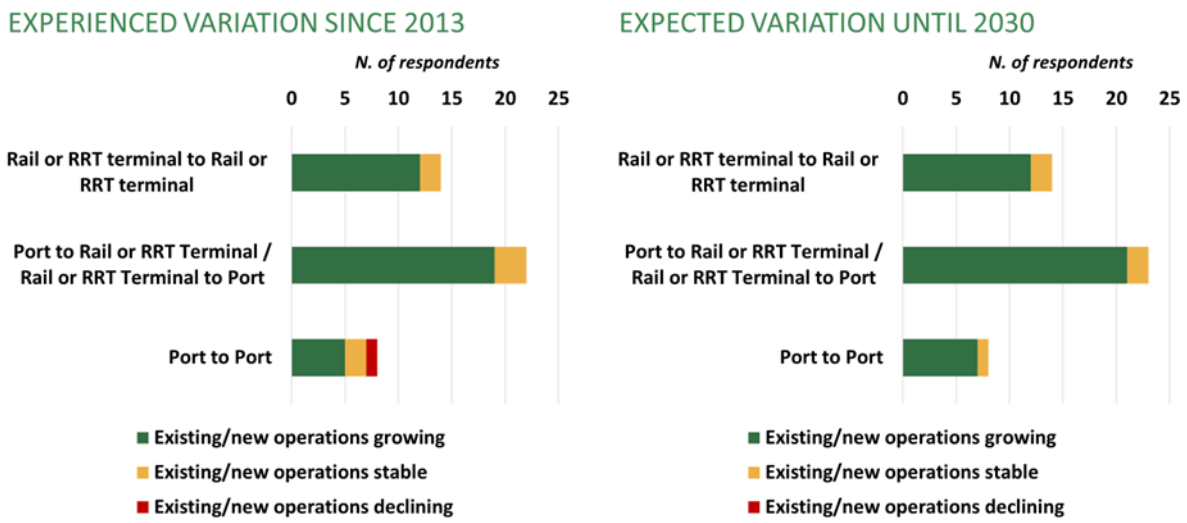
Figure 81 Experienced and expected traffic trend on the type of O/Ds of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 5.R

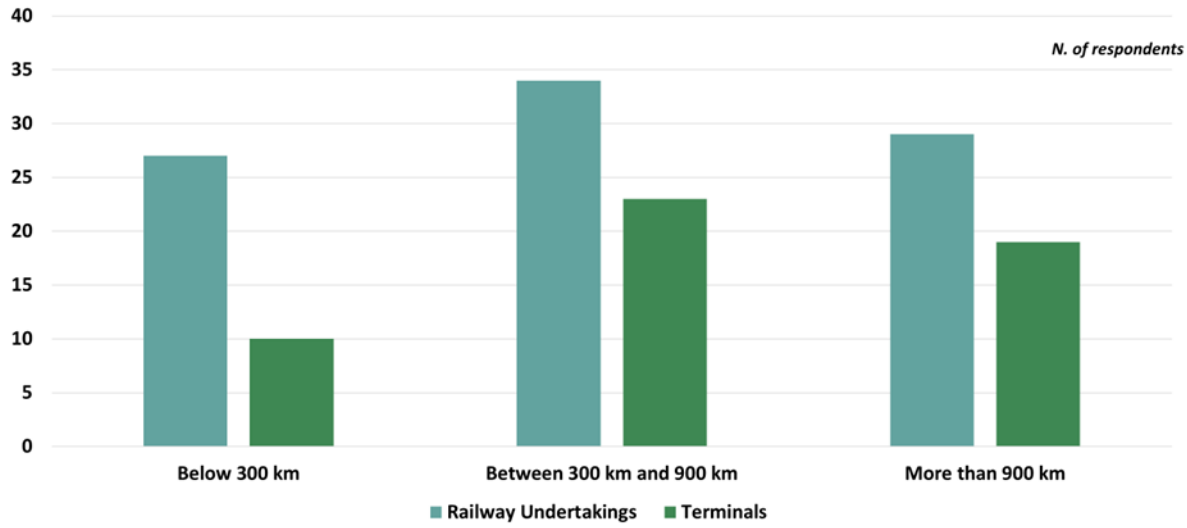
Experienced variations by RUs were mostly positive for the Port to RRT or RRT to RRT segments and stable for the Port to Port one (Figure). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure 53). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments (Figure and Figure 53).

Figure 53 Experienced and expected traffic trend on the type of O/Ds of the trains served at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 5.T

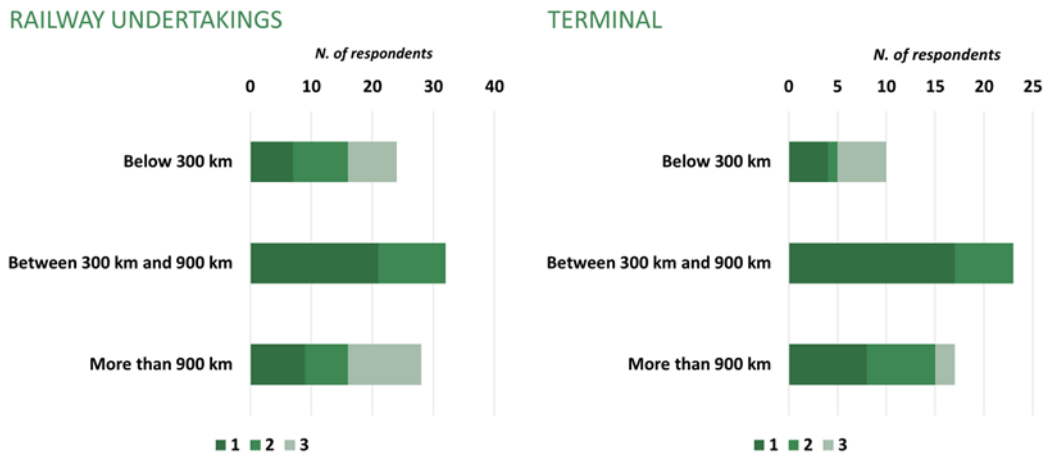
Figure 83 Type of distances of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 6.R and 6.T

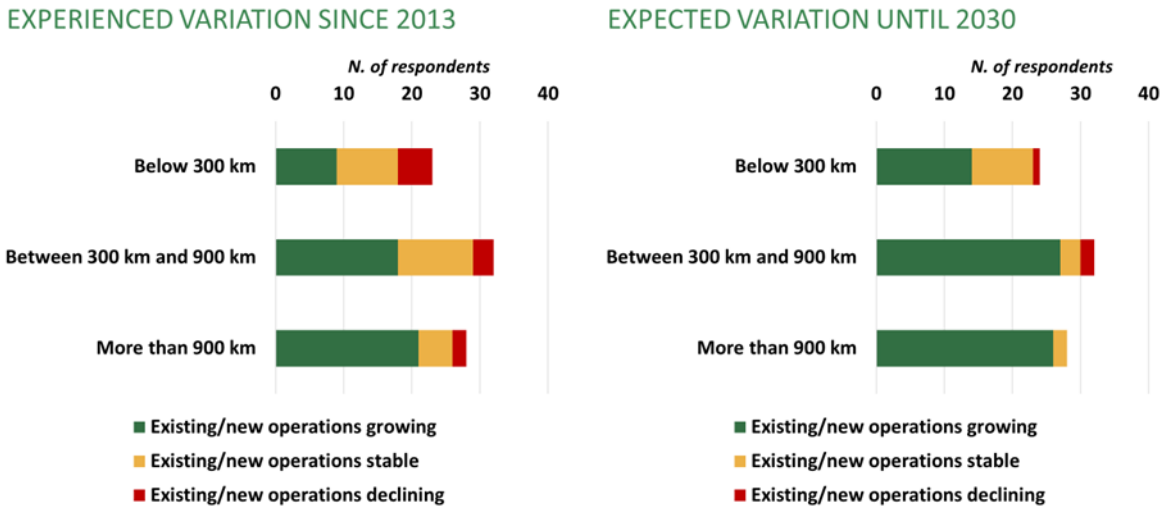
Most international train operations cover distances between 300 km and 900 km, followed by services covering distances longer than 900 km and below 300 km (Figure and Figure).

Figure 84 Ranking of types of distances of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 6.R and 6.T; Note: 1= first, 2=second, 3= third

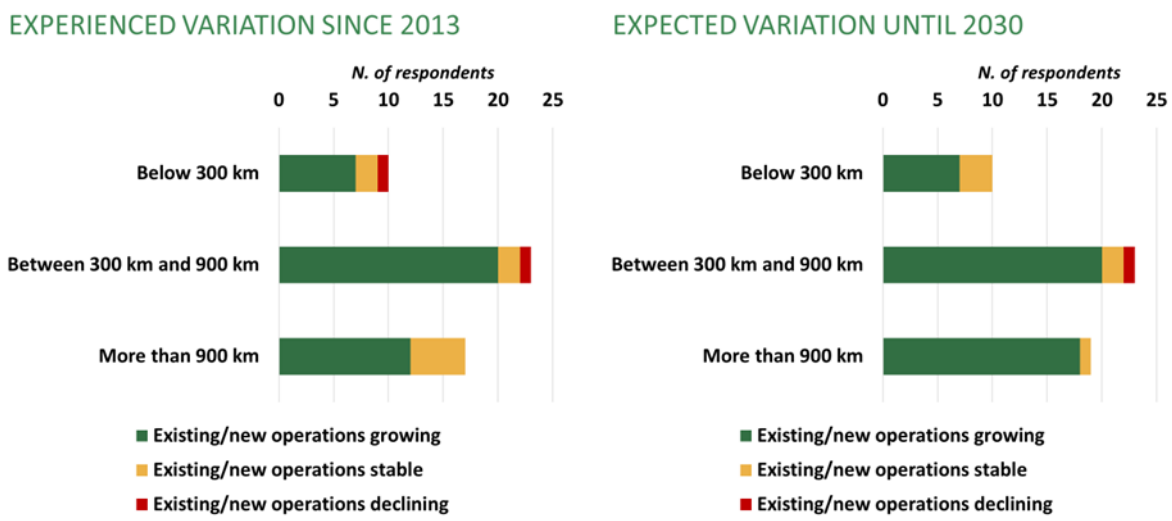
Figure 85 Experienced and expected traffic trend on type of distances of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 6.R

RUs experienced mostly positive variations for services covering distances longer than 300 km and declared the market is stable for operations below 300 km (Figure). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments.

Figure 86 Experienced and expected traffic trend on type of distances of the trains or served at terminals crossing at least one border crossing point(s) in any RFCs

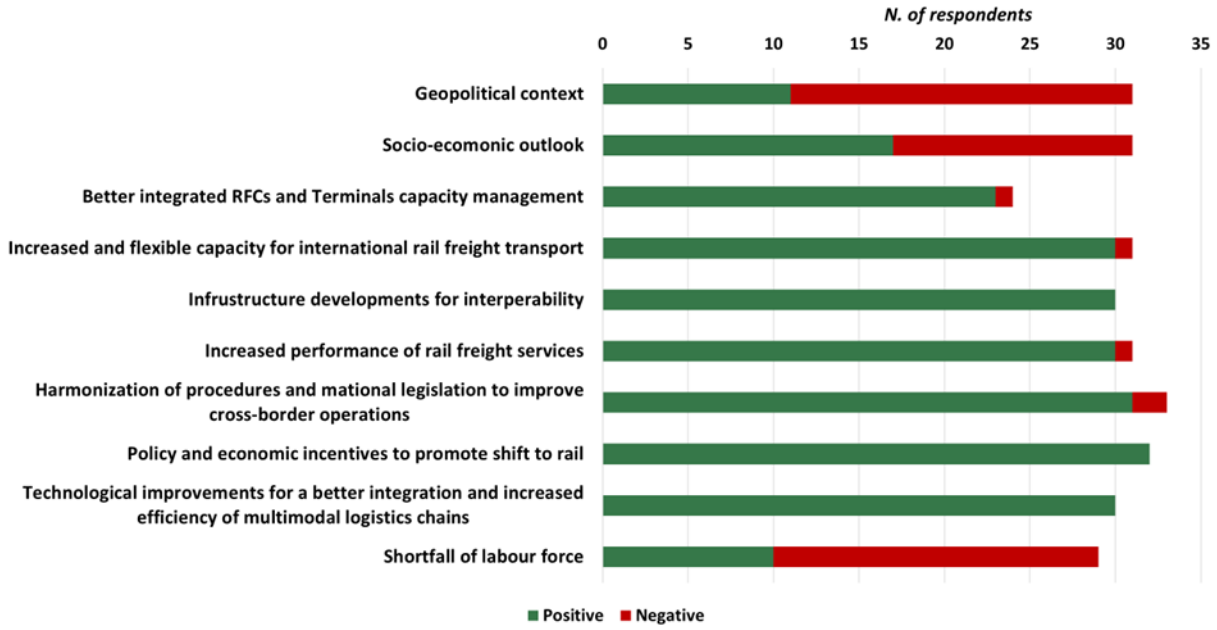


Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 6.T

6.3 MARKET DRIVERS

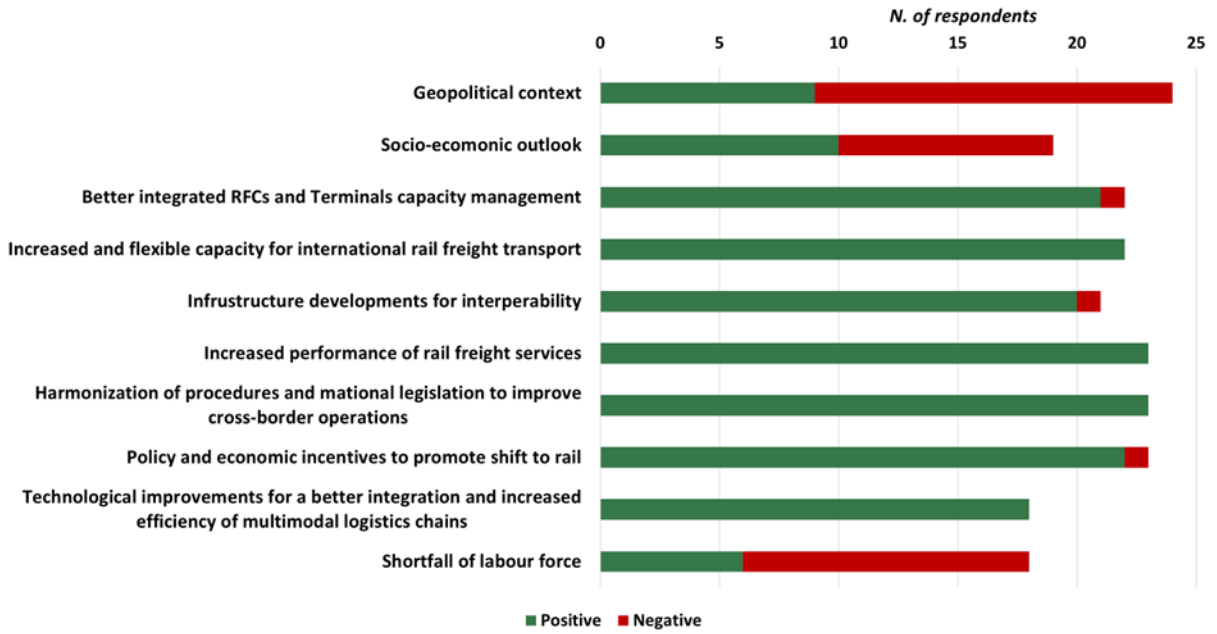
RUs and terminal operators have very similar views about the effects of the main market drivers on the growth of international rail freight transport in the short term, i.e., up until 2030 (Figure 54 and Figure). Most identified drivers are expected to have positive effects as they are assumed to improve rail transport's competitiveness. At the same time, the geopolitical context, the socio-economic outlook as well as the shortfall of the labour force are perceived as threats.

Figure 54 Potential effect of market drivers on the evolution of international rail freight transport operated by RUs until 2030



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 7.RT

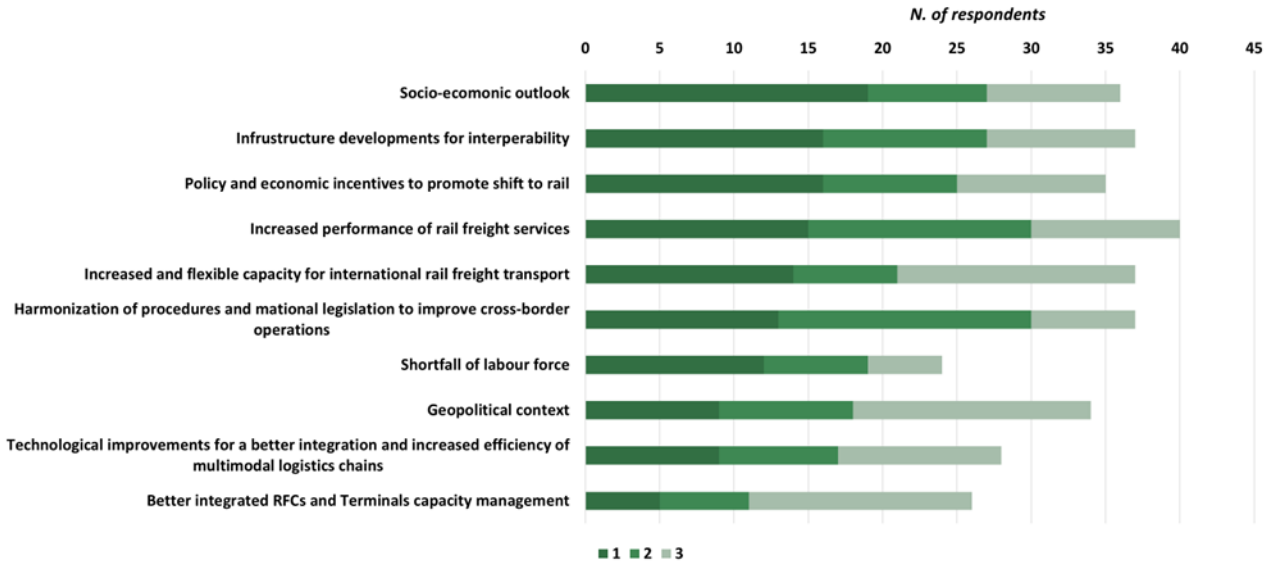
Figure 88 Potential effect of market drivers on the evolution of international rail freight transport served at terminals until 2030



Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 7.RT

Market players rank as most relevant market driver the socio-economic outlook (Figure). This is followed by "infrastructure developments for interoperability", "policy and economic incentives to promote shift to rail". "increased performance of rail freight services" and "harmonisation of procedures and national legislation to improve cross-border operations" are the two most relevant market drivers, according to the respondents, if considering both first- and second-ranking options.

Figure 89 Ranking of the most relevant short-term market drivers for RUs and Terminals



Source: 2023 11 *RFCs* Joint TMS Update; Notes: Question C) 7.RT

Although indicated as having a potential negative impact on the market, labour shortages and geopolitical context are not among the most critical market drivers. Finally, "technological improvements towards better integration and increased efficiency of multimodal logistics chains" and "better-integrated RFCs and terminal capacity management" do not seem to be considered priority issues by the RUs and terminal operators.

7 KEY FINDINGS AND RECOMMENDATIONS ON FACILITATING AND STRENGTHENING RAIL FREIGHT MARKET ALONG THE 11 RFCS NETWORK AND THE RFC RD

The EC introduced the European Green Deal at the end of 2019, representing Europe's long-term comprehensive strategy to make the European continent carbon-neutral by 2050. To implement the European Green Deal and support the achievement of its ambitious goals, the European Commission updated between 2020 and 2021 all main economic sector policies, including for transport and mobility. About one year after the adoption of the European Green Deal, the European Commission published its Smart and Sustainable Mobility Strategy, replacing the 2011 White Paper. To support the achievement of the ambitious target of the European Green Deal, of reducing transport emissions by 90% by 2050 (compared to 1990 levels), the Sustainable and Smart Mobility Strategy sets specific milestones for the rail sector, i.e., doubling passenger high-speed rail traffic by 2030 and tripling it by 2050, while increasing rail freight by 50% by 2030 and doubling it by 2050 (compared to 2015 levels).

To make the above vision and targets a reality, the strategy identifies a total of 82 initiatives in 10 key areas for action, including one dedicated to the greening of freight transport, proposing measures to make freight transport more efficient and more sustainable, by improving rail infrastructure management, offering stronger incentives for low-emission lorries, and better information on freight transport greenhouse gas emissions. The Greening Freight Transport flagship action of the Smart and Sustainable Mobility Strategy involves three main measures:

- A new regulation on the use of railway infrastructure capacity in the single European railway area, amending Directive 2012/34/EU and repealing Regulation (EU) No 913/2010[21] aimed at optimising the use of the railway infrastructure, improving cross-border coordination, increasing punctuality and reliability, and ultimately attracting more freight to rail. Current rules on capacity management are decided annually, nationally and manually. This does not favour cross-border traffic (around 50% of rail freight crosses borders); the fractured approach leads to delays at borders. This, in turn, hinders the functioning of the Single Market. Delays due to congestion caused by uncoordinated maintenance works are also common. The proposal for a regulation on the use of railway infrastructure capacity in the single European railway area builds on the industry-led Timetable Redesign Project. The aim is to better respond to the different needs of the rail sector: stable timetables and early booking of tickets for passenger services, and flexible train runs adapted to just-in-time supply chains for freight shippers.
- A new directive amending Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic[22]. More than 50% of freight is carried by road in the EU (2020 figures), and this transport is a major contributor to greenhouse gas emissions. The current Weights and Dimensions Directive sets the maximum weight length, width and height for heavy-duty vehicles. The proposed directive revises these rules to allow additional weight for

[21] https://transport.ec.europa.eu/document/download/9393e22e-72ee-440d-a983-e2ee116e11ba_en?filename=COM_2023_443_0.pdf
[22] https://transport.ec.europa.eu/document/download/6d96dca5-11f2-4499-81cd-b3d44b67a73d_en?filename=COM_2023_445_0.pdf

vehicles using zero-emission technologies, as they tend to increase a vehicle's weight. This is expected to incentivise the take-up of cleaner vehicles and technologies. The uptake of more aerodynamic cabins and other energy-saving devices will also be encouraged increasing the efficiency of zero-emission powertrains (further to improving driver comfort and safety). The proposal also provides clarity on the use in cross-border traffic, in certain conditions, of heavier and longer vehicles than allowed today in some Member States. This includes clarifying that Member states who allow European Modular Systems (EMS) in their territories will also be able to use them in international operations among the neighbouring Member States, without a need for a bilateral agreement and without a restriction of crossing only one border. As a result, the same amount of cargo can be carried in fewer trips. Finally, to encourage intermodal transport, whereby goods are moved using two or more transport modes but with a standardised cargo unit (like a container trailer or other), lorries, trailers and semitrailers will be allowed to carry extra weight. Extra height will also facilitate the transport of high-cube containers by standard vehicles.

- A new regulation on the accounting of greenhouse gas emissions of transport services[23], defining a new methodology for companies to calculate their greenhouse gas emissions if they choose to publish this information, or if they are asked to share it for contractual reasons. The method is based on the recently adopted ISO/CEN standard for the quantification and reporting of greenhouse gas emissions arising from the operation of transport chains of passengers and freight. Reliable data on door-to-door emissions will enable operators to benchmark their services and allow consumers to make informed choices on transport and delivery options.

The Greening Freight Transport package is part of a broader effort to make mobility and transport more sustainable. It follows on from the key components of the "Fit for 55" package, such as its targets for recharging and refuelling stations, and for the deployment of sustainable fuels in aviation and maritime transport. To complement these proposals, the European Commission is also revising the Combined Transport Directive, as part of which it will consider a range of regulatory, operational and economic measures to make intermodal transport more competitive.

Finally, the Greening Freight Transport package also complements the revised Trans-European Transport Network (TEN-T) policy through incentives and requirements for infrastructure development, and by better integrating the different modes within a multimodal transport system. Digital technologies are also helping to increase efficiency, including the European Rail Traffic Management System and Digital Automatic Coupling for rail, the Electronic freight transport information Regulation and the European Maritime Single Window environment.

With reference to the 50% rail target growth set in the EU policies for the period 2015-2030, Table 41 provides the transport volume figures in million tkm for the EU27 in 2015 and 2022. Data show that the gap to be filled between 2023 and 2030 is significant, especially for the international segment.

[23] https://transport.ec.europa.eu/document/download/6fd194f0-1618-45c8-822e-1b13e808eb23_en?filename=COM_2023_441.pdf

Table 41 Freight volume (million tkm) in 2015 and 2022

	2015	2022	Var. % '15-22
International rail freight transport	155,289	149,032	-4%
National rail freight transport	181,811	199,830	10%
Total rail freight transport	337,100	348,862	3%

Source: Eurostat [rail_go_typepas]; Notes: (1) Data for Belgium are excluded from the total as they are not available for 2015 and 2022. (2) Data are limited to main undertakings

7.1 SUMMARY OF KEY FINDINGS OF THE STUDY

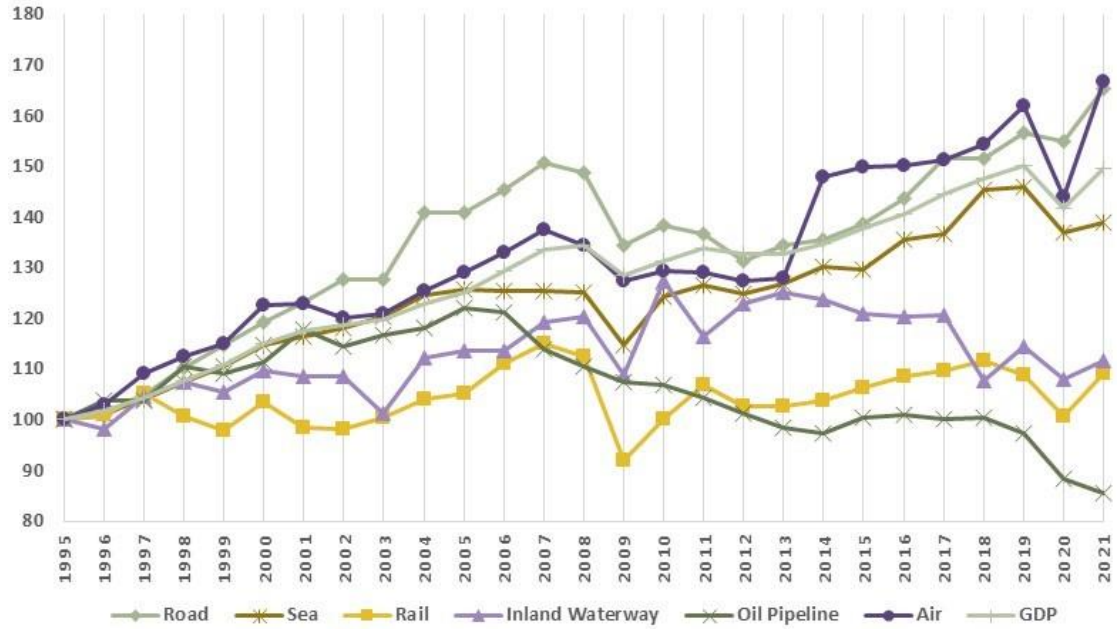
7.1.1 THE RAIL FREIGHT MARKET IN EUROPE AND ON THE RFC RD

Overall market trends and sector developments

An analysis of the available statistics was performed as part of the study based on the data available from the European Commission DG MOVE/Eurostat (Statistical Pocketbook 2023 and RMMS Rail Market Monitoring Report) and from the Independent Regulators Group (IRG)-Rail (Rail Market Monitoring Reports). The analysis provides an overview of the development of the European rail freight sector since mid of the 1990s when the rail freight market liberalization started, allowing monitoring trends before and after the 2008 credit crunch, which is considered the second major financial crisis after the 1930s Great Depression, and which was followed by additional adverse events during the past 10-15 years when the 11 RFCs were gradually established and entered into operation. Key findings from the statistical analysis are as follows:

- The period since the entry into force of the Regulation 913/2010 has indeed been marked by a number of socio-economic, health and geopolitical events which negatively impacted trade and transport flows at the global and European scale. The statistical review shows that the 2008 financial crisis basically altered the economic and transport developments experienced by Europe over the previous decades. EU27 long-term series over the past 30 years show that the effects of this crisis are persisting: albeit positive, the trend of GDP and most transport modes of the following period stands indeed at lower growth rates. Overall, the European rail freight market grew modestly over the last decade, contrasting with the strong development experienced between 2001 and 2008. The EU economy and transport markets were more recently further impacted by the 2020-2021 COVID-19 pandemic and by the current geopolitical crisis that started in 2022 with the Russian-Ukrainian war and deteriorated with the Israel-Gaza conflict and Red Sea crisis.

Transport trends in billion tkm EU27 (1995=100)



Source: European Commission – DG MOVE – Statistical Pocketbook 2023

- Rail freight transport between 2013 and 2021 marginally grew in the EU27 from about 385 billion tkm to 410 billion tkm, i.e. 7%, which is only half of the rate of growth of total transport volumes and GDP. However, over the same period combined transport more than doubled from about 41 billion tkm to 100 billion tkm. Trends for the RFC RD countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In countries along the RFC RD rail freight transport grew from about 209 to 231 billion tkm, i.e. 10%;
- Most RFC RD countries are among the ones registering a higher rail modal share in the EU. Five out of seven countries are positioned within the ten first-ranking EU countries for rail modal share in 2022. At the same time, Czechia, and Slovakia are also among the ones that have registered a high decline in rail modal share over time. This is a general trend at the EU27 scale that is likely related to the change in the commodity basket trade. At both EU 27 and RFC RD related country levels, there is an underlying stagnation or decline of dry and liquid bulk commodities (originating even from before the mid of the 1990s), associated with a growth of intermodal transport, a market segment that is apparently growing with the gradual opening of the rail freight market and greening of logistics chains;
- At the EU27 scale, the COVID-19 pandemic seems to have had different impacts on rail freight traffic measured in net tkm, with either increases or decreases in transport volumes between 2019 and 2021. The negative impact has been apparently significant in the Baltic States, Denmark, Luxembourg, Portugal, and Romania, whereas Bulgaria and Greece experienced about 20% growth. Most of the counties along RFC RD registered positive variations during the pandemic period. Baltic States, in particular, also experienced a significant drop in traffic since the start of the Russian-Ukrainian war in 2022. In fact, EU sanctions implemented with Belarus and Russia following the start of the Ukrainian conflict impacted rail freight traffic negatively in the Baltic States, whereas freight train traffic between Ukraine/Moldova and the EU has increased, particularly through Poland and Romania;

- Since the start of the rail freight liberalisation process in the late 1990's and 2000's, the market share of the domestic incumbent RUs gradually declined in most EU Member States, whereas the market share of non-incumbents increased together with the operations of foreign incumbents. As a general pattern, common to the EU27 and countries along RFC RD, the trend of the market share of domestic incumbents continued to decline in the period between 2013-2021. In the countries along RFC RD, the market share of the domestic incumbents in 2021 was about 50% on average, 60% considering national and international incumbents.

Analysis of the current and future freight transport market along the 11 RFCs Network

As part of the 2024 joint TMS update, an analysis of the current and future market has been done using an EU-wide NEAC model, combining transport and economic statistics at the EU scale with rail traffic data available from RNE databases.

Within the combined 11 RFCs network areas, rail freight transport in 2022 accounted for 18% of the total international freight transport volume, which is approximately 265 million tonnes. This relates to approximately 442,000 trains[24].

For the analysis of the future short-term market trends, at the 2030 time horizon, three scenarios have been simulated. The first one only simulates economic growth (EU Reference); another one simulates the effects of the completion of major transport investments currently ongoing or expected to be finished by 2030 (Projects); and an additional hypothetical one that simulates the impact of 750 meter trains, ERTMS, standard gauge at the Iberian Peninsula and 22.5 axle load, regardless the possibility to implement the required projects (Sensitivity). The three scenarios show an increase in international freight transport in general. Within the 11 RFCs network areas, due to economic growth (EU Reference), the increase in general is about 13%. This is in line with the GDP growth for the EU27, which is 17%. Inland shipping shows a growth of 13%, road has a growth of 14% and rail transport of 13%. In the absence of further developments, the rail freight market is expected to grow at a slower pace compared to GDP and to the overall transport sector, therefore losing market share. This is due to the changing trends in the basket of transported commodities. For all land freight transport, the projects scenario and the sensitivity scenario have a limited impact on the overall growth of international freight transport.

Focusing on international rail freight transport, the reference scenario expects a growth of 13%, which is approximately 35 million tonnes extra compared to the 2022 situation. Both the projects scenario and the sensitivity scenario show the impact of the different rail projects and rail measures. In the project scenario, rail transport grows by an extra 5% compared to the reference scenario (300 to 314 million tonnes) due to projects. In total it is estimated that this is approximately 12 million tonnes of extra international rail freight transport. This is mainly due to splitting one leg of transport chains into more legs as well as some rerouting.

The hypothetical sensitivity scenario shows that compared to 2022, there is a potential of 61 million tonnes extra rail freight transport mainly due to longer trains. The total expected volume of rail freight transport in this scenario reaches 361 million tonnes, corresponding to a 36% growth compared to 2022.

Considering all three scenarios, the sensitivity scenario can be regarded as a potential maximum growth of 36% for rail transport across the 11 RFCs network. Compared to the 2022 base year, transport volumes would

[24] An average volume per train of 600 tonnes is assumed.

increase from 265 to 361 million tonnes i.e. by 36%, out of which around 1/3 is due to economic development and 2/3 to infrastructure investments.

As a result of the analysis performed, it is possible to conclude that the major planned projects along the 11 RFCs network assumed to be completed by 2030 (see Section 3.3.2), and the modernisation of railway lines and cross-border sections in the Eastern-European corridor countries are important to removing infrastructure bottlenecks and reducing travel times and transport costs. Such initiatives are expected to increase competitivity of rail transport on the 11 RFCs network, and thus on each RFC, including the RFC RD. In addition to these projects, completing an interoperable network in line with the TEN-T requirements is fundamental to increase the rail market share.

With reference to the 50% rail growth set in the EU policies for the period 2015-2030, the combined observed growth for the period 2015-2022 (-4%, see Table 41) and expected for the time frame 2023-2030 (13%) still lags below the target. Therefore, the development of a high-quality 11 RFCs Network in line with TEN-T standards does not seem to be sufficient to achieve the ambitious targets set in the relevant European transport policies; an outcome that would hardly change even assuming that additional mega cross-border projects would be completed like the Brenner and Turin-Lyon tunnel.

Such targets remain challenging to meet in the absence of a significant change in the structure of the costs of road and rail transport. Internalising external costs of road transport, and/or incentives to reduce the costs of rail transport might be needed. The potentially negative impacts on rail market share of measures such as improving the efficiency of road transport shall also be considered, as also reported in a recent study by the Community of European Railway and Infrastructure Companies (CER) – *Study on Weights and Dimensions: Impacts of the Proposed Amendments to the Weights and Dimensions Directive on Combined Transport and Rail Freight Transport*[25]. Market opening appears also to be relevant in increasing the competitiveness of rail transport. A recent study by the European Rail Freight Association (ERFA) – *The European Rail Freight Market; Competitive Analysis and Recommendations*[26] – considers how non-incumbent operators, focusing on the fast-growing intermodal and logistics train segments, are likely to experience further growth in market share in the 2020s. According to the study, competition amongst RUs has made rail more attractive compared with road, which can be partially explained by the business model of non-incumbents, more focused (i.e., intermodal and logistics, block trains, and international traffic), lean and agile, and cost-competitive, able to offer better service levels consistently.

Analysis of the current and future freight transport market along the RFC RD

International freight transport across all modes in the catchment area of the RFC RD amounts to 263 million tonnes. Overall, most transport concerns cargo type *Other* (56%), followed by dry bulk (35%). The cargo type *Other* is mostly transported by road, while rail has a large share in the international transport of dry bulk (57%). The figure below provides an overview.

[25] https://www.cer.be/cer-reports/study-on-weights-and-dimensions
[26] https://erfarail.eu/news/the-european-rail-freight-market-competitive-analysis-and-recommendations

Estimated volume (million tonnes) and share of *all* international freight transport by mode and cargo type in the *catchment* area of RFC RD

Source: NEAC estimations

On relations within the catchment area of RFC RD, rail freight transport has a share of 36% in the total amount of international freight transport. This is a volume of approximately 94 million tonnes. The total amount of international rail freight transport of 94 million tonnes relates to approximately 100,000 trains within the corridor area of RFC RD.

The most important rail transport origins and destinations for the RFC RD are locations such as Munich, Eastern-Slovakia, Western Transdanubia (HU), Budapest and Linz, when looking in the corridor area. The most important rail transport relations are between inland locations and not between ports and hinterland. The most important relation is between East-Slovakia and Ostrava (v.v.).

The three future scenarios (Reference, Projects and Sensitivity) show an increase of in international freight transport on the RFC RD in line with what is expected at the European level. In the Reference scenario, mainly due to autonomous economic growth, the increase in general is about 13%, on the RFC RD also at 13%. This is in line with the GDP growth for the EU27 which is 17%. On the RFC RD, inland shipping shows a growth of 11%, road of 14% and rail has a growth of 12%. In the absence of further developments, the rail freight market is expected to grow at the same pace compared to GDP and to the overall transport sector, therefore keeping its market share. For all land freight transport, the Projects scenario and the Sensitivity scenario have an impact on the overall growth of international freight transport, especially on the RFC RD.

On the RFC RD, for the Reference scenario, a growth of international rail transport is expected at 12%, which is approximately 11 million tonnes extra compared to the 2022 situation. This would be (rounded) 12,000 extra international freight trains on the RFC RD. The total number of international freight trains using the RFC RD would then be some 112,000 trains in the Reference scenario in 2030.

The Projects scenario shows the impact of the different rail projects and rail measures all across Europe. Rail transport grows with an extra 1% compared to the reference scenario. In total, it is estimated that this is approximately 1 million tonnes of extra international rail freight transport. This gives (rounded) 2,000 extra trains on the RFC RD. Together with the Reference scenario results, this would be approximately 114,000 trains using the RFC RD.

The Sensitivity scenario shows that there is another potential of 17 million tonnes extra rail freight transport, mainly due to longer trains. The total number of unique international freight trains would then be around 115,000. Compared to the 100,000 unique trains in 2022 in the catchment area, this is a growth of around 15%. This figure can be regarded as a potential maximum growth.

Overall, the sensitivity scenario can be regarded as a potential maximum growth of 20% for international rail freight transport compared to the Reference scenario. Compared to the 2022 base year, transport volumes would increase from 94 to 123 million tonnes i.e. by 31% at maximum.

7.1.2 OCCURRED AND EXPECTED CHANGES DUE TO THE ESTABLISHMENT OF THE RFCS

In the absence of a consistent historical series of data and information on the operations along the 11 RFCs – worth also considering that the RFCs were established and entered into operation in different years between 2013 and 2021 – an e-survey was conducted as part of the 2024 joint TMS update – *2023 11 RFCs Joint TMS Update Survey* – to assess the occurred and expected changes associated with their establishment. The survey involved the Railway Undertaking Advisory Groups (RAGs) and Terminal Advisory Groups (TAGs) of the 11 RFCs. In total, 42 representatives of the RAGs and 30 members of the TAGs submitted valid questionnaires between September 2023 and January 2024.

The survey was conducted to collect the opinion of the 11 RFCs market on three main areas: occurred and expected impact of the RFCs, occurred and expected market developments along the RFCs, and market drivers. The main findings from the survey are summarised in the following bullet points for each of the three areas. Especially regarding the opinion of the RAG and TAG members on the occurred and expected market developments, it is worth noticing that: it reflects their views at the time of submission of the questionnaire (Autumn 2023/January 2024); it represents a partial view of the market as the sample of the respondents is not representative of the market universe; it may contrast with the findings from the statistical review presented in the previous section above, as the opinions relate to the corridors and international trains, whereas national statistics refer to the whole country network and national as well as international traffic.

Occurred and expected impact of RFCs, in the areas of governance, operational efficiency and capacity management

- The respondents' opinion about the changes within the governance area is positive, especially in terms of cooperation with the market, including but not limited to RUs and terminal operators, as well as concerning facilitation of discussion among Member States about the issues affecting the competitiveness of international rail freight transport. The opinion about the progress made regarding cooperation between RFCs and Core Network Corridors (CNCs)/ERTMS horizontal priority is less favourable. The market opinion is negative about the progress made on harmonising legislative, regulatory, procedural and operational aspects of international freight rail services. The expectations of the market-players concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all aspects. Respondents consider the cooperation between RFCs and an EU Network of Infrastructure Managers (ENIM) as assumed in the proposal for the new capacity regulation, to be the best governance solution for bringing issues forward.
- The stakeholders' opinion about the changes that occurred within the operational efficiency area is also generally positive, except for the progress made in the promotion of technical and operational harmonisation of the European railway transport system towards its interoperability. The respondents' expectations concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all the assessed issues related to operational efficiency. Cooperation between RFCs and an EU Network of Infrastructure Managers (ENIM) is also considered the best-fitting governance solution to bring operational efficiency issues forward.

- The respondents' opinions about the changes that occurred within the capacity management area are predominantly negative. Notwithstanding the market's negative opinion of the progress made since the establishment of the RFCs in this area, the expectations on the future impact of the programmes and activities by the RFCs are rather positive with regard to all the investigated aspects related to capacity management. The best governance solution for capacity management improvements is deemed to be the cooperation between the RFCs and an EU network of Infrastructure Managers (IMs).

Occurred and expected market developments

- The vast majority of the respondents operated or still operate rail services or manage/operate terminals serving trains across at least one border-crossing point on any of the RFCs. Most of them also operated or served international rail freight transport before the establishment of the RFCs. The majority of the respondents declare they experienced an increase in their operations since 2013, and most of them also have a positive expectation about the future, expecting overall market growth.
- The variation in traffic experienced by RUs and terminal operators since 2013 is positive for the RFC RD. The majority of the respondents declare they experienced market growth along the corridor.
- The prevailing type of international trains operated on the RFCs network consists of intermodal trains, followed by conventional block trains and single-wagon load trains. Most RUs and terminal operators experienced growth in intermodal train operations in the past years, whereas the trend for conventional block and single-wagon load trains is predominantly stable. Most respondents have a positive expectation for the future in terms of traffic growth for all market segments;
- Concerning traffic between logistics nodes, most operations relate to Port to Rail-Road Terminal (RRT) transport, followed by RRT to RRT services and Port to Port operations. Experienced variations by RUs were mostly positive for the Port to RRT or RRT to RRT segments and stable for the Port to Port one. Terminal operators have predominantly experienced growing trends in all market segments in the past years. The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments;
- Regarding service distances, most operations cover distances between 300 km and 900 km, followed by services covering distances longer than 900 km and below 300 km. RUs experienced mostly positive variations for services covering distances longer than 300 km and declared that the market is stable for operations below 300 km. Terminal operators have predominantly experienced growing trends in all market segments in the past years. The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments;

Market drivers

- RUs and terminal operators have very similar views about the effects of the main market drivers on the growth of international rail freight transport in the short term, i.e., up until 2030. Most identified drivers are expected to have positive effects as they are assumed to improve rail transport's competitiveness. At the same time, the geopolitical context and socio-economic outlook, as well as the shortfall of the labour force, are perceived as threats;
- The socio-economic outlook is ranked first by the market, followed by infrastructure development and interoperability, policy and economic incentives to promote shift to rail. Increased performance of rail freight services and harmonisation of procedures and national legislation to improve cross-border operations are the two most relevant market drivers, according to the respondents, if considering both first- and second-ranking options;
- Although indicated as having a potential negative impact on the market, labour shortages and geopolitical context are not ranked among the most critical market drivers. Finally, technological

improvements towards better integration and increased efficiency of multimodal logistics chains, better-integrated corridors and terminal capacity management do not seem to be considered priority issues by the RUs and terminal operators.

7.2 STUDY RECOMMENDATIONS

Building on the study's key findings, recommendations have been formulated around two main areas:

- Market developments and targets; and
- Institutional and operational developments.

Market developments and targets

The simulations made in the study demonstrate that major projects, and particularly the availability of an 11 RFCs Network in line with TEN-T standards, would significantly increase the competitiveness of rail freight transport. The post-COVID recovery and the recent geopolitical crisis caused delays in the implementation and completion of the projects needed to develop a high-quality 11 RFCs Network in line with TEN-T standards. Price increases and shortages of construction materials particularly affected the progress of ongoing and planned projects. A high-quality 11 RFCs Network might, furthermore, not be sufficient to achieve the ambitious targets set in the relevant European transport policies, in the absence of a significant change in the structure of the costs of road and rail transport. The following recommendations are proposed to support market development towards the achievement of the EU policy targets:

- *Timely complete the development of a high-quality 11 RFCs Network in line with TEN-T standards:*
  - *Building missing links and removing infrastructure bottlenecks* increasing infrastructure capacity by adding new tracks and lines where needed, increasing their speed and improving their gradient, can solve congestion problems, save energy and reduce transport costs as well as improve travel times. Such developments are relevant at the network level, but produce effects also at the individual corridor scale;
  - Achieving the requirements set in the TEN-T Regulation *towards an 11 RFCs Network in line with TEN-T standards*, i.e. 740 meter long trains, ERTMS, 22.5 t axle load, intermodal loading gauge, European standard track gauge, electrification, is fundamental to support the development of a Single European Railway Area;
  - *Support intermodal and combined transport*. The intermodal market is the most promising international rail freight market segment, requiring improvement of interconnectivity between main railway lines and terminals, increasing the capacity of the existing terminal infrastructure, investing in technologies to facilitate and speed up transport and transhipment operations, and tracking and making more reliable the transport of intermodal units along logistics chains and within logistics clusters;
  - Stronger cooperation between all involved parties for better effectiveness in the availability and *the use of funds and the definition of investment implementation strategies focussed on those sections of the network with higher market potential*. For over a decade, the sector has benefited from a stronger TEN-T policy with a dedicated Connecting Europe Facility Fund. Among the different transport modes involved in the TEN-T network, rail and rail cross-border initiatives are treated as a priority. However, the available financial resources are limited overall compared to the financial needs that would be necessary to complete all

projects. Investing in infrastructure might not be sufficient, e.g. to be operational, ERTMS also requires rolling stock to be equipped with onboard units.

- *Introduce market regulatory and policy measures to increase the competitiveness of rail freight transport*. Although not a specific subject of this study, regulatory and policy measures might be necessary to facilitate and foster the rail freight market in Europe towards the achievement of higher market shares and EU policy targets. Rail freight transport is generally more expensive and less flexible compared to road transport. Internalising external costs of road transport and/or creating incentives to reduce the costs of rail transport would increase its competitiveness and support the achievement of the ambitious EU policy targets. In this respect, policymakers shall also consider the potential effects on the modal share of measures improving the efficiency of road transport. As emphasised in the above-mentioned study by ERFA[27] regulatory measures facilitating market opening appear also to be relevant in increasing the competitiveness of rail transport (e.g. enforcement of antitrust regulations; unbundling of subsidised public service operations from open market business; and ending direct subsidies to or recapitalization of state-owned freight railway undertakings).

Institutional and operational developments

Recommendations on institutional and operational developments are formulated as follows, according to the findings from the market consultation (2023 11 RFCs Joint TMS Update Survey), conducted as part of this study and the use of the available infrastructure and market dataset to produce the current and future market analysis for the 11 RFCs:

- *Improve capacity management*. Capacity management is considered by the market and also by the analyses and studies at the basis of the proposal for the new capacity regulation, a key area for improvement. Progress was made in the management of Temporary Capacity Restrictions, however capacity planning remains an issue. Digital Capacity Management as an integral part of the European program “Timetable Redesign (TTR) for Smart Capacity Management” is at the core of the proposal for the new capacity regulation, and it is paramount to reaching the Green Deal’s targets for the transport sector and the rail freight segment within it.
- *Monitor operational performance*. The revised TEN-T regulation identifies new operational requirements, related to punctuality and dwell times at borders. Furthermore, some infrastructure requirements also depend on operations, such as 740 meter long trains. Investing in infrastructure, albeit needed, is long-lasting and capital-intensive. The competitiveness of international rail freight transport also depends on the improvement of cross-border operations and integrated/coordinated planning and management of the rail network at a European scale. An RFCs common KPI framework is already in place, and RNE is also already monitoring infrastructure KPIs, as also graphically represented in CIP. Such activities might be continued in the light of the new set of requirements foreseen in the TEN-T Regulation (EU) 1679/2024, and RFC governance structure, also defined in the Art. 67 of this regulation.
- *Balance network and corridor governance approach*. The analysis of the RFC catchment areas shows that international trains using at least one corridor BCP may actually use more than one RFC. A network approach is more fitting to the planning and management of the network capacity.

[27] https://erfarail.eu/news/the-european-rail-freight-market-competitive-analysis-and-recommendations

Geographical specificities and logistics clusters and chains exist that still make the corridor concept useful, especially to support discussion and coordination among IMs and Member States and for a customer-oriented approach aimed at involving RUs and Terminal Operators. This consideration also seems to be in line with the opinions expressed by the RAG and TAG members in the survey conducted as part of this study, i.e. cooperation between the network of RFCs and ENIM.

ANNEX 1 – OVERVIEW OF THE NEAC MODEL

NEAC is a freight transport forecast model, which helps to identify the best policy options and infrastructure alternatives at European level. The model is able to produce forecasts of transport flows (both volume and vehicles) for different modes (road, rail, IWW, maritime, and other). The model results can be used in transport studies, but also for studying emissions or for the use in social cost-benefit analysis.

Over the past decades, the NEAC freight transport forecast system has frequently helped to assess and evaluate different policy options at European and national level. The system was successfully used in several projects such as TEN-T corridor studies (such as North Sea-Med or Rhine-Alpine), the Iron Rhine cost-benefit analysis, modelling all French international freight transport, and studies into the Alpine crossings, North-South freight transport markets and safe truck parking. The system helped to get insight in order to pick the best policy options to make the European transport system more sustainable, resilient and robust.

For the near future the model is able to assist in studies such as corridor studies, infrastructure projects for rail, road and inland waterways, port studies, safe and secure truck parking, analysing the impact of COVID, Ukraine war or pricing at both European and national level. These are typically topics that play an important role in shaping the future of Europe. Scenarios for the Green Deal or the EU Reference 2020 scenario are used to look at the impact.

The system comprises of a database and a forecast model. Together they are very helpful:

- The database contains freight transport chains to, from and within Europe. It is based on reliable data such as Comext by mode and commodity, Port-to-Port statistics and socioeconomic data on population and GDP. Furthermore, the database contains mode specific networks for road, rail, inland waterways and sea. Terminals and ports form connection points in the networks. An extra asset in the database are the transport costs for the different modes which help to get insights in policies on modal shift;
- The forecast model is based on reliable methods and have been used in many other transport models in Europe and abroad. Think of ETIS+, Transtools, Worldnet or HIGH-TOOL. The forecast model comprises an economic model, a distribution/mode choice model and assignment models for different modes. The model is able to use different scenarios such as the European Reference or Green Deal package. These help to show the impacts on freight transport in general or on modes more specifically.