SCANDINAVIAN-MEDITERRANEAN RAIL FREIGHT CORRIDOR

TRANSPORT MARKET STUDY

2024 UPDATE

Funded by the European Union

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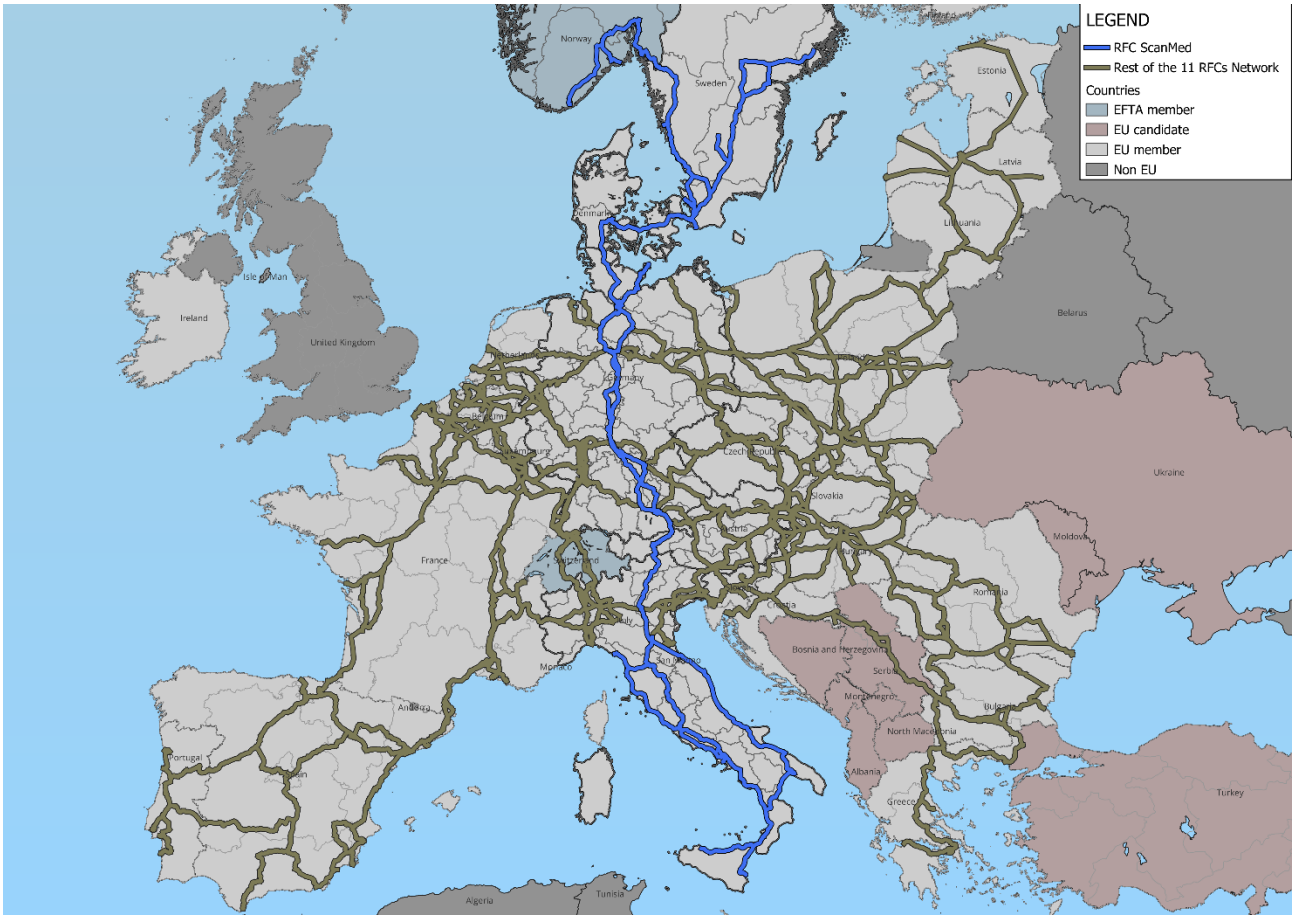
RFC SCANMED 2024 TMS UPDATE RESULTS WITHIN THE 2024 JOINT TMS UPDATE OF THE 11 RFCS BELONGING TO THE EUROPEAN RAIL NETWORK FOR COMPETITIVE FREIGHT

The Rail Freight Corridor ScanMed (RFC ScanMed) 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 ScanMed are summarised in the following paragraphs.

The RFC ScanMed 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%

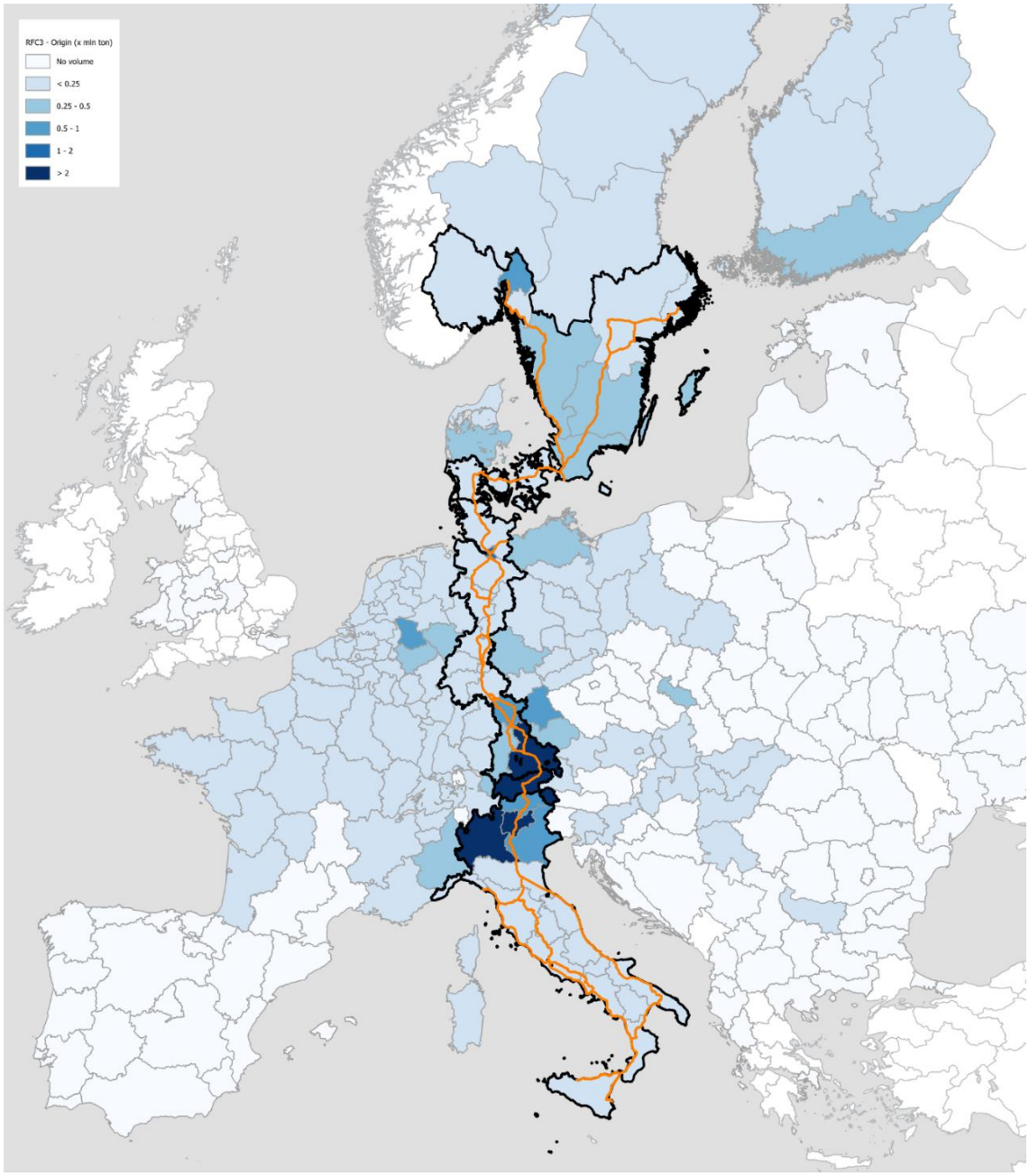
Source: Eurostat [rail_go_typepas]; Notes: (1) Data for Belgium are excluded from the total as they are not available for 2015 and 2022. (2) Data are limited to main undertakings

For the analysis of the current market (Base year scenario), train data from the Train Information System (TIS) managed by RNE have been used[1], which combined with available trade and economic data available at the NUTS 2 area, served as a basis to define the RFC ScanMed 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 ScanMed exceeds the corridor area. It captures large parts of The Netherlands, Belgium, France, and Hungary, to name a few countries. A large proportion of the rail freight transport uses the RFC ScanMed, 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 ScanMed, with important origins such as Hamburg, Munich, and Milan, as well as other locations in Germany and Italy. Some origins are port areas, which use the RFC ScanMed to ship goods to the hinterland such as Hamburg. Also, outside the corridor area different zones can be seen that contribute to the RFC ScanMed. Note that outside the corridor it often concerns small amounts of volume.

[1] 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.

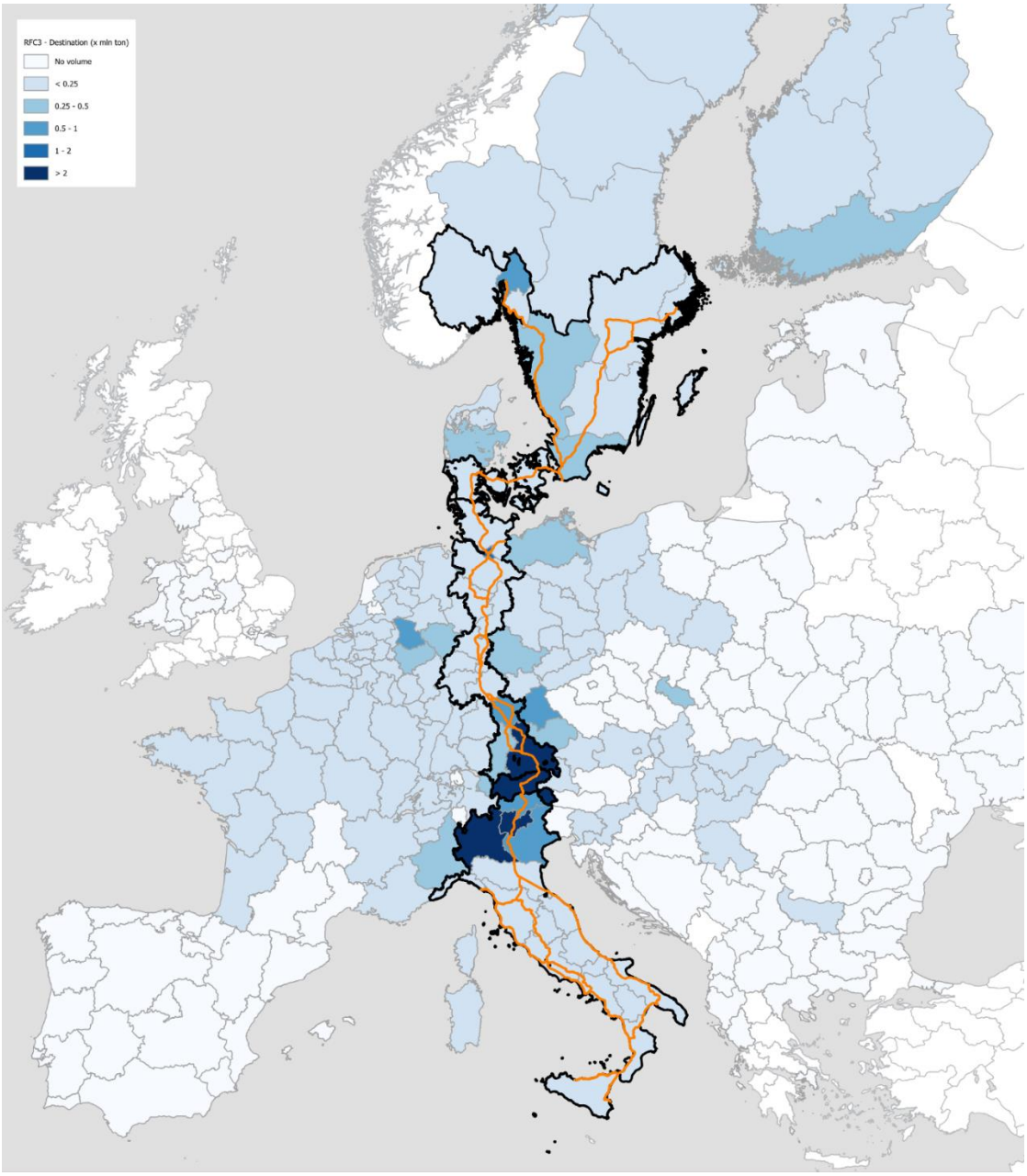
Origins of international rail freight volume (in million tonnes) that use the RFC ScanMed rail network and the delineation of the potential RFC ScanMed catchment area



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

The next figure presents the destinations within the RFC ScanMed 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 ScanMed's services fall outside the corridor area, such as areas in the Netherlands, Belgium, France, and Hungary.

Destinations of international rail freight volume (in million tonnes) that use the RFC ScanMed rail network and the delineation of the potential RFC ScanMed catchment area



Source: NEAC. Legend: Orange = rail tracks of RFC ScanMed. 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 Good Vehicles;
- The internalization of external costs of road transport (road pricing);
- Different 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 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: 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 European 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 [2].

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;

[2] The sensitivity scenario complements 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 also in terms of track gauge. Although 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.

- 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.

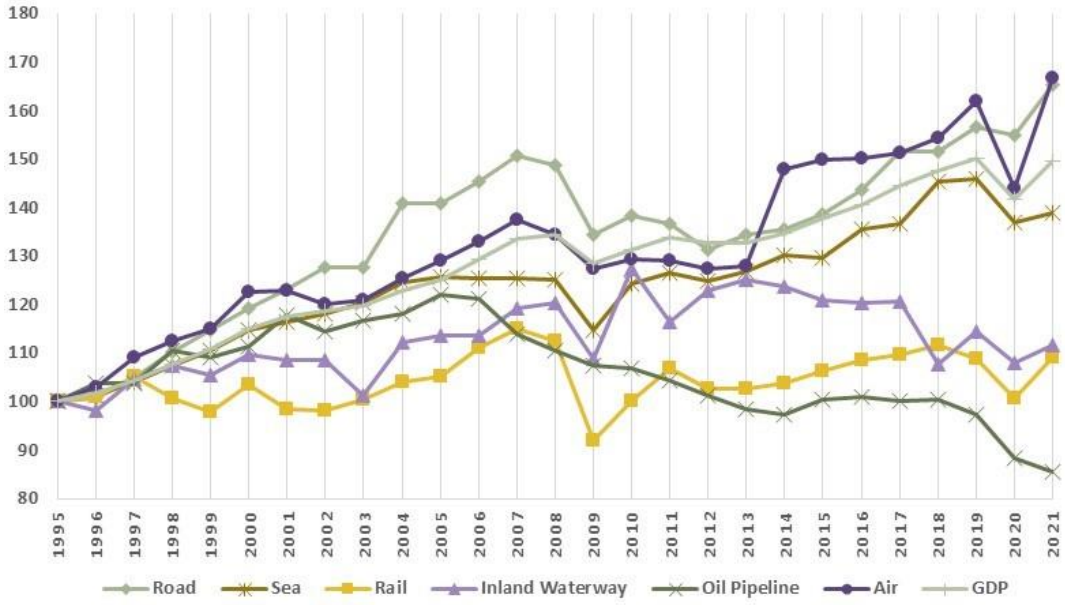
KEY STUDY FINDINGS ON RAIL FREIGHT MARKET IN EUROPE AND ALONG THE RFC SCANMED

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. The statistical data available from the above mentioned sources are not available for the Republic of Serbia, nonetheless they are useful to provide a statistical background to the RFC ScanMed updated transport market study. 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.

Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE – Statistical Pocketbook 2023

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 war of aggression against Ukraine and deteriorated with the Israel-Gaza conflict and Red Sea crisis.

- 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 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 ScanMed concerned countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In the RFC ScanMed concerned countries, rail freight transport grew indeed from about 178 to 200 billion tkm, i.e. 12%.
- The rail modal share varies significantly among the RFC ScanMed countries. It is over 30% in Austria, it is around 15% in Germany, 10% in Sweden and 1.4-2.6% in Italy, Norway and Denmark. The market share seems to be stable over time with positive marginal increases in Hungary and Slovenia. At both EU 27 and RFC ScanMed concerned 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.

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 [tran_hv_ms_frmod]

- At the EU27 scale, the COVID-19 pandemic seems to have had a different impact 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. Excluding Denmark, the RFC ScanMed concerned countries seem to have also registered positive variations during the pandemic period. Baltic States, in particular, also experienced a significant drop in traffic since the start of the Russian war of aggression against Ukraine in 2022. In fact, EU sanctions implemented with Belarus and Russia following the start of the Russian war of aggression against Ukraine impacted negatively on rail freight traffic in the Baltic States, whereas train traffic between Ukraine/Moldova and the EU has increased, particularly through Poland and Romania.
- Since the start of the rail freight liberalisation process late 1990's and 2000's, the market share of the domestic incumbent railway undertakings 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 RFC ScanMed concerned countries, the trend of the market share by domestic incumbents continued to decline in the period 2013-2021. In the RFC ScanMed concerned countries, the market share of the domestic incumbent in 2021 2021 was about 40% on average, slightly above 50% considering national and international incumbents.

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 442.000 international trains[3]), 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, the category *Other* (general cargo, including intermodal transport and container) dominates the international freight transport for the 11 RFCs Network area, by 845 million tonnes. 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.

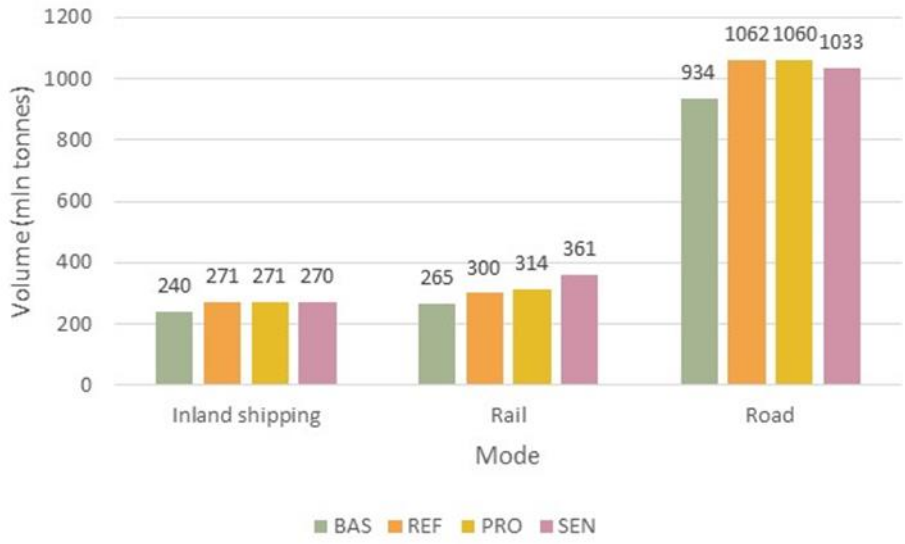
Estimated volume (million tonnes) and share of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network

Source: NEAC estimations

[3] Using an average of 600 tonnes per train

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 and UN), 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% (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).

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

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.

Focusing on international rail freight transport, the reference scenario expects a growth of 13%, which is approximately 35 million tonnes extra in Europe 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 5% compared to the reference scenario (300 million tonnes to 314 million tonnes) due to projects. In total this is approximately 14 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, intermodal loading gauge, ERTMS, and European standard track gauge along the RFCs network. 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 area. 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 area assumed to be completed by 2030, and the modernisation of railway lines and cross-border sections in the Eastern European corridor countries, 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 area, and thus on each RFC. Further to these projects, completing the 11 RFCs Network area 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 combined 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 despite the completion of mega cross-border projects like Fehmarnbelt and Brenner.

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*[4]. 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*[5] – 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 SCANMED

The total volume of international freight transport in the *catchment* area of the RFC ScanMed is estimated at 144 million tonnes in 2022, transported by road, rail, and sea shipping. Inland shipping does not play a role of importance. The international rail freight transport volume in this area is estimated at 31 million tonnes (about 52.000 unique trains). This is 22% of the total amount of freight transport for the RFC ScanMed. The share of sea shipping is 42%, and the share of road transport 36%.

Concerning the cargo types, *Other* (General cargo, including intermodal transport and container) is the most important one at 68 million tonnes (47%). *Dry bulk* is second in the international freight transport within the catchment area of the RFC ScanMed, with a volume of 42 million tonnes (29%). Liquid bulk has a share of 23% in the total volume of international freight transport over all modes in the corridor area of the RFC ScanMed.

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

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

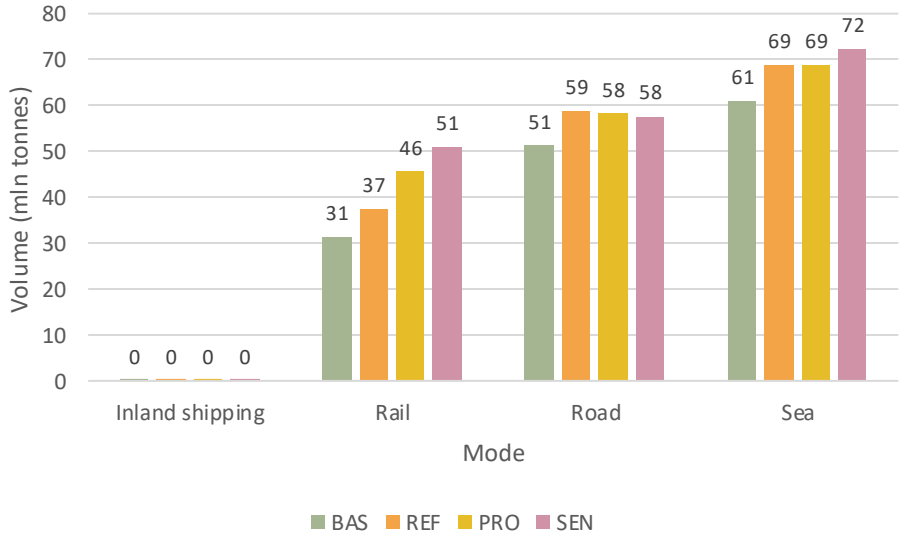
Source: NEAC estimations

The most important rail transport origins and destinations can be found in Germany, Sweden, and Italy in locations such as Hamburg, Munich, and Milan. The port of Hamburg serves as a gateway to the hinterland in the RFC ScanMed. Several other locations outside of the corridor area of RFC ScanMed are important as well such as the Rhein-Ruhr area. The most important relation in the RFC ScanMed is between Munich and Milan.

Between the 2022 Base year and 2030 Reference scenario, all modes grow by 15%. Rail transport grows by 19% (8 million tonnes) from 31 to 37 million tonnes. Road grows by 15% (51 to 59 million tonnes), and sea shipping by 13% (61 to 69 million tonnes).

The implementation of different rail projects across Europe, leads to an overall growth of 5% compared to the Reference scenario for *all* freight transport in the RFC ScanMed (+8 million tonnes, from 165 to 173 million tonnes). In the RFC ScanMed large and smaller projects across the rail network account for this growth. The most important project is the Fehmarnbelt that accounts for the growth. Also, infrastructure projects outside the RFC ScanMed contribute to the growth, leading to mode shift or rerouting.

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



Source: NEAC estimations; Legend: BAS Base year scenario; REF Reference scenario, PRO Projects scenario; SEN: Sensitivity scenario; Note: figures for inland shipping are lower than 1 million tonnes

In the RFC ScanMed, for the Reference scenario, a growth of international rail transport is expected at 19%, which is approximately 6 million tonnes extra compared to the 2022 situation. This would be (rounded) 7,000 extra international freight trains in the RFC ScanMed. The total number of international trains would then be some 42,000 trains in the Reference situation in 2030.

The Projects scenario shows the impact of the different rail projects and rail measures. Rail transport grows an extra 26% compared to the reference scenario. In total it is estimated that this is approximately 9 million tonnes of extra international rail freight transport. This gives (rounded) 9,000 extra trains in the RFC ScanMed. Together with the Reference scenario results, this would be approximately 51,000 trains for the RFC ScanMed.

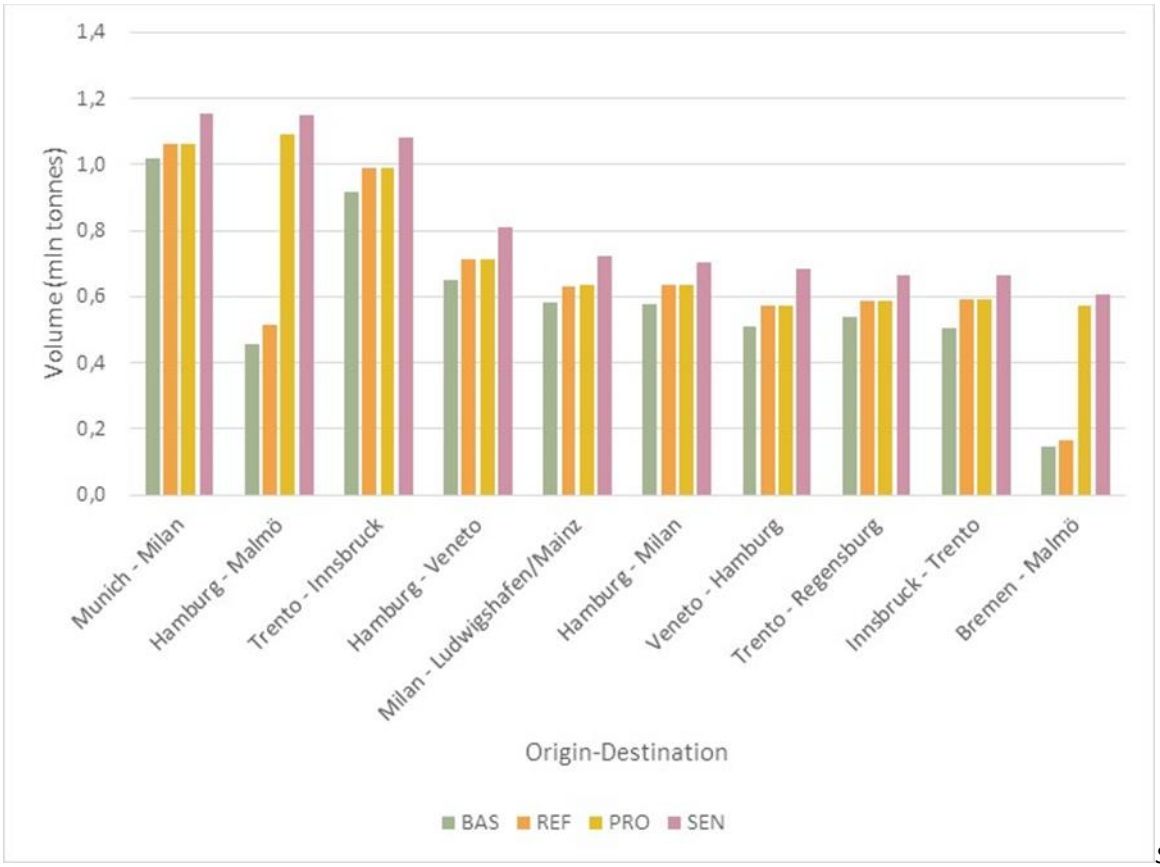
The hypothetical sensitivity scenario shows that there is another potential of 5 million tonnes extra rail freight transport. With an extra volume per train of 15%, the total number of unique international freight trains would then be around 50,000. Compared to the 35,000 unique trains in 2022, this is a growth of around 62%. 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 31 to 51 million tonnes i.e. by 62%.

The figure below shows the top 10 most important international rail freight transport relations within corridor area of the RFC ScanMed[6]. The main relation in the base year is between Munich and Milan. This relation is important for dry bulk transport. In second place comes Hamburg-Malmö, when looking at the Projects scenario. Trento-Innsbruck comes in the third place.

[6] 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 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.

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



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

The following table provides the number of trains per BCP along the RFC ScanMed (i.e. the number of commercial freight trains crossing selected border points) in the period 2020-2023.

Number of trains per BCP along the RFC ScanMed

Border		BCP	2020	2021	2022	2023
NO	SE	Kornsjö	951	1,229	1,401	1,438
SE	DK	Lernacken/Peberholm	7,858	6,965	7,457	6,528
DK	DE	Padborg/Flensburg	9,434	9,116	9,209	9,054
DE	AT	Kiefersfelden/Kufstein	23,684	25,505	25,960	22,261
AT	IT	Brenner/Brennero	18,775	19,866	20,458	18,551

Source: RFC ScanMed KPIs

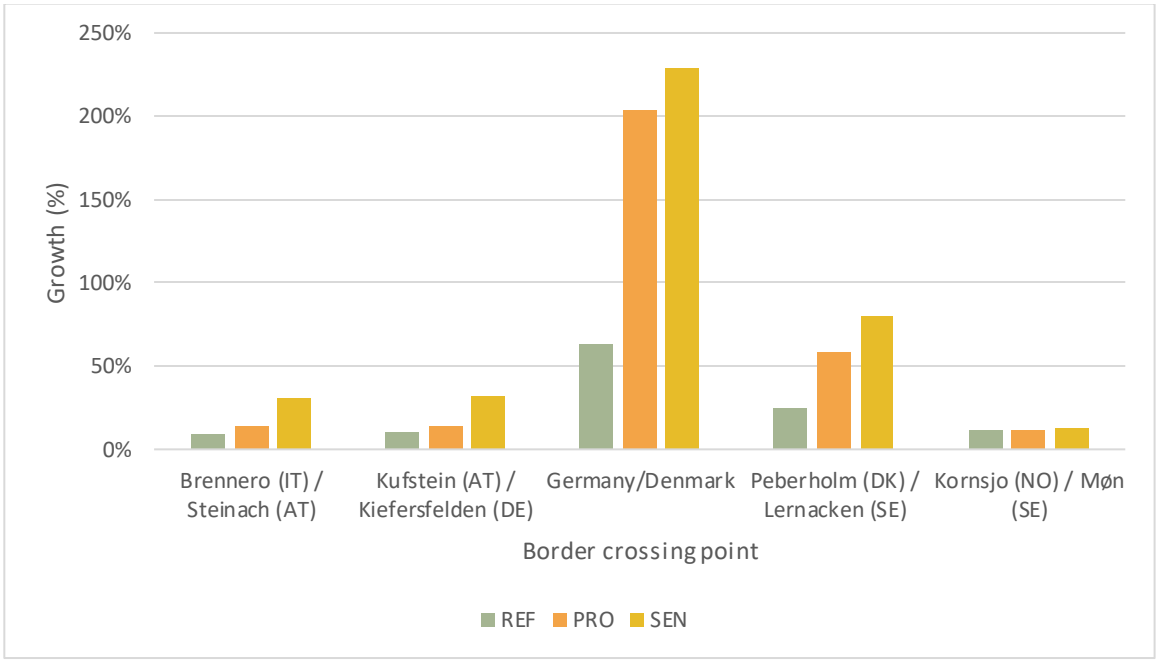
According to the available data, the highest traffic was registered during the last five years at Kufstein/Kiefersfelden, between Germany and Austria, followed by Brenner/Brennero, between Austria and Italy. Train traffic data/trends at BCPs include all RFCs trains and may vary according to traffic management 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. Furthe rmore, the COVID Pandemic first and Russian war of aggression against Ukraine later also affected traffic on the European network for competitive rail transport. Nonetheless, the number of corridor trains reported in the table below seems to be showing an overall stable trend.

The different border crossing points in the RFC ScanMed each show different growth between the 2022 Base year and 2030 Reference, Projects and Sensitivity scenarios. Overall, the Reference shows growth in volume of 17% on the BCPs. 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 40% more volume, which translates into 40% more trains on average on the BCPs. The sensitivity scenario leads to 17% more volume on the BCPs, which is 38% more trains compared to 2022. Due to the extra train length, there is less growth in number of trains. Keep in mind that the number of trains on the different BCPs are related. One train often passes more than 1 BCP in this RFC.

Important note for the relation Germany-Denmark. This combines rail freight transport on the old route and transport via the Fehmarnbelt. This way it is possible to calculate growth. As can be seen, the impact of the infrastructure project leads to a substantial growth, which is in absolute terms plausible. One may expect that the old route will lead to a decline in rail freight transport in favour of the Fehmarnbelt. To a lesser extent, the growth figures also have impact on the BCP between Denmark and Swe den. This one also grows substantially, in the Sensitivity scenario by 80%.

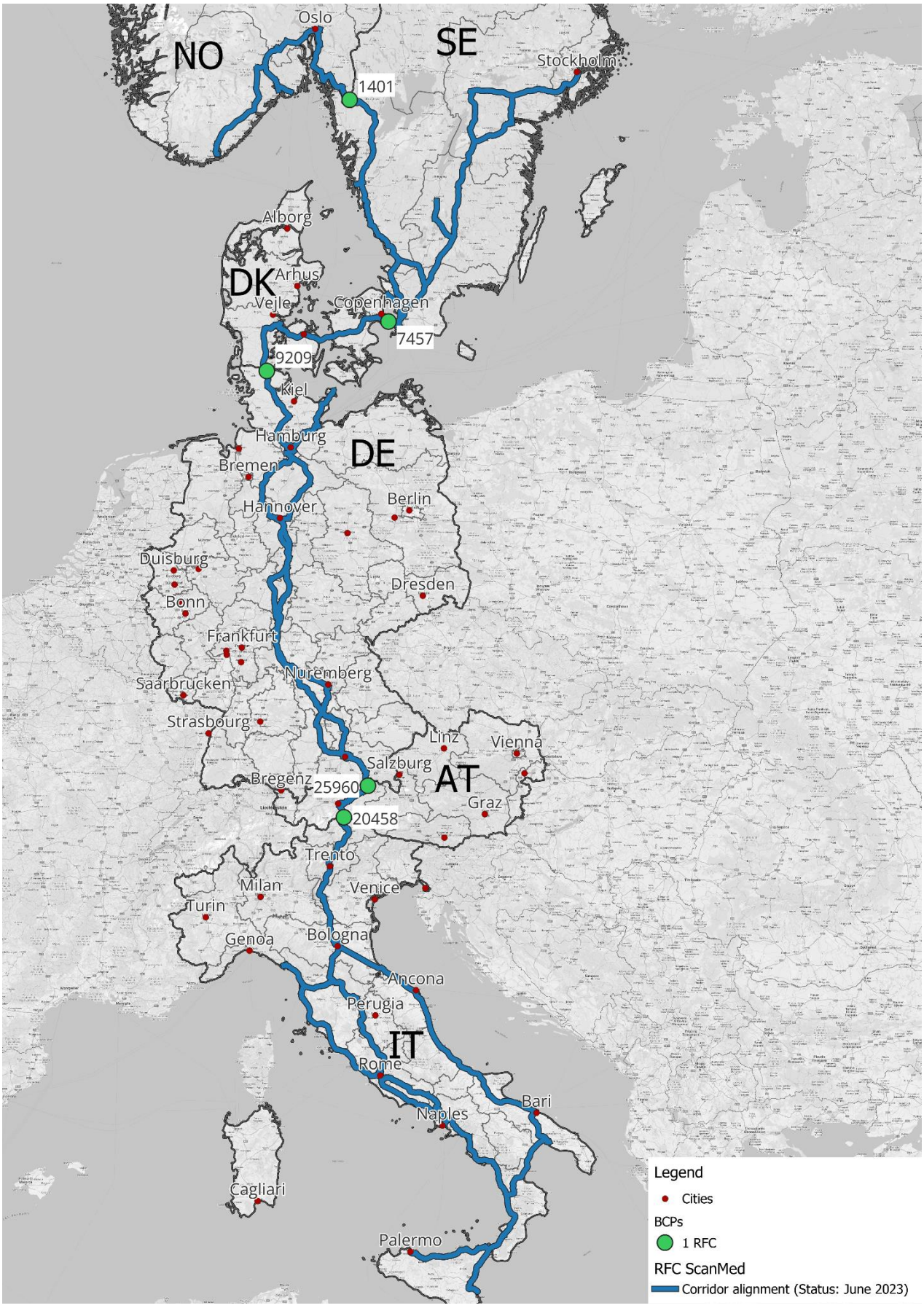
The total amount of unique trains on the BCPs in 2022 in the graph below is estimated at 35.000 trains. In the Reference situation this would be approximately 42,000. In the Projects scenario, this is 51,000 trains, while in the Sensitivity scenario, this is 50,000 trains (due to extra volume per train, the same as the Projects scenario).

Development of volume (in million tonnes) of international rail freight transport on important border crossing points of the RFC ScanMed



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

RFC ScanMed – Trains at BCPs along the RFC ScanMed in the base year 2022



Source: CIP June 2023 and RFC ScanMed KPIs

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. Additionally, differences may exist between RFCs as they were established and entered into operation in different years. Finally, the survey outcome 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.

The responses given by the 11 RFCs RAGs and TAGs members represent furthermore a partial view of the market as the sample of the respondents is not representative of the market universe.

- 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 RFCs (CNCs)/ERTMS horizontal priority is less favourable. According to the market opinion little or no progress has been 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 issues. Respondents consider the cooperation between RFCs and an European 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 European 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 European Network of Infrastructure Managers (ENIM).

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 ScanMed. The majority of the respondents declare they experienced market growth along the corridor.
- 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. Most RUs and terminal operators experienced growth in intermodal train operations in the past years, 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.
- 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 SCANMED

In line with the overall study approach aimed at conducting the 2024 RFC ScanMed 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 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[7] 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

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

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 (EU) 1679/2024 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 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. 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.

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* 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 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.

This report provides the results of the 2024 TMS Update for the ScanMed Rail Freight Corridor (RFC ScanMed).

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 concerns these lines and 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 report includes six additional sections:

- Chapter 2, describing the RFC alignment and infrastructure, the existing bottlenecks and the ongoing and planned projects to solve gaps with reference to 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, reporting on 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 rail freight market 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-arranged 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 CORRIDO PRESENTATION

2.1 CORRIDOR CHARACTERISTICS

The Rail Freight Corridor ScanMed (onwards RFC ScanMed) crosses five Member States of the European Union, namely Sweden, Denmark, Germany, Austria, Italy and Norway. For the purposes of the Joint TMS Update, the description of the RFC ScanMed lines focusses on the principal and diversionary lines currently in operation, excluding the connecting lines A and B, as well as the expected lines not in operation. The total length of the RFC ScanMed principal and diversionary lines is 7,596 km. Most of this network is located in Italy (3,473km), Germany (2,077 km), and Sweden (1,357 km), followed by Denmark (351 km), Norway (175 km), and Austria (164 km).

Table 1 Corridor extent by Member State/Country (principal and diversionary lines)

Member State	Length in km
Norway	174.74
Sweden	1,356.83
Denmark	350.55
Germany	2,076.63
Austria	163.94
Italy	3,472.98
Total	**7,595.67**

Source: Authors based on CIP

2.1.1 CORRIDOR LINES

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

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

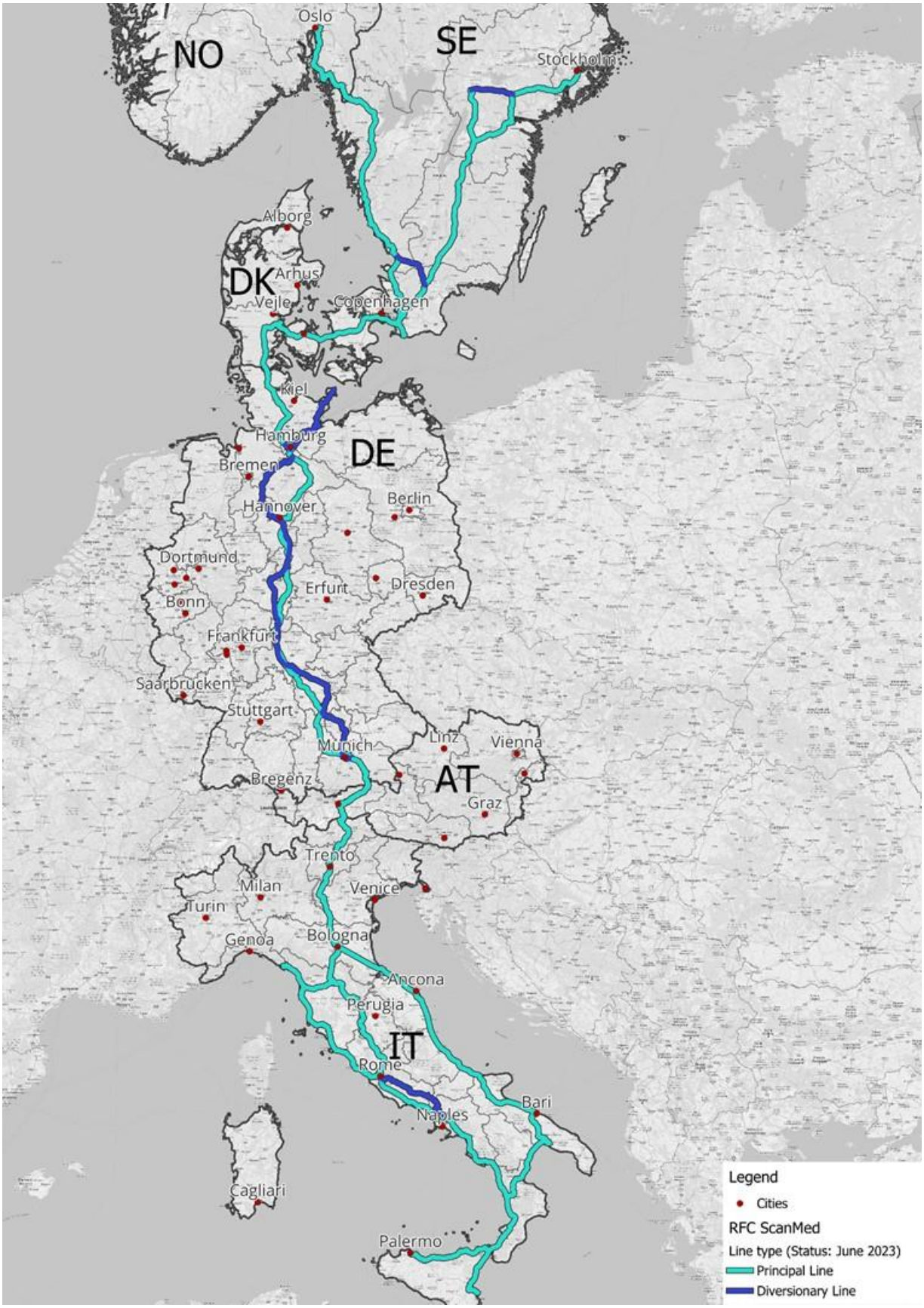
Rail Freight Corridor	Principal Line	Diversionary Line	Total
ScanMed	5,959.48	1,130.67	7,090.15
BA	61.51	0.00	61.51
RD	138.77	114.23	253.00
MED	1.50	0.00	1.50
OEM, NS-B	97.50	92.01	189.51
c	6,258.76	1,336.91	7,595.67

Source: Authors based on CIP

The RFC ScanMed at June 2023 consists of 6,259 km of principal lines and about 1,337 km of diversionary lines.

The RFC ScanMed shares its network with other corridors such as RFC BA, RFC NS-B, RFC OEM, RFC RD and RFC MED. The longest overlapping is with RFC RD considering principal and diversionary.

Figure 1 RFC ScanMed - Type of RFC lines



Source: Authors based on CIP

2.1.2 CORRIDOR TERMINALS

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

Table 3 List of terminals on the RFC ScanMed

Name	Country	Common to other RFCs according to CIP
Freight Terminal Rolvsøy	Norway	
Port of Drammen	Norway	
Port of Grenland	Norway	
Port of Halden	Norway	
Port of Kristiansand	Norway	
Port of Larvik	Norway	
Port of Moss	Norway	
Port of Oslo	Norway	
Freight Terminal Alnabru	Norway	
Kristiansand	Norway	
Älmhult Terminal	Sweden	
Båramo Kombiterminal	Sweden	
Göteborg Hamn	Sweden	
Göteborg Kombiterminal	Sweden	
Hallsberg Kombiterminal	Sweden	
Hallsbergs rangerbangård station	Sweden	
Halmstad Hamn	Sweden	
Helsingborg Kombiterminal	Sweden	
Helsingborgs Hamn	Sweden	
Katrineholm Kombiterminal	Sweden	
Malmö Hamn	Sweden	
Malmö Kombiterminal	Sweden	
Malmö Rangerbangård	Sweden	
Nässjö kombiterminal	Sweden	
Norrköpings Hamn	Sweden	
Sävenäs rangerbangård	Sweden	
Stockholm Årsta	Sweden	
Trelleborg Hamn	Sweden	
Combiterminal Høje Taastrup	Denmark	
Combiterminal Padborg	Denmark	
Combiterminal Taulov	Denmark	
Fredericia Port	Denmark	
Fredericia Shipping in Taulov	Denmark	
Glostrup Railport	Denmark	
Kolding Port	Denmark	
Kolding Railport	Denmark	
Ringsted Railport	Denmark	
C. Steinweg Süd-West Terminal	Germany	OEM, NS-B
Container Depot München	Germany	RD
Container Terminal Altenwerda (CTA)	Germany	OEM, NS-B

Name	Country	Common to other RFCs according to CIP
Container Terminal Burchardkai (CTB)	Germany	OEM, NS-B
Container Terminal Tollerort (CTT)	Germany	OEM, NS-B
DUSS Augsburg-Oberhausen	Germany	RD
DUSS Hamburg Billwerder	Germany	OEM, NS-B
DUSS Ingolstadt	Germany	
DUSS Terminal Hannover-Linden	Germany	OEM, NS-B
DUSS-Terminal München-Riem	Germany	RD
EUROGATE Container Terminal	Germany	OEM, NS-B
EUROKOMBI Terminal	Germany	OEM, NS-B
Hamburg Hohe Schaar	Germany	OEM, NS-B
Hamburg O´Swaldkai	Germany	OEM, NS-B
Hamburg Süd	Germany	OEM, NS-B
Hamburg Wallmann	Germany	OEM, NS-B
Hansaport	Germany	OEM, NS-B
Lübeck, Skandinavienkai LHG-Terminal	Germany	
Maschen Rbf	Germany	OEM, NS-B
MegaHub Lehrte	Germany	OEM, NS-B
Nürnberg Rbf	Germany	RD
Packing Center Hamburg (PCH)	Germany	OEM, NS-B
Seelze Rbf	Germany	OEM, NS-B
TriCon Container-Terminal	Germany	RD
DUSS Container Terminal Göttingen	Germany	
Container terminal Kassel	Germany	
DUSS Container Terminal Beiseförth	Germany	
Container Terminal Hall in Tirol	Austria	
Terminal Brennersee (ROLA)	Austria	
Terminal Wörgl (ROLA)	Austria	
Bari Ferruccio	Italy	
Bologna Interporto RFI	Italy	BA
Bologna_Interporto	Italy	BA
Catania Bicocca	Italy	
Interbrennero	Italy	
Interporto Quadrante Europa	Italy	MED
Interporto Regionale della Puglia	Italy	
Interporto Sud Europa	Italy	
Livorno Guasticce	Italy	
Maddaloni Marcianise RFI	Italy	
Palermo Brancaccio RFI	Italy	
Pomezia S. Palomba Terminal	Italy	
Port of Ancona	Italy	
Port of Augusta	Italy	
Port of Gioia Tauro S. Ferdinando	Italy	
Port of La Spezia	Italy	
Port of Livorno	Italy	
Port of Naples	Italy	
Port of Taranto Cagioni	Italy	

Name	Country	Common to other RFCs according to CIP
Roma Smistamento	Italy	
Verona Quadrante Europa	Italy	MED
Villa Selva	Italy	
Interporto della Toscana	Italy	
Interporto Campano	Italy	
Pescara	Italy	

Source: Authors 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 traffic across the borders of the European Union Member States. Trains crossing BCPs are accordingly one of the monitored KPIs by the RFCs. According to the current alignment of the RFC ScanMed, there are in total 5 BCPs identifiable along the corridor as detailed in the following table.

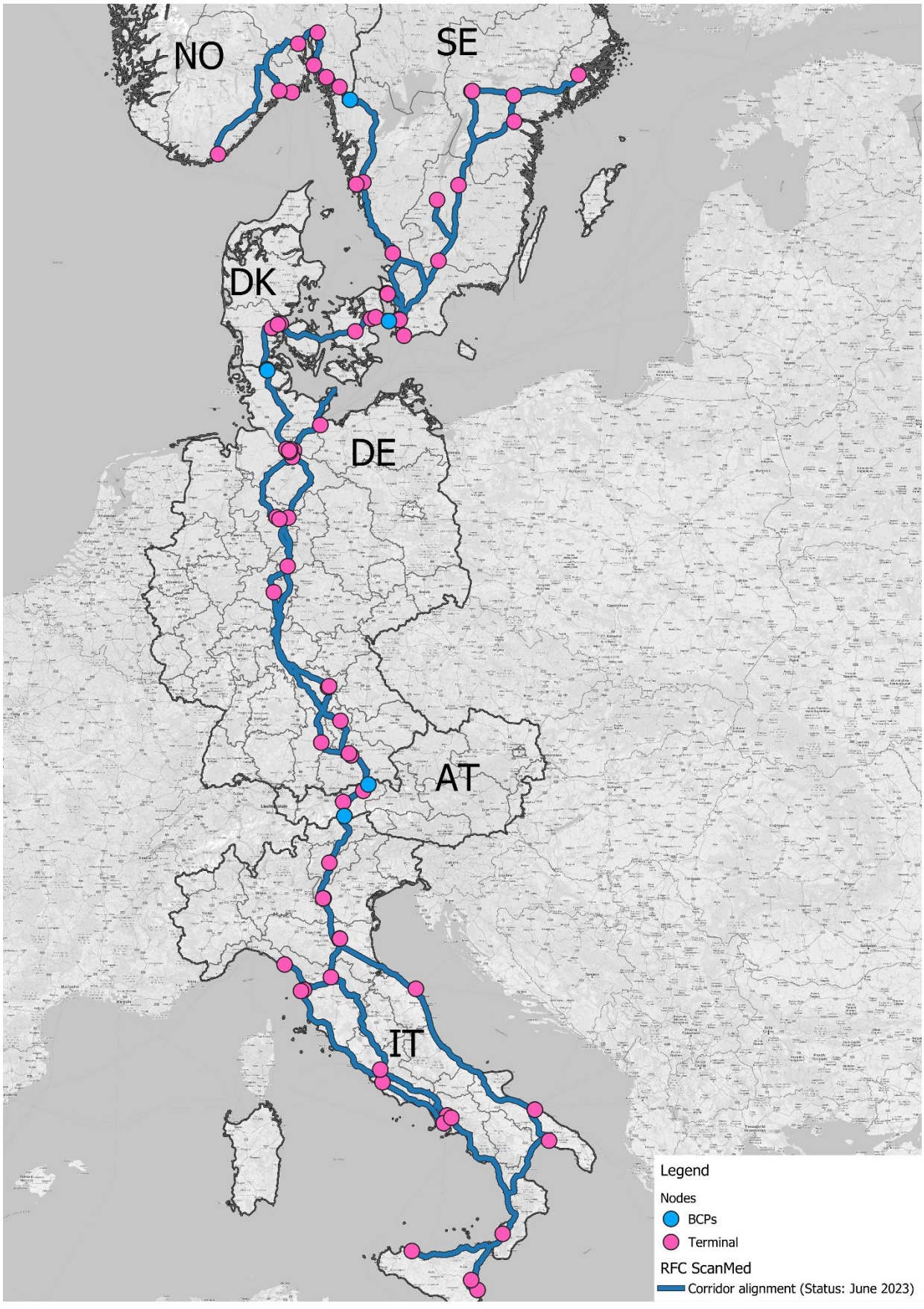
Table 4 RFC ScanMed BCPs

Bordering Member States		Border Crossing Point
NO	SE	Kornsjö
SE	DK	Lernacken/Peberholm
DK	DE	Padborg/Flensburg
DE	AT	Kiefersfelden/Kufstein
AT	IT	Brenner/Brennero

Source: Authors based on CIP

The map in the figure overleaf illustrates the alignment of the RFC ScanMed, its terminals and cross-border nodes, also identifying the sections overlapping with other RFCs.

Figure 2 RFC ScanMed alignment, terminals and cross-border nodes



Source: Authors based on CIP

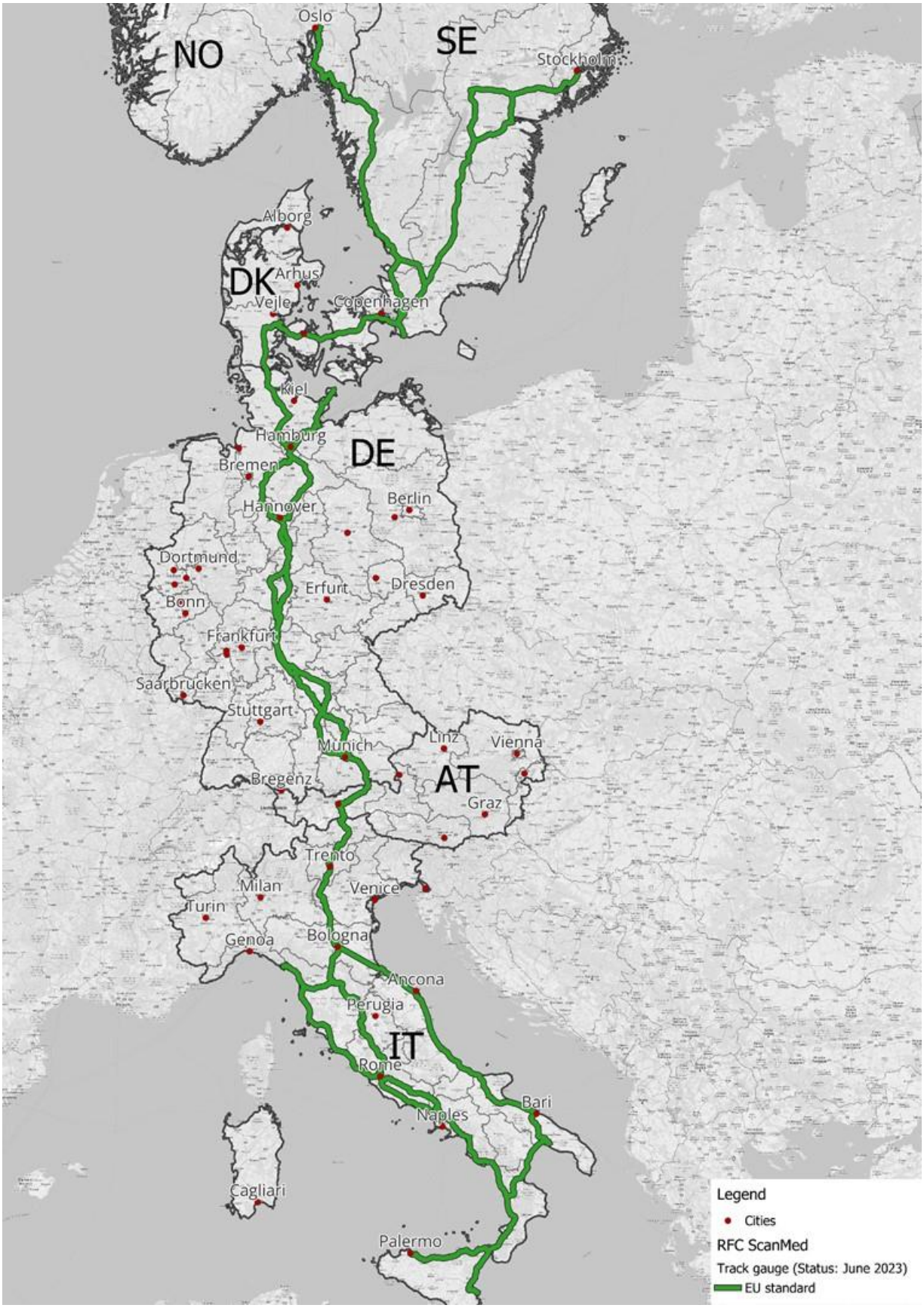
2.1.4 CORRIDOR INFRASTRUCTURE PARAMETERS

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 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 corridor concerned Infrastructure Managers.

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

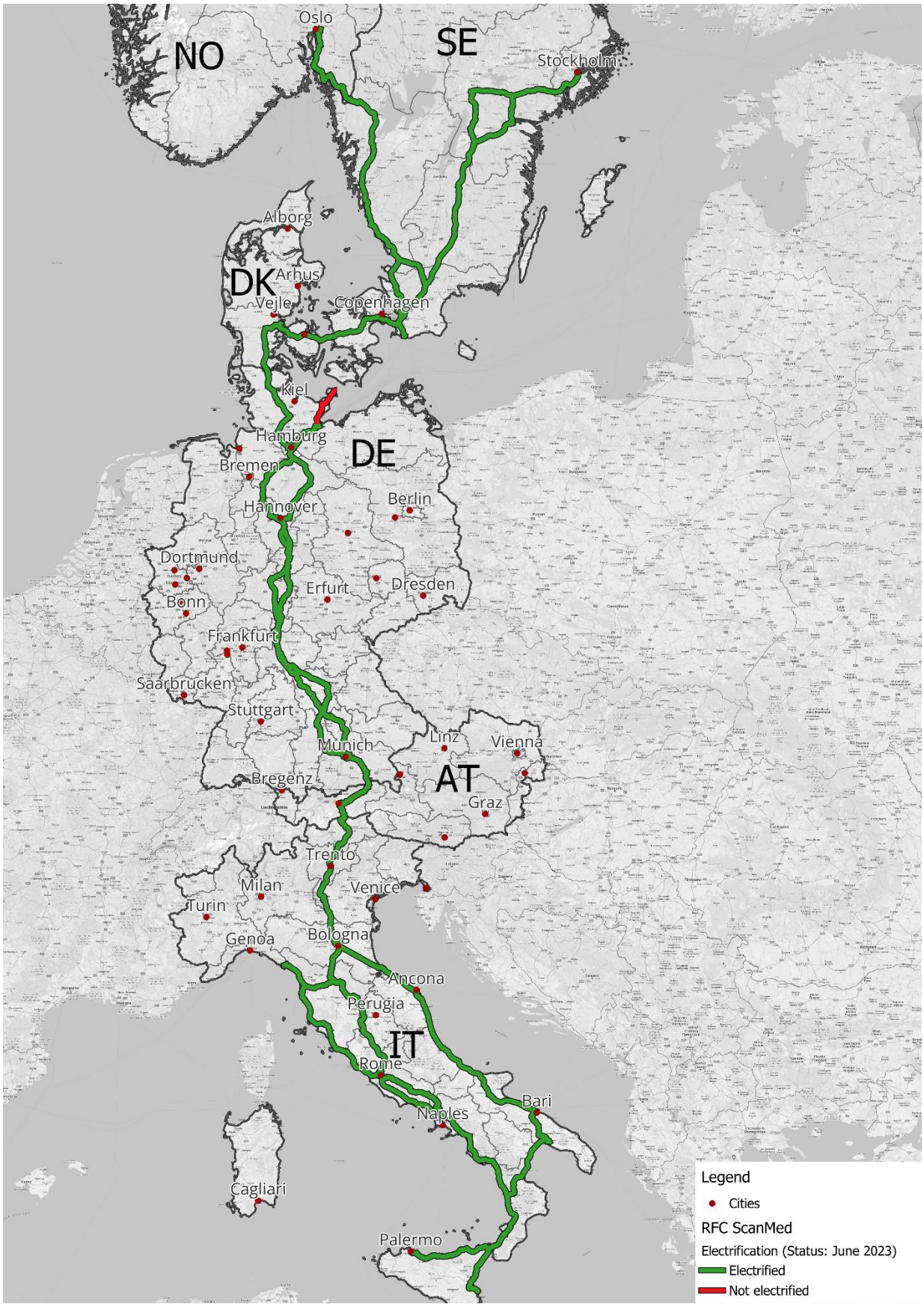
- The RFC ScanMed is already at standard concerning the EU track gauge;
- The RFC ScanMed is also entirely electrified except for the terminals' interconnecting lines Puttgarden-Burg (Fehmarn) West-Puttgardenterminals' in Germany and Båramo-Värnamo in Sweden;
- Concerning axle load the RFC ScanMed is at standard except for the Tyrrhenian and Ionian coasts' lines in the Italian peninsula and in Sicily;
- Speed limitations exist along the RFC ScanMed on some itineraries in Italy, also affecting the Brenner corridor, as well as on some the terminals' interconnecting lines, and on some lines in Norway;
- The operation of 740 m long trains is possible in Denmark, as well as between Malmö and the port of Hamburg (permitted train length on this relation is up to 835 m), and on some other limited sections of the RFC ScanMed in Germany and Norway, subject to traffic conditions and permissions (operational compliance);
- Finally, ERTMS is only available in Austria.

Figure 3 RFC ScanMed - Track gauge



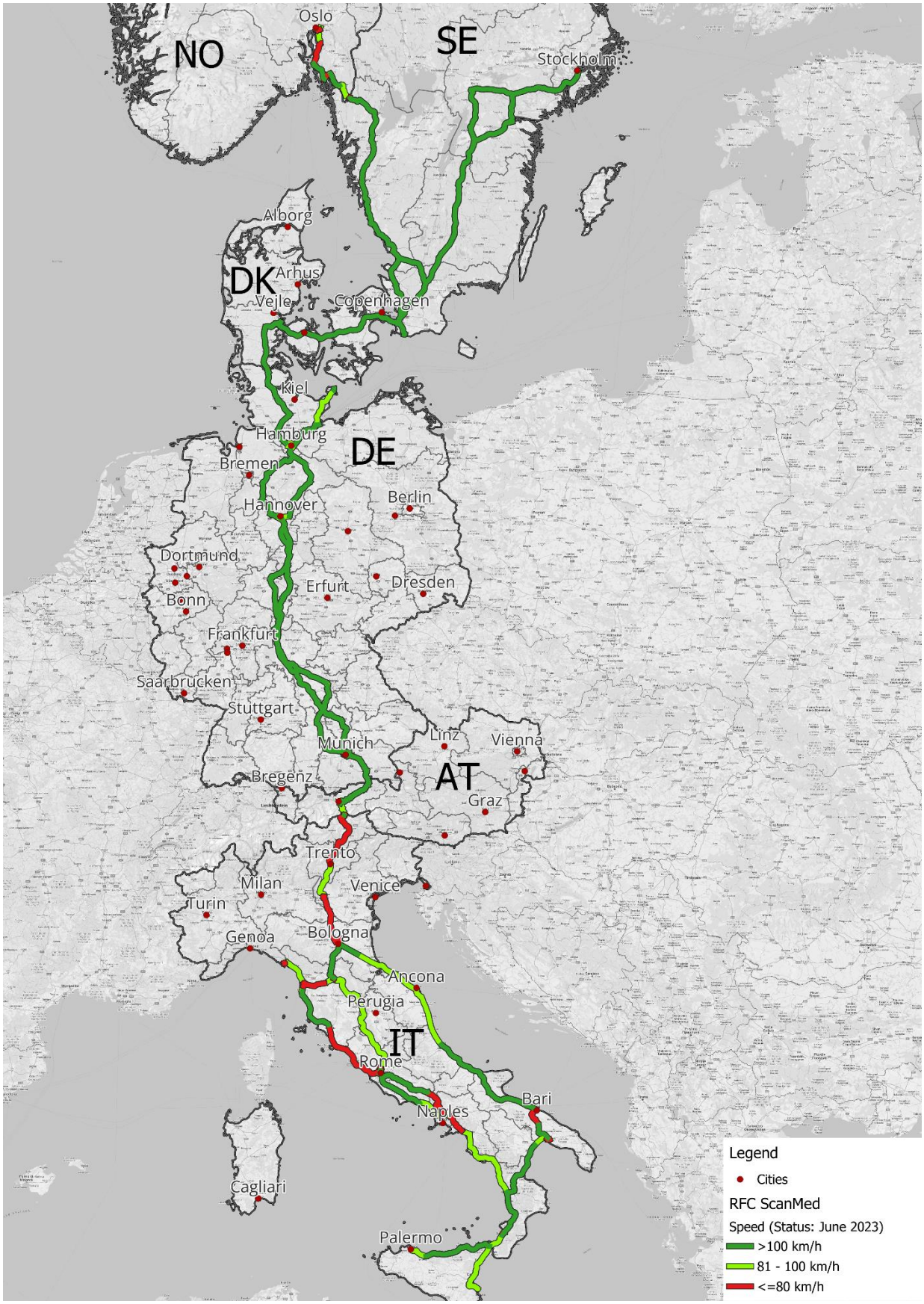
Source: Authors based on CIP

Figure 4 RFC ScanMed – Electrification



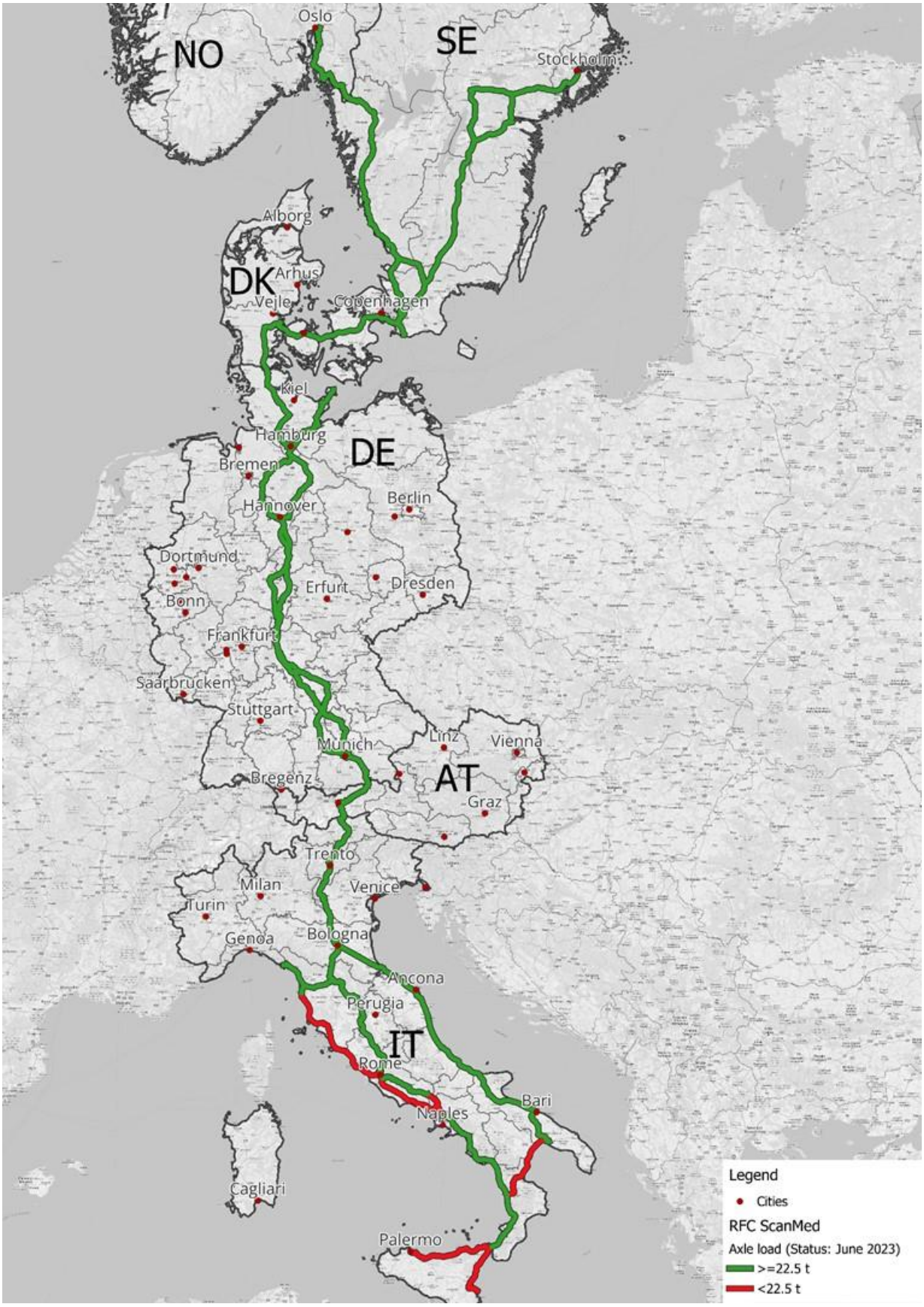
Source: Authors based on CIP

Figure 5 RFC ScanMed- Speed



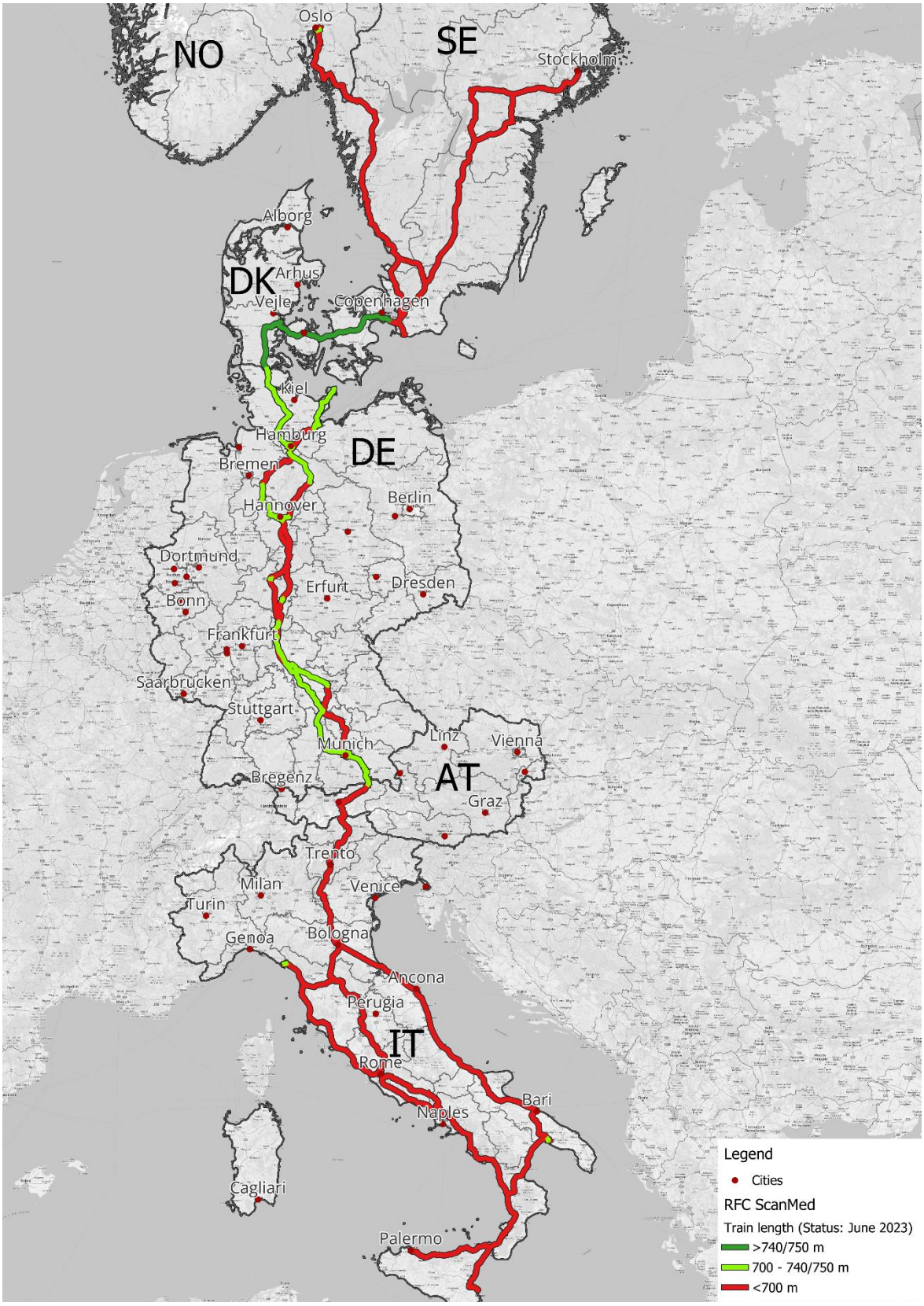
Source: Authors based on CIP

Figure 6 RFC ScanMed – Axle load



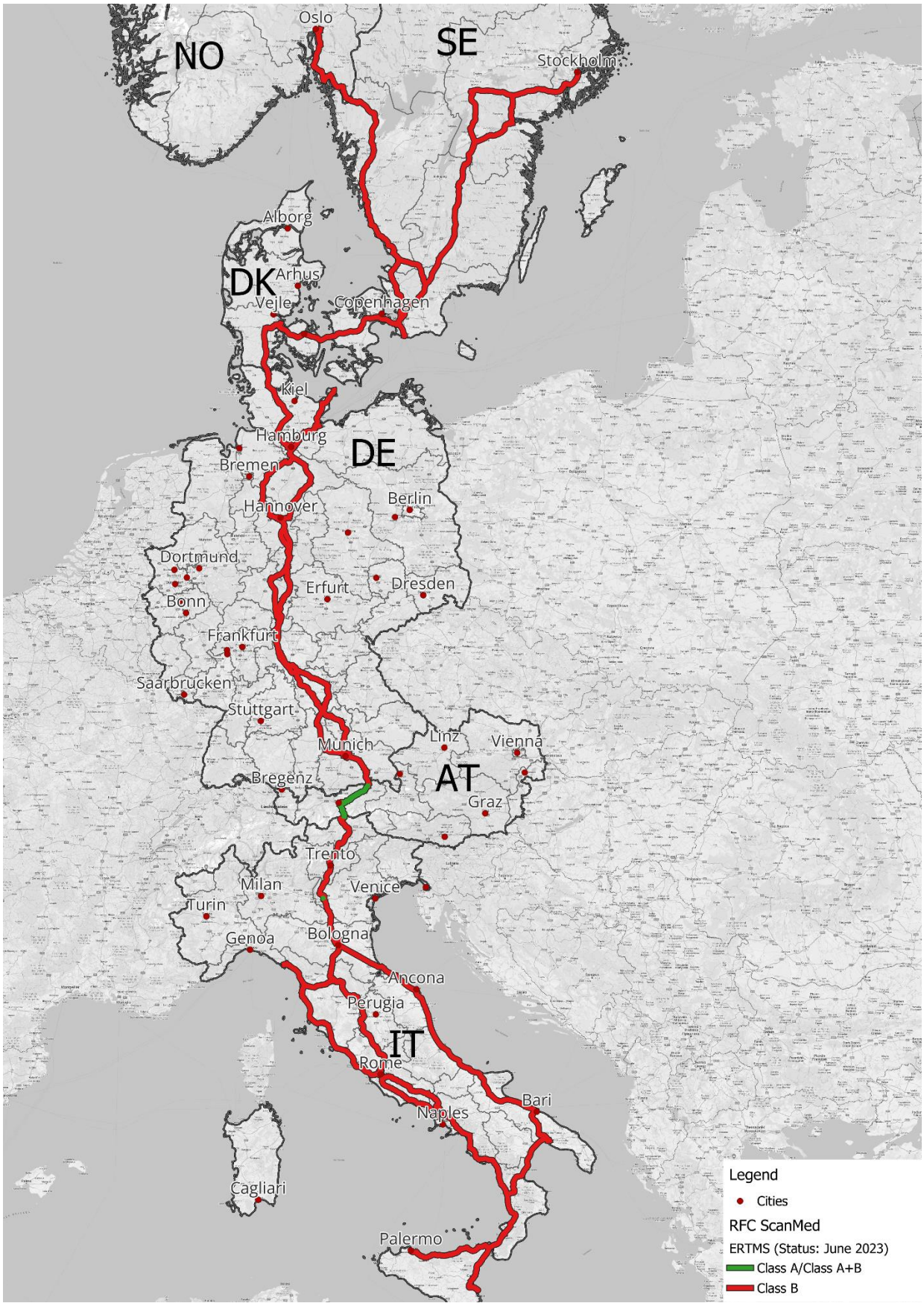
Source: Authors based on CIP

Figure 7 RFC ScanMed - Train length



*Source: Authors based on CIP; Note: * Sections displayed in light green, where 740 meter long trains are possible to be operated based on traffic conditions and upon request, i.e. "operational compliance", also include the network segments codified in CIP as "upon request"*

Figure 8 RFC ScanMed - ERTMS



Source: Authors based on CIP

2.1.5 ONGOING AND PLANNED PROJECTS

The current RFC ScanMed Implementation Plan includes a detailed list of investments foreseen for the development and upgrade of the corridor infrastructure to increase capacity and improve interoperability standards. The Implementation plan also includes an ERTMS deployment plan.

Table 5 and Table 6 overleaf respectively provide the list of ongoing and planned investments and the ERTMS Deployment Plan. It is worth to notice that since the date of publication of the Implementation Plan projects and investments programmes by the corridor concerned infrastructure managers may have changed. The information provided in the tables below is thus to be considered indicative, especially in what concerns implementation dates.

Table 5 List of ongoing and planned projects (Investment plan)

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
Austria							
ÖBB	ETCS	ETCS equipment on RFC ScanMed in Austria Innsbruck - Hall i. T.	ETCS equipment on RFC ScanMed in Austria Innsbruck - Hall i. T.	Interoperability	6.92	2027.04	Planned
ÖBB	Infrastructure	Upgrade Schaftenau - Knoten Radfeld (planning)	Schaftenau – Knoten Radfeld; upgrade to four tracks to increase capacity (not required to fulfil core network infrastructure requirements); planning; strategic land acquisition	Capacity	108.20	2037.12	Planned
ÖBB	Infrastructure	Upgrade Kufstein - Schaftenau (planning)	Kufstein – Schaftenau; upgrade to four tracks to increase capacity (not required to fulfil core network infrastructure requirements); planning; strategic land acquisition	Capacity	29.60	2025.01	Planned
ÖBB	ETCS	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	ETCS equipment on RFC ScanMed in Austria Kufstein-Brenner	undefined	N/A	2025.12	Secured
ÖBB	Infrastructure	Brenner Base Tunnel	New tunnel below the Brenner Pass between Innsbruck (Austria) and Fortezza (Italy)	Capacity	5,262.10	2032.12	Secured
Denmark							
BaneDenmark	ETCS	SP Fjernbane East	The Danish Signalling Programme consist of two infrastructure projects: Fjernbane East and Fjernbane West. The contracts together cover the whole national railway with a total budget (2016) for implementation 2150 million Euro. The corridor related deployment includes Padborg Grænse - Snoghøj (2027), Snoghøj-Korsør (2027), KorsørRingsted (2028), Ringsted - Næstved (2028), Næstved Nykøbing F (2022), Nykøbing F - Holeby (2028), Holeby (Rødby) - Puttgarden (2028), Ringsted - Høje Taastrup (2029) Ringsted-Køge N-Vigerslev (2023), Høje Taastrup - Vigerslev (2029) and Vigerslev - Peberholm (2025).	Interoperability	N/A	2029.12	Secured
BaneDenmark	ETCS	SP Fjernbane West	The Danish Signalling Programme consist of two infrastructure projects: Fjernbane East and Fjernbane West. The contracts together cover the whole national railway with a total budget (2016) for implementation 2150 million Euro. The corridor related deployment includes Padborg Grænse - Snoghøj (2027), Snoghøj-Korsør (2027), KorsørRingsted (2028), Ringsted - Næstved (2028), Næstved Nykøbing F (2022), Nykøbing F - Holeby (2028), Holeby (Rødby) - Puttgarden (2028), Ringsted - Høje	Interoperability	N/A	2027.12	Secured
			Taastrup (2029) Ringsted-Køge N-Vigerslev (2023), Høje Taastrup - Vigerslev (2029) and Vigerslev - Peberholm (2025).				
BaneDenmark	Infrastructure	New high-speed railway on West Funen	New railway line over West Funen (35 km, high speed). Parallel to the existing line, which leads to greater capacity for freight trains	undefined	645.00	2030.06	Secured
Germany							
DB InfraGo	Infrastructure	ABS/NBS München–Rosenheim–Kiefersfelden–Grenze D/A	Partly 2 new tracks	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	ABS/NBS Ulm - Augsburg	Partly new construction	undefined	N/A	N/A	Study / To be decided
DB InfraGo	ETCS	EDP-ETCS Ausrüstung PadborgFlensburg	EDP-ETCS deployment PadborgFlensburg	undefined	N/A	2027.12	Secured

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
DB InfraGo	ETCS	DSD Starter Package 1st Level Scan-Med	DSD Starter Package 1st Level RFC ScanMed: Route 1255 km from 0 to 4,8; route 1280 km from 21,09 to 21,7; Route 1281 to Ashausen Abzw km 154,76159,42; Route 1720 from km 54,29 to 169,376; Route 1281 km 159,42 - 161,043 Abzw Ashausen - Maschen Rbf; Route 5321 km from 0 to 1,3; Route 5510 München-Trudering - Assling (Oberbay) km 14,626 - 64,87; Route 5300 km from 0 to 40,798; route 5310 km from 0 to 34,546; route 5560 km from 6,8 to 35,896; route 5561 km from 0 to 3,616; route 5702 km from 0 to 31,868.	undefined	N/A	2031.12	Secured
DB InfraGo	ETCS	EDP-ETCS L2 equipment Flensburg Maschen RFC Scan Med	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med: route 1040 km 74,69-172,916; route 1220 km 8,88- 74,688; route 1280 km 21,741-39,909	undefined	N/A	2030.12	Secured
DB InfraGo	ETCS	ETCS on HPN S013 – Göttingen Nordstemmen (ABS - 1732)	High Performance Network S013 - Göttingen-Nordstemmen (ABS - 1732) km 26,3 - 107,512	undefined	N/A	2028.12	Secured
DB InfraGo	ETCS	ETCS on HPN S005 - Hamburg - Hannover (1720)	ETCS on High Performance Network S005 - Hamburg - Hannover (1720); route 1153 Lüneburg-Lüneburg km from 132,942 to 157,875; route 1720 Celle-Celle km from 43,7 to 54,29	undefined	N/A	2026.06	Secured
DB InfraGo	ETCS	ETCS on HPN S014 Part 1 Hanau - Fulda (Kinzigtal - 3600)	High Performance Network Corridor S014 - Hanau - Flieden (Kinzigtal - 3600) Flieden - Fulda route 3600 km from 85,24 to 110,1	undefined	N/A	2029.06	Secured
DB InfraGo	ETCS	ETCS on HPN ScanMed Part 2 Fulda - Bebra (3600)	High Performance Network Corridor ScanMed S077 - Fulda - Bebra (3600) Route 3600 km 110,1 to 166,85 (Fulda – Haunetal Neukirchen)	undefined	N/A	2028.12	Secured
DB InfraGo	ETCS	ETCS on HPN ScanMed Part 3 Würzburg - Treuchtlingen (5321)	High Performance Network Corridor ScanMed S151 - Würzburg - Treuchtlingen (5321) Treuchtlingen Herrnberchtheim km from 1,3 to 135,4	undefined	N/A	2030.06	Secured
DB InfraGo	ETCS	ABS/NBS Hamburg - Lübeck - Puttgarden (Hinterlandanbindung FBQ)	ETCS equipment on ScanMed Corridor	undefined	N/A	2029.12	Planned
DB InfraGo	ETCS	ETCS on HPN S121	ETCS on high-performance network S121, Bremen / Rotenburg - Wunstorf	undefined	N/A	2029.12	Planned
DB InfraGo	Infrastructure	ABS/NBS 36: München–Rosenheim–Kiefersfelden–Border D/A	Brenner feeder line - Partly 2 new tracks	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	740 m long passing tracks	Construction of 740 m long passing tracks at several points	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	Node München	Expansion of the west end of München-Pasing, two-track expansion of the Truderinger Spange, four-track expansion of München-Daglfing - München- Johanneskirchen, new construction of a two-track connecting curve München-Daglfing - München-Riem (Daglfinger curve)	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	ABS Augsburg – Donauwörth	3rd track Augsburg-Oberhausen – Donauwörth, Vmax = 160 km/h, new construction of crossing stations in Nordendorf and Langweid	undefined	500.00	N/A	Study / To be decided
DB InfraGo	Infrastructure	NBS/ABS Nürnberg – Ingolstadt – München	Ingolstadt - Petershausen: Addition of a third and fourth track; Petershausen: Construction of a right-side overtaking track for freight traffic with a usable length of 740 m; Construction of a third track Dachau - Munich Hbf along the SPFV tracks	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	ABS Burgsinn – Gemünden – Würzburg – Nürnberg	Block densification Burgsinn - Gemünden - Würzburg - Siegelsdorf; 3rd track Siegelsdorf - Fürth	undefined	250.00	N/A	Study / To be decided

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
DB InfraGo	Infrastructure	Node Hannover	Hannover-Wülfel crossing structure, new connecting track in Lehrte West, two-track expansion of the Empelder curve, new construction of a through track for the south-north direction in Lehrte, three-track expansion Elze - Nordstemmen, crossing structure for height-free routing of traffic in the Hameln route - Hildesheim	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	Node Hamburg	New crossing structure in Hamburg-Wilhelmsburg for rail freight on the Rothenburgsort – Osthafen route, new flyover structure in Meckelfeld for crossing-free threading in/out of routes 1280 and 1255 in the Maschen junction, connection curve Harburg	undefined	N/A	N/A	Study / To be decided
DB InfraGo	Infrastructure	"Hinterland connection to Fixed Link over Fehmarnbelt"	Removing infrastructure bottleneck: Capacitive improvement of the connection of the Fixed Link over Fehmarnbelt to the German Rail Network	Capacity	1,500.00	N/A	Study / To be decided
DB InfraGo	Infrastructure	ABS/NBS Hamburg / Bremen - Hannover	Infrastructure Bottlenecks: Capacity improvement of the stretches Hamburg - Hannover and Bremen - Hannover	undefined	N/A	N/A	Study / To be decided
Italy							
Rete Ferroviaria Italiana	ETCS	ETCS deployment in Italy on RFC ScanMed lines until 2026	ETCS deployment in Italy on RFC ScanMed lines. Lines to be equipped until 2026 according to the National plan.	Interoperability	N/A	2026.12	Study / To be decided
Rete Ferroviaria Italiana	ETCS	ETCS deployment in Italy on RFC ScanMed lines until 2030	ETCS deployment in Italy on RFC ScanMed lines. Lines to be equipped until 2030 according to the National plan.	Interoperability	N/A	2030.12	Study / To be decided
Rete Ferroviaria Italiana	ETCS	ETCS deployment in Italy on RFC ScanMed lines until 2050	ETCS deployment in Italy on RFC ScanMed lines. Lines to be equipped until 2050 according to the National plan.	undefined	N/A	2036.12	Study / To be decided
Rete Ferroviaria Italiana	Infrastructure	Verona RRT	new terminal 750 m	undefined	73.10	2030.12	Study / To be decided
Rete Ferroviaria Italiana	ETCS	ETCS deployment on RFC ScanMed lines in Italy (Brennero - Verona)	Deployment of ERTMS trackside equipment on Brennero - Verona section. ERTMS deployment on the Brennero - Verona line	Interoperability	35.00	2026.12	Study / To be decided
Rete Ferroviaria Italiana	Infrastructure	New HS/HC Adriatic railway line	Increasing speed and enhancement of the Bologna - Lecce railway line	undefined	N/A	2040.12	Study / To be decided
Rete Ferroviaria Italiana	Infrastructure	Upgrading of Bologna Interporto Station	Upgrading of Bologna Interporto Station	undefined	35.40	2030.12	Study / To be decided
Rete Ferroviaria Italiana	ETCS	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	ERTMS deployment on the Bologna - Verona line With reference to the grant agreement INEA/CEF/TRAN/M2018/1779964 relating to Action 2018-IT-TM-0059W, RFI formally requested the termination of the Agreement. Evaluating with the Member State a series of feasibility studies, accompanied by a cost/benefit analysis that compares different scenarios, it was seen that the new ERTMS Plan "accelerated", based on a rapid deployment of ERTMS on the whole network and the consequent decommissioning of the Class B systems, determines the best result. Moreover, the ongoing ERTMS projects on conventional lines with overlap with the class B system	Interoperability	19.00	2030.12	Study / To be decided

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
			(Breakthrough program) show that ERTMS system superimposed on the traditional signalling system is complicated and expensive. For this reason, this project has postponed to 2027 and will be carried out in the accelerated stand alone mode.				
Rete Ferroviaria Italiana	Infrastructure	New rail connection to the port of Vasto	New rail connection to the port area through a single track and construction of new tracks for loading/unloading operations	undefined	25.00	2026.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological and infrastructural upgrade of Napoli node	Technological and infrastructural upgrade of Napoli node NOTE: Updated at October 31st 2018. Please take note that Italian Government is evaluating to reallocate the budget as in the new Contract with RFI (Contratto di Programma per il quinquennio 2021-2027)	undefined	133.00	2026.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological and infrastructural upgrading of Foggia Station	Infrastructural & technological upgrading of Foggia station and new controlling system (layout and interlocking)	undefined	75.40	2025.06	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological upgrading of the Bologna - Castelbolognese - Ancona railway line	Technological and Infrastructural upgrading of the Bologna - Castelbolognese - Rimini	undefined	83.95	2026.12	Secured
Rete Ferroviaria Italiana	ETCS	Technological Upgrade of Brennero - Verona line (Interlocking system)	Technological Upgrading (ACCM implementation project of the access lines to Brennero)- preparatory works for the ERTMS implementation	Interoperability	140.40	2025.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological and infrastructural upgrading of the Bari railway node	Technological and infrastructural upgrading of the Bari railway node (Bari Parco nord, Bari C.le)	undefined	159.61	2024.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Southern access line to Brenner	Upgrading of Brennero southern access lines (Fortezza-Verona): quadrupling Fortezza-Ponte Gardena (lotto1including ACC and PRG di Ponte Gardena) NOTE: Updated at October 31st 2018. Please take note that Italian Government is evaluating to reallocate the budget as in the new Contract with RFI (Contratto di Programma per il quinquennio 2021-2027)	undefined	1,522.00	2026.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological Upgrading of the Padova-Bologna railway line-(phase)	Technological Upgrading of the Padova-Bologna railway line (phase)	undefined	N/A	2026.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Speed increase of the Adriatic Line Bologna-Bari (Bologna-Rimini)	Speed increase of the Adriatic Line Bologna-Bari (Bologna-Rimini)	undefined	350.00	2025.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological Upgrading Padova Bologna railway line (further interventions)	Technological Upgrading of the Padova-Bologna railway line (further interventions)	undefined	105.00	2025.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Upgrading to 22,5 t/axle load without speed limitation (phase)	Upgrading to 22,5 t/axle load without speed limitation (phase)-Castelbolognese/Faenza - Ravenna	undefined	6.00	2024.12	Secured

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
Rete Ferroviaria Italiana	Infrastructure	Doubling Track Termoli - Lesina	Doubling Track between Termoli and Lesina	undefined	700.00	2028.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Upgrade of Bari Lamasinata Freight Station	New railyard near the station of Bari Lamasinata	undefined	155.00	2026.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Upgrade Rail Connection to Gioa Tauro Seaport	Upgrading of the port branch line between San Ferdinando station and Rosarno. The project includes a new layout and a technological upgrade of the two stations with 750 m length tracks.	undefined	N/A	2025.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Rail connection Napoli - Foggia - Bari	New High Speed/High Capacity railway connection between Napoli and Bari (Section Napoli - Cancello)	undefined	848.00	2024.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Upgrading of railway line Napoli Reggio Calabria	Infrastructural and Technological upgrading project to increase the speed of the Tirrenica Sud line from Napoli to Reggio Calabria	undefined	100.00	2023.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Technological and infrastructure upgrading of some Sicilian lines	Infrastructure and technological upgrading of railway routes: Messina - Palermo, Palermo - Catania - Messina and Messina - Siracusa	undefined	48.00	2024.12	Secured
Rete Ferroviaria Italiana	Infrastructure	Upgrade of railway connection to Livorno Calambrone port	Upgrade of railway connections between Pisa, Livorno and the railroad terminal of Guasticce	undefined	488.00	2028.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrade to 750m train length of CNC lines	Upgrading of the railway line to a 750m train length: Brennero - Verona Verona - Bologna Bologna - Prato - Firenze Firenze - Empoli/Pisa - La Spezia Napoli - Foggia Foggia - Bari Bari - Taranto Napoli - Salerno Salerno - Battipaglia - Villa San Giovanni (Rosarno - Villa San Giovanni 600 m) Messina - Catania - Augusta (600 m) Catania - Palermo (600 m)	undefined	87.70	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Brenner base tunnel (BBT)	Construction of a cross-border railway tunnel between the new station of Fortezza and the Innsbruck junction in Austria.	undefined	4,191.74	2032.12	Planned
Rete Ferroviaria Italiana	Infrastructure	750 m upgrading of Verona QE Station	Upgrading of Verona Quadrante Europa transfer station in order to allow 750m train length and increase the current capacity and accessibility	undefined	93.00	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrading Messina-Catania	Upgrading of Messina - Catania - Siracusa: doubling the track between Giampilieri and Fiumefreddo	undefined	2,300.00	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrading of the Firenze -Pisa Line	Infrastructural upgrading of the line Firenze - Pisa: doubling the actual tracks between Firenze Cascine - Bv. Renai and Empoli - Bv. Samminiatello and speed increase of the route	undefined	140.00	2036.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Technological upgrade of Ancona node	Technological and infrastructural upgrade of Falconara Station	undefined	350.65	2029.12	Planned

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
Rete Ferroviaria Italiana	Infrastructure	Roma node improvement	Upgrading Roma node: - Technological upgrade of the Rome node; - Layout and interlocking of Tuscolana e Casilina stations - Infrastructure upgrade of line sections Casilina-Ciampino and Cesano-Ostiense-Tiburtina (High Density - ERTMS) - Technological upgrade of the Rome node (further phase) - Quadruplication of Ciampino-Capannelle line section - Infrastructure upgrade of Tiburtina station area and interchange node	undefined	1,262.46	2028.12	Planned
Rete Ferroviaria Italiana	Infrastructure	750 m upgrading of Verona QE Station	Upgrading of Verona Quadrante Europa transfer station in order to allow 750m train length and increase the current capacity and accessibility	undefined	76.10	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Padova-Bologna - Bari 650-750m train length	Works to allow train length operation to 650-750m on railway section Bologna-Bari (phases) First Phase (2027) Second Phase (After 2027)	undefined	N/A	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrade of train length to 750 m on all Med RFC line sections	Upgrade of train length to 750 m. Interventions concerning compliance with Core Network standards on trains length (Target: 740 m) - (Lines Torino - Trieste/Villa Opicina and alternative routes)	undefined	72.90	2026.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Increasing Speed Adriatic railway line to HS/HC standards	Four tracks between Bivio San Vitale (Bologna) and Castelbolognese (Go live date beyond 2027)	undefined	N/A	2030.12	Planned
Rete Ferroviaria Italiana	ETCS	ERTMS installment on the BA Corridor railway sections planned until 2026	ERTMS instalment on the BA Corridor railway sections planned until 2026 (the ERTMS deployment Plan is still under approval at the Ministry of Infrastructure and Transport)	undefined	N/A	2026.12	Planned
Rete Ferroviaria Italiana	ETCS	ERTMS installment on the BA Corridor railway sections planned after 2026	ERTMS instalment on the BA Corridor railway sections planned after 2023 (the ERTMS deployment Plan is still under approval at Ministry of Transport and Infrastructure)	undefined	N/A	2035.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Allowing circulation without special permission of trains up to 740 m long on the network	Upgrading of the railway line to 750 m train length Ancona - Pescara Pescara - Foggia Pisa - Roma Roma - Cassino - Caserta - Cancello Cancello - Sarno - Bivio Santa Lucia - Salerno Taranto - Metaponto - Sibari - Paola/San Lucido Remarks - There is not upgrading project for the Messina - Fiumetorto Line	undefined	98.50	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Technological Upgrading of the line section Foggia - Bari - Brindisi	Technological and infrastructure upgrading of some stations on the line section Foggia - Bari - Brindisi (phase)	undefined	92.00	2026.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrade loading gauge to P/C80 on the CNC lines	Lines: Bologna - Prato Pisa - La Spezia Roma - Pomezia Napoli - Salerno Napoli - Foggia Bari - Taranto Salerno - Rosarno Rosarno - Villa San Giovanni Messina - Catania - Augusta	Loading gauge	519.00	2030.12	Planned

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
			Palermo - Catania Remarks: The section Rosarno - Villa San Giovanni and all the CNC Sicilian Lines will be upgraded to loading gauge P/C 45.				
Rete Ferroviaria Italiana	Infrastructure	Upgrade loading gauge to P/C80 on the network	Lines: Ancona - Pescara Pescara - Foggia Pisa - Roma Roma - Cassino - Caserta - Cancello Cancello - Sarno - Bivo Santa Lucia - Salerno Taranto - Metaponto - Sibari - Paola/San Lucido Remarks - There is not upgrading project for the Messina - Fiumetorto Line	Loading gauge	114.00	2030.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Technological upgrading of Firenze node	Technological upgrading of Firenze node's lines and stations by the implementation of a new electronic interlocking (ACC-M) including the traffic control system (SCC-M)	undefined	230.00	2025.12	Planned
Rete Ferroviaria Italiana	Infrastructure	New rail link between rail network and Augusta Port and railway bypass	New rail connection to Augusta Port and city railway bypass	undefined	135.00	2026.12	Planned
Rete Ferroviaria Italiana	Infrastructure	Technological Upgrading Bologna - Verona	Technological upgrading to increase the capacity of the line and minimally to reduce the time trip. Those works are necessary for ERTMS and new electronic interlocking implementation	undefined	88.00	2024.10	Planned
Rete Ferroviaria Italiana	Infrastructure	Upgrading project of railway connections and infrastructure in the Port of Taranto	The project is divided in two lots: 1. upgrading of railway equipment for the link of the Cagioni station to the port area 2. new tracks between the new logistic platform and the national railway line (Taranto main station)	undefined	36.00	2024.12	Realisation
Norway							
BaneNor	ETCS	ERTMS National Implementation	Bane NOR's ERTMS National Implementation Plan, a high level description of the programme for signalling renewal, suggests a sequential roll out of ERTMS Level 2 Baseline 3 base on several factors: - age of current signalling systems - the need to eliminate railway sections without interlockings - the need for equipping new railway lines with modern signalling systems (including Class B systems) - a desire for early deployment of a country-wide Traffic Management System (TMS)	undefined	N/A	2034.01	Study / To be decided
Sweden							
Trafikverket	Infrastructure	Lund (Högevall) - Flackarp, four tracks	Four tracks on the section LundArlöv	Capacity	N/A	2023.12	Planned
Trafikverket	ETCS	ScanMed West	Gradual implementation, schedule is being reviewed on the sections; (Göteborg Marieholm) - Lödöse/Öxnered, (Olskroken) - Partille, Sävenäs rangerbangård, (Olskroken) - Göteborg Skandiahamnen, Almedal - Mölndals nedre, Mölndals nedre - Kållered, (Kållered) - Varberg,	Interoperability	N/A	2029.12	Planned

Country & IM	Project Category	Project Name	Description	Benefit	Total budget (€)	Go Live Date	Decision Status
			(Varberg) - Torebo/Falkenberg - Kistinge, (Ängelholm) - Åstorp, (Åstorp) - (Helsingborg gb), (Åstorp) - Teckomatorp/(Kävlinge), (Helsingborg) - (Kävlinge), Kävlinge - (Arlöv) (Kornsjö)/(Mellerud) - (Öxnered), (Uddevalla central) - (Öxnered), (Kistinge) - Ängelholm, (Ängelholm) - (Helsingborg)/(Åstorp), Helsingborg, (Lockarp) - Trelleborg Kornsjö, Vänersborg - (Uddevalla central) Göteborg - Olskroken/Göteborg Marieholm/(Almedal)				
Trafikverket	ETCS	ScanMed East	Gradual implementation, schedule is being reviewed on the sections; (Nässjö) - (Alvesta), Alvesta, (Alvesta) - Älmhult, (Älmhult) - (Hässleholm) (Järna)/Oxelösund - (Vrena)/(Åby), (Norrköping) - (Linköping), (Mjölby) - (Gamlarp), Alvesta - Älmhult (Katrineholm) - (Hallsberg pbg), (Skymossen) - (Mjölby), (Linköping) - Mjölby, Gamlarp - Nässjö, (Hässleholm) - (Eslöv), (Teckomatorp)/Eslöv - (Lund), (Lund)- Arlöv (Järna) - Katrineholm, (Katrineholm) (Norrköping), Hässleholm, Lund - (Kävlinge), Malmö gbg, Malmö C, Östervärn - (Svågertorp)/Lockarp, (Malmö) - (Svågertorp)/(Lernacken), (Fosieby)/(Lockarp) - (Lernacken), Lernacken-Peberholm Björnkulla - Södertälje Hallsberg pbg - (Hallsberg rgb) - Skymossen - Östansjö	Interoperability	N/A	2028.12	Planned
Trafikverket	Infrastructure	Göteborgs hamnbana	Double track sections on the line to Gothenburg harbour	Capacity	N/A	2024.12	Planned
Trafikverket	Infrastructure	Åstorp new passing track	New passing track in Åstorp	Capacity	N/A	2024.12	Planned
Trafikverket	Infrastructure	Hallsberg-Degerön double track	Double track on the section Hallsberg-Degerön	Capacity	N/A	2029.12	Planned
Trafikverket	Infrastructure	Varberg-Hamra double track	Double track on the section VarbergHamra	Capacity	N/A	2024.01	Planned

Source: RFC ScanMed 2024 Implementation Plan

Table 6 ERTMS Deployment plan

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Austria	ÖBB-Infrastruktur	Abzw Fritzens-Wattens 2 - Abzw Innsbruck 1	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Fritzens-Wattens 2 - Hall in Tirol	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Innsbruck 1 - Matrei	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Knoten Radfeld - Abzw Knoten Stans	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Knoten Radfeld - Brixlegg	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Knoten Stans - Abzw Fritzens-Wattens 2	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Abzw Knoten Stans - Schwaz	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Austria	ÖBB-Infrastruktur	Abzw Steinach 4 - Steinach in Tirol/Brennero	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Brixlegg - Jenbach	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Fritzens-Wattens - Abzw Fritzens-Wattens 2	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Hall in Tirol - Innsbruck Hbf	Principal Line	ETCS equipment on RFC ScanMed in Austria Innsbruck - Hall i. T.	2027	ETCS L2	SRS 3.6.0	SV1.0
Austria	ÖBB-Infrastruktur	Innsbruck Hbf - Abzw Innsbruck 1	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 3.6.0	SV1.0
Austria	ÖBB-Infrastruktur	Jenbach - Abzw Knoten Stans	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Kirchbichl - Wörgl Hbf	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Kufstein - Kirchbichl	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Matrei - Steinach in Tirol	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Schwaz - Fritzens-Wattens	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Steinach in Tirol - Abzw Steinach 4	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 2.3.0d	SV1.0
Austria	ÖBB-Infrastruktur	Wörgl Hbf - Abzw Knoten Radfeld	Principal Line	ETCS equipment on RFC ScanMed in Austria Kufstein -Brenner	2025	ETCS L2	SRS 3.6.0	SV1.0
Denmark	Banedanmark	Fredericia - Snoghøj	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Høje Taastrup - Peberholm/Lernacken	Principal Line	SP Fjernbane East	2029	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Kolding - Taulov	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Korsør - Ringsted	Principal Line	SP Fjernbane East	2029	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Lunderskov - Kolding	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Nyborg - Korsør	Principal Line	SP Fjernbane East	2029	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Padborg - Lunderskov	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Padborg - Padborg/Flensburg Friedensweg	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Ringsted - Høje Taastrup	Principal Line	SP Fjernbane East	2029	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Snoghøj - Nyborg	Principal Line	SP Fjernbane East	2029	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Taulov - Fredericia	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Denmark	Banedanmark	Taulov - Snoghøj	Principal Line	SP Fjernbane West	2027	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Access to DUSS München Riem	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Almstedt - Göttingen	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Germany	DB InfraGo	Ansbach - Treuchtlingen - Windsfeld-Dittenheim	Principal Line	ETCS on HPN ScanMed Part 3 Würzburg - Treuchtlingen (5321)	2030	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Augsburg Hbf - Mering	Principal Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Augsburg Oberhausen - Augsburg Hbf	Principal Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Augsburg Oberhausen - Augsburg Hbf	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Bad Oldesloe - Hamburg Wandsbek Wf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Bebra - Bebra-Blankenheim	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Bebra-Blankenheim - Fulda SFS Nord	Principal Line	ETCS on HPN ScanMed Part 2 Fulda - Bebra (3600)	2028	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Burg (Fehmarn) West - Schwartau Waldhalle	Diversionary Line	ABS/NBS Hamburg - Lübeck - Puttgarden (Hinterlandanbindung FBQ)	2029	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Burgsinn Bbf - Würzburg Hbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Celle - Lehrte Nord	Principal Line	ETCS on HPN S005 - Hamburg - Hannover (1720)	2026	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Donauwörth - Augsburg Oberhausen	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Eichenberg - Bebra	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Elmshorn - Hamburg Eidelstedt (Ef)	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030			
Germany	DB InfraGo	Elze (Han) - Northeim	Principal Line	ETCS on HPN S013 – Göttingen Nordstemmen (ABS - 1732)	2028	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Flensburg Friedensweg - Flensburg Weiche	Principal Line	EDP-ETCS Ausrüstung PadborgFlensburg	2027	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Flensburg Weiche - Jübek	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Flieden - Gemünden (Main)	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Fulda - Burgsinn Bbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Fulda - Fulda Bronnzell	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Fulda Bronnzell - Flieden	Principal Line	ETCS on HPN S014 Part 1 Hanau - Fulda (Kinzigtal - 3600)	2029	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Fulda SFS Nord - Fulda	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Fuldatal-Ihringshausen - Kassel Nordwest	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Fürth Hbf - Fürth Gbf	Diversionary Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Grafing Bahnhof - Rosenheim	Principal Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Germany	DB InfraGo	Göttingen - Eichenberg	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Göttingen - Fuldatallhringshausen	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Göttingen Gbf Nord - Göttingen	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Billwerder Moorfleet Abzw - Hamburg Billwerder	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Eidelstedt (Ef) - Hamburg Horn	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030			
Germany	DB InfraGo	Hamburg Eidelstedt (Ef) - Hamburg Langenfelde Bbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Ericus - Hamburg Oberhafen	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Hausbruch - Hamburg Unterelbe	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Hbf - Hamburg Ericus	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Horn - Hamburg Rothenburgsort Ro	Principal Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Hamburg Langenfelde Bbf - Hamburg Rainweg	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Oberhafen - Hamburg Wilhelmsburg Abzw	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Hamburg Rainweg - Hamburg Hbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Rothenburgsort Ro - Hamburg Oberhafen	Principal Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Hamburg Rothenburgsort Ro - Hamburg Rothenburgsort Tk	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Rothenburgsort Tk - Hamburg Billwerder Moorfleet Abzw	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Süderelbbrücke - Hamburg Harburg	Diversionary Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Hamburg Unterelbe - Hamburg Harburg	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Wandsbek Wf - Hamburg Horn	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hamburg Wilhelmsburg - Hamburg Süderelbbrücke	Diversionary Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Hamburg Wilhelmsburg Abzw - Hamburg Harburg	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Hamburg Wilhelmsburg Abzw - Hamburg Wilhelmsburg	Diversionary Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Hamburg-Harburg - Meckelfeld	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Germany	DB InfraGo	Hamburg-Harburg - Meckelfeld	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030			
Germany	DB InfraGo	Hannover Messe/Laatzen - Elze (Han)	Principal Line	ETCS on HPN S013 – Göttingen Nordstemmen (ABS - 1732)	2028	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Hannover-Linden - Hannover-Waldhausen	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Linden Hafen - Hannover-Linden	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Waldhausen - Hannover-Waldheim	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Waldhausen - Hannover-Wuelfel	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Waldheim - Hannover Messe/Laatzen	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Waldheim - Lehrte West	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Hannover-Wuelfel - Almstedt	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Ingolstadt Hbf – München Karlsfeld	Diversionary Line	Please select a ERTMS-Project	-	ETCS L2	to be defined	to be defined
Germany	DB InfraGo	Ingolstadt Nord - Ingolstadt Hbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Jübek - Rendsburg	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Kassel Nordwest – Kassel Oberzwehren (Abzw)	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Kassel-Oberzwehren (Abzw) - Fulda	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Lehrte Nord - Lehrte West	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Lübeck Hbf - Bad Oldesloe	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Lübeck-Kücknitz - Schwartau Waldhalle	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Lüneburg - Uelzen Pbf	Principal Line	ETCS on HPN S005 - Hamburg - Hannover (1720)	2026			
Germany	DB InfraGo	Lüneburg - Uelzen Pbf	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Meckelfeld - Maschen Pbf	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Meckelfeld - Maschen Rbf	Connecting Line A	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Meckelfeld - Maschen Rbf	Connecting Line A	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Mering - Olching	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	München Friedenheimer Brücke - München Süd	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München Nord Rbf - München Nord Rbf Ausfahrt	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Germany	DB InfraGo	München Nord Rbf Ausfahrt - München Nord Rbf Lassallestraße	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München Nord Rbf Forstweg - München Nord Rbf	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	München Nord Rbf Lassallestraße – München Freimann	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	München Ost Pbf - München Ost Riedenburger Straße	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München Ost Pbf - München-Trudering	Diversionary Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	München Ost Rbf - München-Riem West	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München Ost Riedenburger Straße - München Ost Rbf	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München Süd - München Ost Pbf	Diversionary Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	München-Daglfing - München-Trudering	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Freimann - München-Johanneskirchen	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Johanneskirchen - München-Daglfing	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Karlsfeld - München-Laim Rbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Laim Rbf - München Friedenheimer Brücke	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Riem West - München-Riem Pbf	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	München-Trudering - Grafing Bahnhof	Principal Line	DSD Starter Package 1st Level Scan-Med - ETCS on lines of RFC Rhine-Danube	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	München-Trudering - Grafing Bahnhof	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Neumünster - Elmshorn	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030			
Germany	DB InfraGo	Nienburg (Weser) - Wunstorf	Diversionary Line	ETCS on HPN S121	2029	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Northeim - Göttingen Gbf Nord	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Nürnberg Eibach - Nürnberg Reichelsdorf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Nürnberg Hohe Marter - Nürnberg Eibach	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Nürnberg Hohe Marter - Nürnberg Rbf	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Nürnberg Rbf - Nürnberg Eibach	Connecting Line A	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Olching - München Nord Rbf Forstweg	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Padborg/Flensburg	Principal Line	EDP-ETCS Ausrüstung PadborgFlensburg	2027	ETCS L2	SRS 3.4.0	SV2.0

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
		Friedensweg - Flensburg Friedensweg						
Germany	DB InfraGo	Rendsburg - Neumuenster	Principal Line	EDP-ETCS L2 equipment Flensburg-Maschen RFC Scan Med	2030			
Germany	DB InfraGo	Rosenheim - Rosenheim Süd	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Rosenheim Süd - Kiefersfelden/Kufstein	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Rotenburg (Wümme) - Verden (Aller)	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Schwartau Waldhalle - Lübeck Hbf	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Seelze Mitte - Hannover Linden Hafen	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Seelze Rbf - Seelze	Connecting Line B	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Stelle - Lüneburg	Principal Line	ETCS on HPN S005 - Hamburg - Hannover (1720)	2026	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Stelle - Lüneburg	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Treuchtlingen - Donauwörth	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Treuchtlingen - Treuchtlingen - Windsfeld-Dittenheim	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.6.0	SV2.1
Germany	DB InfraGo	Uelzen Pbf - Celle	Principal Line	ETCS on HPN S005 - Hamburg - Hannover (1720)	2026			
Germany	DB InfraGo	Uelzen Pbf - Celle	Principal Line	DSD Starter Package 1st Level Scan-Med	2031	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Verden (Aller) - Nienburg (Weser)	Diversionary Line	ETCS on HPN S121	2029	ETCS L2	SRS 3.4.0	SV2.0
Germany	DB InfraGo	Wunstorf - Seelze Mitte	Diversionary Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Würzburg Hbf - Würzburg Heidingsfeld West Ültg	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Würzburg Hbf Zell Fbn - Würzburg Hbf	Principal Line	Please select a ERTMS-Project	-	to be defined	to be defined	to be defined
Germany	DB InfraGo	Würzburg-Heidingsfeld West Ültg - Ansbach	Principal Line	ETCS on HPN ScanMed Part 3 Würzburg - Treuchtlingen (5321)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Ancona - Pescara	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	BIVIO/PC FENILONE - Verona Quadrante	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	BIVIO/PC S. MASSIMO - BIVIO/PC S. LUCIA	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bari Lamasinata - Bari Parco Nord	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Bari Parco Nord - Gioia del Colle	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana							
Italy	Rete Ferroviaria Italiana	Battipaglia - Paola	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bellavista - Bivio/PC Metaponto	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bellavista - PM Cagioni	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bicocca - Augusta	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Bertalia - Bivio Trebbo	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Bertalia - Doppio Bivio/PC Beverara	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Crociali - FIRENZE CASTELLO	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Crociali - FIRENZE CASTELLO	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Maddaloni - Cancello	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Maddaloni - Maddaloni Marcianise	Connecting Line A	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Mortellini - Livorno Calambrone	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio S. Vitale - Castelbolognese-Riolo Terme	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio S. Vitale - Castelbolognese-Riolo Terme	Principal Line	ERTMS installment on the BA Corridor railway sections planned after 2026	2035	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Tavernelle - Bivio Bertalia	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio Trebbo - Doppio Bivio/PC Beverara	Principal Line	ERTMS installment on the BA Corridor railway sections planned until 2026	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Bivio Trebbo - Doppio Bivio/PC Beverara	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana							
Italy	Rete Ferroviaria Italiana	Bivio/PC Fenilone - Bivio/PC S. Lucia	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio/PC Metaponto - Taranto	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio/PC S. Lucia - Isola della Scala	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bivio/PC S. Massimo - Bivio/PC Fenilone	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bologna Interporto - Bivio Trebbo	Principal Line	ERTMS installment on the BA Corridor railway sections planned until 2026	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Bologna Interporto - Bivio Trebbo	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Brennero - Trento Roncafort	Principal Line	Technological Upgrade of Brennero - Verona line (Interlocking system)	2025	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Brennero - Trento Roncafort	Principal Line	ETCS deployment on RFC ScanMed lines in Italy (Brennero - Verona)	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Cabina Lamasinata - Bari Lamasinata	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Cabina Lamasinata - Bari Parco Nord	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Cancello - Napoli Traccia	Connecting Line A	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Cancello - Salerno	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Caserta - Bivio Maddaloni	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Cassino - Caserta	Diversionary Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Castelbolognese-Riolo Terme - Faenza	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Dev. Navicelli Pisa Centrale - Dev. Tagliaferro Pisa	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana	Centrale						
Italy	Rete Ferroviaria Italiana	Dev. Navicelli Pisa Centrale - Pisa Centrale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Dev. Tagliaferro Pisa Centrale - Bivio Mortellini	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Doppio Bivio Rimesse - Bivio Crociali	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Doppio Bivio Rimesse - Bivio S. Vitale	Principal Line	ERTMS installment on the BA Corridor railway sections planned until 2026	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Doppio Bivio Rimesse - Bivio S. Vitale	Principal Line	ERTMS installment on the BA Corridor railway sections planned after 2026	2035	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Doppio Bivio Rimesse - Bivio S. Vitale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Doppio Bivio/PC Beverara - Doppio Bivio Rimesse	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Empoli - Pisa Centrale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	FIRENZE CASTELLO - FIRENZE RIFREDI	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2026	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	FIRENZE CASTELLO - FIRENZE RIFREDI	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	FIRENZE CASTELLO - Firenze Rifredi Dev. Olmatello	Principal Line	Please select a ERTMS-Project	-	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	FIRENZE RIFREDI - Firenze Rifredi Dev. Olmatello	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	FIRENZE RIFREDI - PM ROVEZZANO	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Faenza - Rimini	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Firenze Rifredi Dev. Olmatello - Empoli	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Fiumetorto - Palermo Brancaccio	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana							
Italy	Rete Ferroviaria Italiana	Foggia - Cabina Lamasinata	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Formia-Gaeta – Gricignano Teverola	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Gioia Tauro - Villa S. Giovanni Mare	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Gioia del Colle - Bellavista	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Gricignano-Teverola - Caserta	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Gricignano-Teverola - Maddaloni Marcianise Sm. FP	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Isola della Scala - Nogara	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	La Spezia Marittima - Vezzano Ligure	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	La Spezia Migliarina - La Spezia Marittima	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	La Spezia Migliarina - Vezzano Ligure	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Livorno Calambrone - Livorno Centrale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Livorno Centrale - Montepescali	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Livorno Centrale - Montepescali	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Maddaloni Marcianise Sm. FP - Cancello	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Maddaloni Marcianise Sm. FP - Maddaloni Marcianise	Connecting Line A	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Messina Maritima - Bicocca	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana							
Italy	Rete Ferroviaria Italiana	Messina Maritima - Fiumetorto	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Metaponto - Paola	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Montepescali - Roma Ostiense	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Nogara - Poggio Rusco	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	ORTE - PM NORD ROMA SM.	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	PM Cabina C Roma Sm. - Roma Casilina	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	PM Cagioni - Bivio/PC Metaponto	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	PM Cagioni - Metaponto	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV1.1
Italy	Rete Ferroviaria Italiana	PM NORD ROMA SM. - PM Cabina C Roma Sm.	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	PM NORD ROMA SM. - ROMA SM.	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	PM ROVEZZANO - ORTE	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Paola - Rosarno	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Pesaro - Ancona	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Pescara - Foggia	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Pisa Centrale - Bivio Mortellini	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete	Pisa Centrale - Dev. Tagliaferro Pisa Centrale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
	Ferroviaria Italiana							
Italy	Rete Ferroviaria Italiana	Poggio Rusco - Bivio Tavernelle	Principal Line	ERTMS deployment on the ScanMed Corridor (Verona - Bologna section)	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Pomezia-S. Palomba - Formia-Gaeta	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	ROMA SM. - PM Cabina C Roma Sm.	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Rimini - Pesaro	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Roma Casilina - Cassino	Diversionary Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Roma Casilina - Cassino	Diversionary Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Roma Casilina – Pomezia S. Palomba	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Roma Ostiense - Roma Casilina	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Rosarno - Gioia Tauro	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Rosarno - S. Ferdinando	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2050	2036	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Salerno - Battipaglia	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Steinach in Tirol/Brennerro - Brennero	Principal Line	ETCS deployment on RFC ScanMed lines in Italy (Brennero - Verona)	2026	ETCS L1 LS	SRS 3.4.0	SV2.0
Italy	Rete Ferroviaria Italiana	TRENTO RONCAFORT - BIVIO/PC S.MASSIMO	Principal Line	Technological Upgrade of Brennero - Verona line (Interlocking system)	2025	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	TRENTO RONCAFORT - BIVIO/PC S.MASSIMO	Principal Line	ETCS deployment on RFC ScanMed lines in Italy (Brennero - Verona)	2026	ETCS L2	SRS 3.6.0	SV2.1
Italy	Rete Ferroviaria Italiana	Vezzano Ligure - Dev. Navicelli Pisa Centrale	Principal Line	ETCS deployment in Italy on RFC ScanMed lines until 2030	2030	ETCS L2	SRS 3.6.0	SV2.1
Norway	Bane NOR	Alnabru Terminal - Bryn	Principal Line	ERTMS National Implementation - section Oslo S - Ski	2023	ETCS L2	SRS 3.4.0	to be defined

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Norway	Bane NOR	Bryn - Loenga	Principal Line	ERTMS National Implementation - section Oslo S - Ski	2023	ETCS L2	SRS 3.4.0	to be defined
Norway	Bane NOR	Fredrikstad - Rolvsøy	Principal Line	ERTMS National Implementation - section Fredrikstad - Sarpsborg	2028			
Norway	Bane NOR	Halden - Kornsjø	Principal Line	ERTMS National Implementation - section Sarpsborg - Sverige	2034	ETCS L2	to be defined	to be defined
Norway	Bane NOR	Kornsjø - Kornsjø/Mon	Principal Line	ERTMS National Implementation - section Sarpsborg - Sverige	2034	ETCS L2	to be defined	to be defined
Norway	Bane NOR	Loenga - Ski	Principal Line	ERTMS National Implementation - section Oslo S - Ski	2023	ETCS L2	SRS 3.4.0	to be defined
Norway	Bane NOR	Moss - Fredrikstad	Principal Line	ERTMS National Implementation - section Oslo S - Fredrikstad	2030			
Norway	Bane NOR	Rolvsøy - Sarpsborg	Principal Line	ERTMS National Implementation - section Fredrikstad - Sarpsborg	2028			
Norway	Bane NOR	Sarpsborg - Halden	Principal Line	ERTMS National Implementation - section Sarpsborg - Sverige	2034			
Norway	Bane NOR	Ski - Moss	Principal Line	ERTMS National Implementation - section Oslo S - Fredrikstad	2030	ETCS L2	SRS 3.6.0	SV2.1
Sweden	Trafikverket	Almedal - Varberg	Principal Line	ScanMed West 4	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Alvesta - Älmhult	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Arlöv - Malmö godsbangård	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Eldsberga - Åstorp	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Fosieby - Svågertorp	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Fosieby - Trelleborg	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Gubbero - Almedal	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Göteborg Marieholm - Olskroken	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Hallsbergs rangerbangård - Mjölby	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Halmstads central - Halmstads rangerbangård	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Halmstads rangerbangård - Eldsberga	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Helsingborgs godsbangård - Teckomatorp	Connecting Line A	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Hässleholm - Arlöv	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Katrineholms central - Hallsbergs rangerbangård	Diversionary Line	ScanMed East	2028	to be defined	SRS 3.6.0	to be defined
Sweden	Trafikverket	Katrineholms central - Norrköpings central	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Kornsjø/Mon - Skälebol	Principal Line	ScanMed West	2029	to be defined	SRS 3.6.0	to be defined

Country	IM	Name	Segment Type	Project Name	Project Go Live	ETCS Operational Level	ETCS Deployment Type	ETCS System Version
Sweden	Trafikverket	Lernacken - Peberholm/Lernacken	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Malmö godsbangård - Fosieby	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Mjölby - Nässjö central	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Norrköpings central - Mjölby	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Nässjö central - Alvesta	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Olskroken - Gubbero	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Skälebol - Göteborg Marieholm	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Svågertorp - Lernacken	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Teckomatorp - Arlöv	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Varberg - Halmstads central	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Älmhult - Hässleholm	Principal Line	ScanMed East	2028	ETCS L2	SRS 3.6.0	to be defined
Sweden	Trafikverket	Älvsjö godsbangård - Katrineholms central	Principal Line	ScanMed East	2028	to be defined	SRS 3.6.0	to be defined
Sweden	Trafikverket	Åstorp - Teckomatorp	Principal Line	ScanMed West	2029	ETCS L2	SRS 3.6.0	to be defined

Source: RFC ScanMed 2024 Implementation Plan

2.1.6 INFRASTRUCTURE AND OPERATIONAL BOTTLENECKS AND PROPOSED SOLUTIONS

Besides physical infrastructure restrictions related to interoperability and capacity constraints to be solved by means of the investments described in Section 3.3.2 above, also administrative, regulatory, and operational bottlenecks can have a negative effect on the flow of transportation. Especially on cross-border sections on rail there can occur many hindrances other than just physical infrastructure restrictions. RFC ScanMed adopted the 'bottleneck' definition used in the framework of the TEN-T (Trans European Network) policy. According to Article 2(q) of Regulation (EU) 1315/2013 "'bottleneck' means a physical, technical, or functional barrier which leads to a system break affecting the continuity of long-distance or cross-border flows and which can be surmounted by creating new infrastructure or substantially upgrading existing infrastructure that could bring significant improvements which will solve the bottleneck constraints.

Table 7 Bottlenecks classification

Physical barrier	Missing link
	Insufficient link
	Missing connectivity
Technical barrier	No electrification
	Only single lanes / tracks
	Insufficient tunnel heights
	Insufficient loading gauge
	Insufficient maximum permitted train length
	Insufficient maximum speed
	Weight restrictions
	Insufficient capacity
	Different / outdated traffic systems
	No intermodality
Functional barrier	Lack of digitalisation
	No transport management system
	Customs regulation
	Cross border regulations
	Personnel planning (RU's)

Source: RFC ScanMed 2021 STRING Bottleneck Study

The investment plan of the RFC ScanMed includes a detailed set of projects aimed at solving infrastructure bottlenecks and missing links. Among them the initiatives aimed at solving the restrictions in the STRING stretch of the TEN-T ScanMed Core Network Corridor (CNC) between Oslo and Hamburg are of particular relevance for the further development of international rail transport for both passenger and freight along the RFC ScanMed. A study was completed in 2021 dedicated to the analysis of the RFC ScanMed bottlenecks in this part of the corridor. Concerning infrastructure bottlenecks the Fehmarn Belt Fixed Link is the prominent example of a missing link that upon its completion, including the hinterland connections in Denmark and Germany, would be able to modally shift volume to rail significantly and contribute to regional integration just as the Öresund bridge has done since its completion. Because of its positive impact, regional stakeholders have put forward the concept of further fixed links between Sweden and Denmark, namely the HH project which will be made of a road and rail connection between Helsingborg and Helsingør as well as the Öresund Metro which will represent a dedicated regional rail passenger line between Malmö and Copenhagen, both also aimed at relieving capacity constraints on the Öresund.

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 Rail Freight Corridors 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 coordination of RNE.

The KPI framework includes capacity management, operations and market development indicators. The most relevant indicators are described below for the years 2020, 2021 and 2022.

Table 8 provides the number of trains per BCP along the RFC ScanMed (i.e. the number of commercial freight trains crossing selected border points), whereas Table 9 includes the number of trains crossing a BCP along the RFC (i.e. the number of trains crossing a corridor BCP, provided that trains crossing more than one BCP are only counted once).

Table 8 Number of trains per BCP along the RFC ScanMed

Border		BCP	2020	2021	2022	2023
NO	SE	Kornsjö	951	1,229	1,401	1,438
SE	DK	Lernacken/Peberholm	7,858	6,965	7,457	6,528
DK	DE	Padborg/Flensburg	9,434	9,116	9,209	9,054
DE	AT	Kiefersfelden/Kufstein	23,684	25,505	25,960	22,261
AT	IT	Brenner/Brennero	18,775	19,866	20,458	18,551

Source: RFC ScanMed KPIs

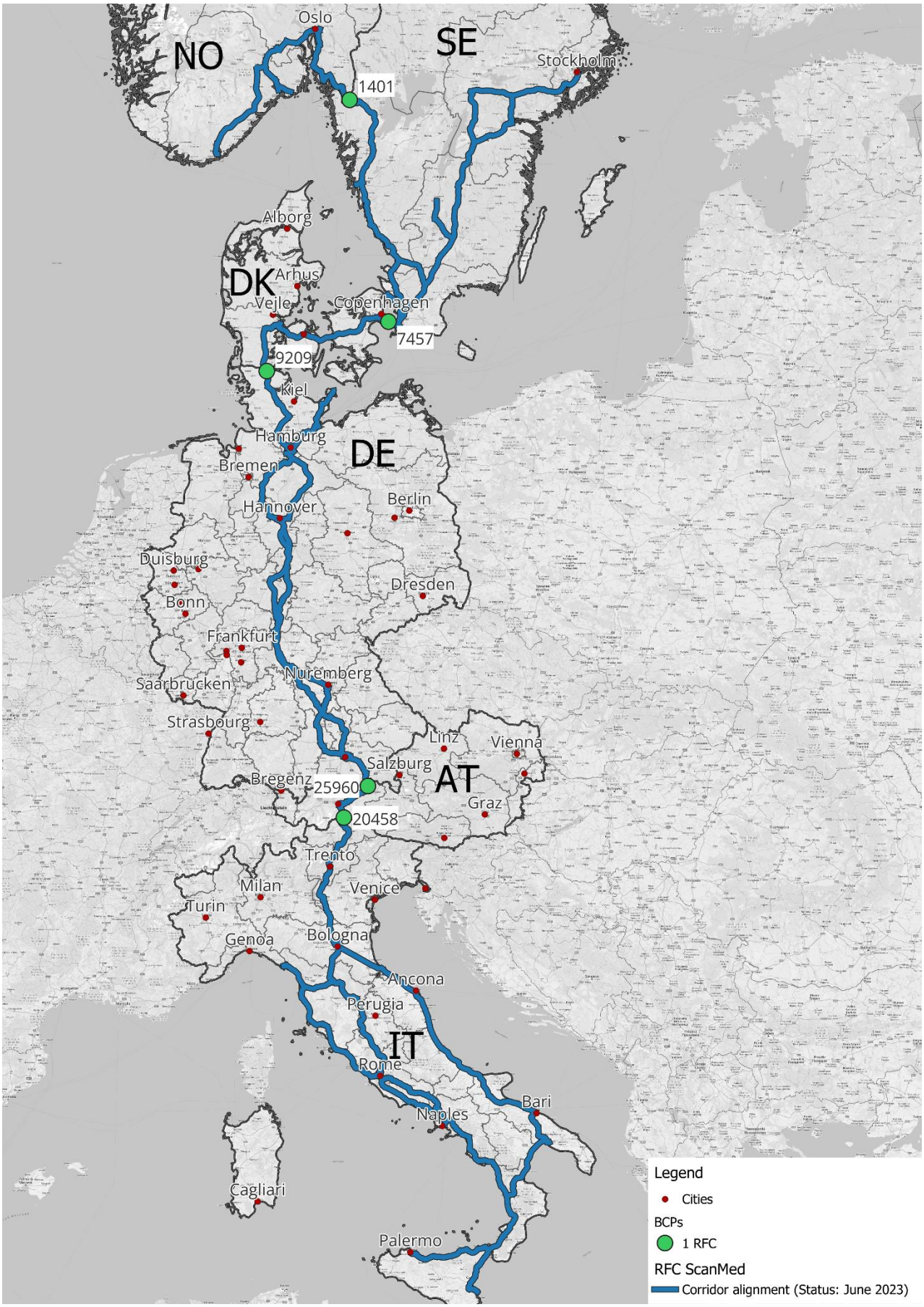
According to the available data, the highest traffic was registered during the past years at Kufstein/Kiefersfelden, between Germany and Austria, followed by Brenner/Brennero, between Austria and Italy. Train traffic data/trends at BCPs include all RFCs trains and may vary according to traffic management 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. Furthermore, the COVID Pandemic first and the Russian war of aggression against Ukraine later also affected traffic on the European network for competitive rail transport. Nonetheless, the number of corridor trains reported in the table below seems to be showing an overall stable trend.

Table 9 Corridor trains crossing at least one RFC ScanMed BCP

	2020	2021	2022	2023
Number of trains crossing a border along RFC ScanMed	46,902	46,743	46,375	43,170

Source: RFC ScanMed KPIs

Figure 9 RFC ScanMed – Trains at BCPs along the RFC ScanMed in 2022



Source: Authors based on CIP and RFC ScanMed KPIs

Further to the number of trains at BCPs, the set of common indicators also include capacity management related parameters, for which data are collected and provided for all RFCs. Figures for the RFC ScanMed are provided in Table 10 below.

Table 10 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	13.7	10.1	10.9	13.5
Volume of requested capacity – PaPs (at X-8), mio (path) km	5.6	3.1	3.9	3.6
Number of requests – PaPs (at X-8)	45	44	33	29
Number of conflicts – PaPs (at X-8)	23	22	8	9
Volume of pre-booked capacity– PaPs (at X-7.5), mio (path) km	4.4	2.4	3.2	3.15
Ratio of pre-booked capacity (to the volume of capacity offered at x-11)	32.4%	24.0%	29.0%	23.4%
Volume of offered capacity – Reserve Capacity (at X-2), mio (path) km	1.8	1.8		
Number of requests – Reserve Capacity (at X+12) (number of PCS dossiers)	2			
Volume of requested capacity – Reserve Capacity (at X+12), mio (path) km	0.05			

Source: RFC ScanMed KPIs

The commonly adopted KPI framework additionally includes indicators to measure the average planned speed of the offered Pre-allocated Paths (Figure 10) and punctuality of freight services along the RFCs (Table 11).

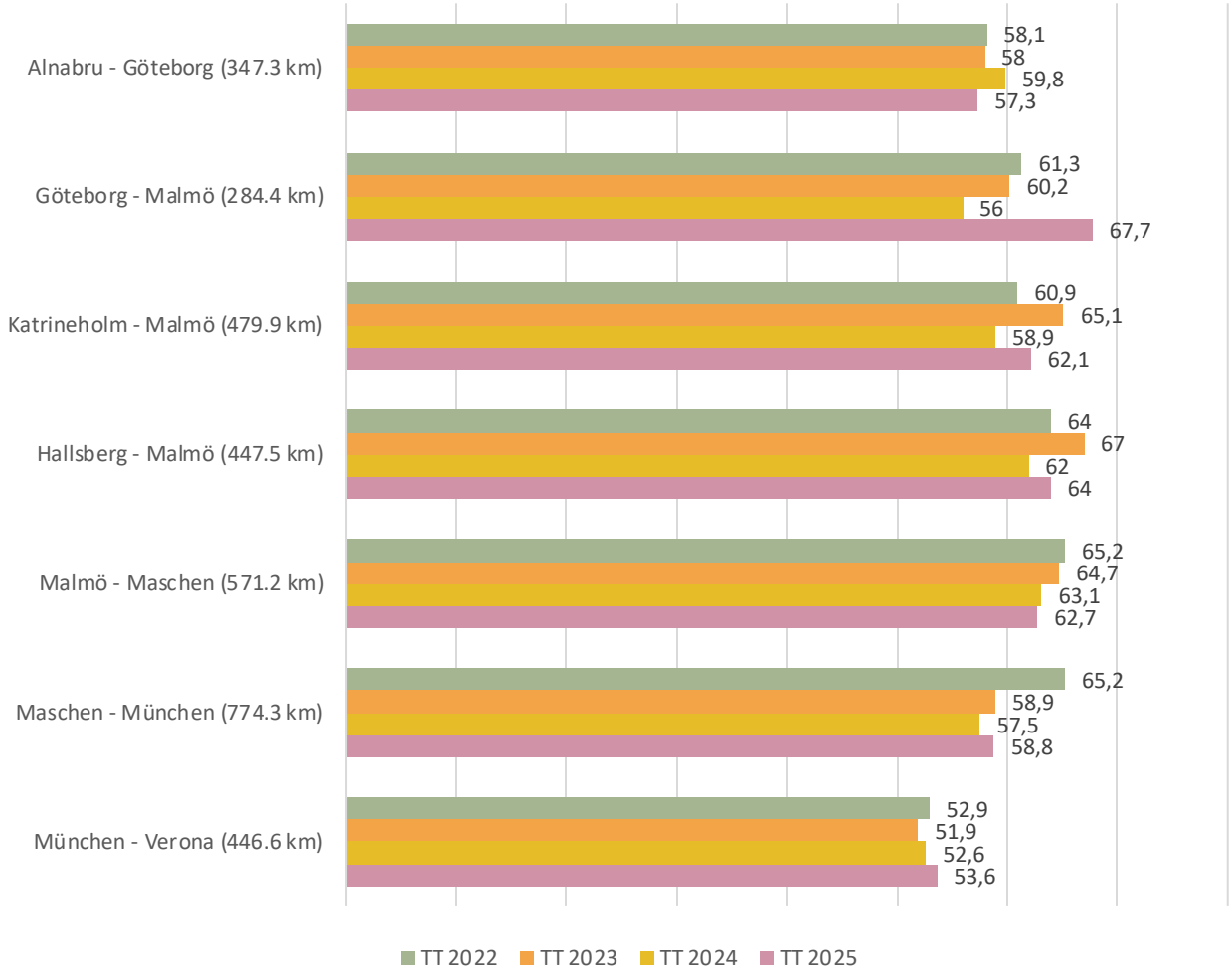
Table 11 Punctuality

				(delay ≤ 30 minutes)
	2020	2021	2022	2023
Punctuality at origin (RFC entry)	71.0%	66.0%	62.0%	62.0%
Punctuality at destination (RFC exit)	64.0%	55.0%	48.0%	47.0%
				(delay ≤ 15 minutes)
Punctuality at origin (RFC entry)	62.0%	56.0%	53.0%	52.0%
Punctuality at destination (RFC exit)	56.0%	47.0%	41.0%	40.0%

Source: RFC ScanMed KPIs

The indicators for the past three years seem to show a steady trend in terms of capacity management and slight decreasing indicators for punctuality, particularly at destination, which might be also related to capacity restrictions along several corridor sections. The COVID Pandemic, reducing traffic of passengers' trains, might also have had a positive impact in terms of punctuality, resulting in better performance of the RFC during 2020 and 2021. Average planned speed of PaPs generally shows a stable/slight decline compared to TT 2022, except for the path Alnabru - Göteborg.

Figure 10 Average planned speed of PaPs, km/h



Source: RFC ScanMed KPIs

2.2.2 SPECIFIC PERFORMANCE OBJECTIVES AND TARGETS

A key task performed by the RFC ScanMed for the monitoring and improvement of the corridor performance relates to Train Performance Management (TPM). The aim of the Corridor's Train Performance Management (TPM) is to measure punctuality, analyse weak points and recommend corrective measures, thus managing the performance of international train services and improving punctuality across borders and handover points.

To improve punctuality (see performance KPIs in Section 41) specific targets have been adopted for 2024, i.e. 70% for punctuality at origin and 60% for punctuality at destination, with reference to delays up to 30 minutes. Furthermore, a specific objective has been also defined, i.e. measuring delays on the Corridor's cross-border stretches, such as the Munich – Verona and the Malmö – Maschen lines, where punctuality can be more realistically improved.

Further to TPM the RFC ScanMed, similarly to other RFCs, is also producing annual reports on the performance of the corridor and the user satisfaction survey.

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

The Train Information System (TIS) tool coordinated 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 can be involved in the operation of international trains. For the analysis presented in this section, Railway Undertakings belonging to the same group of companies have been aggregated into a single unit of analysis. This specified, according to the TIS database, 166 railway undertakings/groups of railway undertakings have been identified which were involved in the operation of international rail freight services along the RFCs in 2022. About half operated more than 1,000 trains, whereas one-fourth operated more than 5,000 trains.

Table 12 Railway Undertakings operating international rail freight trains in 2022

N. of trains	N. 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 Railway Undertakings operating trains along the RFCs in 2022 varied from a minimum of 27 on the RFC Atlantic to 134 on the RFC Rhine-Danube. 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 3.2 below. Not surprisingly, more operations, particularly by large Railway Undertakings/Groups of Railway Undertakings, are concentrated along the RFCs crossing Central and Eastern European countries.

Table 13 Railway Undertakings using RFCs in 2022 by class of number of operated trains

N. 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 corridor: 55% of the RUs operate trains on 4 to 7 RFCs, whereas about 25% operate trains on up to 3 corridors and another 20% operate trains on 8 or more corridors. Only 4 RUs operate trains on all RFCs, and 12 operate trains on only one RFC.

Table 14 Railway Undertakings using RFCs in 2022 by number of corridors 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

61 RUs operated trains on the RFC ScanMed in 2022. Most of them operated trains on more corridors and registered up to 1,000 operations. Still, 6 RUs operated more than 5,000 trains along the RFC ScanMed in 2022.

2.2.4 PASSENGERS TRAIN OPERATIONS ALONG THE RFC SCANMED

As part of the study, a high-level recognition of the passengers' train operations was performed based on the information available from the Train Information System (TIS) tool coordinated by RNE. 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.

Table 15 Main international passengers' cross-border relations encoded in TIS using OEM RFC in 2022

Involved RFC	Origin		Destination	
RFC03	München Hbf	DE	Kufstein	AT
RFC03	Kufstein	AT	München Hbf	DE
RFC03	Rosenheim	DE	Kufstein	AT
RFC03	Malmö central	SE	Østerport	DK

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. There seems to be no evidence of the negative effects of the establishment and operations of the RFCs on passenger traffic.

3 2024 TMS UPDATE BACKGROUND INFORMATION

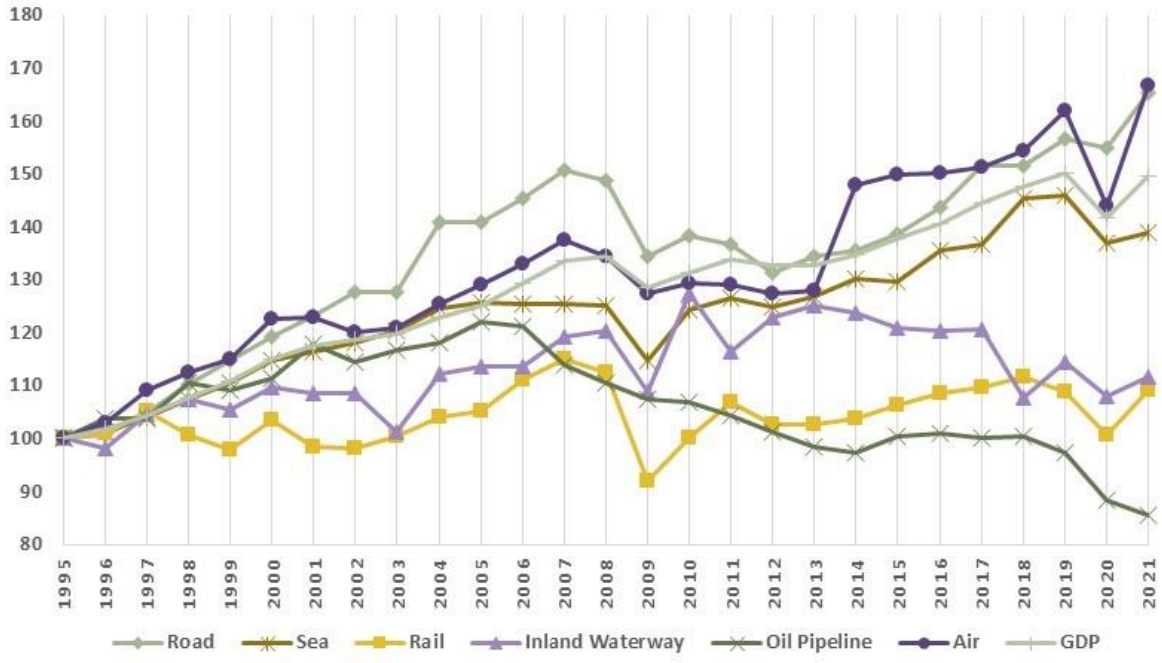
The first section of this chapter provides a statistical framework on the main socio-economic and transport developments on a European scale over the past decades. The second section reports on the main indicators monitored at the European level regarding the rail transport market and its liberalization 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. When ever 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

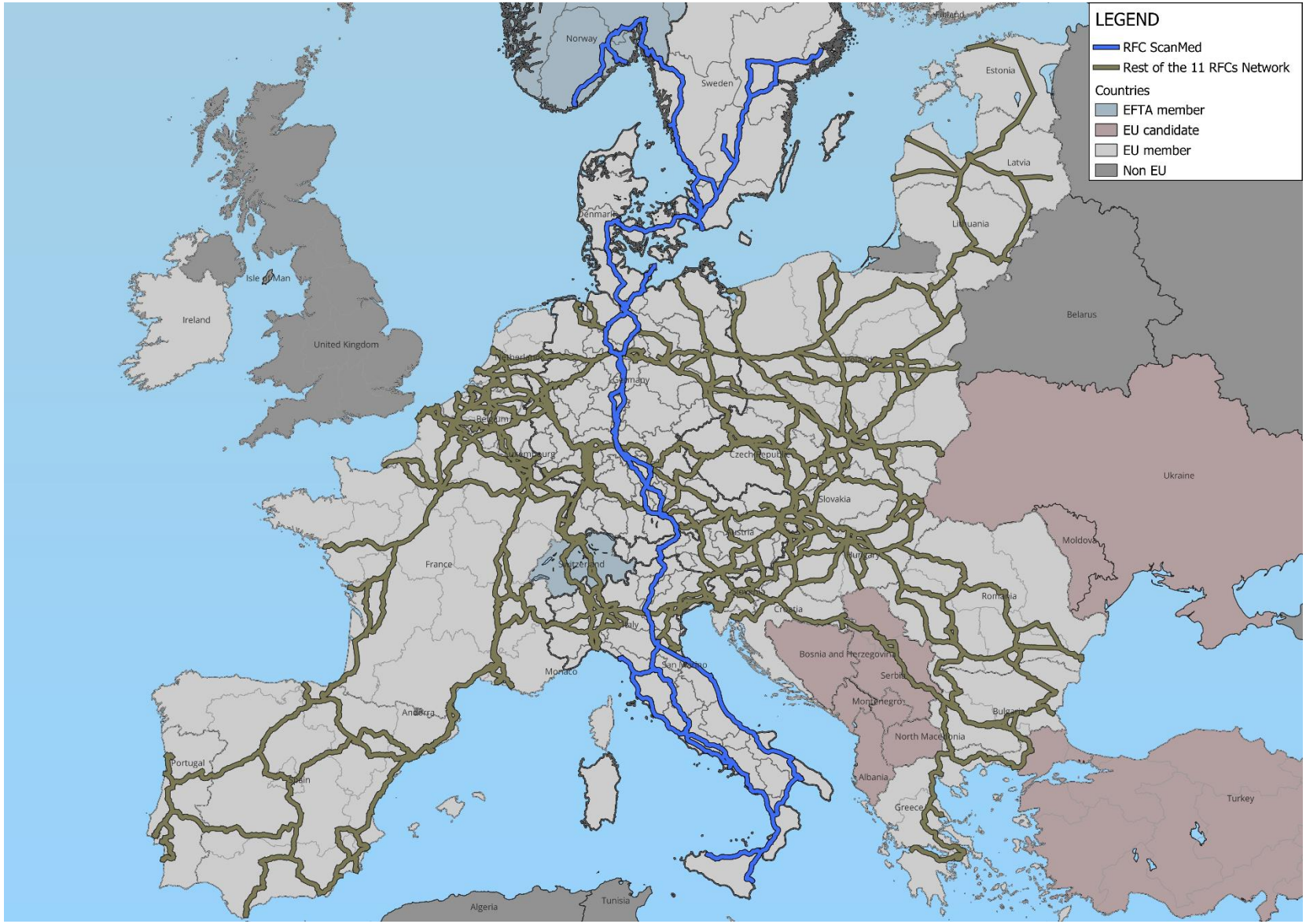
This section briefly reports the main transport statistics from the Statistical Pocketbook 2023, produced by the EC – DG MOVE and Eurostat. The analysis provides an overview of the development of the European rail freight sector since the middle of the 1990s when the rail freight market liberalization 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 – Statistical Pocketbook 2023

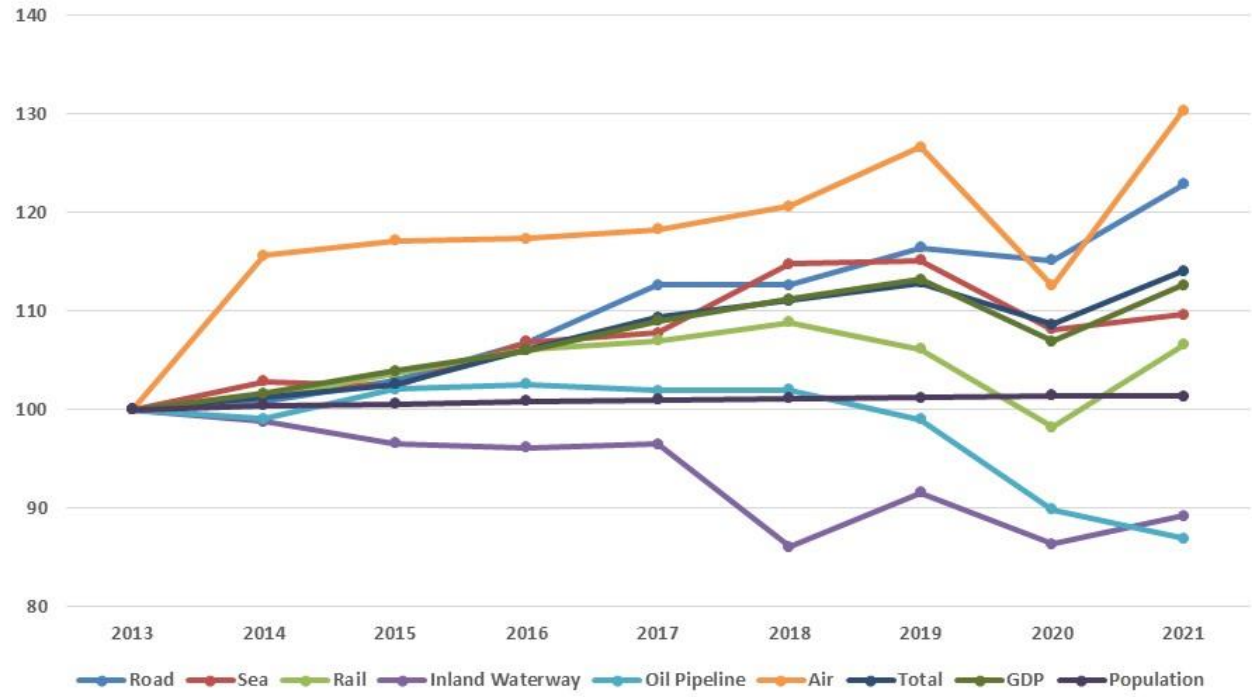
Figure 12 The RD RFC within the 11 RFCs Network



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 war of aggression against Ukraine 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 16 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 16).

Table 17 Combined transport traffic by UIRR companies

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 ScanMed concerned 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 18 RFC ScanMed concerned countries 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
Road	679.5	768.4	800.6	2.1%	2.1%	4.2%
Railways	177.7	191.2	199.7	1.2%	1.5%	4.5%
Inland waterways	62.5	52.7	50.0	-2.8%	-2.8%	-5.2%
Oil pipelines	42.1	43.0	43.9	0.4%	0.5%	2.0%
Total	**961.8**	**1,055.3**	**1,094.2**	**1.6%**	**1.6%**	**3.7%**

Source: EC – DG MOVE – Statistical Pocketbook 2023

The share of rail in total freight transport based on tkm varies significantly across the European Union. Data in Table 19 show rail share is generally higher in Eastern and Central European countries and lower in Western

Europe. Austria and Switzerland are exceptions to this pattern, which is 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 19 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 [tran_hv_ms_frmod]

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 I slower in Ireland, Greece, Portugal, and Spain.

The RFC ScanMed countries are generally registering stable, slightly declining trends in rail market share. A trend that is likely related to the change in the commodity basket trade.

Table 20 Goods transported by rail 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 [rail_go_grpgood__custom_10416020]

Table 21 Goods transported by rail 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 [rail_go_grpgood__custom_10416020]

Table 22 Goods transported by rail by group of goods - from 2008 onwards based on NST 2007 (Tonnes '000) in the RFC ScanMed concerned 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	84,577	159,093	192,851	200,165	108,274	33,758	7,314	18.1%	24.9%	29.9%	32.9%
Metal ores and other mining and quarrying products; peat; uranium and thorium	98,009	119,526	116,638	90,660	18,629	-2,888	-25,978	21.0%	18.7%	18.1%	14.9%
Products of agriculture, hunting, and forestry; fish and other fishing products	18,457	23,785	29,740	28,316	11,283	5,955	-1,424	4.0%	3.7%	4.6%	4.7%
Chemicals, chemical products, and man-made fibers; rubber and plastic products ; nuclear fuel	31,258	38,511	33,545	32,062	2,287	-4,966	-1,483	6.7%	6.0%	5.2%	5.3%
Basic metals; fabricated metal products, except machinery and equipment	74,132	87,083	75,028	70,664	896	-12,055	-4,364	15.9%	13.6%	11.6%	11.6%
Coke and refined petroleum products	53,948	54,321	51,026	49,227	-2,922	-3,295	-1,799	11.6%	8.5%	7.9%	8.1%
Coal and lignite; crude petroleum and natural gas	35,168	47,447	30,823	28,757	-4,345	-16,624	-2,066	7.5%	7.4%	4.8%	4.7%
Other goods	71,529	109,990	116,066	107,839	44,537	6,076	-8,227	15.3%	17.2%	18.0%	17.7%
Total transported goods	**467,078**	**639,756**	**645,717**	**607,690**	**178,639**	**5,961**	**-38,027**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat [rail_go_grpgood__custom_10416020]

Table 23 Goods transported by rail by group of goods - from 2008 onwards based on NST 2007 (tkm '000.000) in the RFC ScanMed concerned 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	42,958	56,170	67,523	71,687	24,565	11,353	4,164	29.9%	32.6%	36.6%	40.4%
Products of agriculture, hunting, and forestry; fish and other fishing products	17,516	20,896	19,985	17,323	2,469	-911	-2,662	12.2%	12.1%	10.8%	9.8%
Chemicals, chemical products, and man-made fibers; rubber and plastic products ; nuclear fuel	6,488	6,316	8,181	7,455	1,693	1,865	-726	4.5%	3.7%	4.4%	4.2%
Metal ores and other mining and quarrying products; peat; uranium and thorium	10,079	12,255	10,557	9,935	478	-1,698	-622	7.0%	7.1%	5.7%	5.6%
Coal and lignite; crude petroleum and natural gas	19,871	20,123	18,401	15,284	-1,470	-1,722	-3,117	13.8%	11.7%	10.0%	8.6%
Basic metals; fabricated metal products, except machinery and equipment	13,556	12,751	12,514	12,173	-1,042	-237	-341	9.4%	7.4%	6.8%	6.9%
Coke and refined petroleum products	6,145	8,408	7,136	7,237	991	-1,272	101	4.3%	4.9%	3.9%	4.1%
Other goods	27,154	35,306	40,201	36,211	13,047	4,895	-3,990	18.9%	20.5%	21.8%	20.4%
Total transported goods	**143,767**	**172,225**	**184,498**	**177,305**	**40,731**	**12,273**	**-7,193**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat [rail_go_grpgood__custom_10416020]

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 20 and Table 23). 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 any 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 RFC ScanMed concerned countries (see Table 22 and Table 23).

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[8]. 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[9].

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 25 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).

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

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

Table 24 Market liberalisation and number of active railway undertakings

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 railway undertakings gradually declined in most EU Member States (Table 25), 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 ScanMed concerned countries, the market share of the domestic incumbent in 2021 was 40% on average, slightly above 50% considering national and international incumbents.

Table 25 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, such as France, Spain, and the United Kingdom, also experienced a decline (Table 26). 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 one of the RFC ScanMed concerned countries: **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 26 Rail traffic in million train-km

Country	Total rail traffic			Share of freight services		
Year	2013	2021	var. 2021-2013	2013	2021	var. 2021-2013
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	**1055**	**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 27) 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 Denmark, the RFC ScanMed concerned countries seem to have also registered positive variations during the pandemic period.

Table 27 Rail freight traffic in billion net tkm

Country	Freight traffic			Evolution of tkm	
Year	2013	2021	var. 2021-2013	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 (Table 28). The RFC ScanMed-concerned countries show stable/marginally positive growth, with relevant growth observed in Germany.

Table 28 International freight services

Member state	2010	2020	var. 2020-2010
AT - Austria	**14%**	**17%**	**3%**
BE - Belgium	4%	5%	1%
BG - Bulgaria	1%	2%	1%
CZ - Czechia	-	**11%**	-
DE - Germany	**53%**	**62%**	**9%**
DK - Denmark	**2%**	**2%**	**0%**
EE - Estonia	6%	1%	-4%
EL - Greece	-	1%	-
ES - Spain	1%	2%	0%
FI - Finland	3%	3%	1%
FR - France	8%	13%	5%
HR - Croatia	-	2%	-
HU - Hungary	7%	10%	3%
IT - Italy	**10%**	**10%**	**0%**
LT - Lithuania	10%	12%	2%
LU - Luxembourg	1%	0%	-1%
LV - Latvia	17%	7%	-9%
NL - Netherlands	5%	10%	5%
NO - Norway	**1%**	**1%**	**0%**
PL - Poland	21%	23%	2%
PT - Portugal	0%	1%	0%
RO - Romania	2%	0%	-2%
SE - Sweden	**9%**	**8%**	**-1%**
SI - Slovenia	4%	5%	1%
SK - Slovakia	10%	8%	-2%

Source: EC – DG MOVE and IRG-Rail

The network usage intensity of freight trains remained overall stable, with either marginal positive, negative or null variations between 2013 and 2021, except for Austria. More significant variations during the same period occurred for total traffic, meaning that passenger services increased equally and, in most cases, more than freight services. The parameter is calculated on the total network of the countries, and the data for the electrified sections of the network generally show higher usage intensity than the one related to the entire network.

Table 29 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. 2021-2013	2013	2021	var. 2021-2013	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 RFCs. 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 prices, 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.

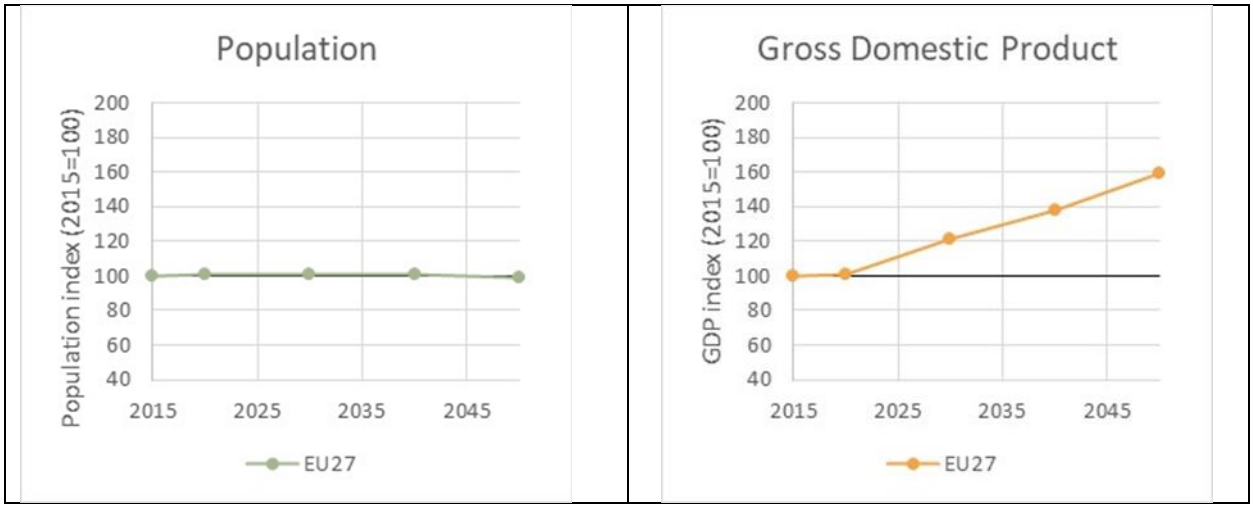
For a complete list of included transport and energy policies, we refer to the report on the EU Reference Scenario published by the EC[10]. The central model behind the EU Reference Scenario is the PRIMES model, an energy system model that produces projections for energy, transport and CO_2 emissions.

Figure 14 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 impact of the COVID-19 pandemic is visible in the 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.

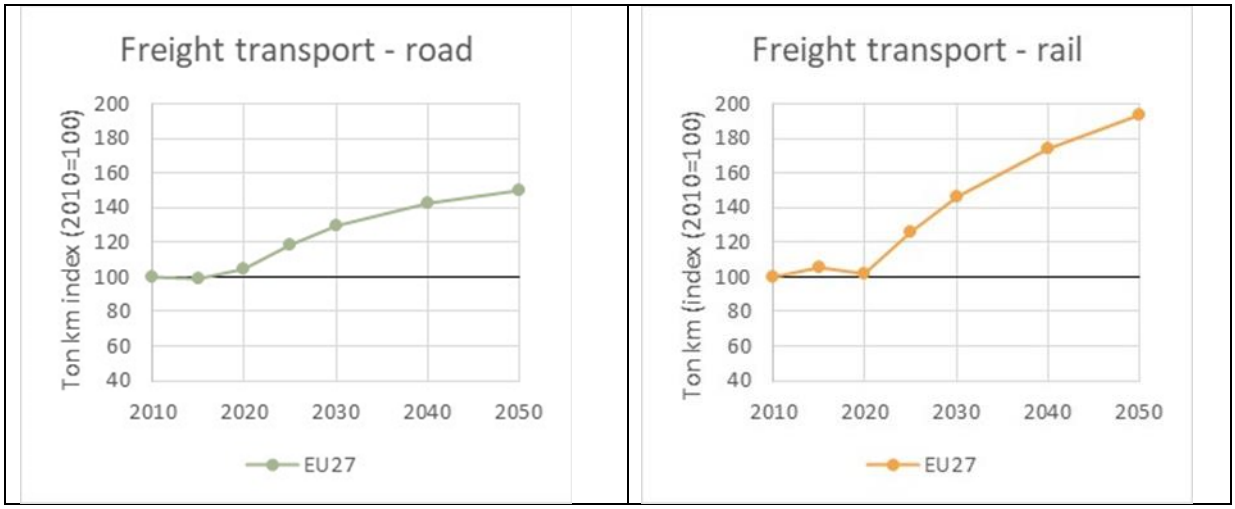
Figure 14 Forecasts population and GDP development in the EU27 between 2015 and 2045



Source: EC (2021)

[10] EC, 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

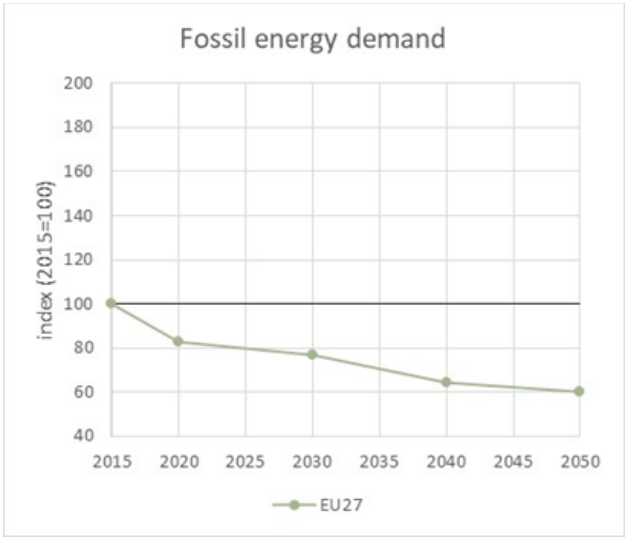
Figure 15 Forecasts on freight transport by road and rail (tkm, index 2010=100) for the EU27



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.

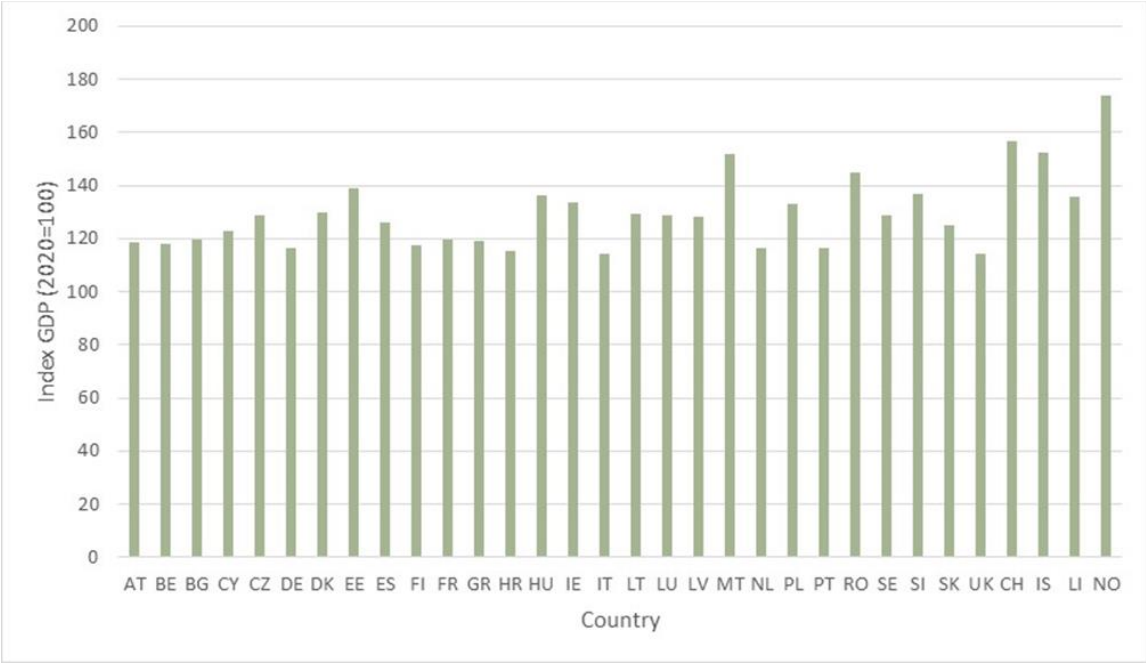
Figure 16 Forecasts on fossil energy demand for the EU27



Source: EC (2021)

The GDP figures from the EU Reference Scenario are used to make projections for 2030 for international rail transport in Europe. Figure 17 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



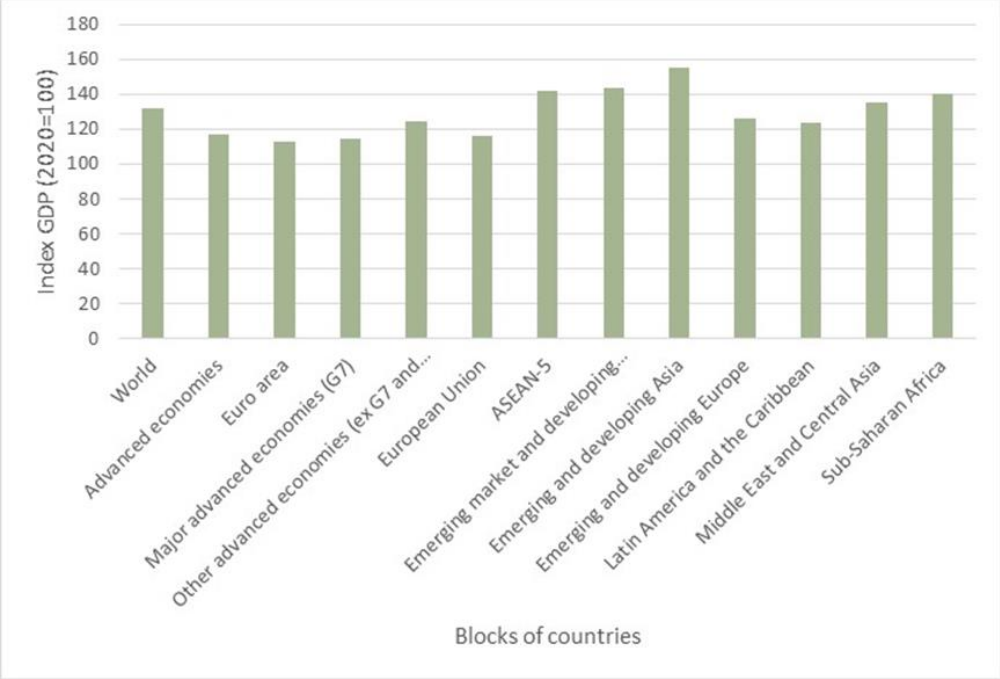
Source: EC (2021)

World Economic Outlook

Concerning the World Economic Outlook[11], 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. Figure 18 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.

[11] 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 Antwerp Western ring road, 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 rail 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).

Currently, a number of projects are ongoing and/or are 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 complement 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. Other projects are much smaller such as the upgrading or modernisation of railway lines. 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.

Table 30 below shows the projects that are considered in the Projects scenario. The selected projects reflect the purpose of the study and nature of the model, limited to the freight market analysis and thus modal share estimation, excluding network capacity simulation and assessment, and looking at the 2030 time-horizon. It is worth noticing that given the uncertainties related to the completion by 2030 of the European standard gauge network in the Iberian peninsula, as well as the full deployment of ERTMS and the possibility of operating 740 meter trains and the achievement of the 22.5 t 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 the 11 RFCs Network in line with the TEN-T standards (see 3.3.3). This network-wide solution was deemed more appropriate than implementing individual projects within the Projects scenario 2030 as the presence of gaps in the completion of the 11 RFCs Network at TEN-T standard makes the impact of those investments negligible, especially for the European track gauge, axle load, P400 loading gauge, ERTMS and 740 meter long trains standards.

Table 30 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	OEM
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

Project	End date	RFC
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
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

Source: Authors based on review of RFCs Implementation Plans and Core Network Corridors Common Project List

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[12]. 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 not fully defined yet. 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%**.
- ***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

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

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[13], 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.*** 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 complements 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.
- ***Brenner base tunnel***. As part of the Sensitivity analysis, we also included the Brenner base tunnel, between Austria and Italy. It is assumed to have an impact on the North-South rail freight traffic.

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

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

4 ANALYSIS OF THE CURRENT RFC SCANMED TRANSPORT MARKET

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

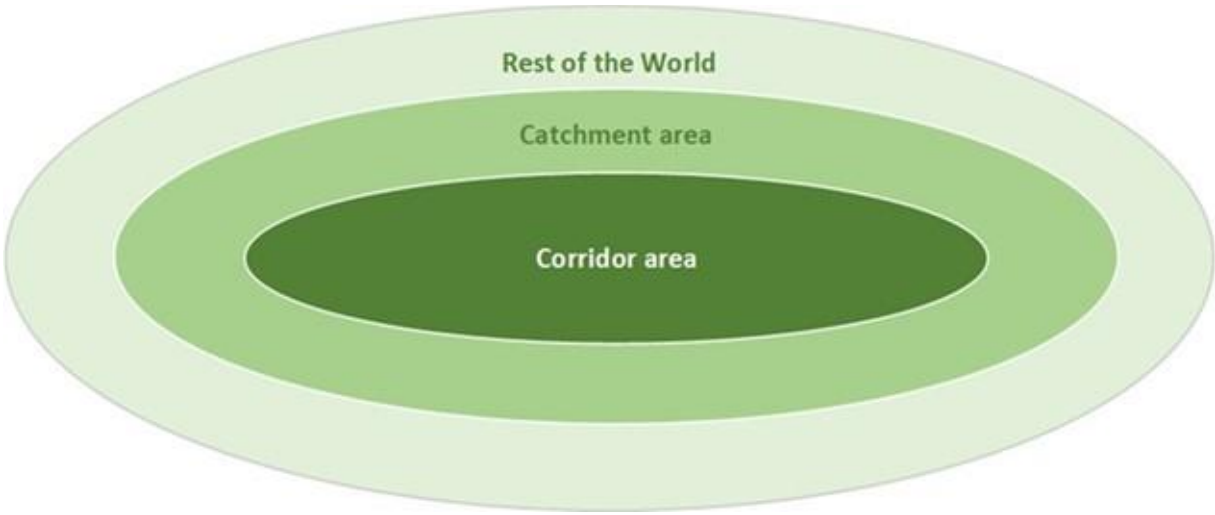
- Section 4.1 presents the **definition of the catchment area and corridor area**. It shows the importance of both definitions and lays a basis for the rest of the chapter.
- Section 4.2 presents **international rail freight transport for the 11 RFCs network area**:
  - Section 4.2.1 gives an overview of the catchment area of the **11 RFCs network area**;
  - Section 4.2.2 provides a general overview of **all international freight transport in the catchment area for the 11 RFCs network 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 **catchment area for international rail freight transport for the 11 RFCs network 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 area**.
- Section 4.3 provides the **international (rail) freight transport along the RFC ScanMed**:
  - Section 4.3.1gives an overview of the **RFC ScanMed corridor and catchment areas**;
  - Section 4.3.2 provides **a general overview of all international freight transport in the RFC ScanMed corridor 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 catchment area of the RFC ScanMed**. This provides a general overview of the origins and destinations of rail freight for the RFC ScanMed.
  - Section 4.3.4 describes the **international rail freight transport along the RFC ScanMed**.

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 difference between these two types of areas is important, as numerous origins and destinations within a corridor area of an RFC 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[14] 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 the freight railway lines of this RFC. Regarding the **catchment area**, a more precise definition is applied. To qualify, rail transport between an origin and destination must cross *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 only be appropriately understood within the rail freight market across the whole European rail network. Each RFC has connections or overlaps with other RFCs. Also, trains using an RFC often have an origin or destination outside of a corridor area. Furthermore, by looking at

[14] 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 the basis for the analysis of the individual RFCs' markets.

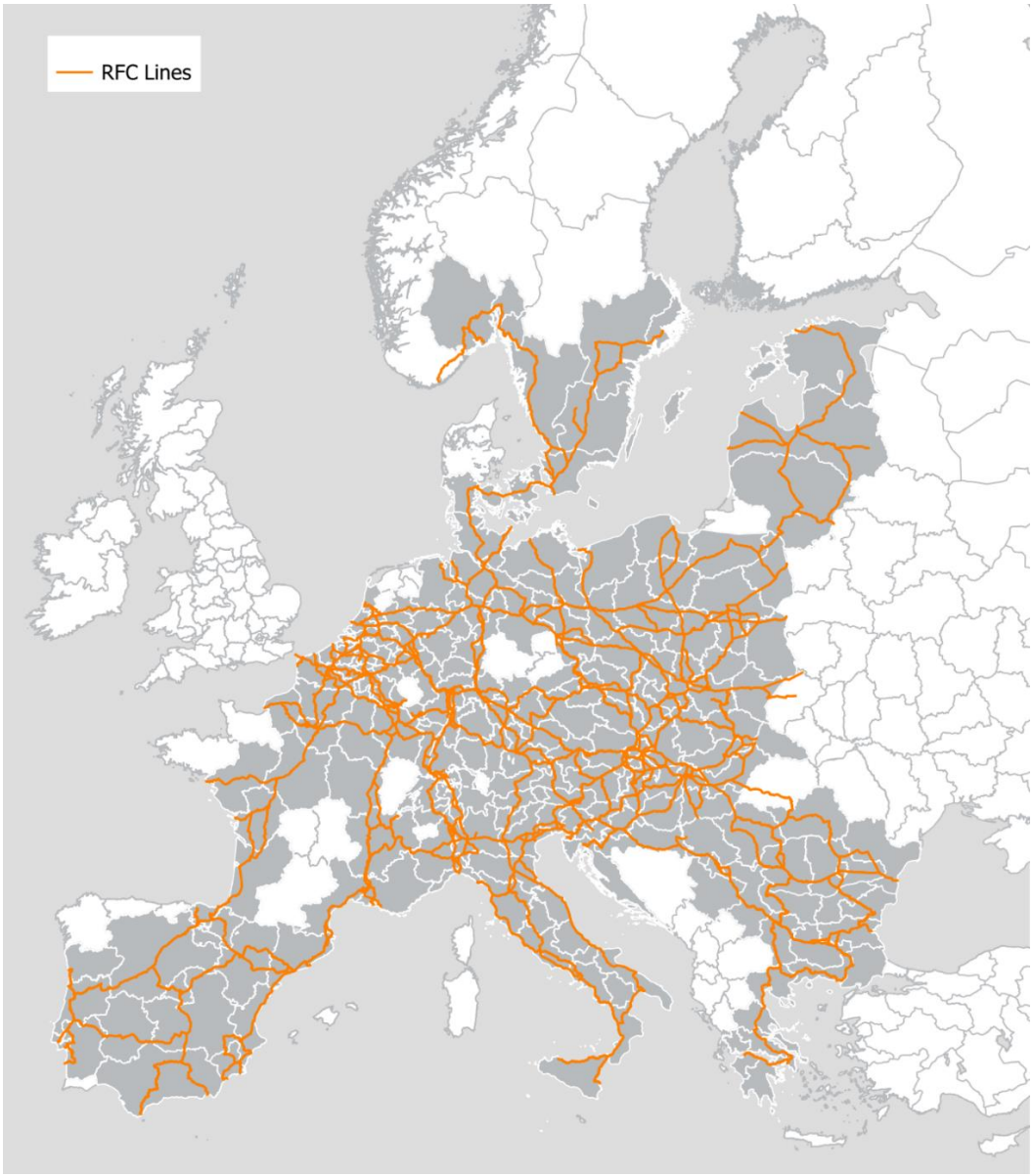
This section starts with a description of the corridor and catchment areas of the 11 RFCs network. It then first focuses on *all* international freight transport of the catchment area of the 11 RFCs Network. After that it presents the results at an aggregate level, before describing the volumes for origin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

4.2.1 CORRIDOR AND CATCHMENT AREAS OF THE 11 RFCS NETWORK

Figure 20 provides an overview of the *corridor area* 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 have no railway lines that belong to and RFC. The 11 RFCs Network *catchment area*[15] covers a much wider area. It includes countries and regions such as Ukraine, Moldova, Kazakhstan, UK, Northern Scandinavia and China. For rail transport the 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.

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

Figure 20 Corridor area and railway lines of the 11 RFCs Network

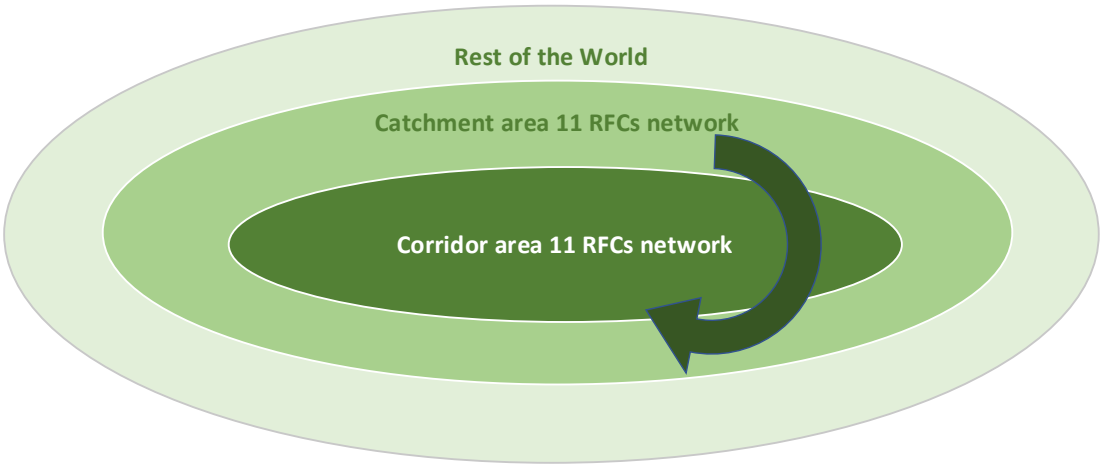


Source: RNE/Panteia/NEAC

Figure 21 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 corridor area of the 11 RFCs Network and the 11 RFCs Network 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 area of the 11 RFCs Network. The analysis focuses on land modes that compete within the catchment area, i.e. road, rail, and inland shipping[16]. For the RFC specific part, also sea transport receives attention.

[16] 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.

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[17]

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 442.000 international trains[18]), 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[19], the category *Other* (general cargo, including intermodal transport and container) dominates the international freight transport for the 11 RFCs Network, by 845 million tonnes. 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.

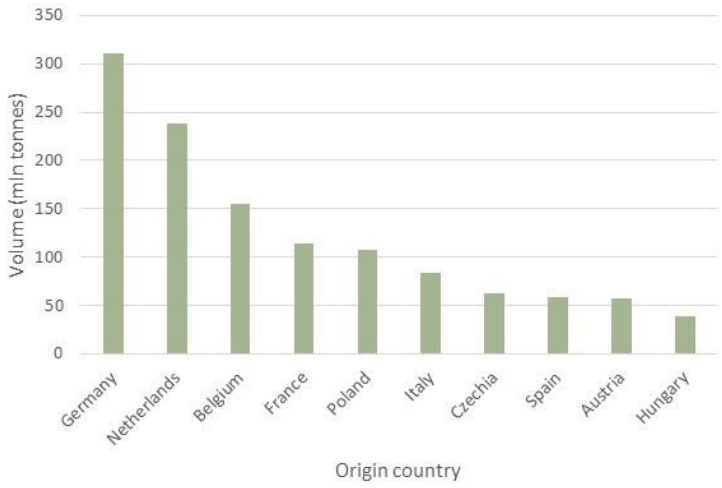
Figure 22 Estimated volume (million tonnes)[20] of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network in 2022.

Source: NEAC estimations

[17] This chapter is a copy of section 4.2.2 of the RFCs joint transport market study.
[18] Using an average of 600 tonnes per train
[19] 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.
[20] 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.

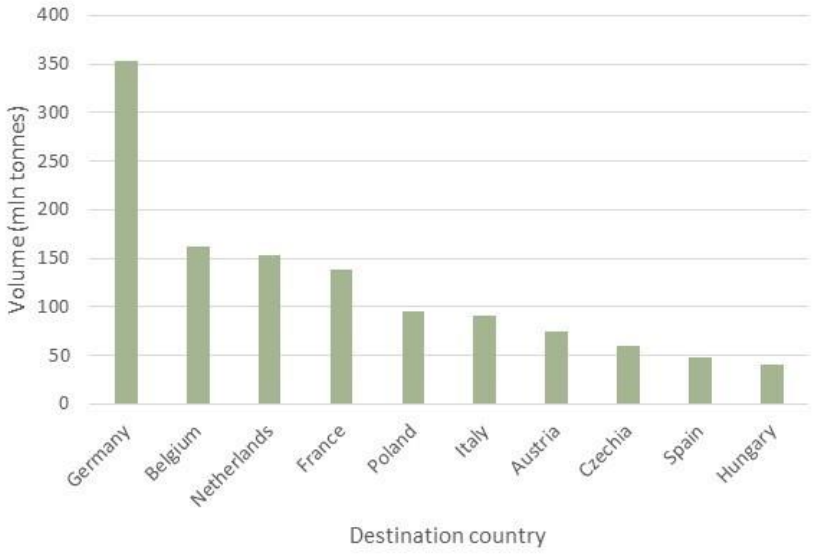
Figure 23 and Figure 24 show the top 10 origin and destination countries of *all* international freight transport within the 11 RFCs Network catchment area. The top 3 origin and destination countries for international freight transport over land in the 11 RFCs Network are Germany, the Netherlands and 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, and Port of Antwerp-Bruges), both the Netherlands and Belgium are important origin and destination countries as well 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



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.



Source: NEAC estimations

Table 31 shows the 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 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). The freight transport relations between these 3 countries show the importance of the ports in the Rhine-Scheldt delta for their hinterland. Some 27% of all international freight transport in the 11 RFCs Network area concerns the relationship between these 3 countries.

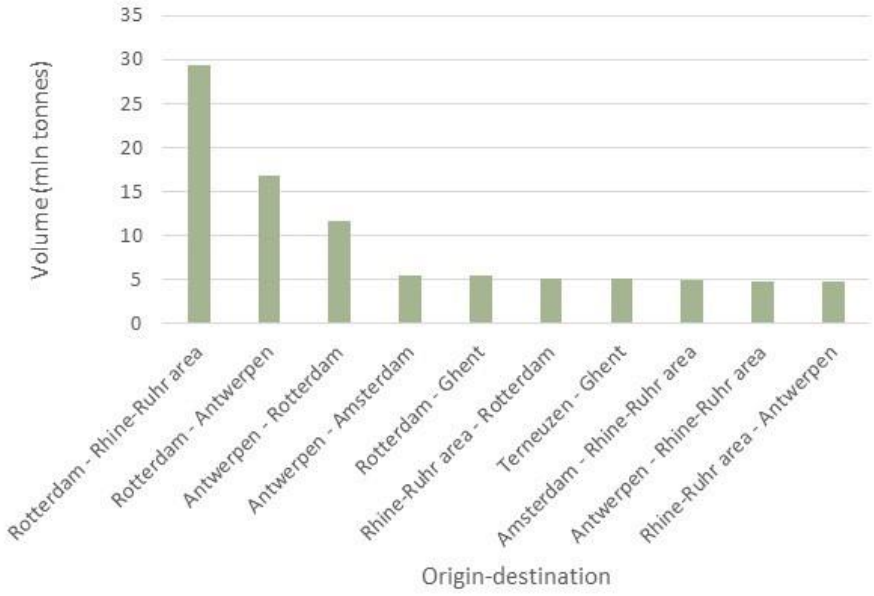
Table 31 Freight volumes (million tonnes) between the 15 most important origin and destination countries in 2022.

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 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 Port) and Antwerp (Port of Antwerp-Bruges), and inland locations such as the Rhein-Ruhr area).

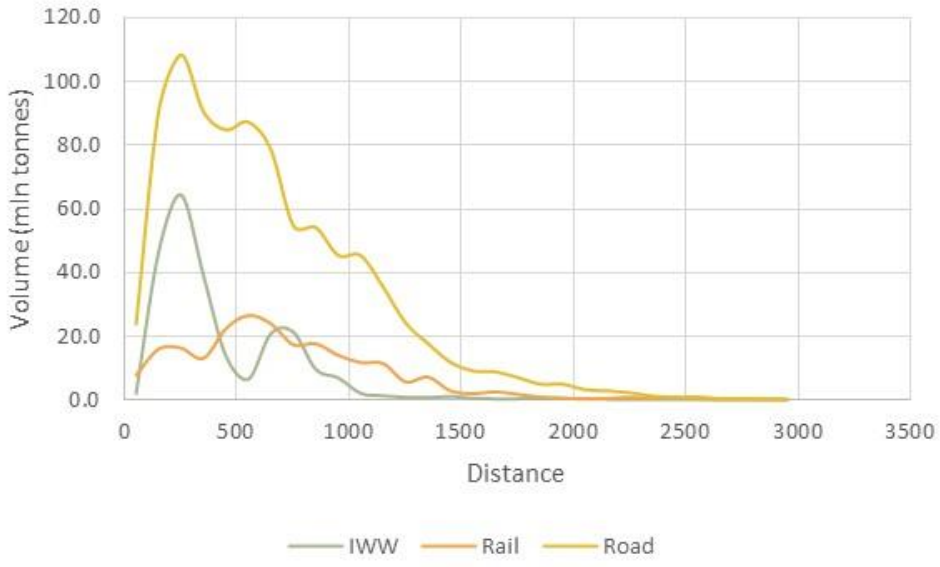
Figure 25 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of all international freight transport over land in 2022 within the catchment area of the 11 RFCs Network



Source: NEAC estimations

The 'trip' length distribution for international freight transport in Europe in the catchment 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) *within* the catchment area of the 11 RFCs Network in 2022



Source: NEAC estimations

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

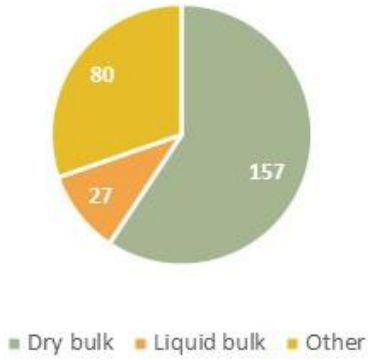
The rail freight transport catchment area of the 11 RFCs Network is shown in Figure 28 and Figure 29. Figure 28 provides an overview of the volumes by origin, while Figure 29 shows the volumes by destinations. As can be seen, international rail freight transport is clearly generated or destinated outside the corridor area of the

11 RFCs Network (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. Note that some areas are white. These do not generate or receive international rail transport.

Important NUTS2 origins[21] for rail freight transport are Rotterdam, Hamburg, the Rhein-Ruhr area, Linz, Ostrava, Katowice, Trieste, 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.

Figure 27 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.

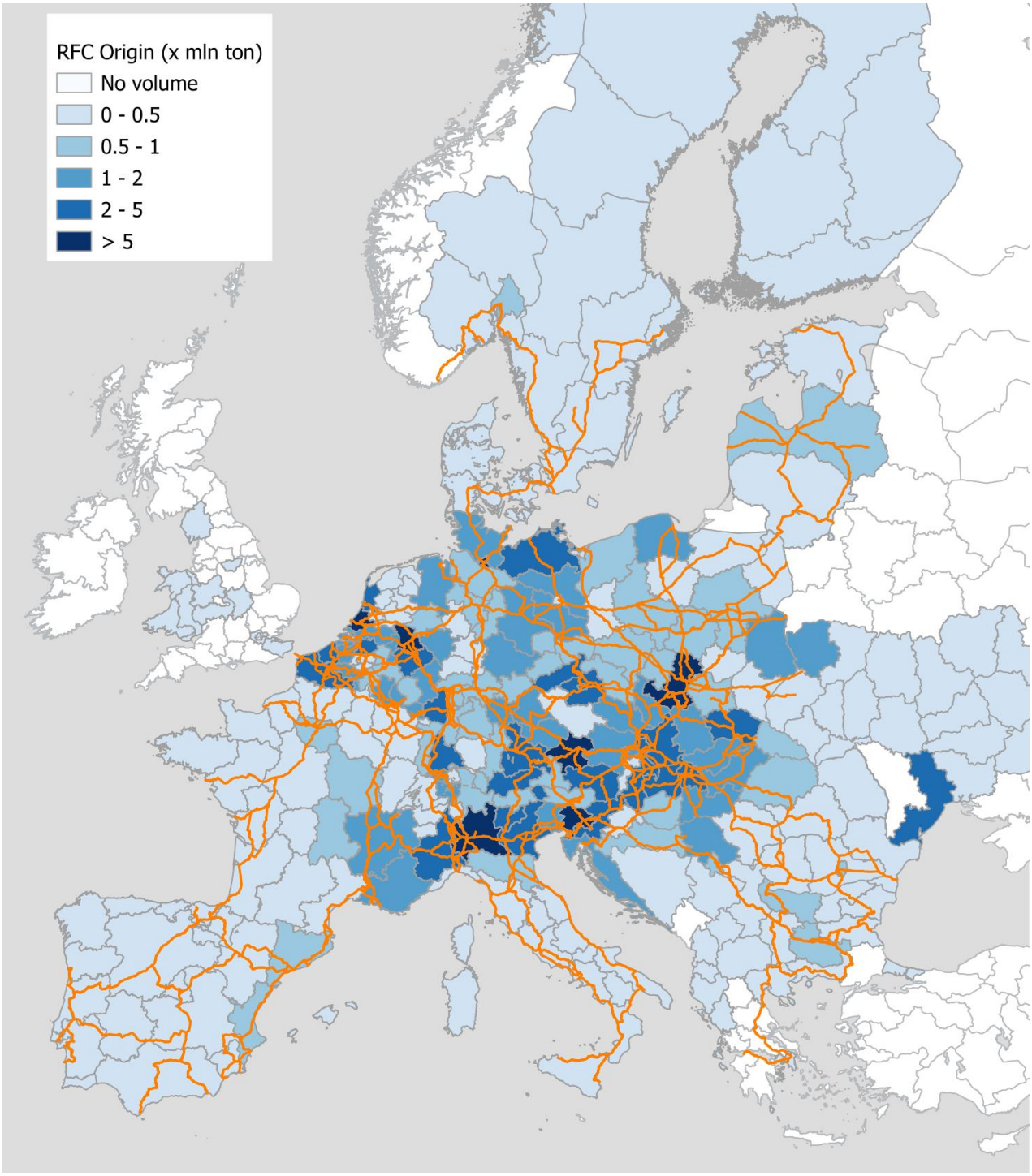
Figure 27 Estimated volume of international rail freight transport (million tonnes) by cargo type in 2022, in the 11 RFCs Network catchment area



Source: NEAC estimations

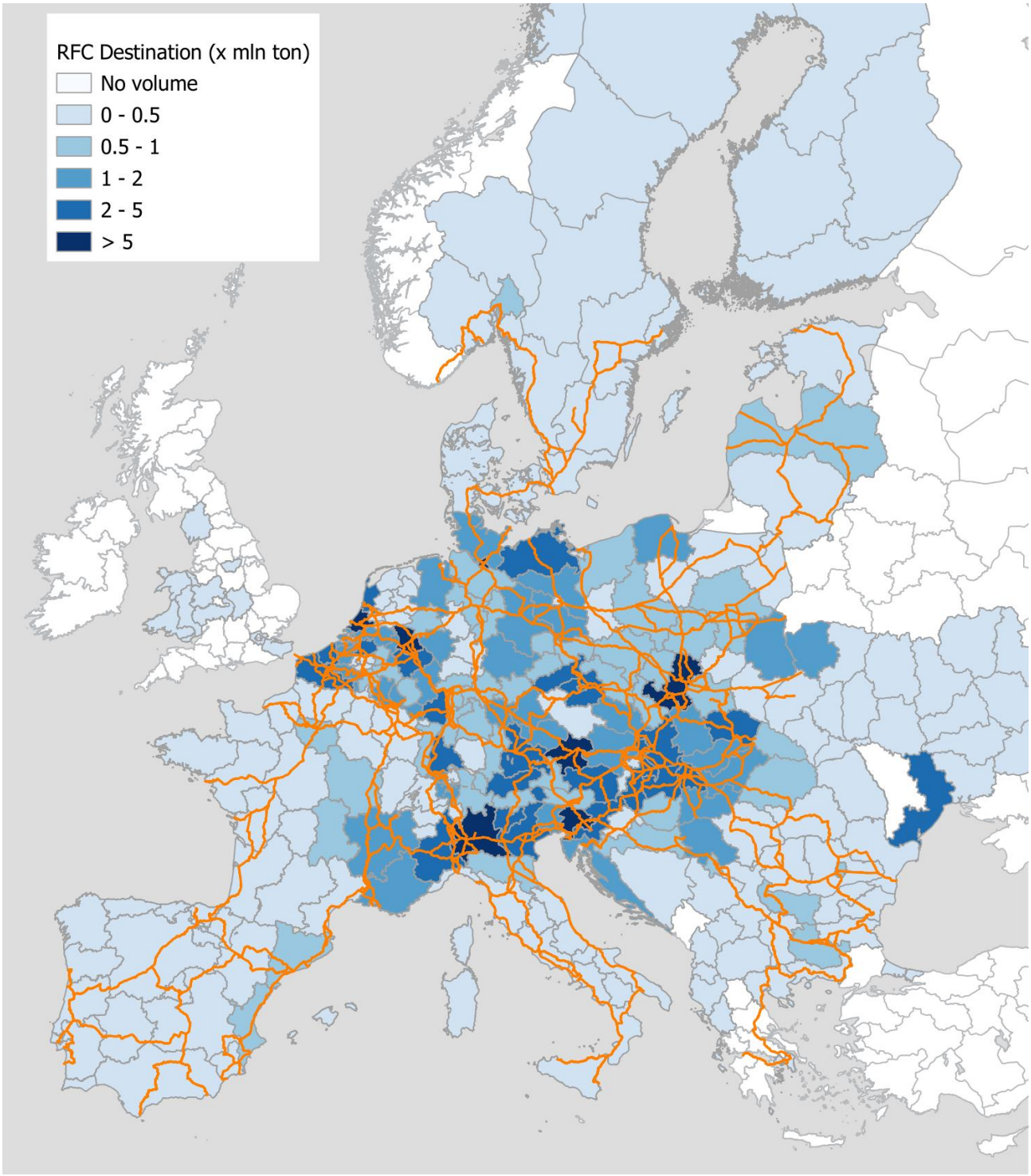
[21] We present the NUTS2 regions by mentioning the main cities in these regions, to make it easier to understand the results.

Figure 28 Origins of international rail freight transport (in million tonnes) for the 11 RFCs Network catchment area in 2022.



Source: NEAC estimations

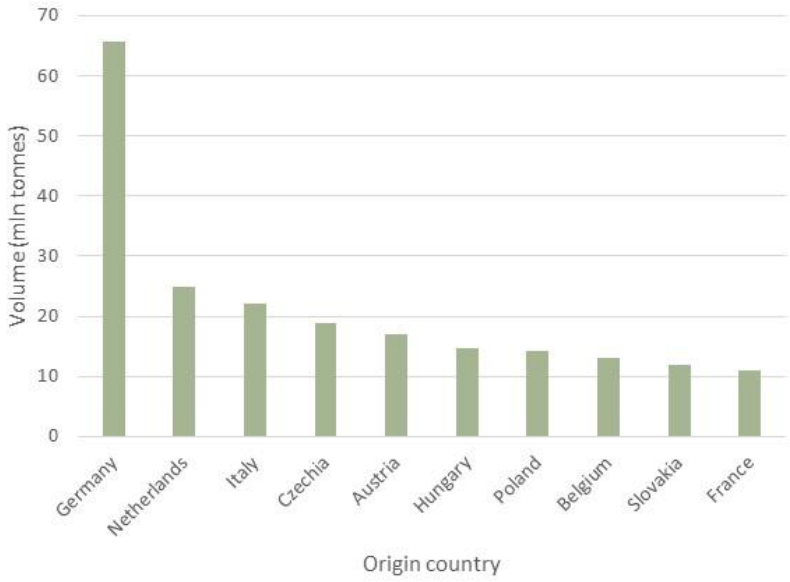
Figure 29 Destinations of international rail freight transport (in million tonnes) for the 11 RFCs Network catchment area in 2022



Source: NEAC estimations

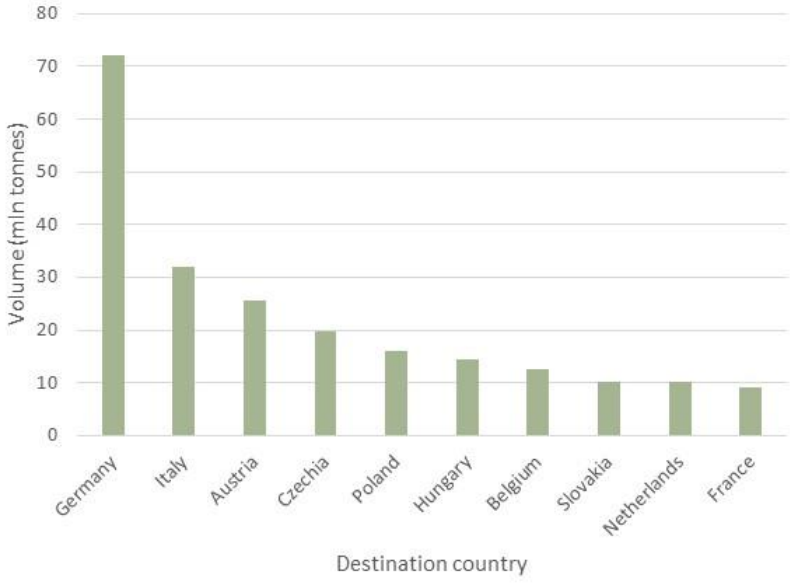
The most important origin and destination countries for rail transport are shown in Figure 30 and Figure 31. For both origin and destination, Germany is the country with the highest international rail freight transport volumes. As an origin country it ships 66 million tonnes, while as a destination it 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

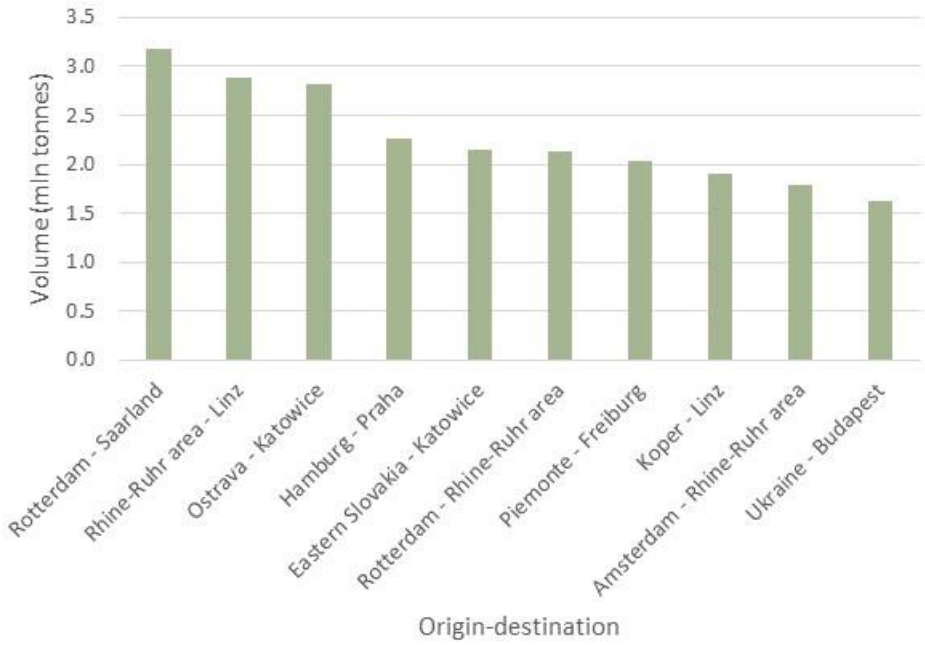
Figure 31 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the 11 RFCs Network catchment area



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). In second place 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 Ostrava and Katowice, which is mostly dry bulk (coal) for the steel plants in Ostrava. 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 relations in 2022 in the 11 RFCs Network catchment area



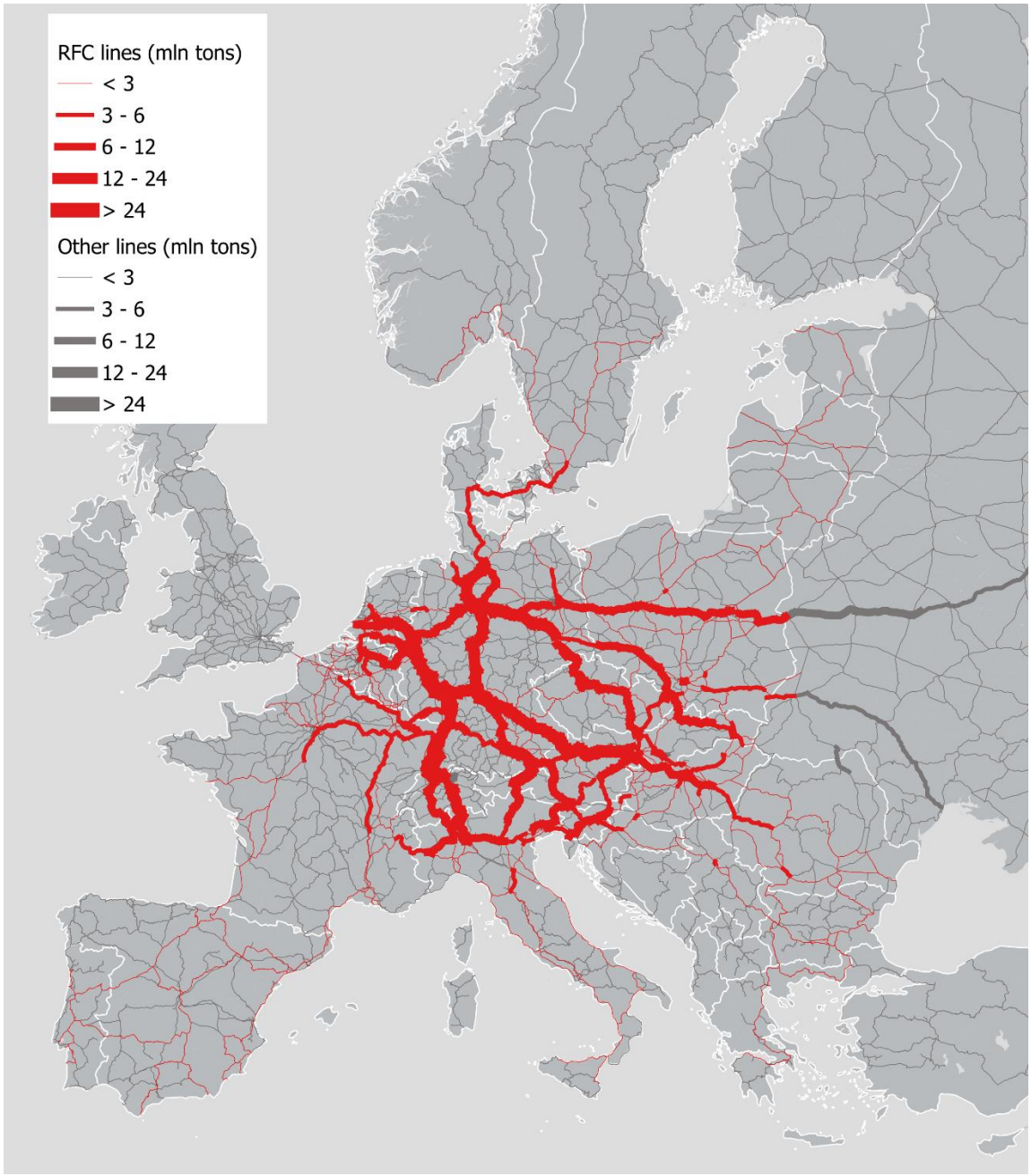
Source: NEAC estimations

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

Figure 33 shows the estimated international rail freight flows (in tonnes) for the 11 RFCs Network area. This provides a general overview of the main railway lines in Europe. As can be seen, Germany comprises the most used railway lines 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, Greece, South of France, Sweden, Norway and the Baltic States. The international rail freight volumes in those 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 FREIGHT TRANSPORT IN THE RFC SCANMED

After the presentation of the European international freight transport market, this section provides further details on international freight transport for the RFC ScanMed. The structure of this section is as follows:

- Presentation of the catchment and corridor areas of the RFC ScanMed;
- Description of the results for all international freight transport for the RFC ScanMed corridor area;
- Results of the international rail freight transport in the RFC ScanMed catchment area;
- Flows of rail freight on the RFC ScanMed.

4.3.1 CORRIDOR AND CATCHMENT AREA OF RFC SCANMED

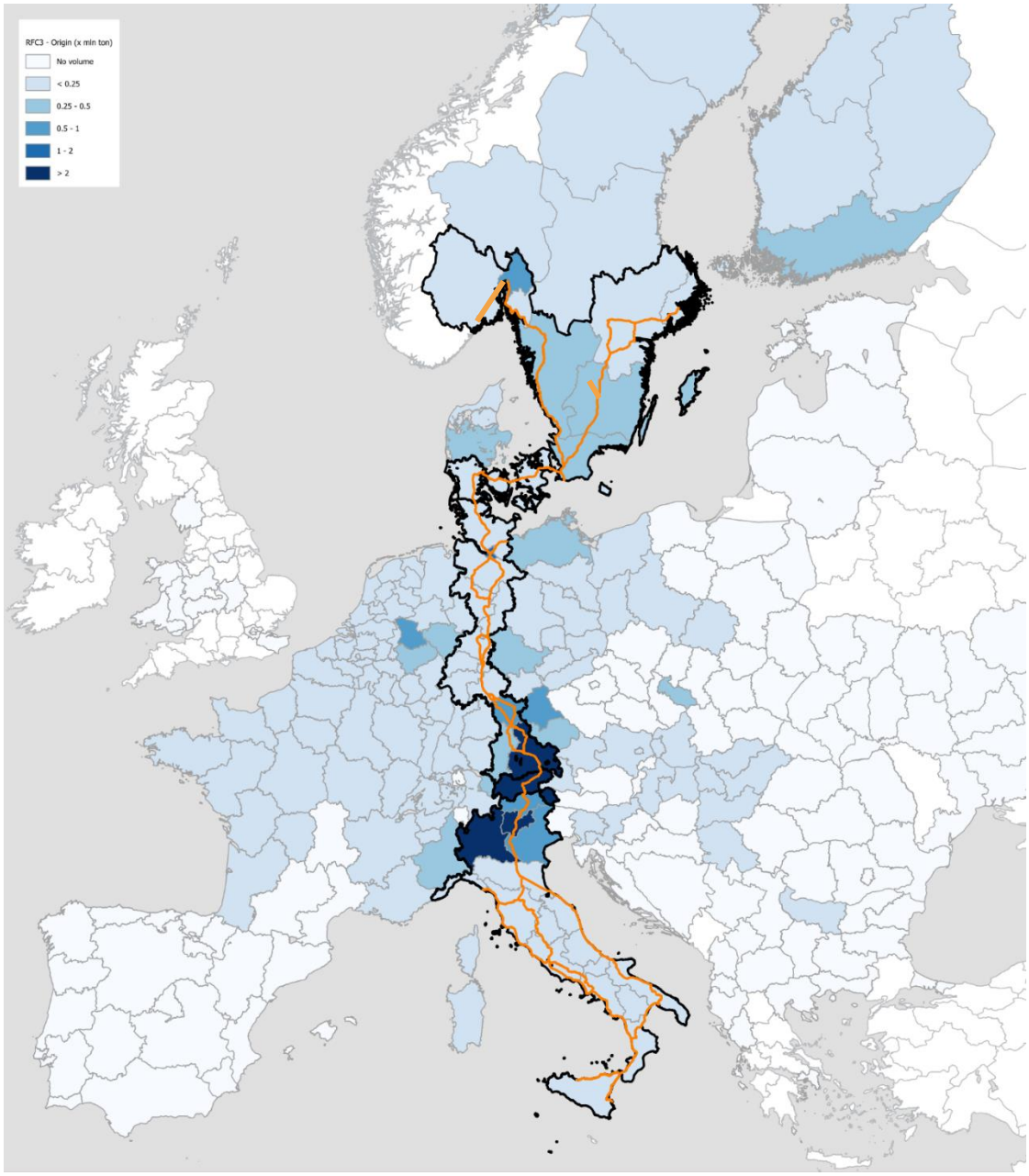
In section 4.1, a definition of corridor and catchment areas is given. This section details the corridor area for the RFC ScanMed. Figure 34 provides an overview of the RFC ScanMed network within its corridor area, in relation to the rest of the European rail network. The RFC ScanMed network and corridor 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 ScanMed is also dependent upon rail transport to and from locations outside the corridor area of the RFC ScanMed, as further elaborated in later sections.

Figure 34 Corridor area and rail network of the RFC ScanMed

Source: Panteia

The catchment area for international rail freight transport of the RFC ScanMed exceeds the corridor area. It captures large parts of The Netherlands, Belgium, France, and Hungary, to name a few countries. A large proportion of the rail freight transport uses the RFC ScanMed, 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 ScanMed, with important origins such as Hamburg, Munich, and Milan, as well as other locations in Germany and Italy. Some origins are port areas, which use the RFC ScanMed to ship goods to the hinterland such as Hamburg. Also, outside the corridor area different zones can be seen that contribute to the RFC ScanMed. Note that outside the corridor it often concerns small amounts of volume.

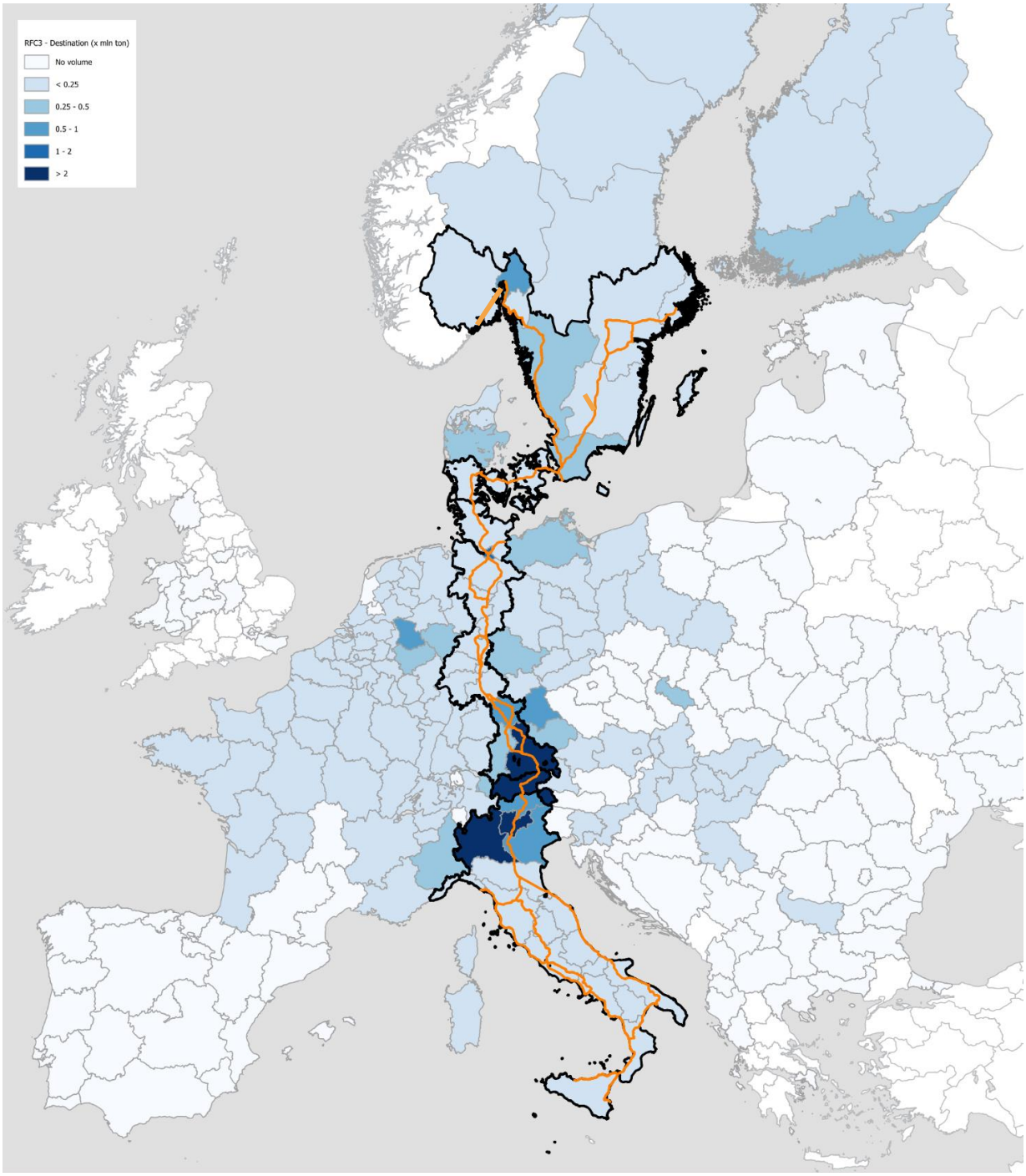
Figure 35 Origins of international rail freight volume (in million tonnes) that use the RFC ScanMed rail network and the delineation of the potential RFC ScanMed catchment area



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

The next figure presents the destinations within the RFC ScanMed 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 ScanMed's services fall outside the corridor area, such as areas in the Netherlands, Belgium, France, and Hungary.

Figure 36 Destinations of international rail freight volume (in million tonnes) that use the RFC ScanMed rail network and the delineation of the potential RFC ScanMed catchment area



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

4.3.2 ALL INTERNATIONAL FREIGHT TRANSPORT FOR THE RFC SCANMED

The total volume of international freight transport in the *catchment* area of the RFC ScanMed is estimated at 144 million tonnes in 2022, transported by road, rail, and sea shipping. Inland shipping does not play a role of importance. The international rail freight transport volume in this area is estimated at 31 million tonnes (about 35.000 unique trains). This is 22% of the total amount of freight transport for the RFC ScanMed. The share of sea shipping is 42%, and the share of road transport 36%.

Concerning the cargo types, *Other* (General cargo, including intermodal transport and container) is the most important one at 68 million tonnes (47%). *Dry bulk* is second in the international freight transport within the catchment area of the RFC ScanMed, with a volume of 42 million tonnes (29%). Liquid bulk has a share of 23% in the total volume of international freight transport over all modes in the corridor area of the RFC ScanMed.

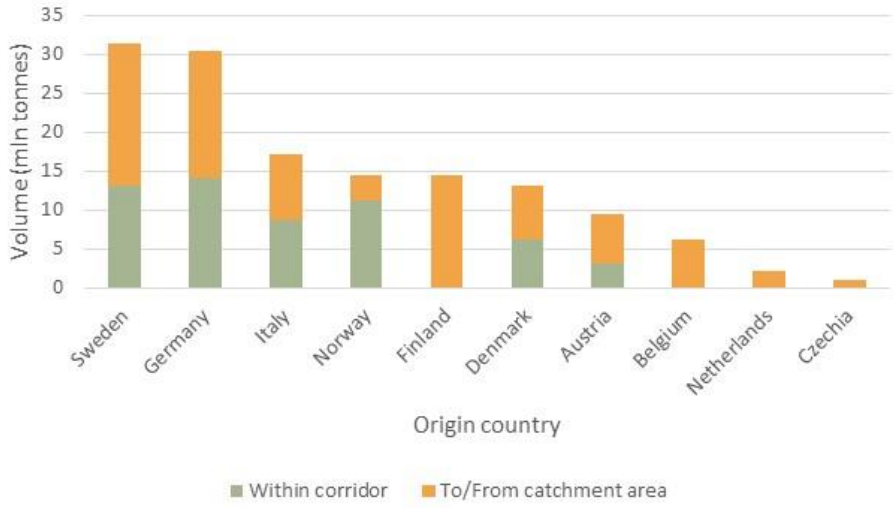
Figure 37 Estimated volume (million tonnes) and share of *all* international freight transport over land by mode and cargo type in the *catchment* area of RFC ScanMed

Source: NEAC estimations

Figure 38 and Figure 39 show the origin and destination countries for all international freight transport within the catchment area (which includes the corridor area) of the RFC ScanMed. The green colour shows the origin and destination *within* the corridor area of the RFC ScanMed. The orange colour shows the international freight transport to and from the rest of the catchment area. As can be seen, only the RFC ScanMed countries (SE, NO, DK, DE, CH, AT, and IT) have green-coloured bars beside the orange ones, as these are the corridor countries.

The main countries with origin locations for international freight transport in the RFC ScanMed are Sweden, Germany, and Italy. This concerns all transport by road, rail, and sea shipping. A volume of 31 million tonnes of international freight transport by *all modes* has its origin in Sweden. Of this volume, 42% (13 million tonnes) is transported to other countries within the RFC, such as Norway or Germany. Germany comes in second place with 30 million tonnes originating from locations in this country. In this case, 14 million tonnes (46%) go to other countries within the RFC. Italy is the third most important origin country with 17 million tonnes. Countries such as Finland, Belgium, The Netherlands, and Czechia are origin countries located outside of the RFC ScanMed. As can be seen, Sweden and Germany dominate transport in the RFC ScanMed.

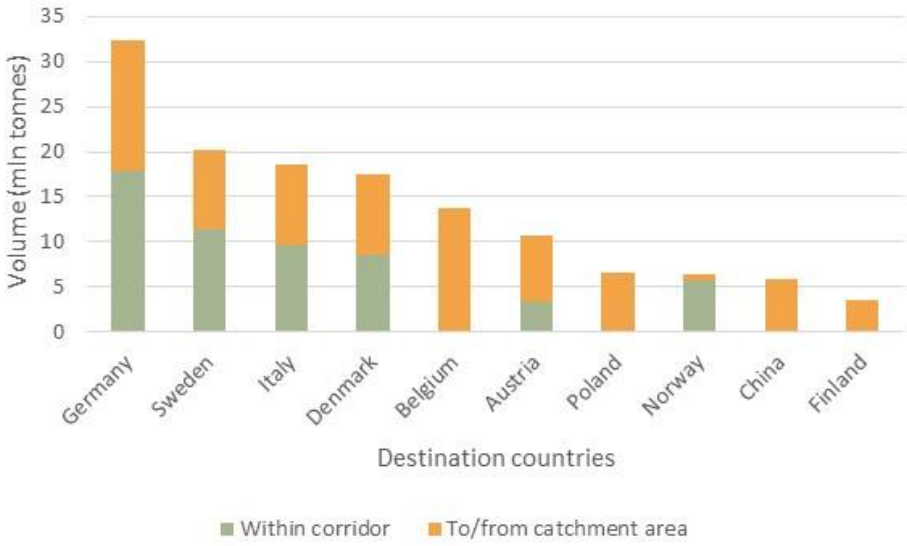
Figure 38 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 within the catchment and corridor area of RFC ScanMed



Source: NEAC estimations

The main countries with destination locations are Germany, Sweden, and Italy. Germany receives 32 million tonnes, of which 18 million tonnes stem from other RFC ScanMed countries. Sweden is second, with a volume of 20 million tonnes, of which 11 million tonnes have their origin in other RFC ScanMed countries. Italy receives 19 million tonnes, with 10 million tonnes coming from other RFC ScanMed countries. On the destination side, Germany dominates freight transport in the RFC ScanMed.

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 ScanMed



Source: NEAC estimations

The following table shows all international freight volume between the countries *within the corridor area* of RFC ScanMed for the *land* modes. The total amount of international freight volume is 36 million tonnes within the corridor area. The most important freight transport relation is between locations in the Germany and Italy at 7 million tonnes of freight transport by all land modes. The reverse direction has 6 million tonnes.

Also, the volume on the relations Sweden-Norway (vv) is notable. Other relations play a less dominant role. NB, the zero's indicate a small amount of volume (<0.5 million tonnes).

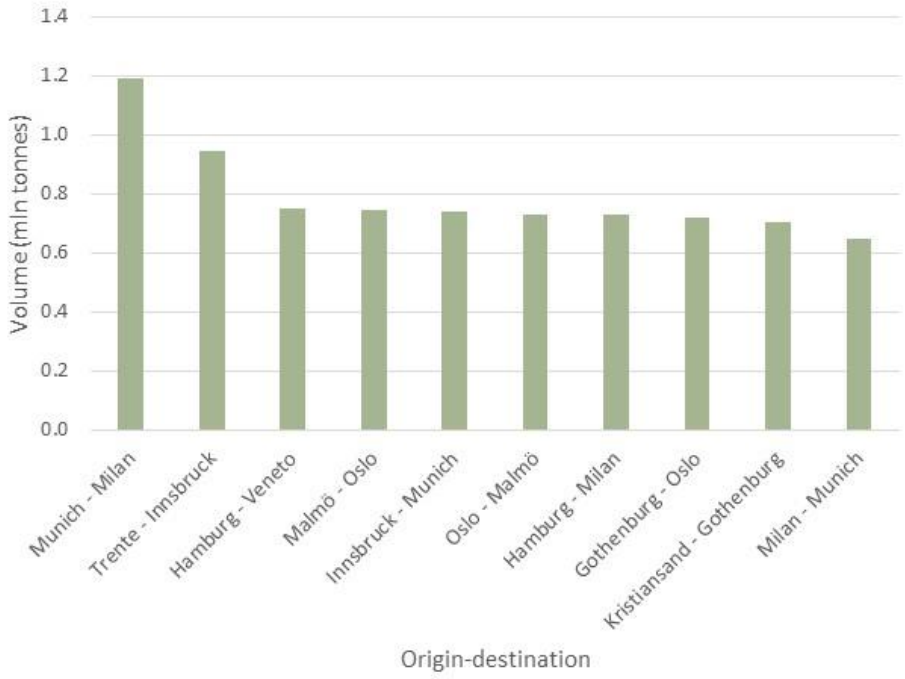
Table 32 Total freight volume (million tonnes) between the countries for land modes within the corridor area of the RFC ScanMed

From/To	AT	DE	DK	IT	NO	SE	Total
AT		2	0	1		0	3
DE	1		2	7	0	1	11
DK	0	2		0	0	2	4
IT	2	6	0			0	8
NO		0	0			3	4
SE	0	1	2	0	3		6
Total	3	10	4	8	4	6	36

Source: NEAC estimations

The chart below depicts the main origins and destinations for all *land* modes. The most important relation is Munich-Milan, at 1.2 million tonnes. Trento-Innsbruck comes in second place, at 0.9 million tonnes, followed by Hamburg-Veneto (at 0.7 million tonnes). Note that all origins and destinations of the RFC ScanMed in the top-10 do not differ much in volume. This is between 0.6 and 0.8 million tonnes.

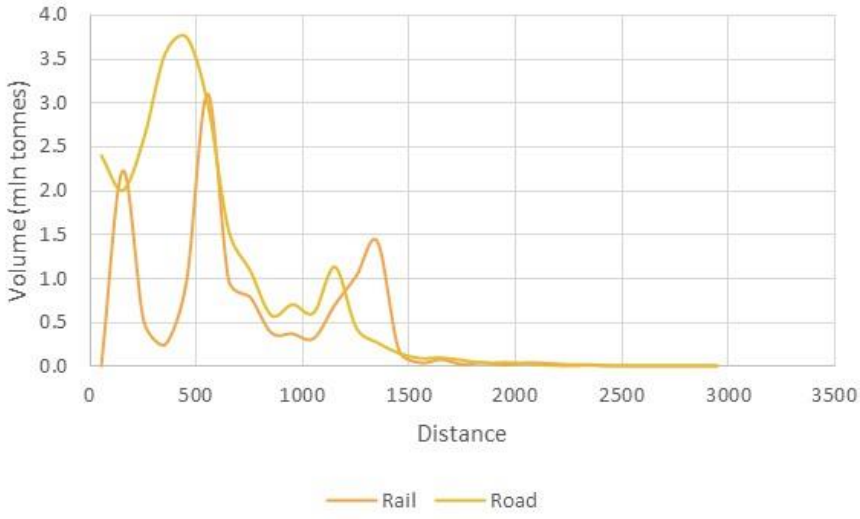
Figure 40 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of *all* international freight transport over land in 2022 within the corridor area of RFC ScanMed



Source: NEAC estimations

The 'volume' distance distribution for international freight transport *within the corridor area* of RFC ScanMed is shown in the figure below (in million tonnes) by distance (in km). For international rail freight transport, the peak is around 550 km, at 3 mln tonnes. However, we also see a peak around 200 km and around 1300 km. Rail transport in the RFC ScanMed has more than one peak. This is a sign that transport within the corridor, especially rail serves different areas, each with an own specific volume distribution. For road freight transport the peak lies at 350 and 450 km with a volume of 3.6 and 3.7 million tonnes. As can be seen, after 1,500 km the volume of rail and road transport is small.

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

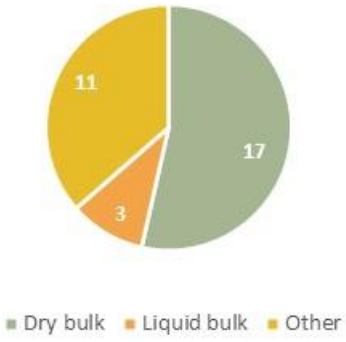


Source: NEAC estimations

4.3.3 INTERNATIONAL RAIL FREIGHT TRANSPORT IN THE RFC SCANMED CATCHMENT AREA

Looking at the volumes of international rail freight transport by cargo type within the catchment (and corridor) area of the RFC ScanMed, *Dry bulk* is the most important cargo type. It has a share of 53%, with 17 million tonnes of rail freight. The category *Other* has a share of 36% and liquid bulk of 10% in the total volumes of international rail freight transport in the RFC ScanMed.

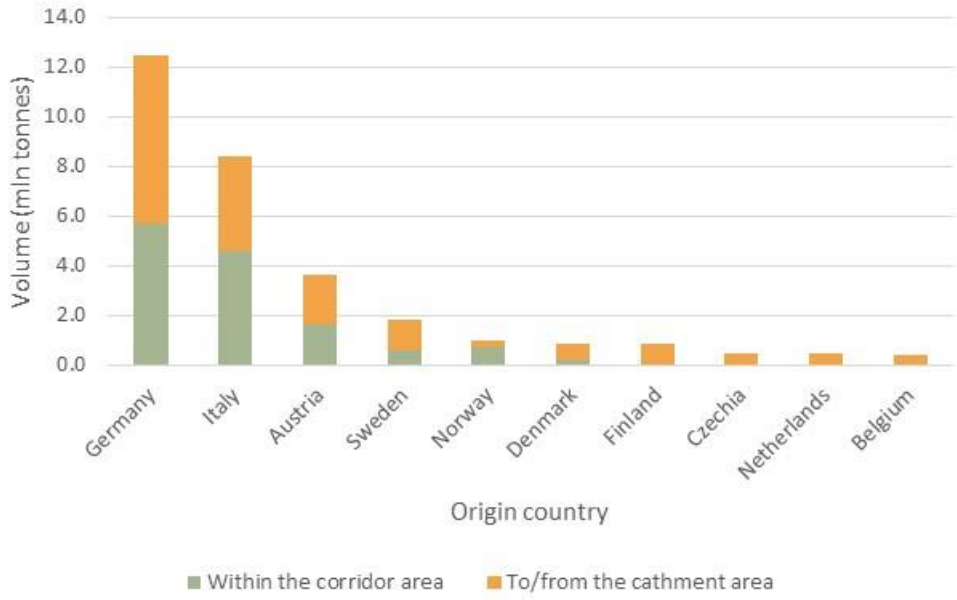
Figure 42 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 within the catchment (and corridor) area of the RFC ScanMed



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 12 million tonnes. This country is an important origin for countries *outside* of the RFC ScanMed, 54% of the rail freight is transported to locations in outside of the RFC ScanMed countries, using the RFC ScanMed network. In second place comes Italy at 8 million tonnes. Third comes Austria at 4 million tonnes of international rail freight transport volume. Note that the share of rail freight transport *within* the corridor area of the RFC ScanMed is 44% (which relates to the green bars in the graph). Also note that the flows from non-RFC ScanMed countries such as Austria, Czechia, or Spain are relatively small.

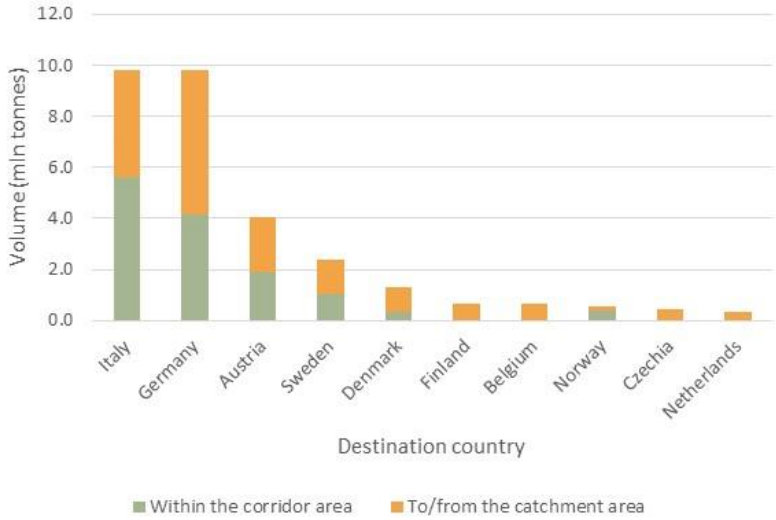
Figure 43 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the catchment and corridor area of the RFC ScanMed



Source: NEAC estimations

The most important destination country is Italy. It receives almost 10 million tonnes of rail transport. Other important destination countries are Germany (also 10 million tonnes), and Austria (4 million tonnes). The volume stemming from other countries in the RFC ScanMed is 45%. It shows that the RFC ScanMed is a rail freight corridor with an important international position as 55% of the relations outside the RFC ScanMed uses the rail network of the RFC ScanMed.

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 ScanMed

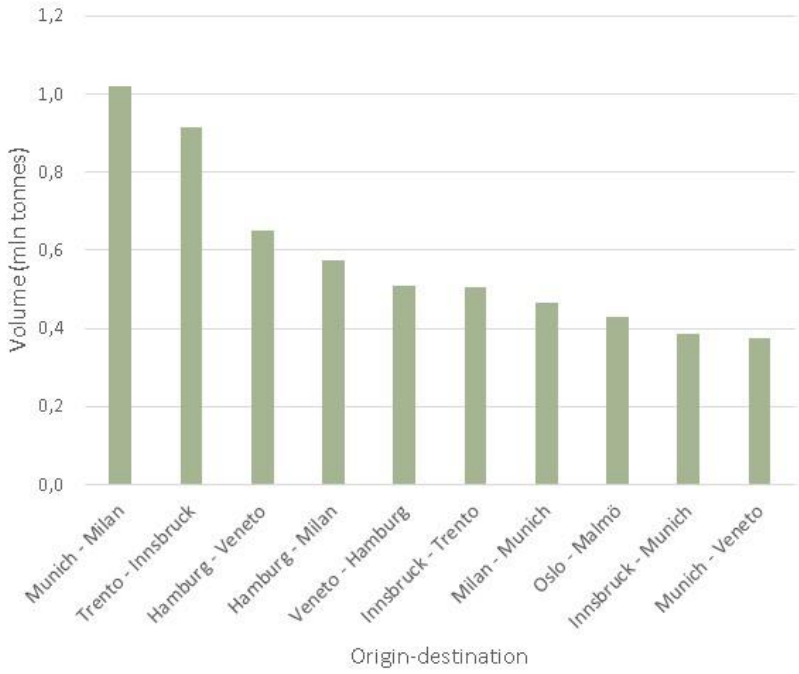


Source: NEAC estimations

The figure below shows the top 10 most important international rail freight transport relations within corridor area of the RFC ScanMed. The relation between Munich and Milan is the most important one, at 1.0 million tonnes. This concerns mostly dry bulk transport. The relation Trento-Innsbruck comes in second place, which

is mainly dry bulk (0.8 million tonnes). Hamburg-Veneto comes in third place at 0.6 million tonnes of international rail freight transport (dry bulk, containers and general cargo). The top-10 shows different relations across the RFC ScanMed in different locations. This is already noted earlier when presenting the volume distribution.

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 ScanMed

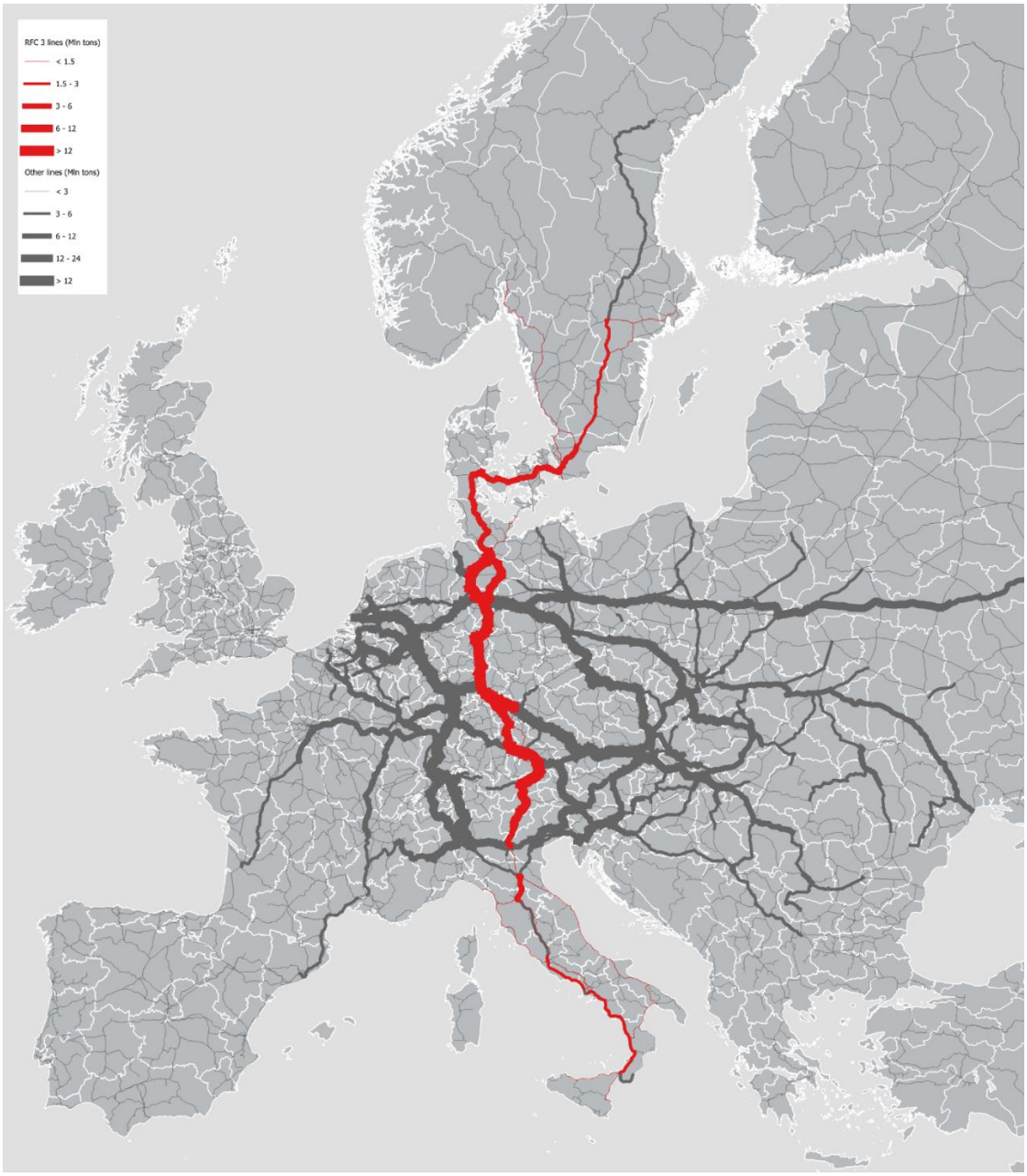


Source: NEAC estimations

4.3.4 INTERNATIONAL RAIL FREIGHT TRANSPORT FLOWS IN THE RFC SCANMED

The figure below shows the estimated international rail freight flows (in tonnes) for the RFC ScanMed. This provides a general overview of the use of the main rail lines in the corridor area. The volumes on the RFC ScanMed cannot be understood if we present them isolated. The rail volumes on the different tracks of the RFC ScanMed often have an origin or destination elsewhere in Europe. Looking at the map, we see a significant volume north to south in the RFC ScanMed. However, one needs to keep in mind that this does not indicate just one flow all the way from north to south. Instead, there are lots of flows leaving or joining the RFC ScanMed in between. As it was mentioned earlier about 55% of the volumes stem from or go to locations outside of the corridor area of the RFC ScanMed.

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



Source: NEAC estimations

5 ANALYSIS OF THE FUTURE RFC SCANMED TRANSPORT MARKET

The future market analysis has been performed for the three scenarios described in Section 3.3 above, i.e. EU Reference scenario, Projects scenario 2030 and Sensitivity scenario. The results for three scenarios have been produced for 2030. The future of 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 combined 11 RFCs network area are presented, then for the RFC ScanMed corridor area:

- Section 5.1 presents **international freight transport in the combined 11 RFCs network area**:
  - Section 5.1.1 provides a **general overview of *all* international freight transport for the combined 11 RFCs network 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 **international *rail* freight transport for the combined 11 RFCs network 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 5.2 provide **international rail freight transport in the RFC ScanMed.**
  - Section 5.2.1 provide **a general overview of all international freight transport in the RFC ScanMed**. 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 5.2.2 describes the **international rail freight transport of the RFC ScanMed** is presented. This provides a general overview of the origins and destinations of rail freight for the RFC ScanMed. We present 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 5.2.3 presents the **developments on the most important border crossing points** in the RFC ScanMed.

5.1 FUTURE TRANSPORT MARKET IN THE COMBINED 11 RFCS NETWORK AREA

This section describes the results of the future market analysis in the 11 RFCs Network catchment 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 INTERNATIONAL ALL FREIGHT TRANSPORT FOR THE 11 RFCS NETWORK CATCHMENT AREA

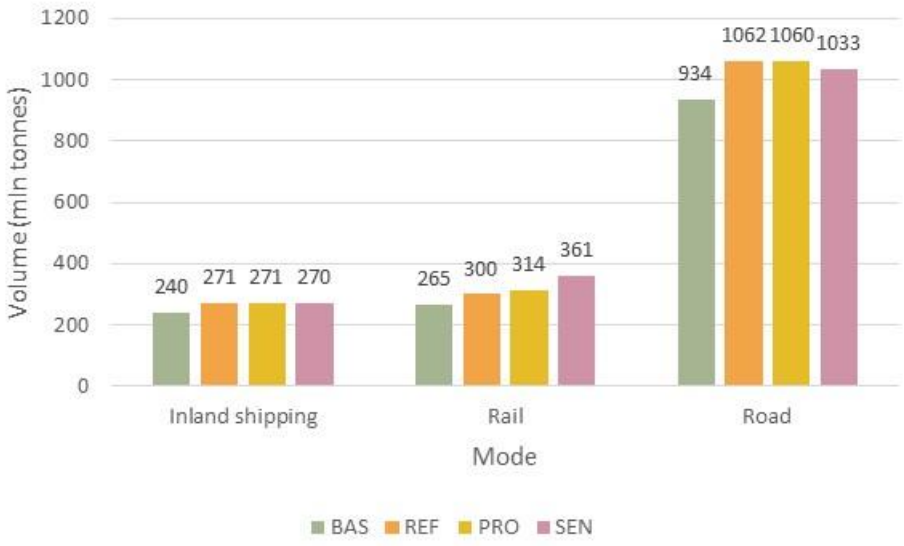
Due to the economic developments, all modes grow in the Reference scenario between 2022 and 2030. Inland shipping and rail grow by 13%, road by 14%. In absolute terms, international road freight transport grows most, by 126 million tonnes (from 934 to 1,062 million tonnes). Inland shipping grows by 31 million tonnes (from 240 to 271 million tonnes) and rail transport by 35 million tonnes (from 265 to 300 million

tonnes). Figure 47 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 rail projects across Europe, such as Rail Baltica, the Koralm railway line and tunnel, the Semmering tunnel, the second track Koper-Divača, or Rijeka-Zagreb-Koprivnica account for this growth. 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 with reference to the TEN-T requirements and the loading gauge. Compared to the base year situation, a growth of 36% is calculated for rail (+23% compared to the Reference scenario). The introduction of longer trains (740 meter) has an important effect on this result. This scenario can be regarded as a maximum potential for rail transport. Both inland shipping and road transport de crease, inland shipping by 1 million tonnes for and road transport by 27 million tonnes. Keep in mind that the increase of rail transport (47 mln tonnes) is not fully covered by a shift to 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.

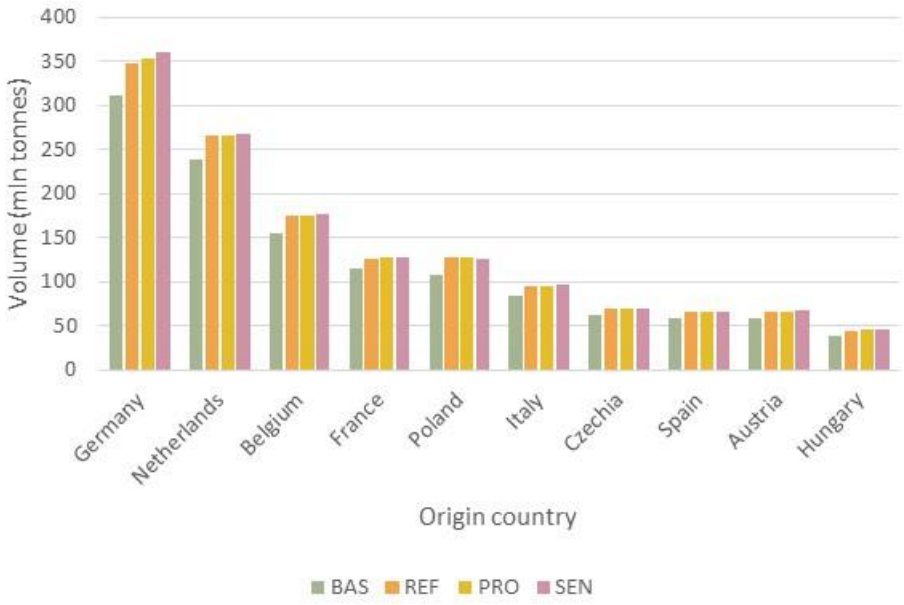
Figure 47 Development of volume (in million tonnes) by mode and scenario for the 11 RFCs Network catchment area



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 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).

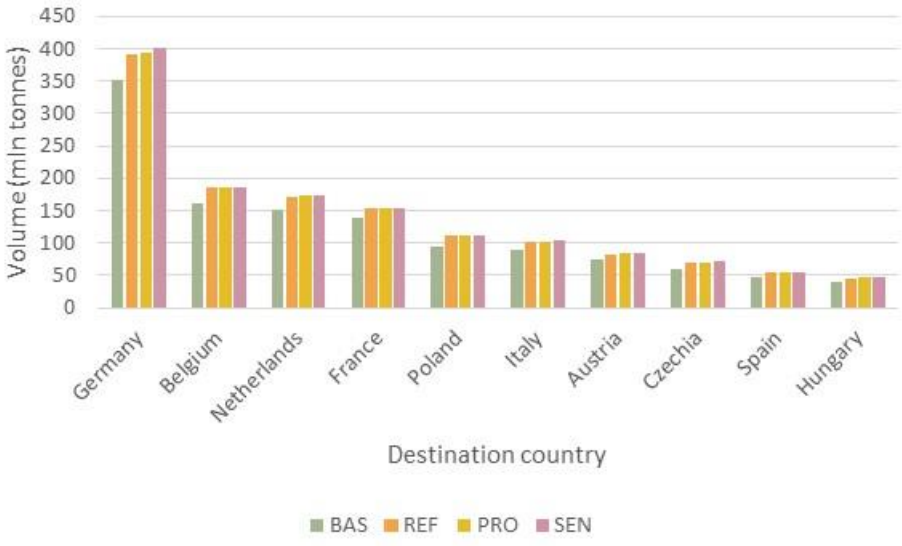
Figure 48 Development of volume (in million tonnes) of *all* international freight transport for the top 10 origin countries within the 11 RFCs Network catchment area



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

Similar growth rates can be found for the destination countries. Also, the top three countries for international freight transport consist 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 within the corridor area of the 11 RFCs Network



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 RFC'S NETWORK CATCHMENT AREA

Figure 50 and Figure 51 show the development of the 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

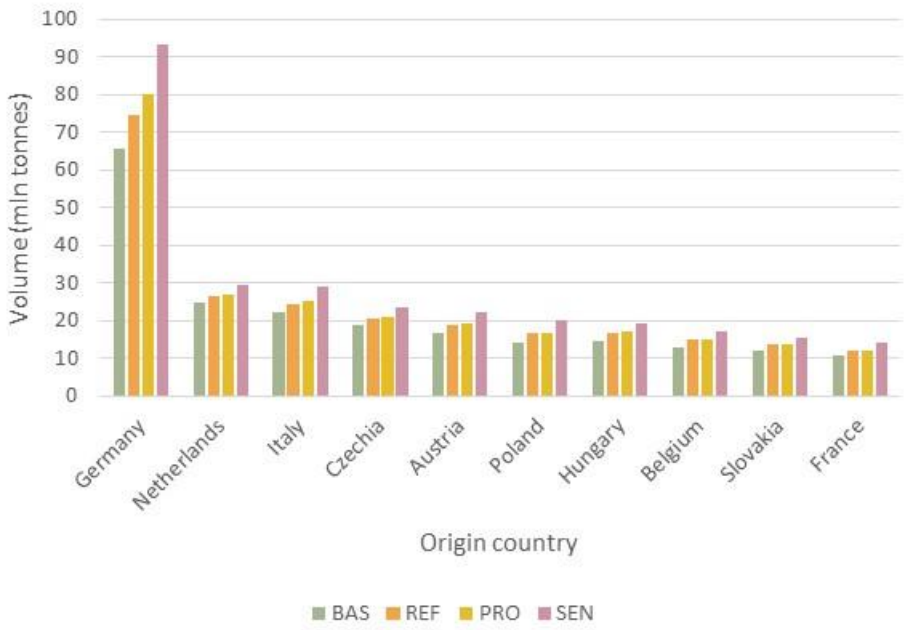
are more prominent for international rail transport than for *all* international rail freight transport as shown in the previous section.

In the *Reference scenario*, 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 growth 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).

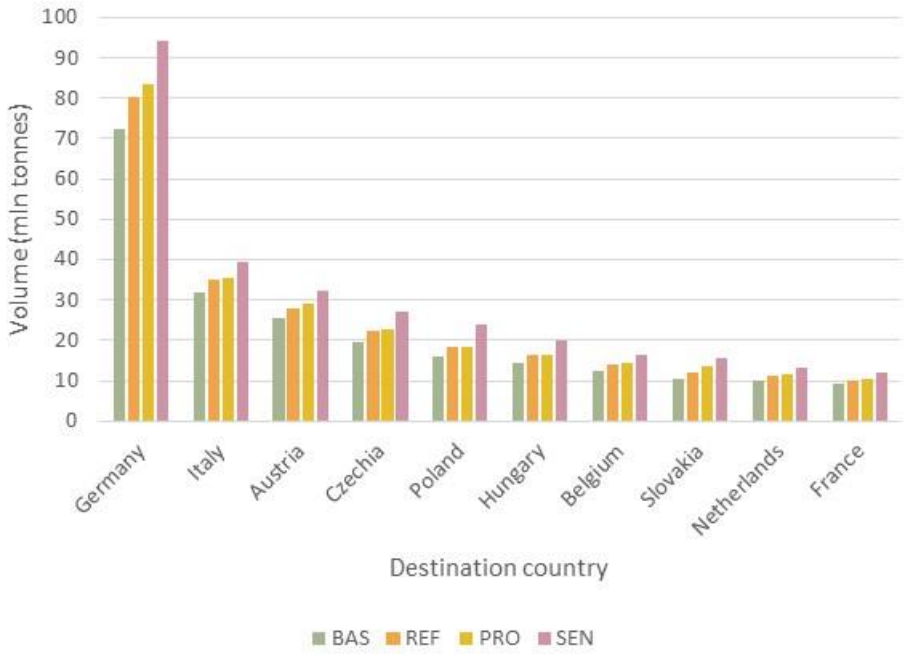
The potential extra volume in the top 10 origin countries, as shown by the *Sensitivity scenario*, is overall 18% (from 239 to 283 million tonnes), compared to the Reference scenario. The lowest growth compared to the Reference scenario can be seen for the Netherlands (+10% from 27 to 29 million tonnes), 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.



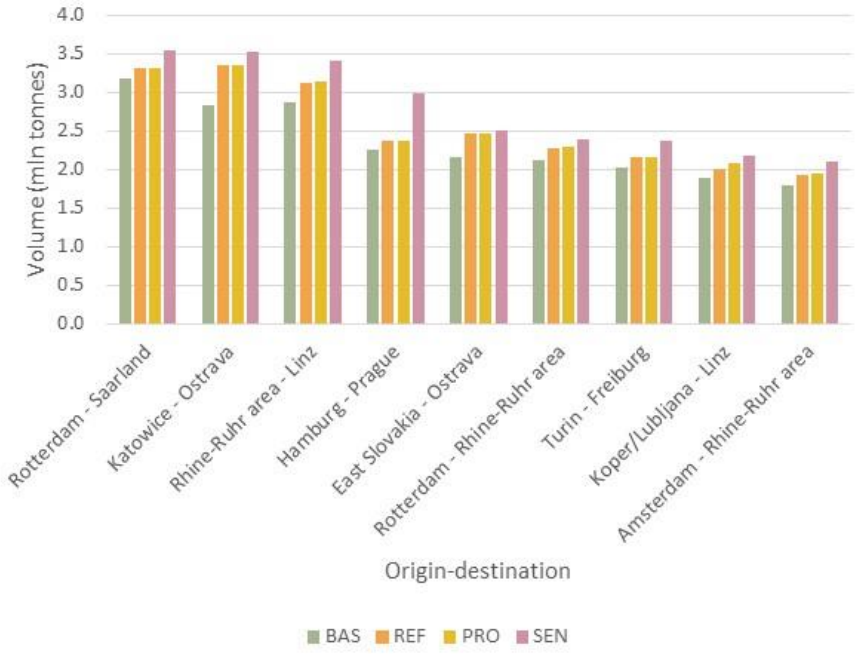
Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

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 are important for the steel production in Saarland and Ostrava and for the transport of dry bulk. Another important relation concerns 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 Western Slovenia (Koper) and Graz. It shows that the Semmering base tunnel and Koralm tunnel seem to have a significant impact on international rail freight transport also on this relation.

The Sensitivity scenario shows, compared to the Reference scenario most growth between Hamburg and Prague (+25% from 2.3 to 3.0 million tonnes) and between Koper and Graz (+41% from 1.4 to 2.0 million tonnes). The general measures function as a multiplier and add extra growth of the Project scenario.

Figure 52 Development of volume (in million tonnes) of all international rail freight transport by the top 10 relations within the corridor area of the 11 RFCs Network



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

5.2 FUTURE OF THE INTERNATIONAL FREIGHT TRANSPORT FOR RFC SCANMED

5.2.1 FUTURE OF ALL INTERNATIONAL FREIGHT TRANSPORT FOR RFC SCANMED

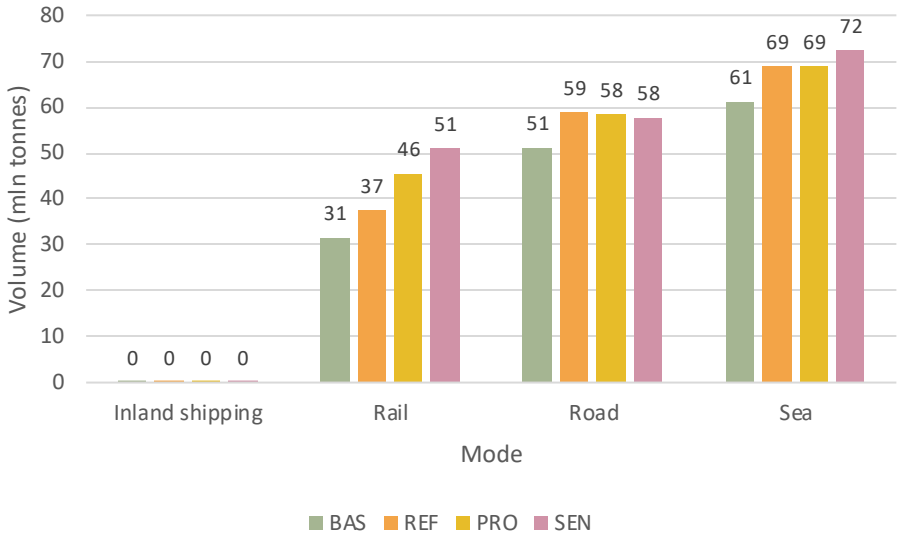
This section shows the results of the future market analysis for the RFC ScanMed. Figure 53 shows the overall developments by mode and scenario in the catchment and corridor area of RFC ScanMed.

Between the 2022 Base year and 2030 Reference scenarios, all modes grow due to economic developments, in general by 15%. Rail transport grows by 19% (6 million tonnes) from 31 to 37 million tonnes. Road grows by 15%, and sea shipping by 13%. In absolute terms, international freight transport by road grows by 8 million tonnes, from 51 to 59 million tonnes. Sea shipping increases in volume from 61 to 69 million tonnes.

The implementation of different rail projects across Europe, leads to overall growth of 20% compared to 2022 of freight transport in the RFC ScanMed (+8 million tonnes). In the RFC ScanMed large and smaller projects across the rail network account for this growth. Also, infrastructure projects outside the RFC ScanMed contribute leading to mode shift or rerouting. But most important, the opening of the Fehmarnbelt leads to growth for the ScanMed.

The third scenario shows a hypothetical development for rail transport. Compared to the base year situation, a growth of 26% in volume (37 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 in 2030. The growth has different causes, such as rerouting, mode 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 third scenario, rail transport in the RFC ScanMed grows by 62% compared to the base situation. This is a substantial achievement compared to the 19% forecasted for the Reference scenario.

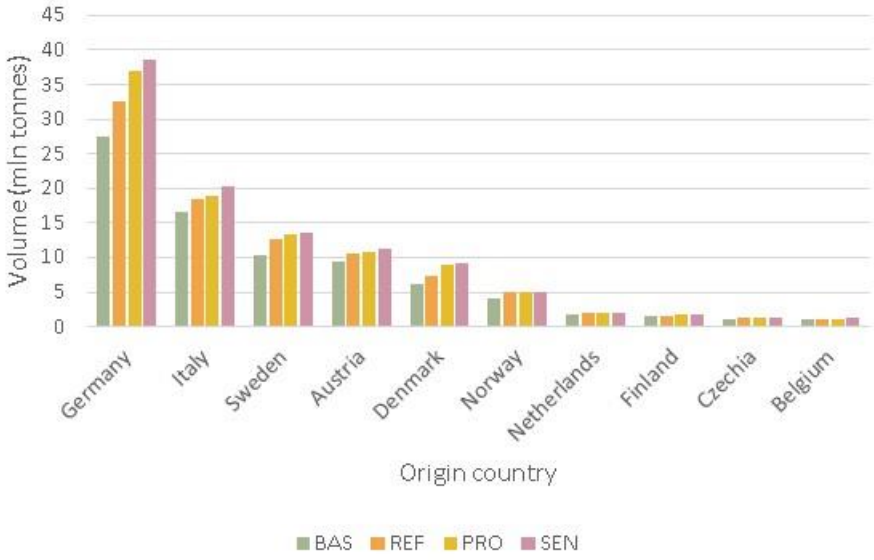
Figure 53 Development of volume (in million tonnes) by mode and scenario for the corridor area of RFC ScanMed



Source: NEAC estimations; Legend: BAS Base year scenario; REF Reference scenario, PRO Projects scenario; SEN: Sensitivity scenario; Note: figures for inland shipping are lower than 1 million tonnes

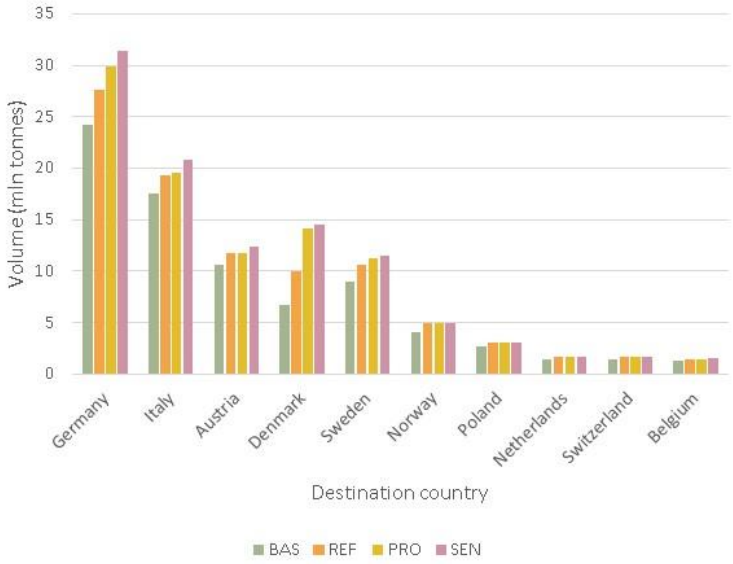
The next two figures show the development of the volume of international in freight transport by *land modes* for the origin and destination countries in the catchment area and the corridor area of the RFC ScanMed for their respective scenarios. In general, the most prominent growth stems from the economic development (REF). The Projects (PRO) scenario and the Sensitivity (SEN) scenario show small differences. Concerning the Projects scenario variations are primarily due to mode 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 totals are almost equal between the different scenarios. The reason is mainly due to a shift between the land modes.

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



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

Figure 55 Development of volume (in million tonnes) of all international freight transport by the destination countries in the RFC ScanMed



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

Concerning the top 10 origins, these are the same as for the base year. The overall growth for the top-10 origins in the Reference scenario is 16% and varies from 10% (The Netherlands) to 22% (Sweden and Norway). Germany, Italy, and Sweden are the top 3 origin countries in the RFC ScanMed. Concerning the Projects scenario, we see a further growth compared to the Reference scenario (+10%). Concerning the Sensitivity scenario, an even higher volume is registered (+16% compared to the Reference). The growth per country varies in the sensitivity scenario from 15% (The Netherlands) to 48% (Denmark) compared to 2022.

The picture for the destination countries is like the one for the origin countries. Germany dominates the chart. The overall growth in the top 10 countries is approximately 16% for both the Reference scenario. The growth between the 2022 Base year and the Reference scenario varies from 10% (Italy, Austria) to 40% (Denmark). The Projects scenario adds overall another 10% to the growth. The growth between the 2022 Base year and the Reference scenario varies from 11% (Austria) to 109% (Denmark). The growth for the Sensitivity scenario ranges from 16% (Austria) to 116% (Denmark) compare to 2022. As can be seen, the opening of the Fehmarnbelt has an important impact on Denmark.

5.2.2 FUTURE OF INTERNATIONAL RAIL FREIGHT TRANSPORT FOR RFC SCANMED

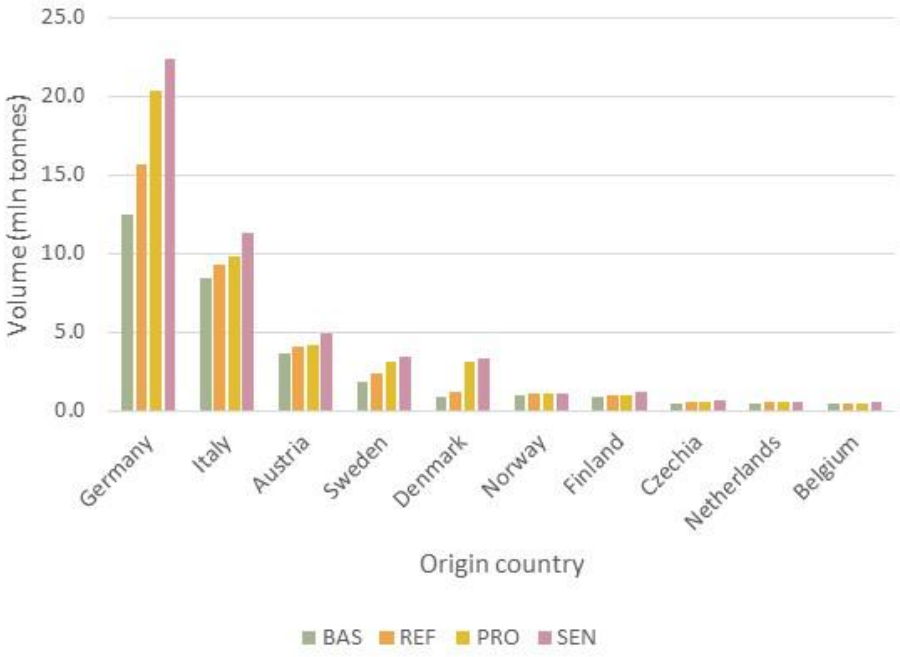
As concerns the RFC ScanMed, we see a growth from 31 million tonnes to 37 million tonnes in the Reference situation. Expressed in trains, this would mean a growth from about 35,000 international trains to about 42,000 trains. The Projects scenario adds another 9 million tonnes to the total volume leading to a total number of trains of 51,000. The sensitivity scenario will finally lead to a volume of 51 million tonnes, which is about 50,000 trains. The slightly lower number of trains compared to the project scenario is because the volume is transported by longer trains.

The next two graphs show the development of volume in international *rail* freight transport for origin and destination countries for the RFC ScanMed. Concerning origin countries, international rail freight transport is highest in Germany (16 million tonnes in the Reference scenario). Italy and Austria come in second and third place (at 9 and 4 million tonnes respectively).

The Projects scenario shows the impact on the volume of international rail freight transport. Overall, the growth in international rail volume for the top-10 countries is about 27% extra compared to the Reference scenario. The potential extra volume as shown by the TEN-T standards interoperability scenario is overall 44% higher on the total volume compared to the Reference scenario. In the sensitivity scenario we see a relatively high growth in Sweden, Germany and Denmark, all related to the Fehmarnbelt. 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, introduction of ERTMS and the transition to the standard gauge in Spain and Portugal.

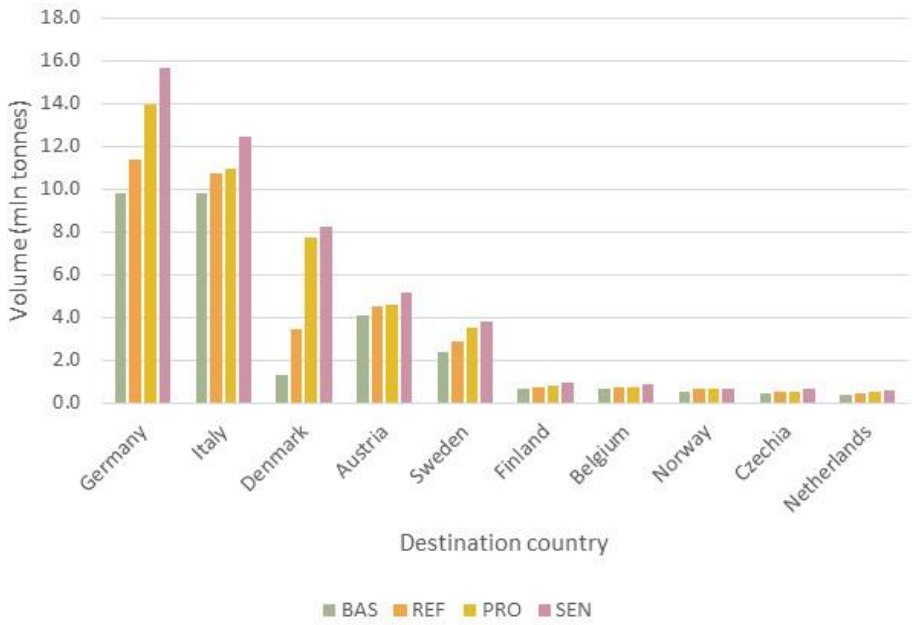
For destinations, a similar picture can be noticed. In this case, Germany has a number 1 position in the RFC ScanMed concerning international rail freight transport. Italy and Denmark are ranked 2 and 3 for international rail freight transport. The impact of the Projects scenario is substantial, whereas the Sensitivity scenario shows additional effects. Compared to the 2022 Base year situation, the growth is 63% and varies in the sensitivity scenario varies from 27% (Italy) to 520% (Denmark). It needs to be stressed that despite the high growth figure in Denmark, the growth in absolute terms is plausible (from 1.3 million tonnes in 2022, to 8.2 million tonnes in the Sensitivity scenario).

Figure 56 Development of volume (in million tonnes) of all international rail freight transport by the origin countries in the RFC ScanMed



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

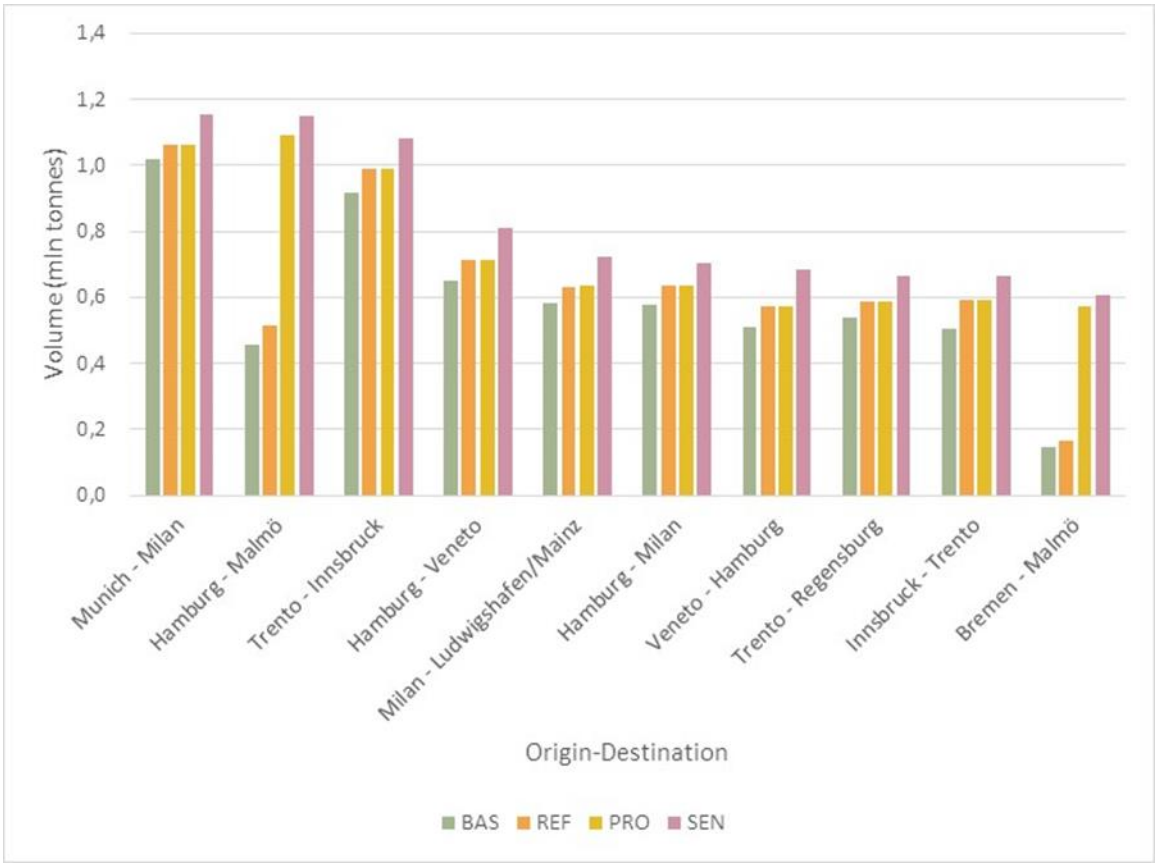
Figure 57 Development of volume (in million tonnes) of all international rail freight transport by destination countries in the RFC ScanMed



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

Looking at the top 10 relations within the RFC ScanMed, the main relation is between Munich and Milan at 1.0 million tonnes. This relation is important for a dry bulk. In second place comes Hamburg-Malmö with a volume around 1 mln tonnes when looking at the Projects and Sensitivity scenario. The impact of the Fehmarnbelt is clearly shown here. Trento-Innsbruck is third with an estimated volume of around 1 mln tonnes. As can be seen different relations in north and south are important for the RFC ScanMed.

Figure 58 Development of volume (in million tonnes) of all international rail freight transport by the top 10 relations within the catchment area of RFC ScanMed



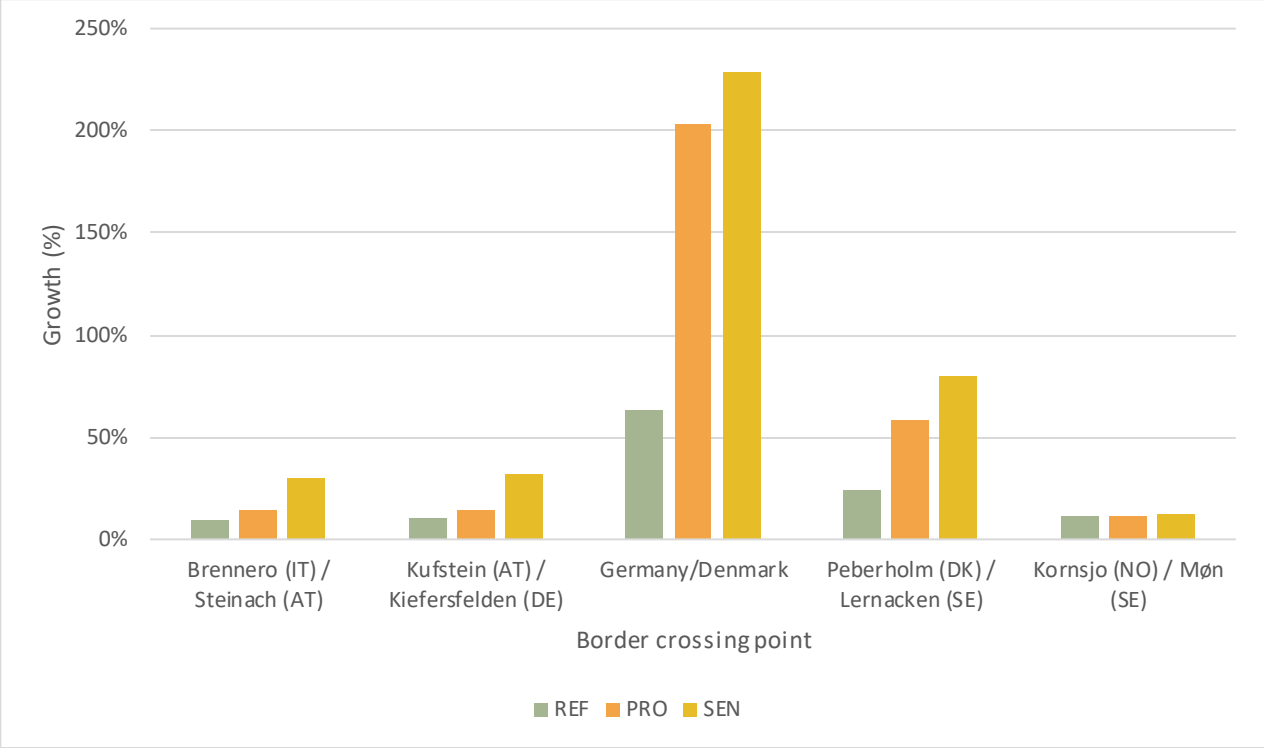
Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

5.2.3 DEVELOPMENT OF THE MOST IMPORTANT BCPS IN THE RFC SCANMED

The different border crossing points in the RFC ScanMed each show different growth between the 2022 Base year and 2030 Reference, Projects and Sensitivity scenarios. Overall, the Reference shows growth in volume of 17% on the BCPs. 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 40% more volume, which translates in to 40% more trains on average on the BCPs. The sensitivity scenario leads to 17% more volume on the BCPs, which is 38% more trains compared to 2022. Due to the extra train length, there is less growth in number of trains. Keep in mind that the number of trains on the different BCPs are related. One train often passes more than 1 BCP in this RFC.

Important note for the relation Germany-Denmark. This combines rail freight transport on the old route and transport via the Fehmarnbelt. This way it is possible to calculate growth. As can be seen, the impact of the infrastructure project leads to a substantial growth, which is in absolute terms plausible. One may expect that the old route will lead to a decline in rail freight transport in favour of the Fehmarnbelt. To a lesser extent, the growth figures also have impact on the BCP between Denmark and Swe den. This one also grows substantially, in the Sensitivity scenario by 80%.

Figure 59 Development of volume (in million tonnes) of international rail freight transport on important border crossing points of the RFC ScanMed

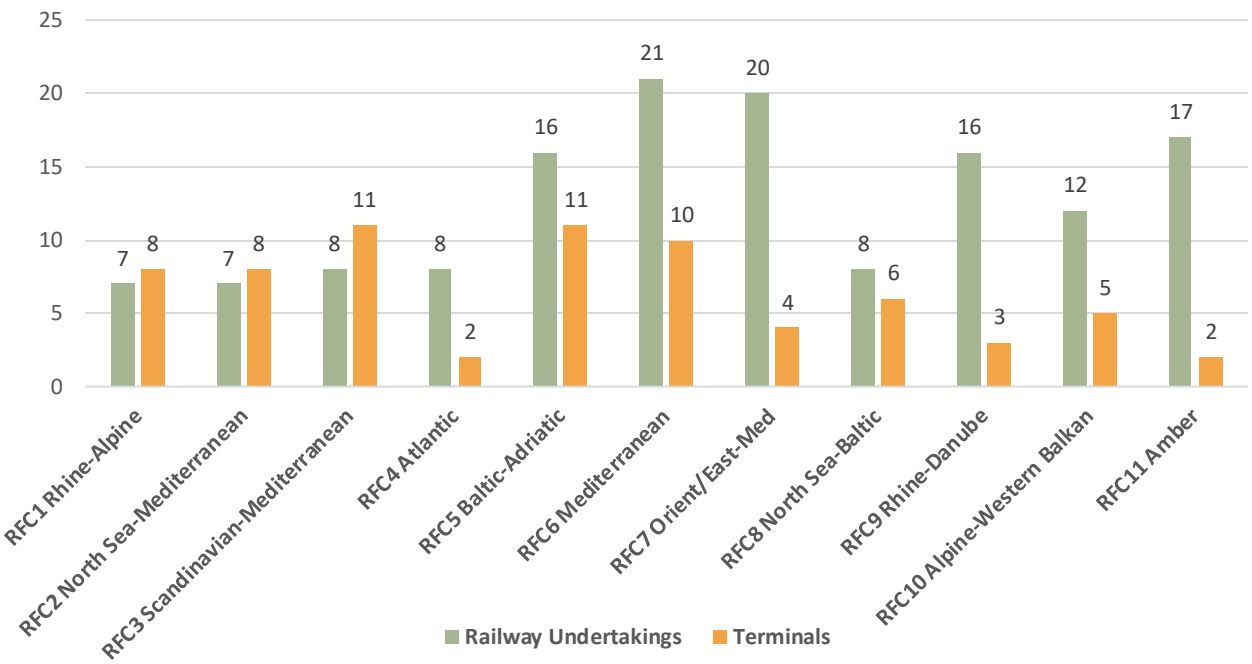


Source: NEAC estimation; Legend: BAS=Base year, REF=Reference, PRO=Projects, SEN=Sensitivity

6 OCCURRED AND EXPECTED CHANGES ASSOCIATED WITH THE ESTABLISHMENT OF THE RAIL FREIGHT CORRIDORS: 2023 11 RFCS JOINT TMS UPDATE 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 is 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 EC (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 (Figure 60).

Figure 60 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 Survey; 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 RFCs, 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:

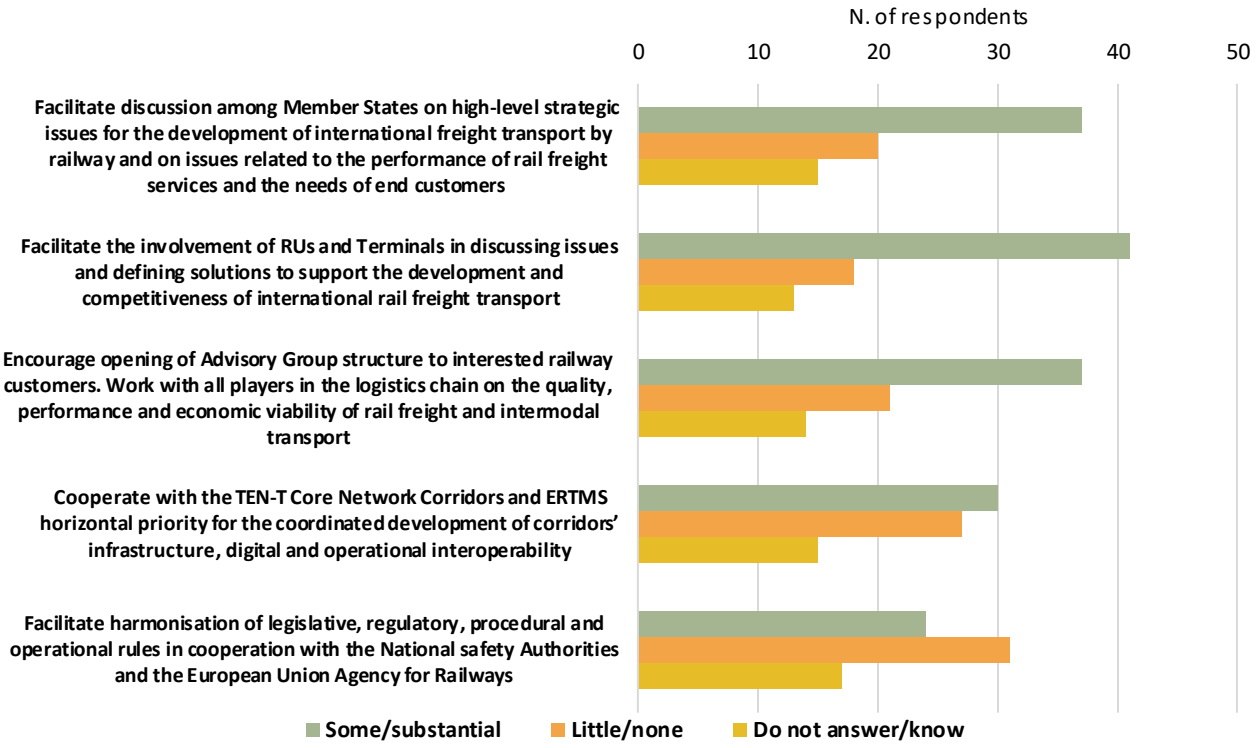
- Changes occurred since the establishment of the RFCs;
- Expected changes assuming continuation of the activities by the RFCs; and
- The best fitting governance to address the issues identified for each of the three investigated areas, also considering the proposed termination of the RFCs activities 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[22]

6.1.1 GOVERNANCE ISSUES

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 61). The opinion about the progress made regarding cooperation between RFCs and Core Network RFCs (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.

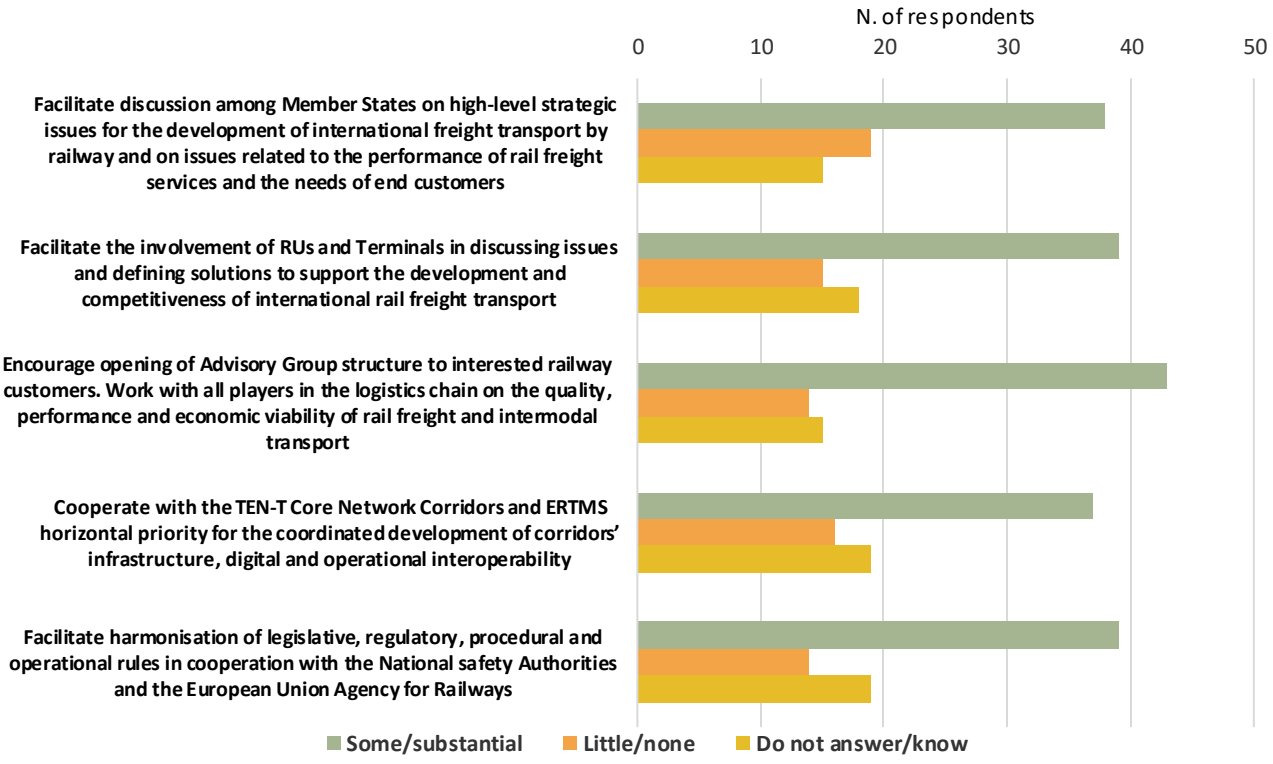
[22] https://ec.europa.eu/transparency/documents-register/detail?ref=SEC(2023)443&lang=en

Figure 61 Progress made to date since the establishment of the RFCs - Governance Issues



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

Figure 62 Expected changes based on current programmes/initiatives - Governance Issues



Source: 2023 11 RFCs Joint TMS Update Survey; 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 62).

Respondents consider the cooperation between RFCs and an European Network of Infrastructure Managers (ENIM) to be the best governance solution for bringing issues forward (Figure 63).

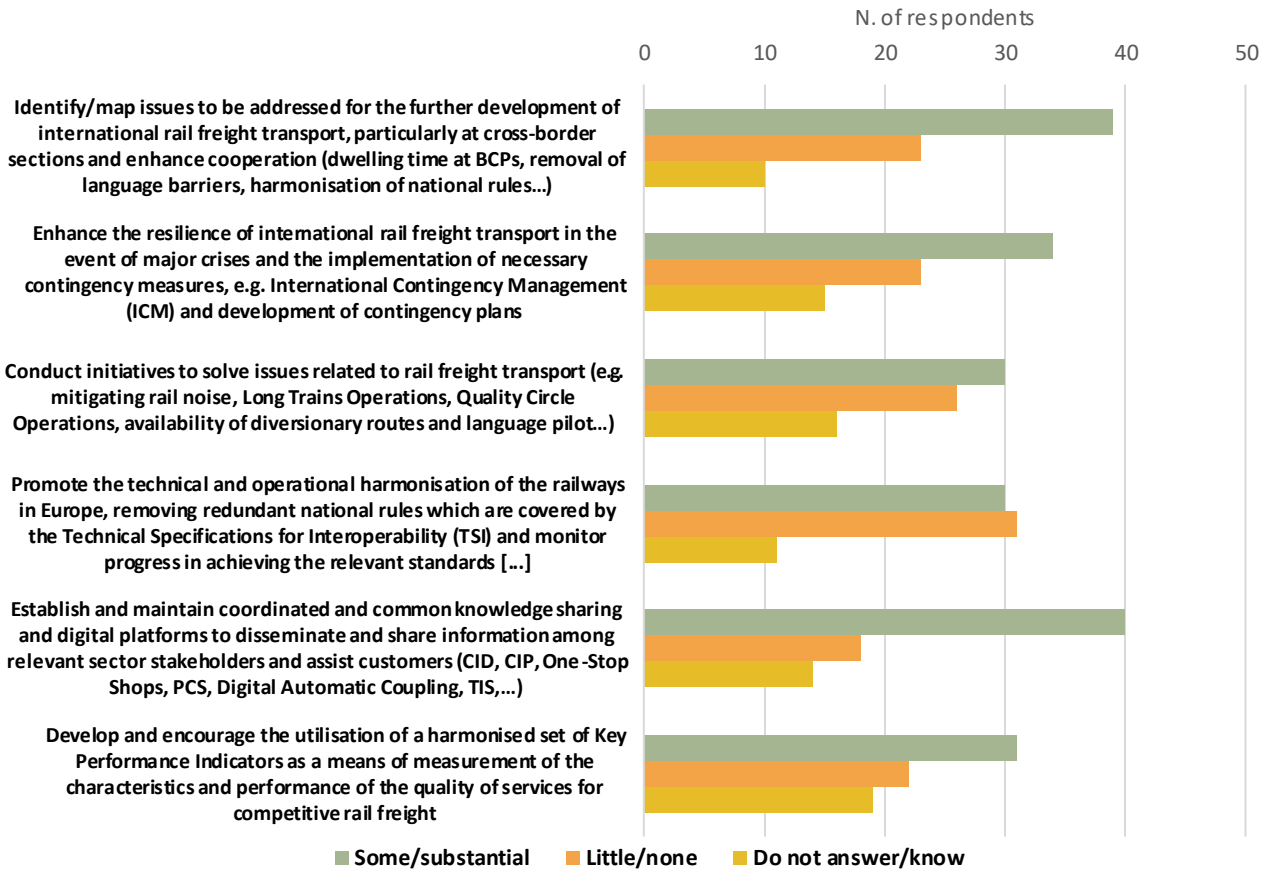
Figure 63 Best fitting governance to bring the issue forward - Governance Issues

Source: 2023 11 RFCs Joint TMS Update Survey; 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 64).

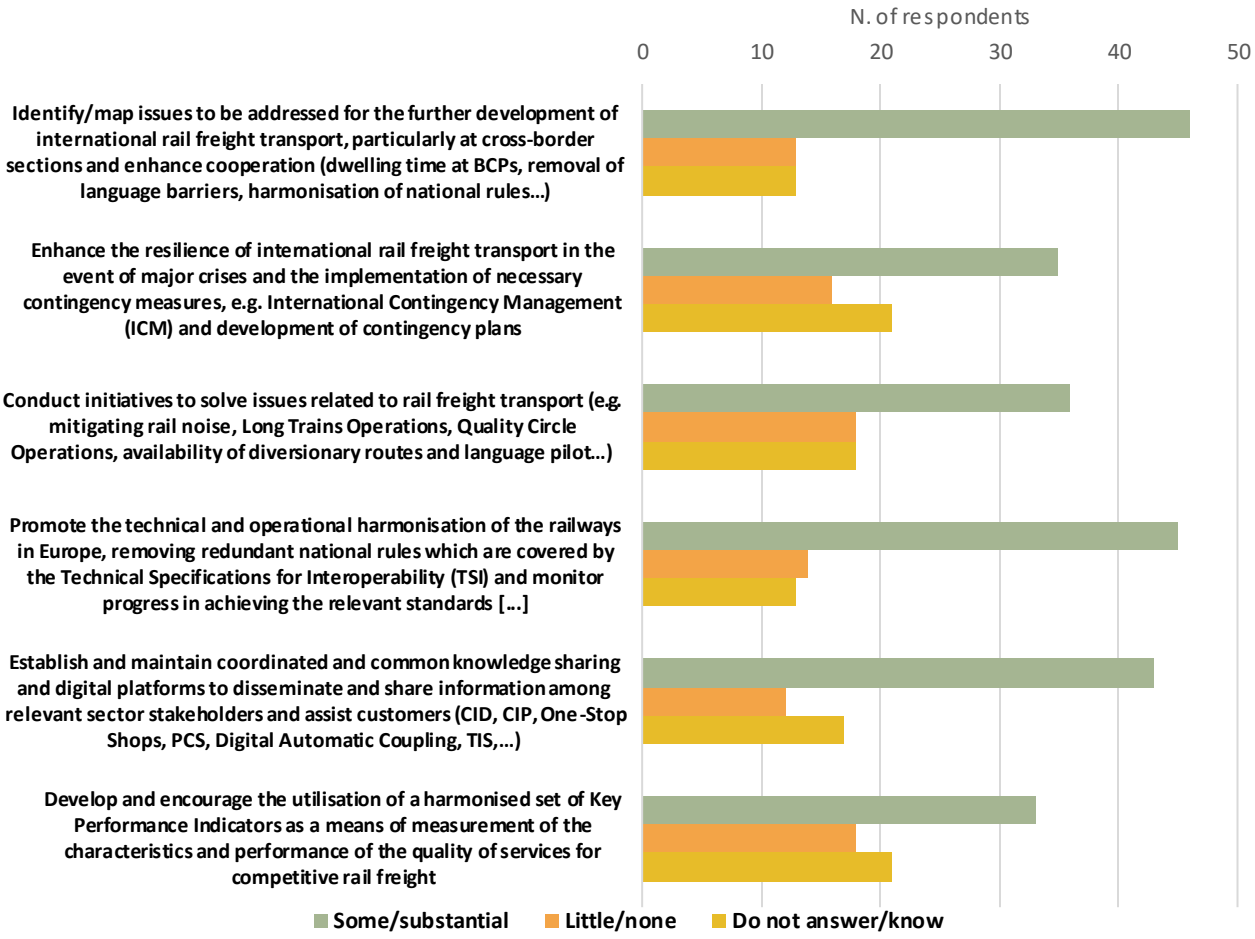
Figure 64 Progress made to date since the establishment of the RFCs - Operational Efficiency Issues



Source: 2023 11 RFCs Joint TMS Update Survey; 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 65).

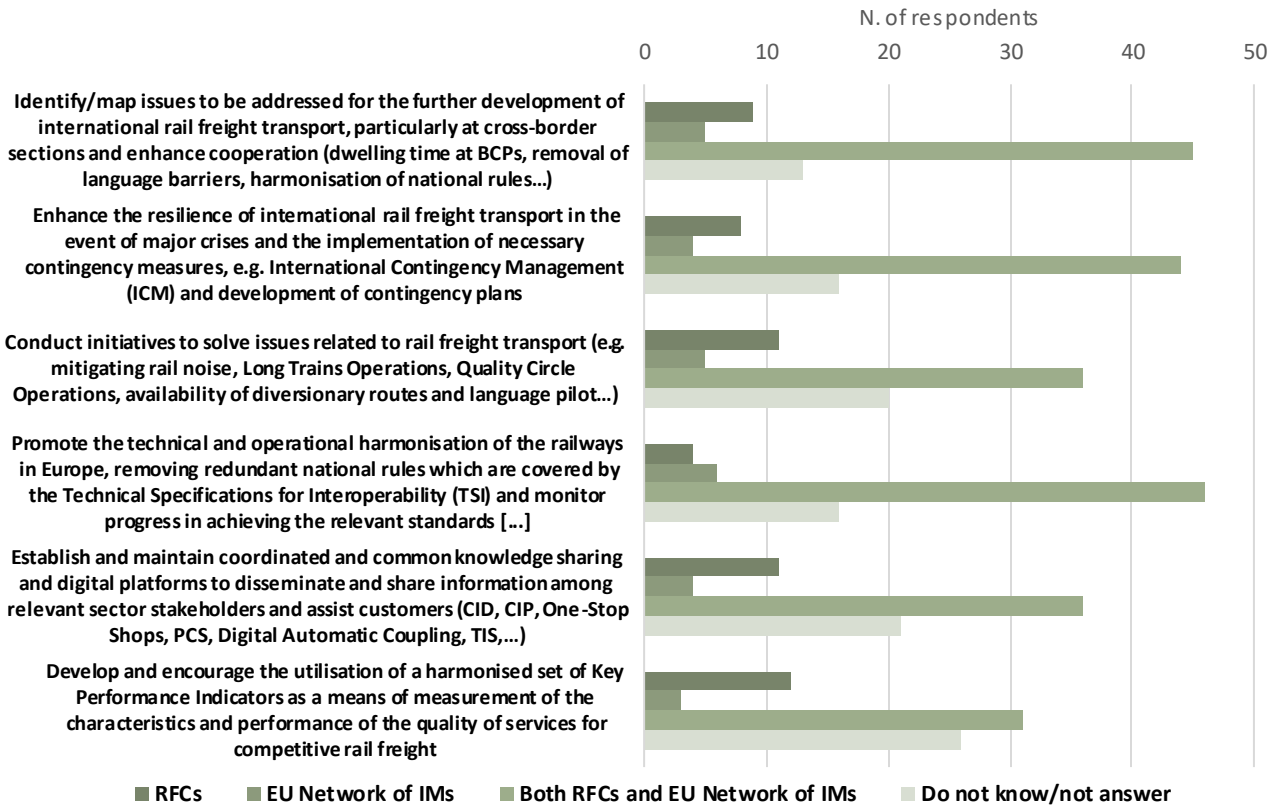
Figure 65 Expected changes based on current programmes/initiatives by RFCs - Operational Efficiency Issues



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

Cooperation between RFCs and an European Network of Infrastructure Managers (ENIM) is also considered the best-fitting governance solution to bring operational efficiency issues forward (Figure 66).

Figure 66 Best fitting governance to bring the issue forward - Operational Efficiency Issues

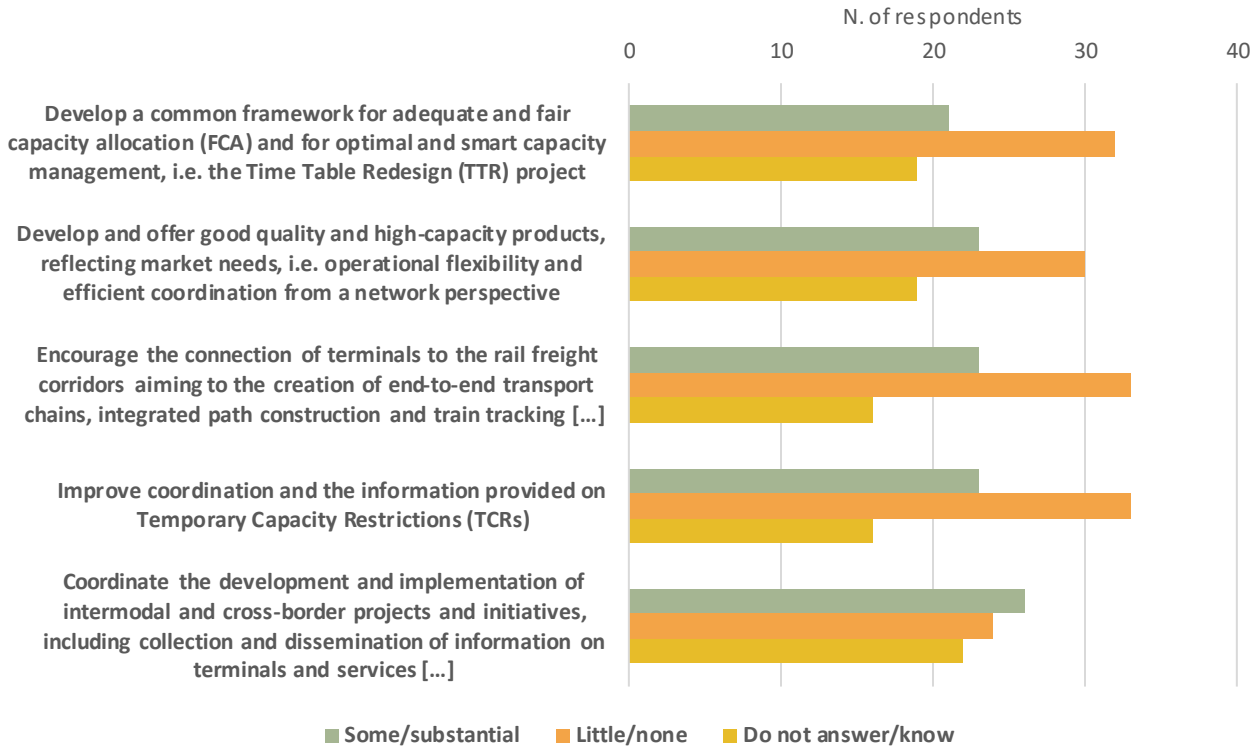


Source: 2023 11 RFCs Joint TMS Update Survey; Notes: Question B) 2.RT

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 67).

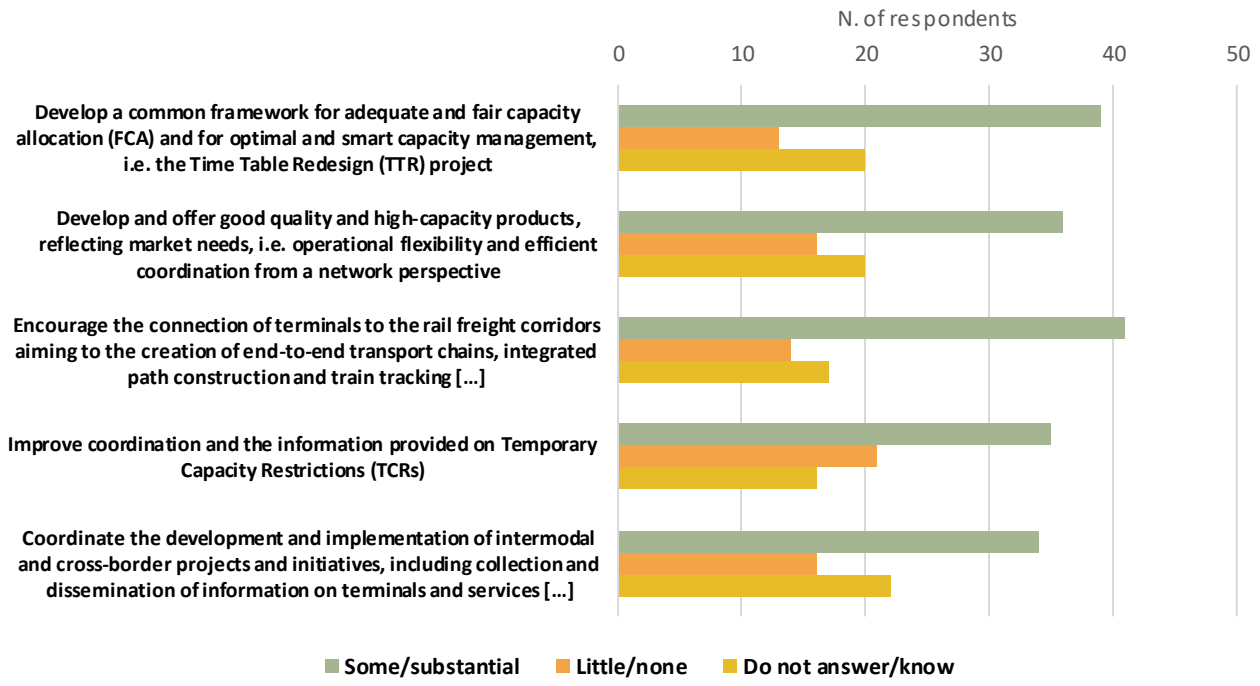
Figure 67 Progress made to date since the establishment of the RFCs - Capacity Planning Issues



Source: 2023 11 RFCs Joint TMS Update Survey; 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 68).

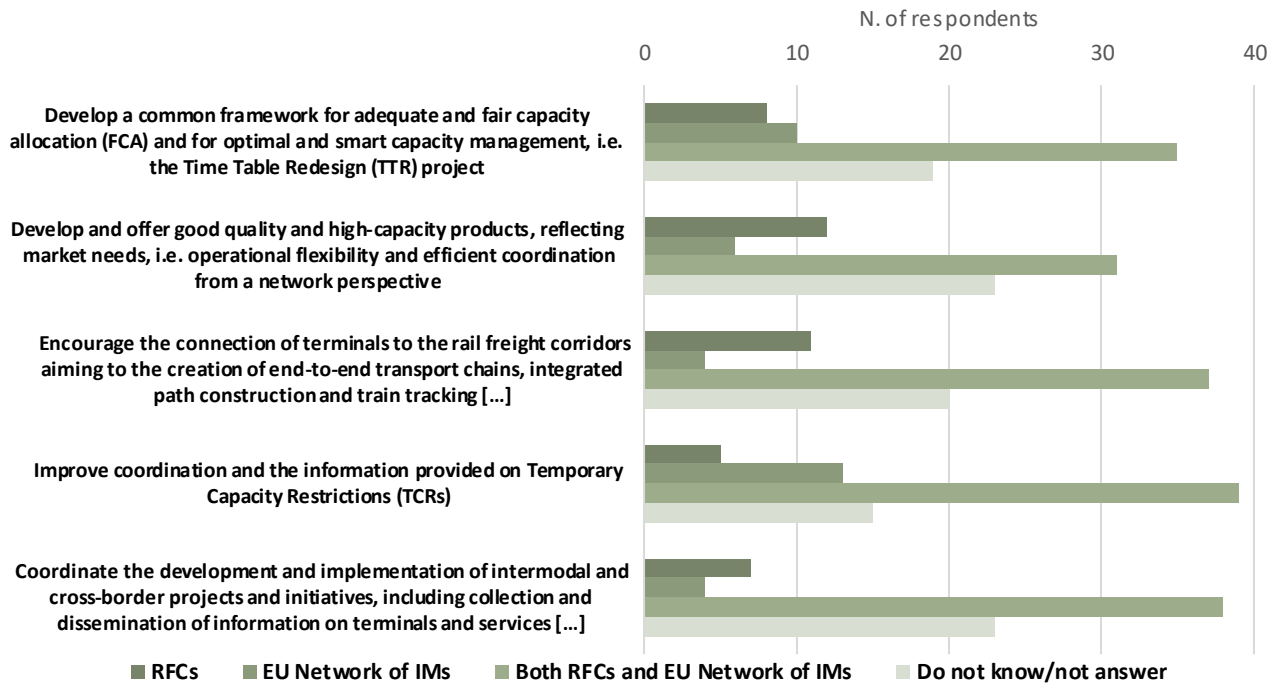
Figure 68 Expected changes based on current programmes/initiatives - Capacity Planning Issues



Source: 2023 11 RFCs Joint TMS Update Survey; 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 European Network of Infrastructure Managers (ENIM) (Figure 69).

Figure 69 Best fitting governance to bring the issue forward - Capacity Planning Issues

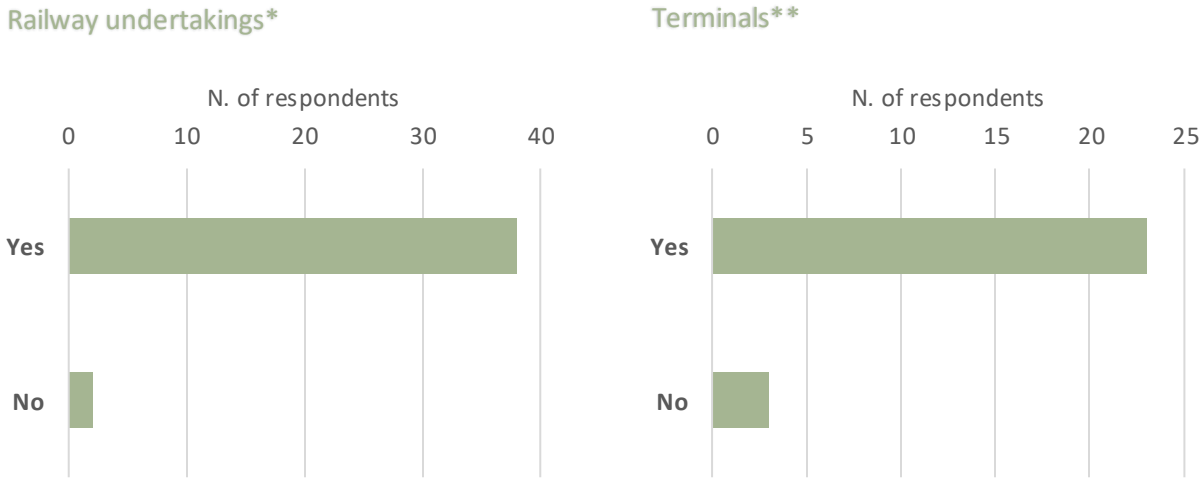


Source: 2023 11 RFCs Joint TMS Update Survey; Notes: Question B) 3.RT

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 Update Survey, which is further described in this section.

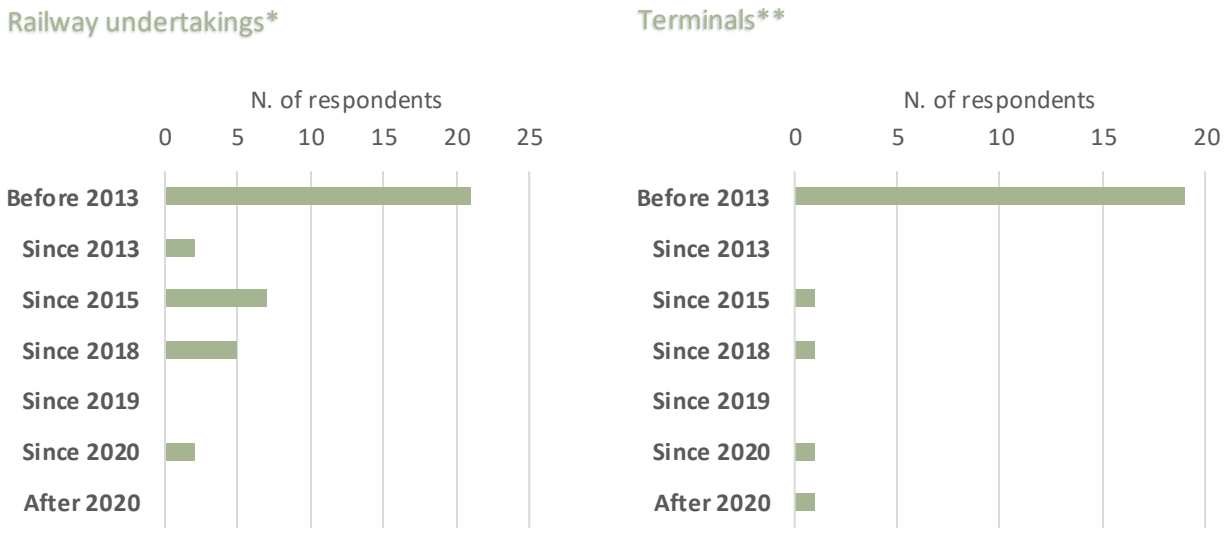
Figure 70 Respondent has operated/operates rail services or manages/operates terminals serving trains across at least one border crossing point(s) on any RFC



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

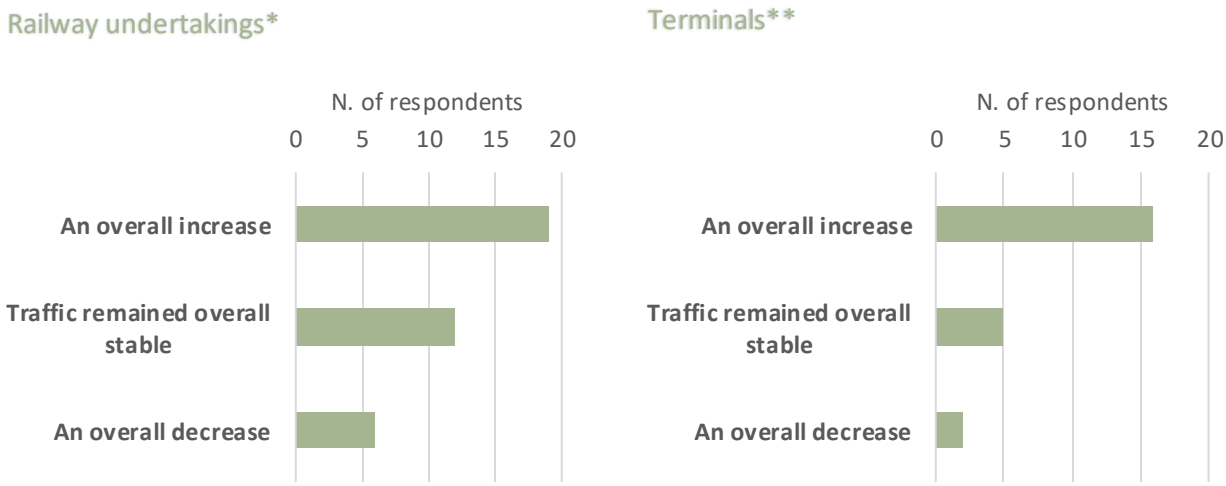
The vast majority of the respondents who participated in the survey operated or still operates rail services or manage/operate terminals serving trains across at least one border crossing point(s) on any RFC. Most of them also operated or served international rail freight transport before the establishment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

Figure 71 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 Survey; Notes: Questions C) 1.1R and 1.1T,
**37 out of 42 respondents, ** 23 out of 30 respondents*

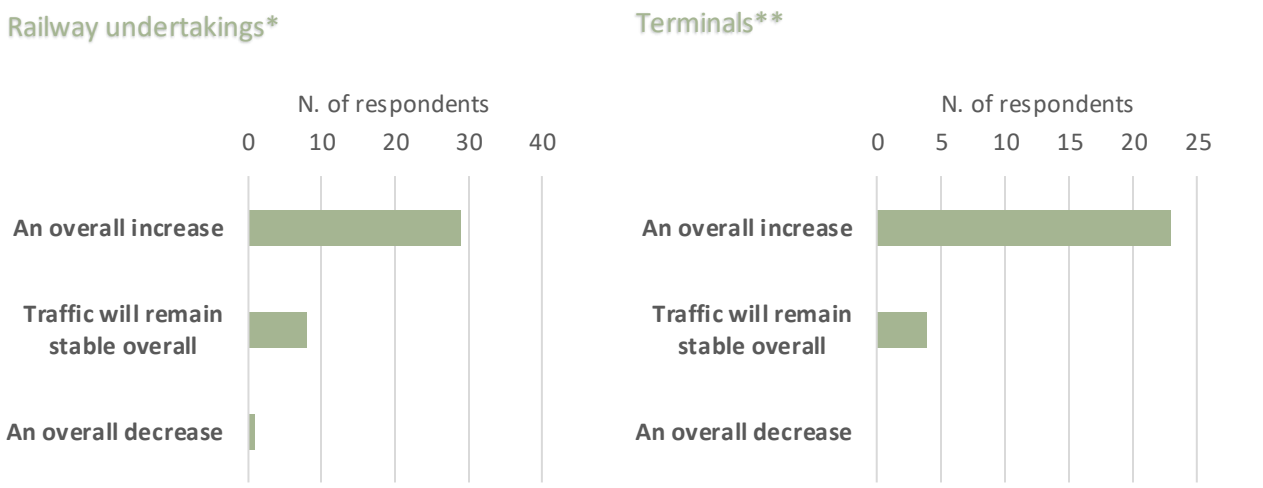
Figure 72 Variation in the operation of trains and in serving trains crossing at least one border crossing point(s) on any RFC since 2013



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

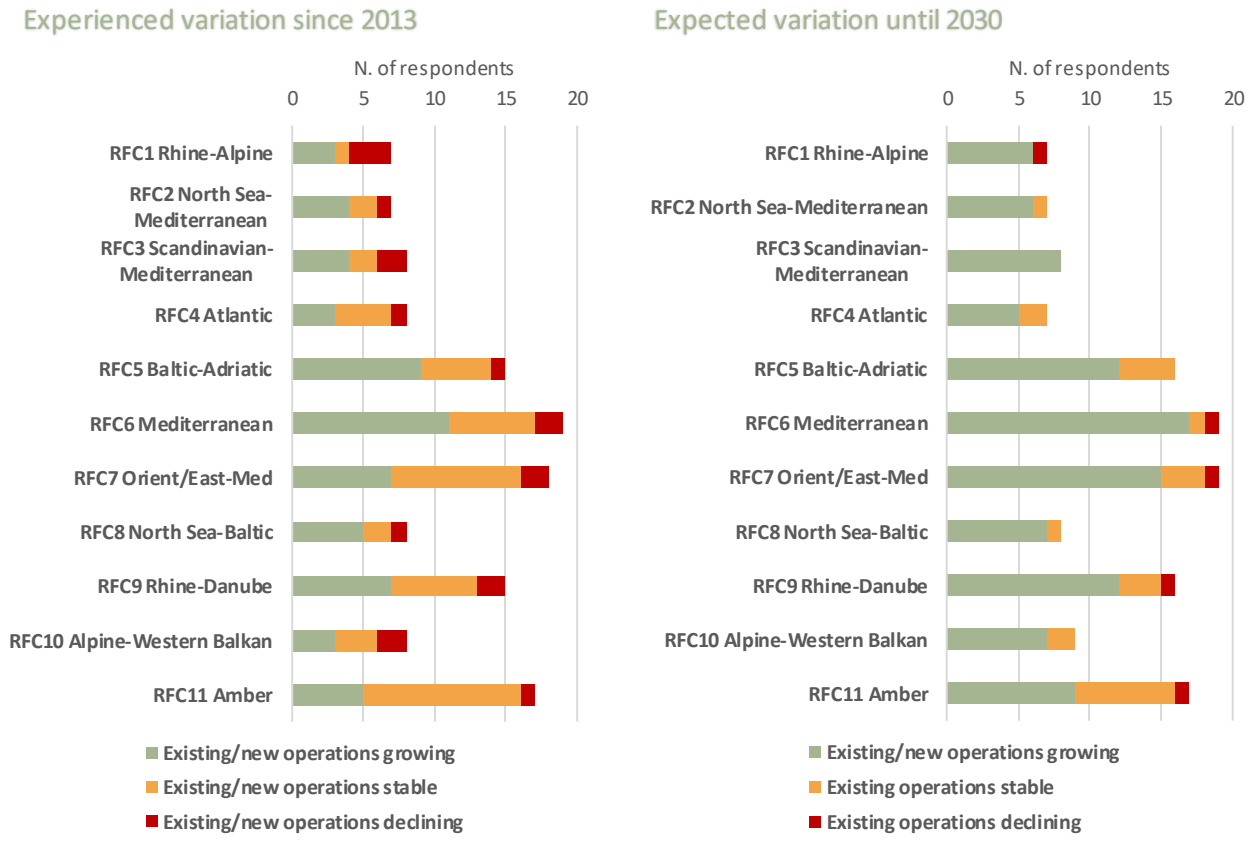
The majority of the respondents declare they experienced an increase in their operations since 2013 (Figure 72), and most of them also have a positive expectation about the future, expecting overall market growth (Figure 73).

Figure 73 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 Survey; Notes: Questions C) 2.R and 2.T, *38 out of 42 respondents, ** 23 out of 30 respondents*

Figure 74 Experienced and expected traffic trends according to the trains operated by RUs, crossing at least one border crossing point(s) on any RFC

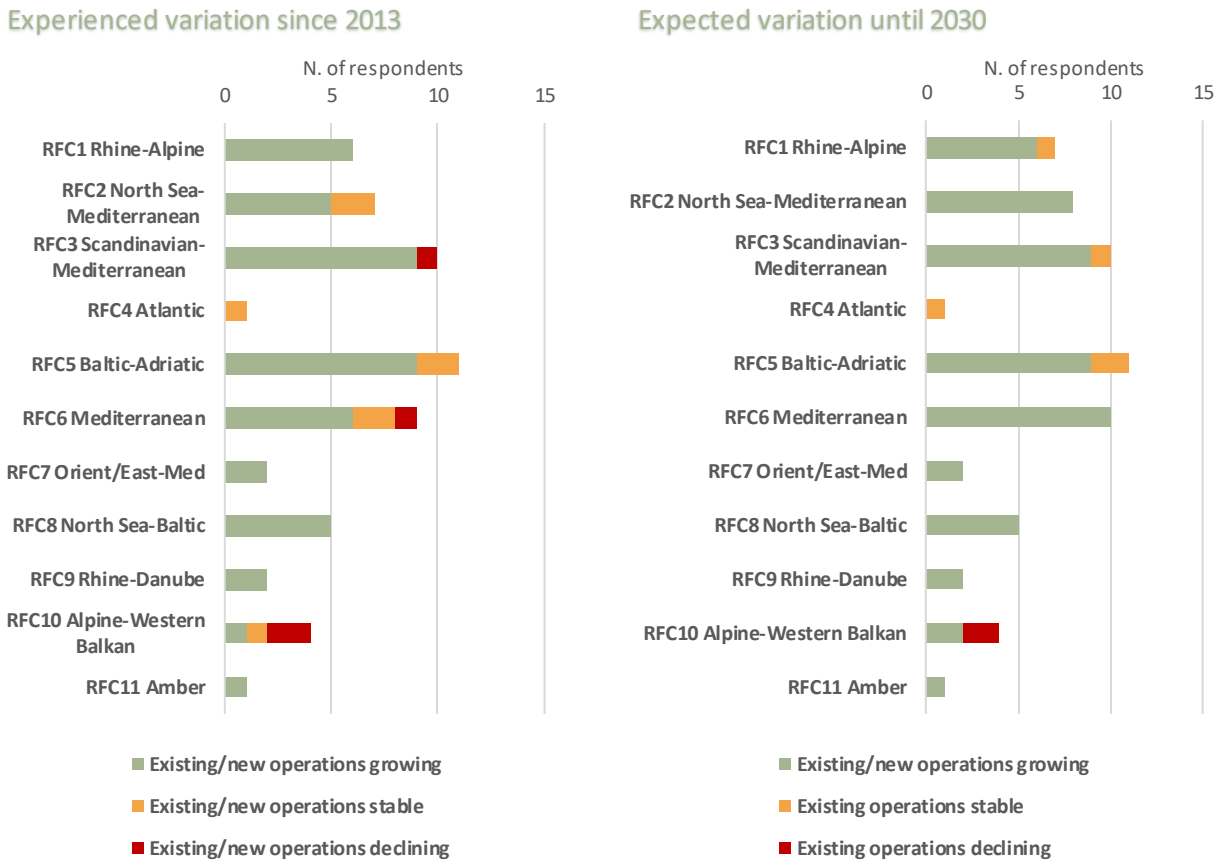


Source: 2023 11 RFCs Joint TMS Update Survey; Notes: Question C) 3.R

The variation in traffic experienced by RUs since 2013 differs from RFC (Figure 74). 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. For RALP, the

number of growing and declining registered trends are similar. The expectation for the future (2030) is generally positive for all RFCs.

Figure 75 Experienced and expected traffic trends on RFCs 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 Survey; Notes: Question C) 3.T

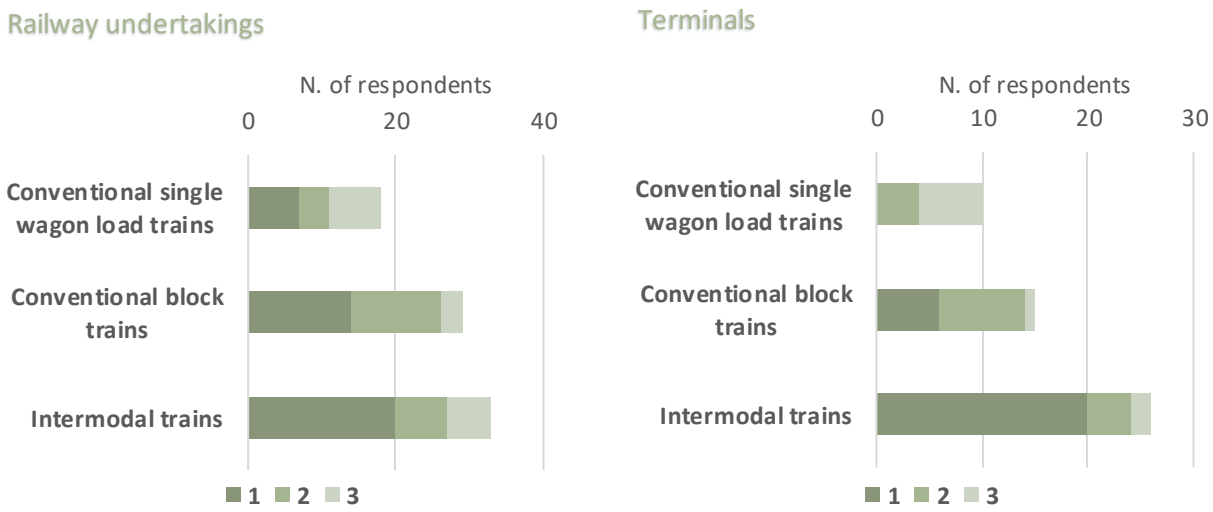
The variation in traffic experienced by terminal operators since 2013 and the expected growth are generally positive, except for the ATL and AWB RFCs (Figure 75). The prevailing response is pessimistic about the experienced variation, whereas the number of growing and declining registered trends is similar regarding future expectations.

Figure 76 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 Survey; Notes: Questions C) 4.R and 4.T

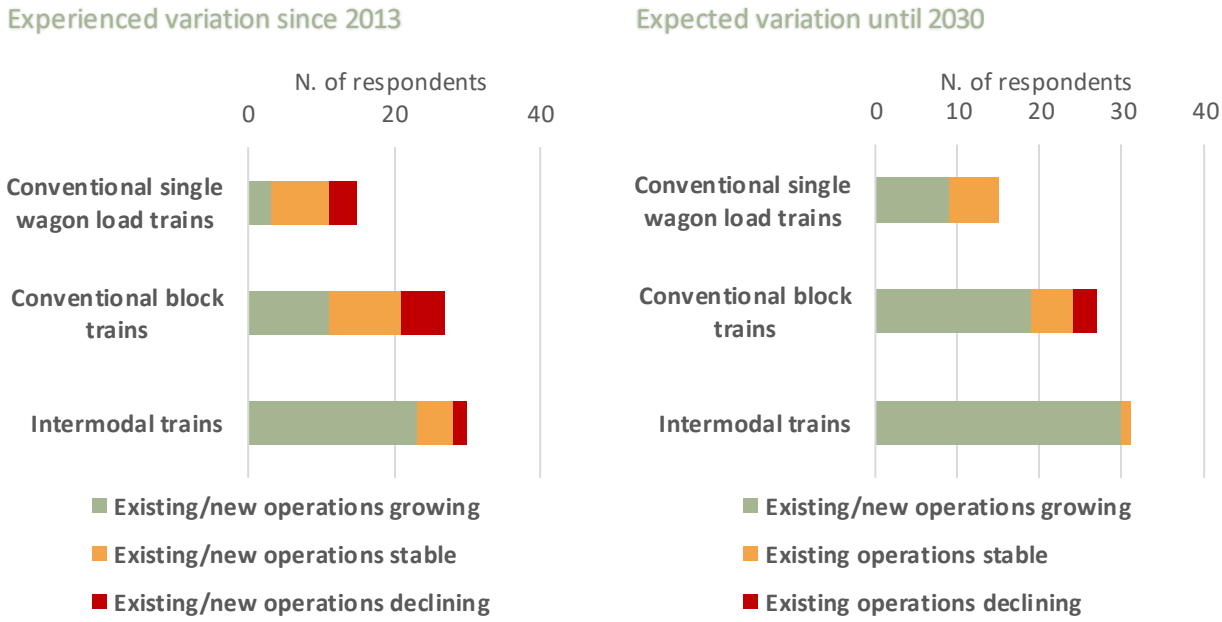
The prevailing type of international trains operated on the 11 RFCs Network consists of intermodal trains, followed by conventional block trains and single wagonload trains (Figure 76 and Figure 77).

Figure 77 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 Survey; Notes: Questions C) 4.R and 4.T; Note: 1= first, 2=second, 3= third

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



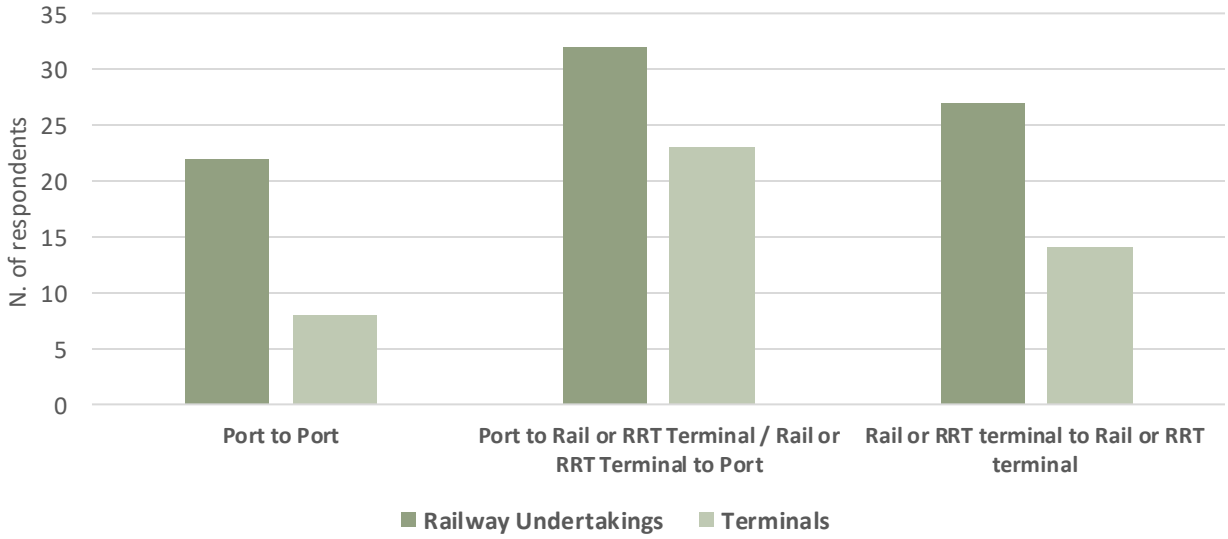
Source: 2023 11 RFCs Joint TMS Update Survey; Notes: Question C) 4.R

Most RUs and terminal operators experienced growth in intermodal train operations in the past years (Figure 78 and Figure 79), 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 79 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 Survey; Notes: Question C) 4.T

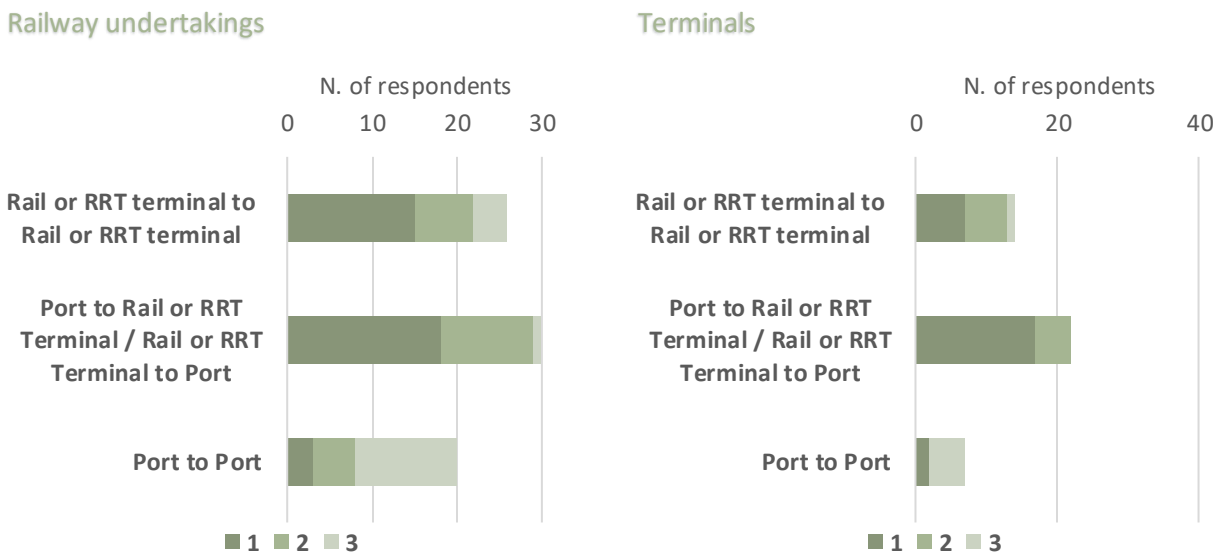
Figure 80 The type of O/Ds of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) on any RFC



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

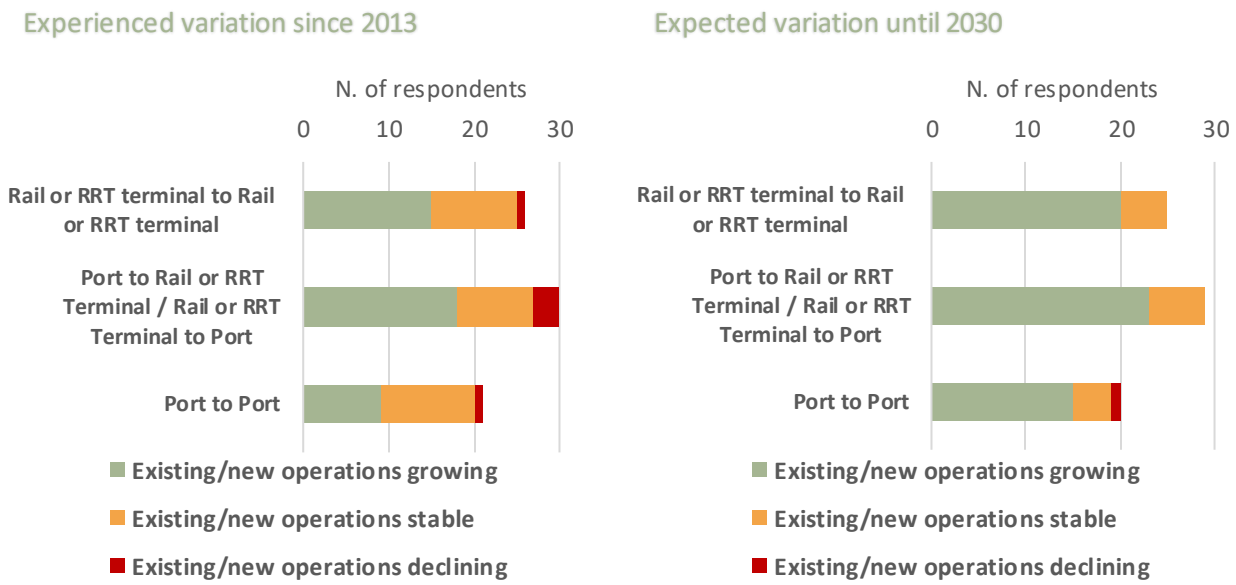
Most operations relate to Port to Rail-Road Terminal (RRT) transport, followed by RRT to RRT services and Port to Port operations (Figure 80 and Figure 81).

Figure 81 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 Survey; Notes: Questions C) 5.R and 5.T; Note: 1= first, 2=second, 3= third

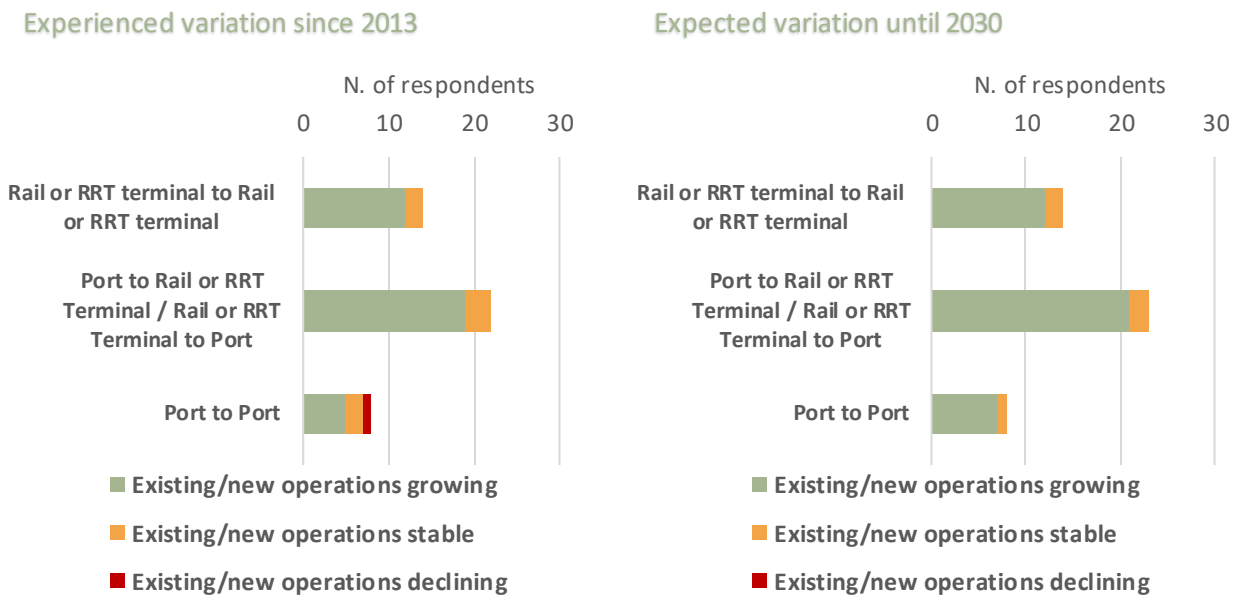
Figure 82 Experienced and expected traffic trend on the type of O/Ds of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



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

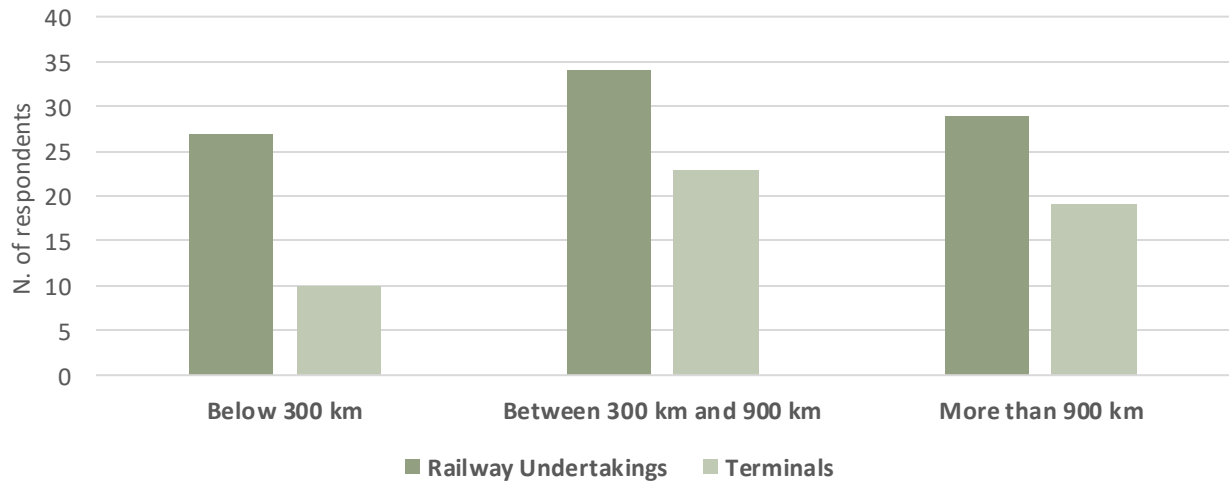
Experienced variations by RUs were mostly positive for the Port to RRT or RRT to RRT segments and stable for the Port to Port one (Figure 82). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure 83). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments (Figure 82 and Figure 83).

Figure 83 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 Survey; Notes: Question C) 5.T

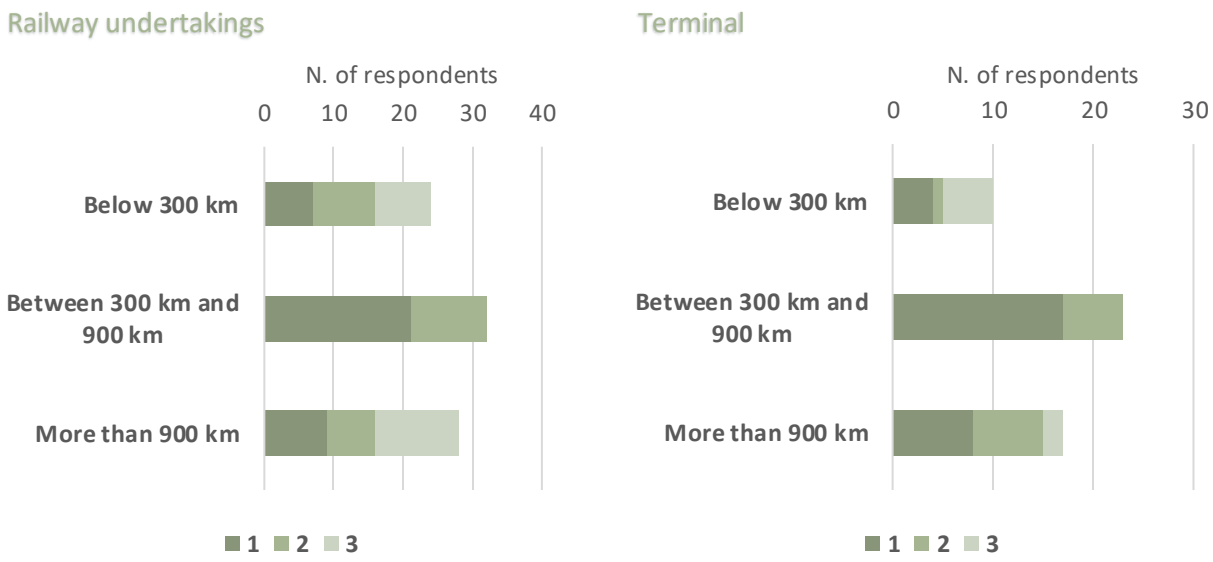
Figure 84 Type of distances of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



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

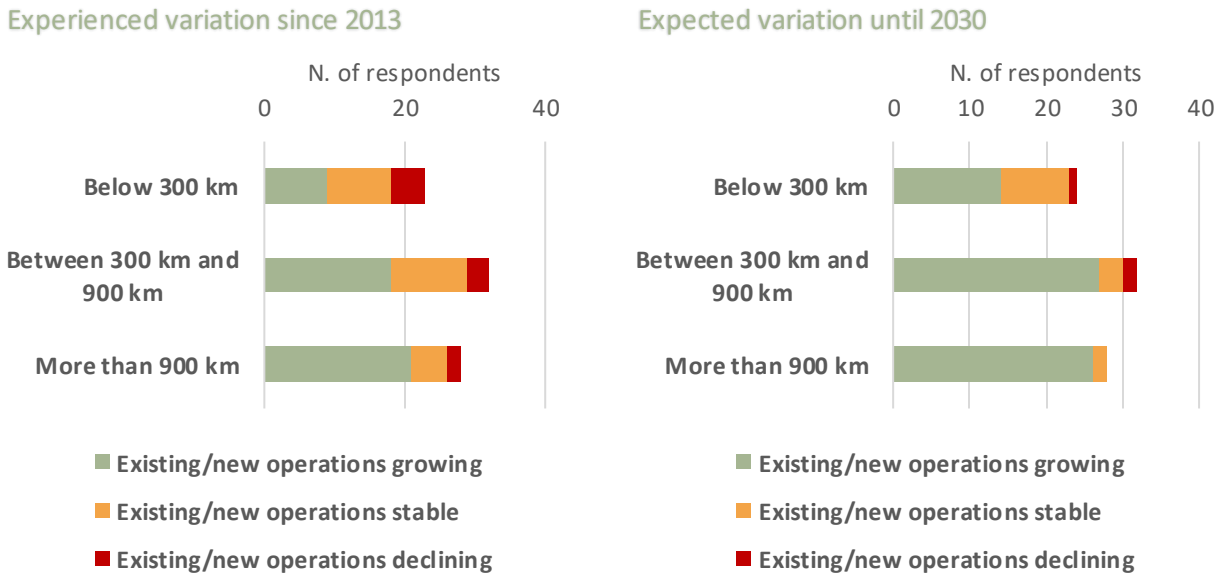
Most international train operations cover distances between 300 km and 900 km, followed by services covering distances longer than 900 km and below 300 km (Figure 84 and Figure 85).

Figure 85 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 Survey; Notes: Questions C) 6.R and 6.T; Note: 1= first, 2=second, 3= third

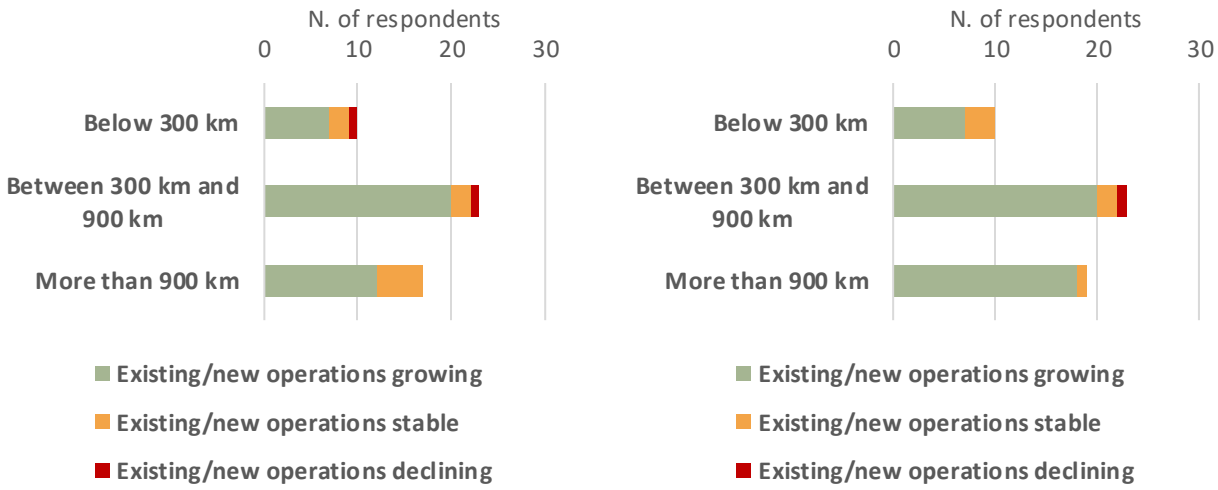
Figure 86 Experienced and expected traffic trend on type of distances of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



Source: 2023 11 RFCs Joint TMS Update Survey; 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 86). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure 87). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments.

Figure 87 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

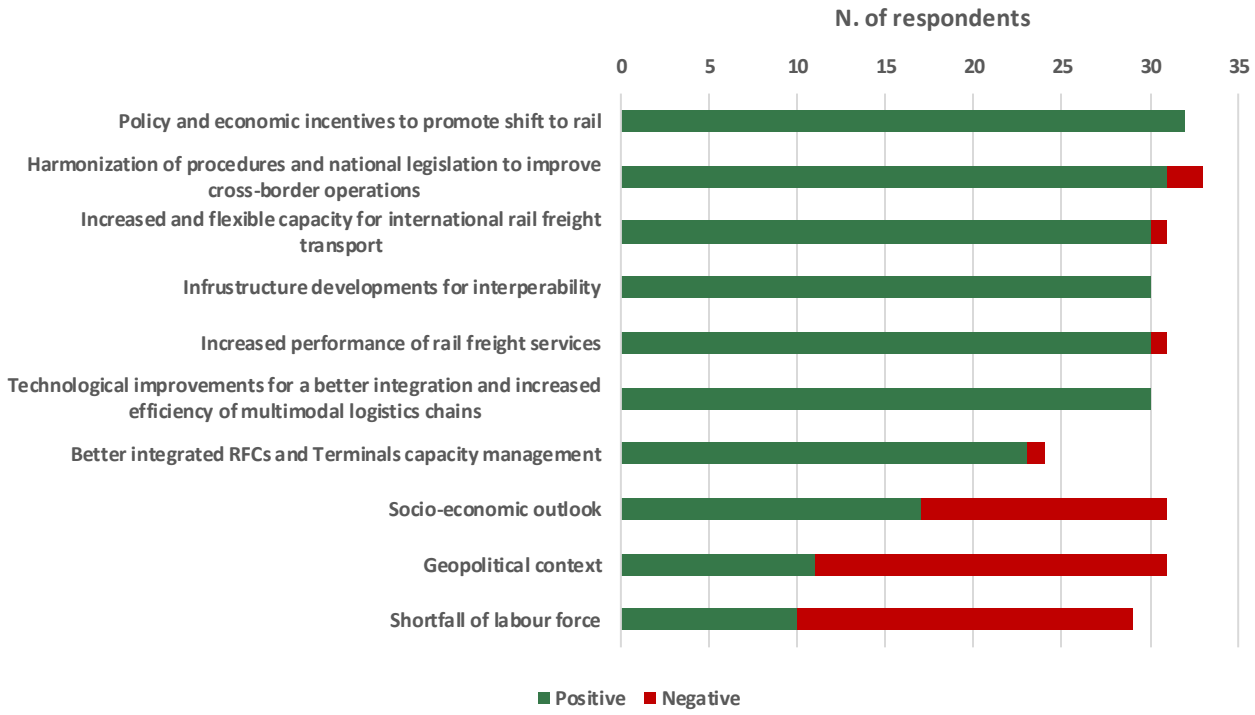


Source: 2023 11 RFCs Joint TMS Update Survey; Notes: Questions C) 6.T

6.3 MARKET DRIVERS

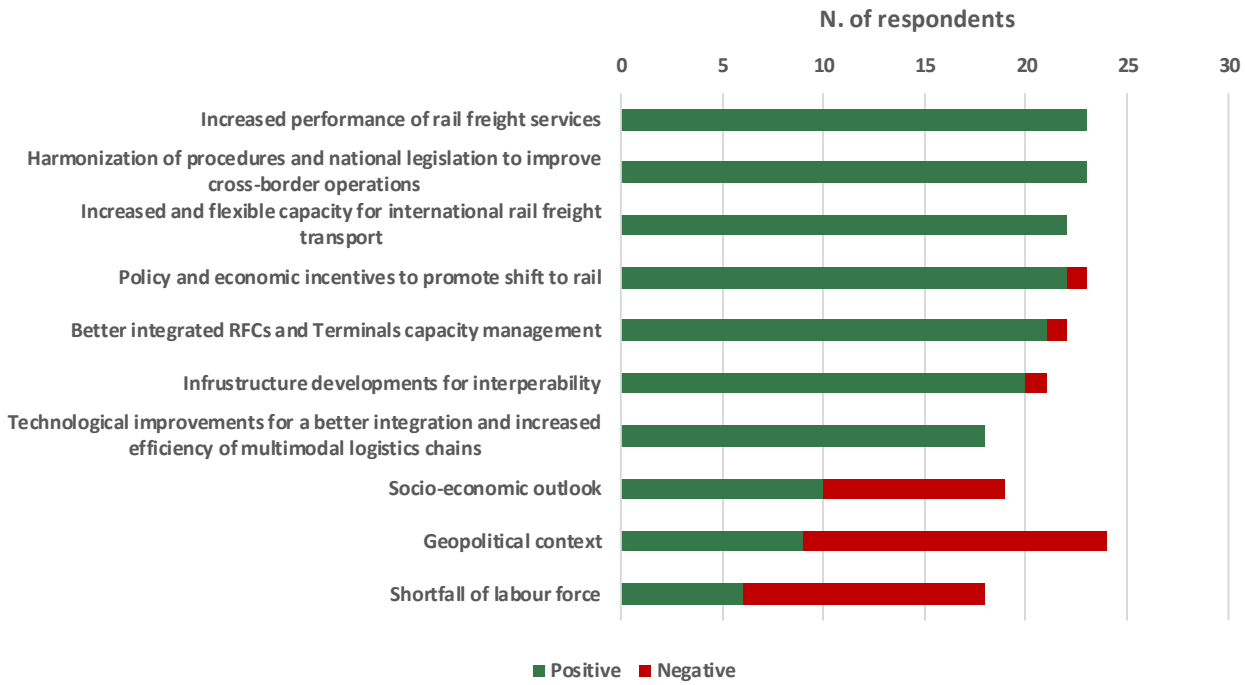
RUs and terminal operators have very similar views about the effects of the main market drivers on the growth of international rail freight transport in the short term, i.e., up until 2030 (Figure 93 and Figure 94). Most identified drivers are expected to have positive effects as they are assumed to 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 88 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 Survey; Notes: Question C) 7.RT

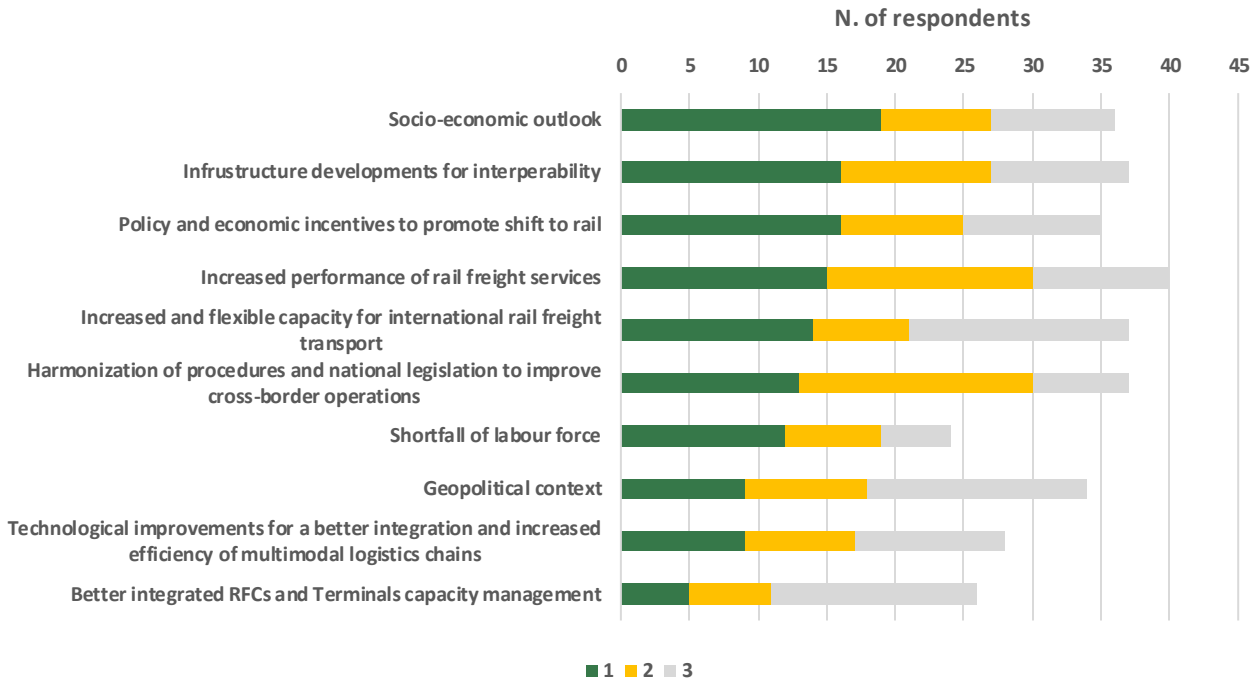
Figure 89 Potential effect of market drivers on the evolution of international rail freight transport served at terminals until 2030



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

Market players rank as most relevant market driver the socio-economic outlook (Figure 95). 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 90 Ranking of the most relevant short-term market drivers for RUs and Terminals



Source: 2023 11 RFCs Joint TMS Update Survey; 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 CONSIDERATIONS AND REMARKS ON FACILITATING AND STRENGTHENING RAIL FREIGHT MARKET ALONG THE 11 RFCS NETWORK AND THE RFC SCANMED

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 EC 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 EC 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[23] 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[24]. 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 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

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

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 results, 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[25], 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 EC 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 34 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.

Table 33 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

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

7.1 SUMMARY OF KEY FINDINGS OF THE STUDY

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

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 EC DG MOVE/Eurostat (Statistical Pocketbook 2023 and Rail Market Monitoring Report) and from the Independents Regulatory Bodies (IRG) (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 2030s 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 between 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 war of aggression against Ukraine and deteriorated with the Israel-Gaza conflict and Red Sea crisis.
- 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 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 ScanMed concerned countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In the RFC ScanMed concerned countries rail freight transport grew indeed from about 178 to 200 billion tkm, i.e. 12%.
- The RFC ScanMed countries register a stable slightly declining trend in rail share market over time. 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 ScanMed concerned 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.
- The COVID-19 pandemic seems to have had different impacts at the EU27 scale 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, Portugal, and Romania, whereas Bulgaria and Greece experienced about 20% growth. In general, the RFC ScanMed concerned countries seem to have registered positive variations during the pandemic period.
- Since the start of the rail freight liberalisation process late 1990's and 2000's, the market share of the domestic incumbent railway undertakings 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 RFC ScanMed concerned countries, the trend of the market share by domestic incumbents continued to decline in the period 2013-2021. In the RFC ScanMed concerned countries, the market share of the domestic incumbent in 2021 was about 40% on average, slightly above 50% 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 train traffic data available from RNE databases. The model and analysis cover the entire 11 RFCs network and results are possible to be extracted for each individual RFC.

According to the performed analyses, international freight transport across all modes in the catchment area of the RFC ScanMed amounts to 144 million tonnes. Overall, most transport concerns cargo type *Other* (68%), followed by *Dry Bulk* (29%). The cargo type *Other* is mostly transported by road (72%), while rail has a large share in the international transport of dry bulk (40%).

On relations within the catchment area of RFC ScanMed, rail freight transport has a share of 22% in the total amount of international freight transport. This is a volume of approximately 31 million tonnes. The total amount of international rail freight transport of 31 million tonnes relates to approximately 35,000 trains in the catchment area of RFC ScanMed.

Looking *within the corridor area*, rail transport amounts to 13 million tonnes. This is equivalent to approximately 13,000 trains from and to locations within the corridor area of the RFC ScanMed.

The most important rail transport origins and destinations can be found in Hamburg, Munich, Milan, and Innsbruck. The port of Hamburg serves as a gateway to the hinterland in the RFC ScanMed. Both ports have overlaps in their hinterlands. The most important rail transport relations however are between inland locations and not between ports and hinterland. The most important relation is between Munich and Milan.

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 one simulates the impact of a fully interoperable rail network, regardless the possibility to implement the required projects (Sensitivity).

The three scenarios show an increase in international freight transport in Europe in general and in the RFC ScanMed specifically. Mainly due to autonomous economic growth, the increase in the Reference scenario is about 13%, in the RFC ScanMed slightly more at 15%. This is in line with the GDP growth for the EU27 which is 17%. In the RFC ScanMed, road has a growth of 15%, rail transport of 19%, and sea shipping 13%. For all land freight transport, the Projects scenario and the sensitivity scenario have an impact on the overall growth of international freight transport, especially in the RFC ScanMed.

In the RFC ScanMed, for the Reference scenario, a growth of international rail transport is expected at 19%, which is approximately 6 million tonnes extra compared to the 2022 situation. This would be (rounded) 42,000 international freight trains in the RFC ScanMed in the Reference scenario.

Both the Projects scenario and the sensitivity scenario show the impact of the different rail projects and rail measures. Rail transport grows an extra 2% compared to the reference scenario. In total it is estimated that this is approximately 8 million tonnes of extra international rail freight transport. This gives (rounded) 9,000 extra trains in the RFC ScanMed compared to the Reference scenario. Together with the Reference scenario results, this would be approximately 51,000 trains within the RFC ScanMed.

The hypothetical TEN-T standards scenario shows that there is another potential of 5 million tonnes extra rail freight transport due to longer trains, intermodal loading gauge, ERTMS, and European standard track gauge along the RFCs network. With an extra average volume of 15%, the total number of unique international freight trains would then be around 50,000. Compared to the 35,000 unique trains in 2022, this is a growth of around 43%. 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 31 to 51 million tonnes i.e. by 33%, 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 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. Further to these projects, completing an interoperable 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, assuming transport along the RFC would at least have a trend similar to the one of the concerned countries for the period 2015-2022 (-4%, see Table 33) and expected for the time frame 2023-2030 (+33%) 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, despite the completion of mega cross-border projects like Fehmarnbelt and Brenner.

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*[26]. 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*[27] – 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

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

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 ScanMed

International freight transport across all modes in the catchment area of the RFC ScanMed amounts to 144 million tonnes. Overall, most transport concerns cargo type *Other* (68%), followed by dry bulk (29%). The cargo type *Other* is mostly transported by road (72%), while rail has a large share in the international transport of dry bulk (40%).

On relations within the catchment area of RFC ScanMed, rail freight transport has a share of 22% in the total amount of international freight transport. This is a volume of approximately 31 million tonnes. The total amount of international rail freight transport of 31 million tonnes relates to approximately 52,000 trains within the corridor area of RFC ScanMed.

Looking within the corridor area, rail transport amounts to 13 million tonnes. This is equivalent to approximately 22,000 trains from and to locations within the corridor area of the RFC ScanMed.

The most important rail transport origins and destinations can be found in different locations across the RFC ScanMed such as Hamburg, Munich, Milan, and Innsbruck. The port of Hamburg serves as a gateway to the hinterlands in the RFC ScanMed. The most important relation is between Munich and Milan.

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 one simulates the impact of a fully interoperable rail network, regardless the possibility to implement the required projects (Sensitivity).

The three scenarios show an increase in international freight transport in Europe in general and in the RFC ScanMed specifically. Mainly due to autonomous economic growth, the increase in general is about 13%, in the RFC ScanMed slightly more at 15%. This is in line with the GDP growth for the EU27 which is 17%. In the RFC ScanMed, rail shows a growth of 19%, road has a growth of 15%, and sea shipping 13%. 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 increasing slightly 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 in the RFC ScanMed.

In the RFC ScanMed, for the Reference scenario, a growth of international rail transport is expected at 19%, which is approximately 6 million tonnes extra compared to the 2022 situation. Using an average volume of 600 tonnes per train, this would be (rounded) 10,000 extra international freight trains in the RFC ScanMed. *Within the corridor area* of the RFC ScanMed in 2022 the total amount of unique international freight trains is estimated at about 22,000. The total number of international trains would then be some 26,000 trains in the Reference situation in 2030.

Both the Projects scenario and the sensitivity scenario show the impact of the different rail projects and rail measures. Rail transport grows an extra 26% compared to the reference scenario. In total it is estimated that this is approximately 5 million tonnes of extra international rail freight transport. Taking an average volume of 600 tonnes per train, this gives (rounded) 14,000 extra trains in the RFC ScanMed. Together with the Reference scenario results, this would be approximately 76,000 trains for the RFC ScanMed.

The hypothetical TEN-T standards interoperability scenario shows that there is another potential of 5 million tonnes extra rail freight transport. With an average volume of 690 tonnes per train, the total number of unique international freight trains would then be around 74,000. Compared to the 52,000 unique trains in 2022, this is a growth of 42%. 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 32 to 51 million tonnes i.e. by 59%.

Compared to the findings from the previous TMS it is worth noticing that there are differences in the results when comparing 2012 and 2022. This is partially due to using a different method. In the present TMS update, the observed number of trains on border crossing points as available from RNE databases have been used as a base to estimate the numbers of unique trains (i.e. trains crossing more BCPs are counted once) and thus the tonnes transported.

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 2020 – 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 Undertakings 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 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 issues. 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 issues related to capacity management. The best governance solution for capacity management improvements is deemed to be the cooperation between the RFCs and an European Network of Infrastructure Managers (ENIM).

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 ScanMed. 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 corridors and terminal capacity management do not seem to be considered priority issues by the RUs and terminal operators.

7.2 STUDY RECOMMENDATIONS

In line with the overall study approach aimed at conducting the 2024 RFC MED 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 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[28] 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).

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

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 the Green Deal's targets for the transport sector and the rail freight segment within it;
- *Monitor operational performance*. The revised TEN-T Regulation (EU) 1679/2024 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 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. 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.

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, Russian war of aggression against Ukraine 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.

ANNEX 2 – 2023 11 RFCS JOINT TMS UPDATE SURVEY COMPLETE RESULTS

This annex is enclosed as a separate file.