MEDITERRANEAN RAIL FREIGHT CORRIDOR

TRANSPORT MARKET STUDY

2024 UPDATE

Funded by the European Union

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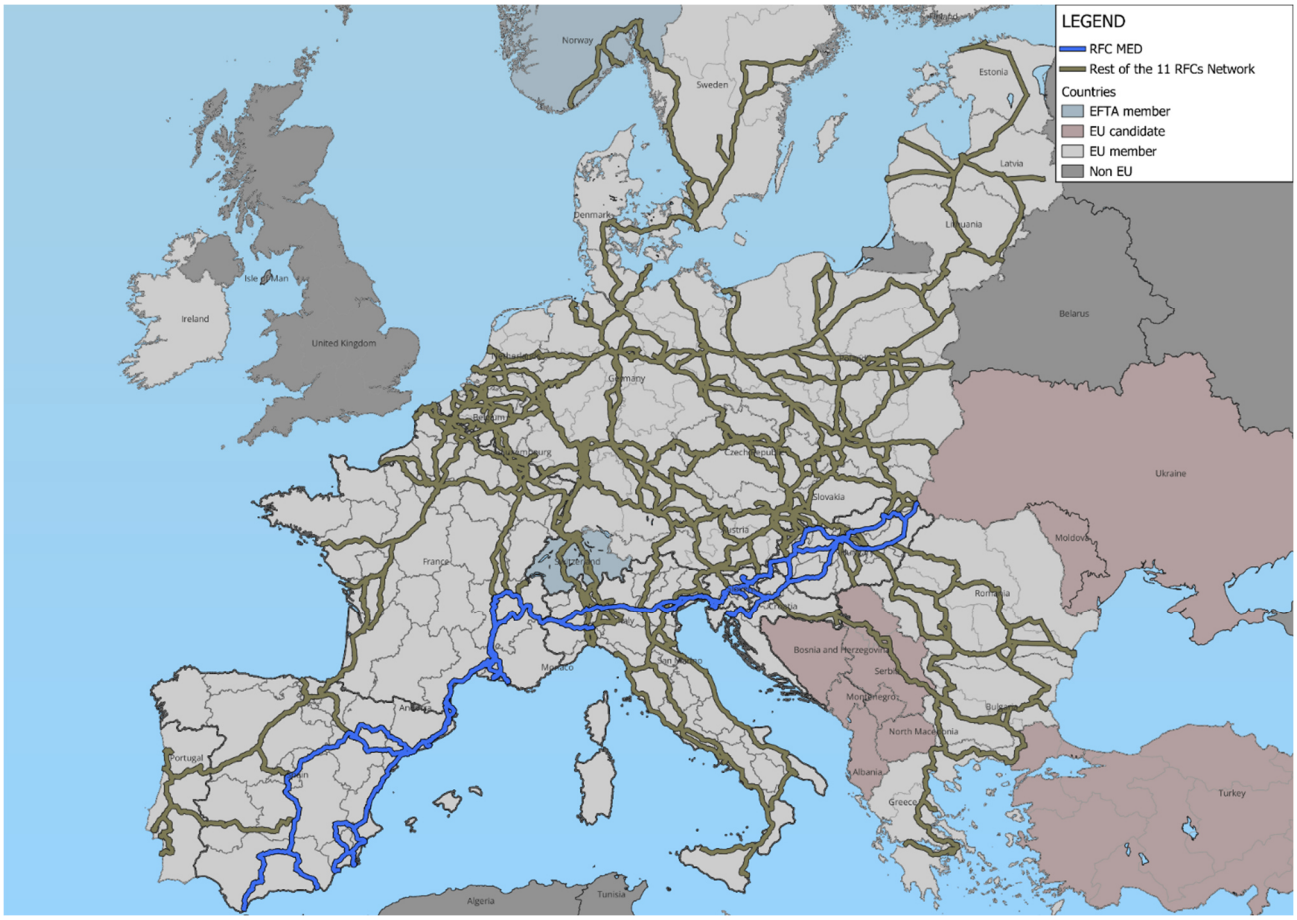
RFC MED 2024 TMS UPDATE RESULTS WITHIN THE 2024 JOINT TMS UPDATE OF THE 11 RFCS BELONGING TO THE EUROPEAN RAIL NETWORK FOR COMPETITIVE FREIGHT

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

The RFC MED 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%

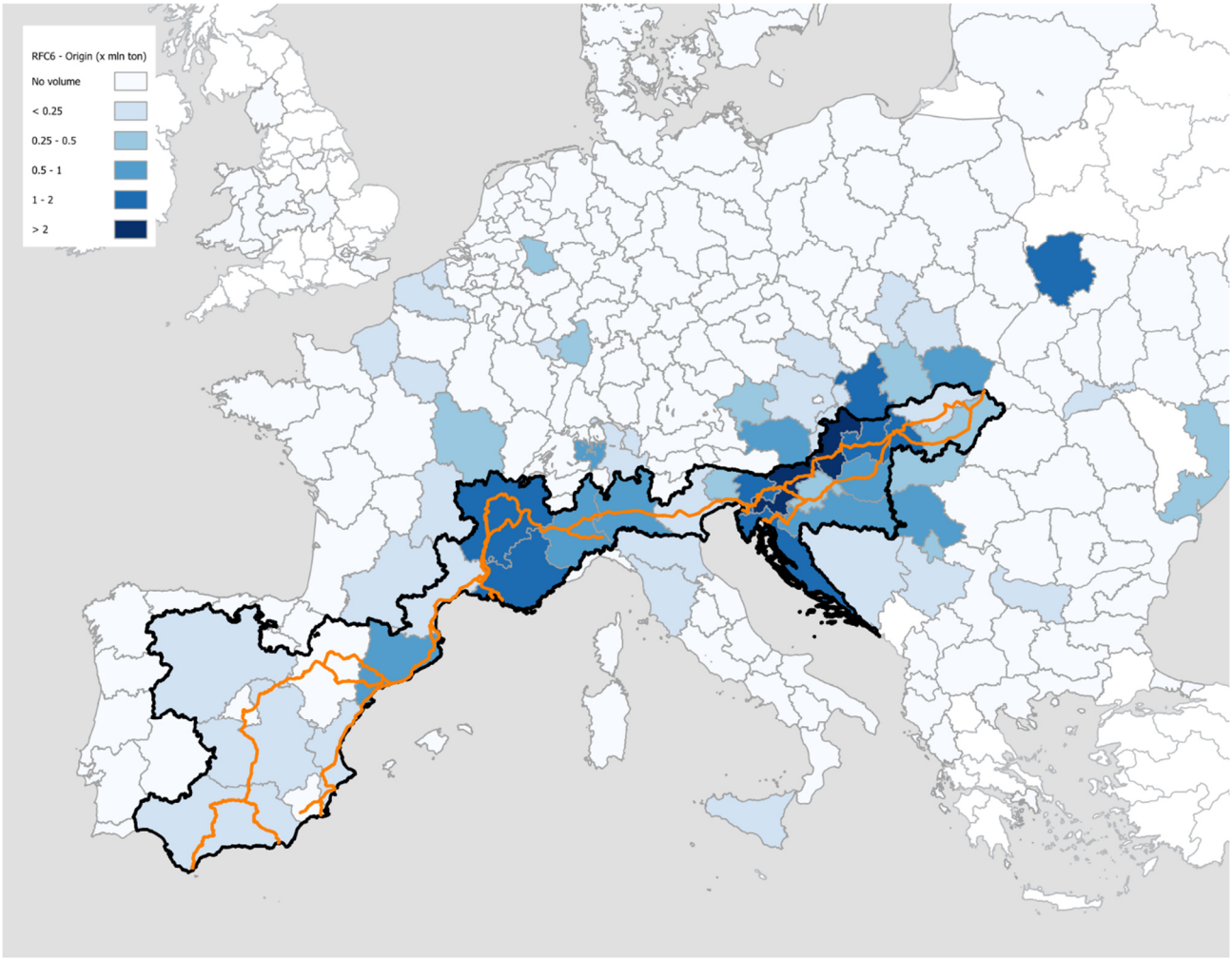
Source: Eurostat [rail_go_typepas]; Notes: (1) Data for Belgium are excluded from the total as they are not available for 2015 and 2022. (2) Data are limited to main undertakings

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 MED 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 MED - namely the NUTS 2 regions where trains crossing at least one RFC MED BCP have either their origin and/or destination – exceeds the corridor area, i.e. the area crossed by the corridor infrastructure (see overview in the overleaf figures). The RFC MED catchment area captures large parts of Europe, including Spain, France, Italy, Slovenia, Croatia, Hungary, Austria, Serbia, Romania and Ukraine. A large proportion of the rail freight transport uses the RFC MED, and its border the origins of the RFC MED, with important origins such as Barcelona, Tarragona, Paris, Lyon, , Milano, Trieste, Koper/Ljubljana, Zagreb/Rijeka, and Budapest. Also, outside the corridor area different zones can be seen that contribute to the RFC MED, such as Rhein-Ruhr area, Belgium, Luxemburg, and the agricultural area of Central Europe. 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.

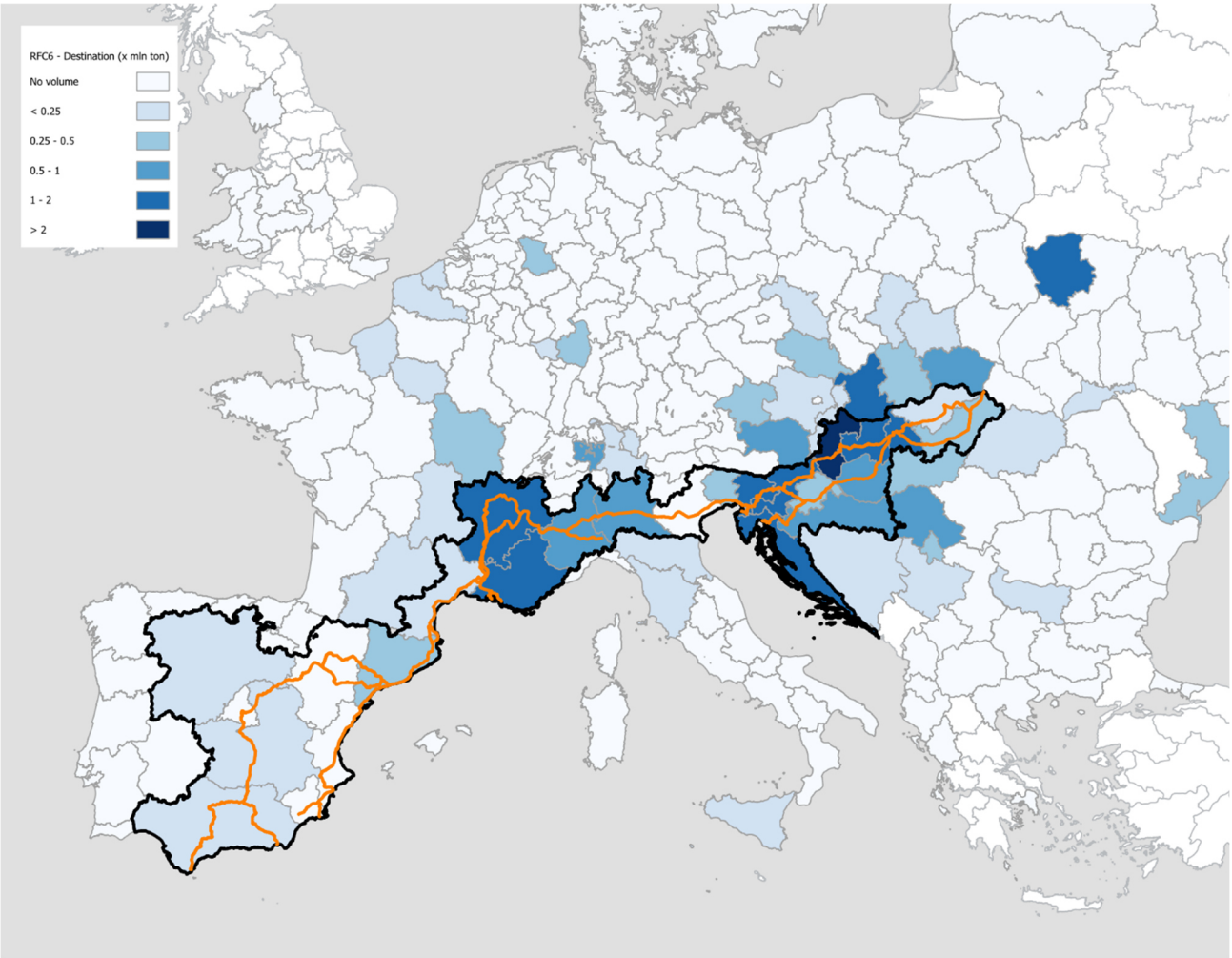
Origins of international rail freight volume (in million tonnes) that use the RFC MED rail network and the delineation of the potential RFC MED catchment area



Source: NEAC estimations; Legend: Orange = rail tracks of RFC MED. Blue = Volume by origin. Black = Delineation of potential catchment area

The next figure presents the destinations within the RFC MED 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 MED's services fall outside the corridor area, such as areas in the rest of Belgium, Luxemburg, Germany, France, and Austria. Within the corridor area, there are also a few zones with limited rail volumes for international transport such as in Spain.

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



Source: NEAC estimations; Legend: Orange = rail tracks of RFC MED. Blue = Volume by origin. Black = Delineation of potential catchment area

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

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

[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.

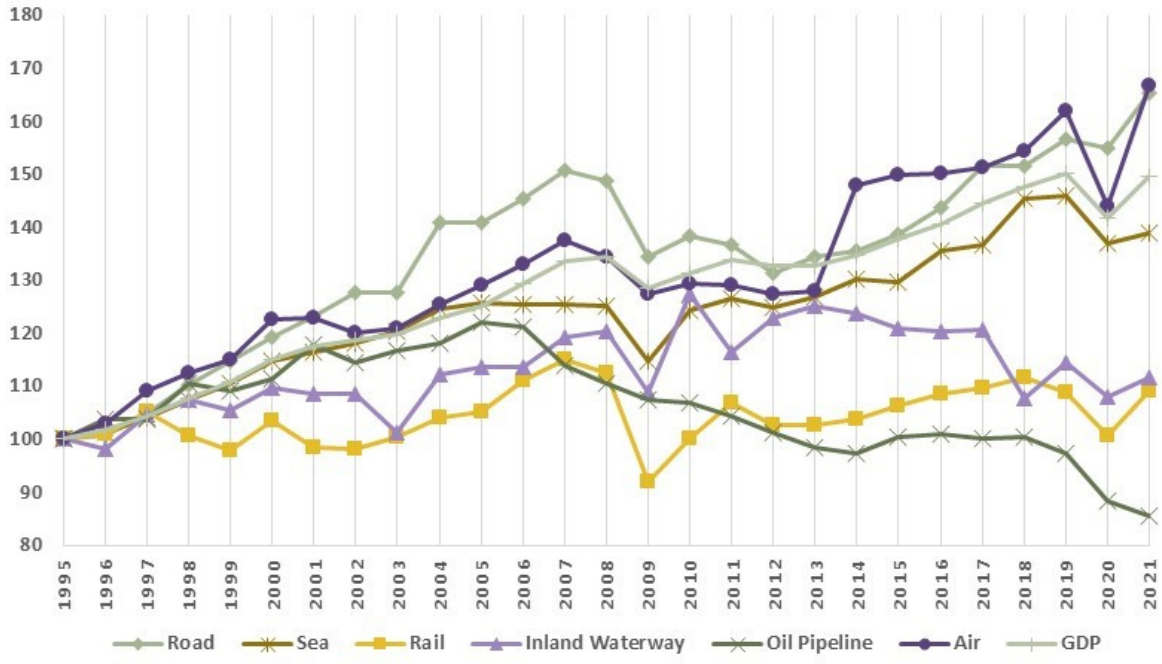
KEY STUDY FINDINGS ON RAIL FREIGHT MARKET IN EUROPE AND ALONG THE RFC MED

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) provides an overview of the development of the European rail freight sector since mid of the 1990s when the rail freight market liberalization started, allowing monitoring trends before and after the 2008 credit crunch, which is considered the second major financial crisis after the 1930s Great Depression, and which was followed by additional adverse events during the past 10-15 years when the 11 RFCs were gradually established and entered into operation. 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 MED 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. EU27 long-term series over the past 30 years show that the effects of this crisis are persisting: albeit positive, the trend of GDP and most transport modes of the following period stands indeed at lower growth rates. Overall, the European rail freight market grew modestly over the last decade, contrasting with the strong development experienced between 2001 and 2008. The EU economy and transport markets were more recently further impacted by the 2020-2021 COVID-19 pandemic and by the current geopolitical crisis that started in 2022 with the Russian-Ukrainian war and deteriorated with the Israel-Gaza conflict and Red Sea crisis.

Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE – Statistical Pocketbook 2023

- Rail freight transport between 2013 and 2021 marginally grew in the EU27 from about 385 billion tkm to 410 billion tkm, i.e. 7%, which is only half 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 MED concerned countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In the RFC MED concerned countries, rail freight transport grew indeed from about 76 to 90 billion tkm, i.e. 18%.
- The rail modal share varies significantly among the RFC MED countries. It is over 25% in Hungary and Slovenia, it is about 20% in Croatia, it is around10% in France and Italy. It is less than 5% in Spain,. The market share seems to be stable over time with positive marginal increases in Hungary and Slovenia. At both EU 27 and RFC MED 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.
- 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. The RFC MED 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-Ukrainian war in 2022. In fact, EU sanctions implemented with Belarus and Russia following the start of the Ukrainian conflict 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 MED concerned countries, the trend of the market share by domestic incumbents continued to decline in the period 2013-2021. In the RFC MED concerned countries, the market share of the domestic incumbent in 2021 was about 60% on average, 70% 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, 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.

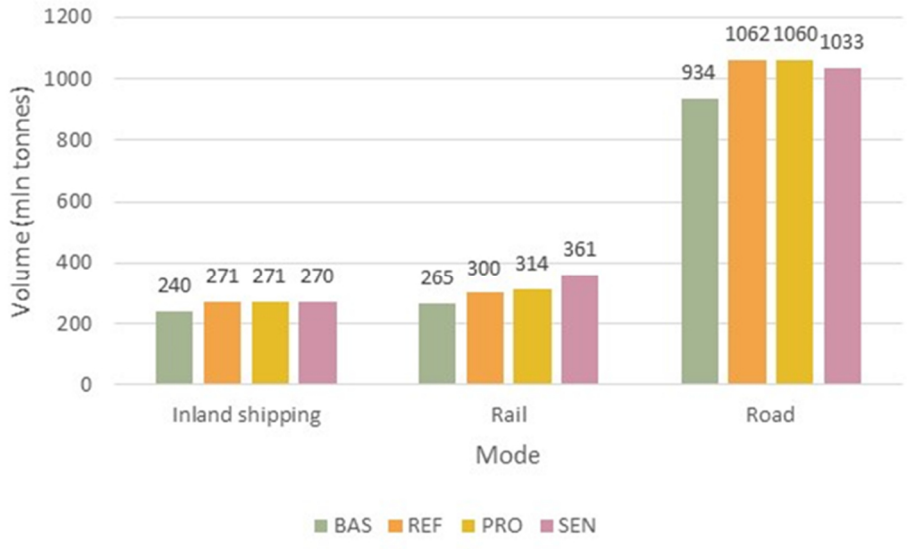
[3] Using an average of 600 tonnes per train

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

Source: NEAC estimations

The three future scenarios (Reference, Projects and Sensitivity) show an increase in international freight transport in general. Within the 11 RFCs Network catchment area, due to economic growth (EU Reference and UN), the increase in general is about 18%. This is in line with the GDP growth for the EU27, which is 17%. Inland shipping shows a growth of 13% (from 240 to 271 million tonnes), road has a growth of 14% (from 934 to 1062 million tonnes) and rail transport of 13% (from 265 to 300 million tonnes). In the absence of further developments, the rail freight market is expected to grow at a slower pace compared to GDP and to the overall transport sector, therefore losing market share. This is due to the changing trends in the basket of transported commodities and differentiated geographic demand growth distribution. For all land freight transport, the projects scenario and the sensitivity scenario have a limited impact on the overall growth of international freight transport.

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



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

Focusing on international rail freight transport, the reference scenario expects a growth of 13%, which is approximately 35 million tonnes extra compared to the 2022 situation. Both the Projects scenario and the Sensitivity scenario show the impact of the different rail projects and rail measures. In the Projects scenario,

rail transport grows an extra 4% compared to the reference scenario (300 million tonnes to 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, 22.5 t axle load, ERTMS, and standard gauge on the Iberian Peninsula. The total expected rail freight transport volumes in this scenario reaches 361 million tonnes, corresponding to a 20% growth compared to the Reference scenario.

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

As a result of the analysis performed, it is possible to conclude that the major planned projects along the 11 RFCs Network assumed to be completed by 2030, and the modernisation of railway lines and cross-border sections 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 competitivity of rail transport on the 11 RFCs Network, and thus on each RFC, including the RFC MED. Further to these projects, completing the 11 RFCs Network in line with the TEN-T requirements is key to increase the rail market share.

With reference to the 50% growth set in the EU policies for the period 2015-2030, the 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 even assuming additional mega cross-border projects would be completed like Brenner and Turin-Lyon.

Such targets remain challenging to meet in the absence of a significant change in the structure of the costs of road and rail transport. Internalising external costs of road transport, and or incentives to reduce the costs of rail transport might be needed. The potentially negative impacts on rail market share of measures such as improving the efficiency of road transport shall also be considered, as also reported in a recent study by the Community of European Railway and Infrastructure Companies (CER) – *Study on Weights and Dimensions: Impacts of the Proposed Amendments to the Weights and Dimensions Directive on Combined Transport and Rail Freight Transport*[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.

[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

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

International freight transport across all modes in the catchment area of the RFC MED amounts to 147 million tonnes, transported by road, rail, inland shipping and sea shipping. Overall, most transport concerns both cargo type *Other* (76 million tonnes, 52%) and *Dry bulk* (54 million tonnes, 37%). On relations in the catchment area of RFC MED, rail freight transport has a share of 24% in the total amount of international freight transport. This is a volume of 36 million tonnes. The total amount of international rail freight transport of 36 million tonnes relates to approximately 40,000 trains within the corridor area of RFC MED.

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

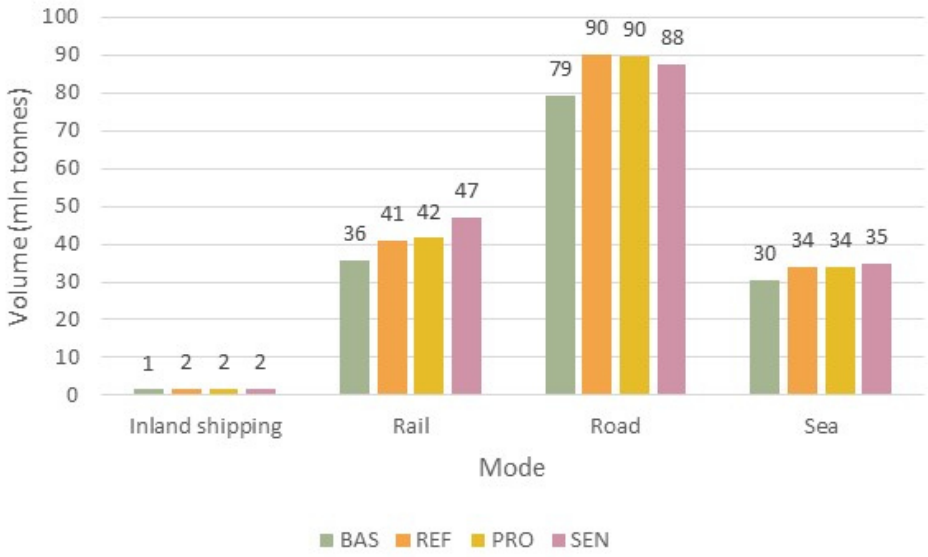
Source: NEAC estimations

The most important rail transport origins and destinations can be found in Italy, Spain, France, Slovenia, Croatia and Hungary in locations such as Trieste, Barcelona, Montpellier, Koper and Budapest. The ports of Koper, Barcelona and Trieste serve as a gateway to their respective hinterlands in the RFC MED. The most important relation in the RFC MED is between Barcelona and Montpellier.

The three future scenarios (Reference, Projects and Sensitivity) show an increase in international freight transport in the RFC MED in line with what expected at the European level. Mainly due to autonomous economic growth, all modes grow. Inland shipping grows by 24%, road by 14%, rail transport by 14%, and sea shipping by 11%. In absolute terms, international road freight transport grows most, by 11 million tonnes (from 79 to 90 million tonnes). Rail transport grows by 5 million tonnes from 36 to 41 million tonnes. Sea shipping grows from 30 to 34 million tonnes. Inland shipping plays a minor role in the RFC MED.

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 slightly losing 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 MED.

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



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

In the RFC MED, for the Reference scenario, a growth of international rail transport is expected at 14%, which is approximately 5 million tonnes extra compared to the 2022 situation. This would be (rounded) 5,000 extra international freight trains in the RFC MED. The total number of international trains would then be some 45,000 trains in the Reference situation in 2030.

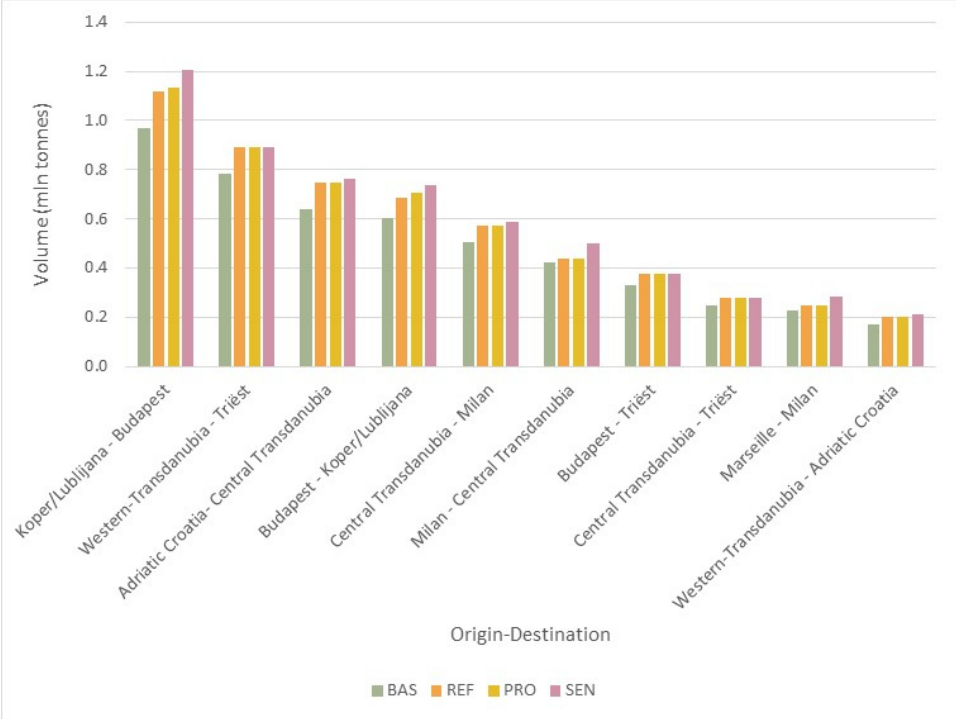
Both the Projects scenario and the Sensitivity scenario show the impact of the different rail projects and rail measures. Rail transport grows an extra 6% compared to the reference scenario. In total it is estimated that this is approximately 1 million tonnes of extra international rail freight transport. This gives (rounded) 1,000 extra trains in the RFC MED. Together with the Reference scenario results; this would be approximately 50,000 trains for the RFC MED.

The Sensitivity scenario shows that there is another potential of 5 million tonnes extra rail freight transport due to longer trains, ERTMS, and standard gauge in Spain and Portugal. The total number of unique international freight trains able to transport 600-700 Tons would be around 50,000. Compared to the 40,000 unique trains in 2022, this is a growth of around 25% (this figure can be regarded as a potential maximum growth). Regarding this growth, it should be noted that depending on the number of longer trains used (740 m of the total), the number of trains may vary.

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 36 to 47 million tonnes i.e. by 31%.

The figure below shows the top 10 most important international rail freight transport relations within corridor area of the RFC MED. The relation between Koper and Budapest is the most important one, with almost 1.0 million tonnes. This concerns mostly liquid bulk transport. Western Transdanubia (Győr/Szombathely, Western Hungary) - Trieste comes in second place, which is mostly dry bulk (0.8 million tonnes). Adriatic Croatia (Split) – Central Transdanubia (Székerfehérvar, Hungary) comes in third place at 0.6 million tonnes of international rail freight transport with.

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



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 MED (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 MED

Border		BCP	2020	2021	2022	2023
ES	FR	Figueres Vilafant/Perpignan	1,192	1,182	1,571	1,431
ES	FR	Portbou/Cerbère	3,586	3,380	3,111	2,247
FR	IT	Modane/Bardonecchia	7,530	8,271	8,546	3,352
IT	SI	Villa Opicina/Sežana	8,455	8,973	7,522	7,940
SI	HR	Dobova/Savski Marof/	7,300	7,161	7,058	8,009
SI	HU	Hodoš/Őriszentpéter/	6,097	6,755	6,297	6,544
HR	HU	Koprivnica/Gyékényes	8,001	7,091	6,008	9,741

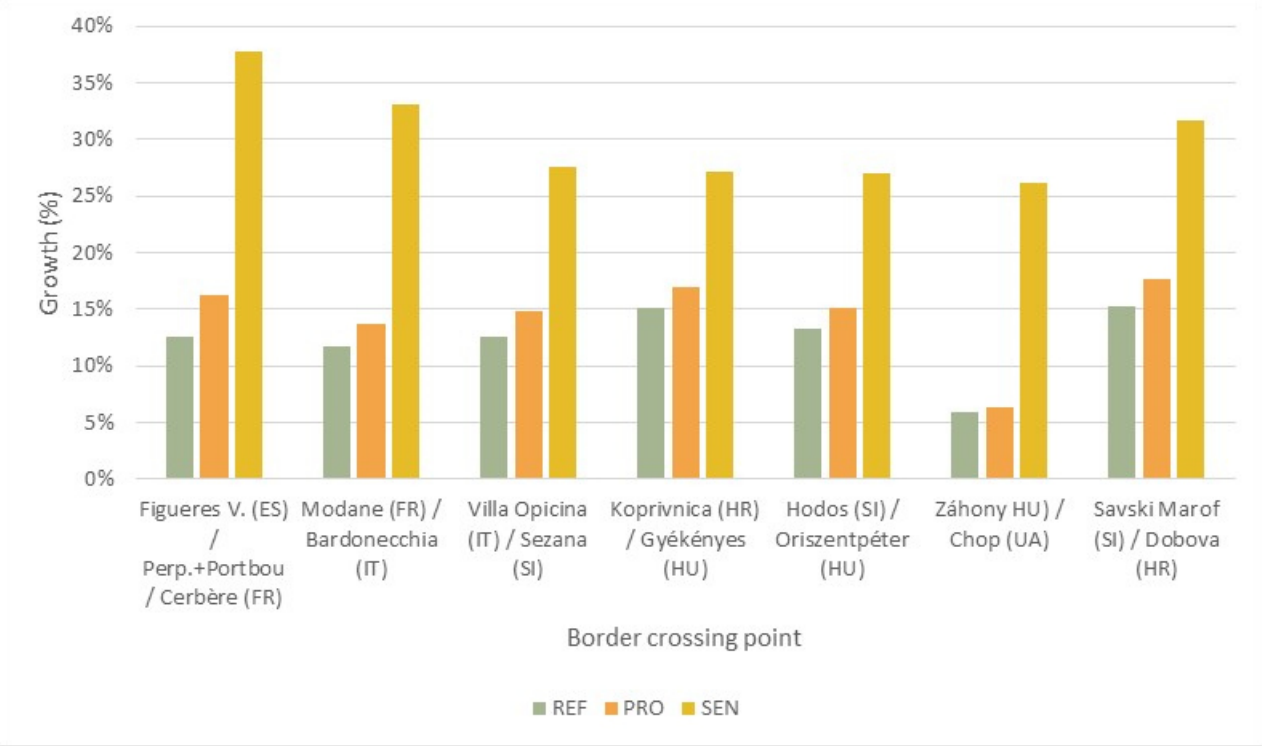
Source: RFC MED KPIs; Notes: the drop in the number of trains at the Modane/Bardonecchia BCP is attributable to the closure of the line as of 27/08/2023

According to the available data (averages for the past four years), the highest traffic was registered at Villa Opicina/Sežana/, between Italy and Slovenia, Modane/Bardonecchia, between France and Italy, Koprivnica/Gyékényes, between Croatia and Hungary, Dobova/Savski Marof/ between Slovenia and Croatia, and Hodoš/Őriszentpéter, between Slovenia and Hungary. Train traffic data/trends at BCPs include all international trains crossing a border along the RFC and may vary according to traffic management solutions and traffic conditions on the accessing/interconnected lines, as well as traffic capacity restrictions on these lines, due to temporary/permanent maintenance and/or construction works. Furthermore, the COVID Pandemic first and Russian aggression to Ukraine later also affected traffic on the European network for competitive rail transport.

The different border crossing points in the RFC MED each show different growth rates between the 2022 Base year and 2030 Reference, Projects and Sensitivity scenarios. Overall, the Reference scenario shows a growth in volume of 12%. This is in line with the general growth for rail transport between the 2022 Base year and 2030 Reference scenario. The completion of different projects by 2030 leads to different growth patterns; on average, the growth in relation to the base is 14% more volume, which translates into 14% more trains. The sensitivity scenario leads to 30% more volume, which is 13% more trains compared to 2022. Due to the extra train length, there is less growth in number of trains.

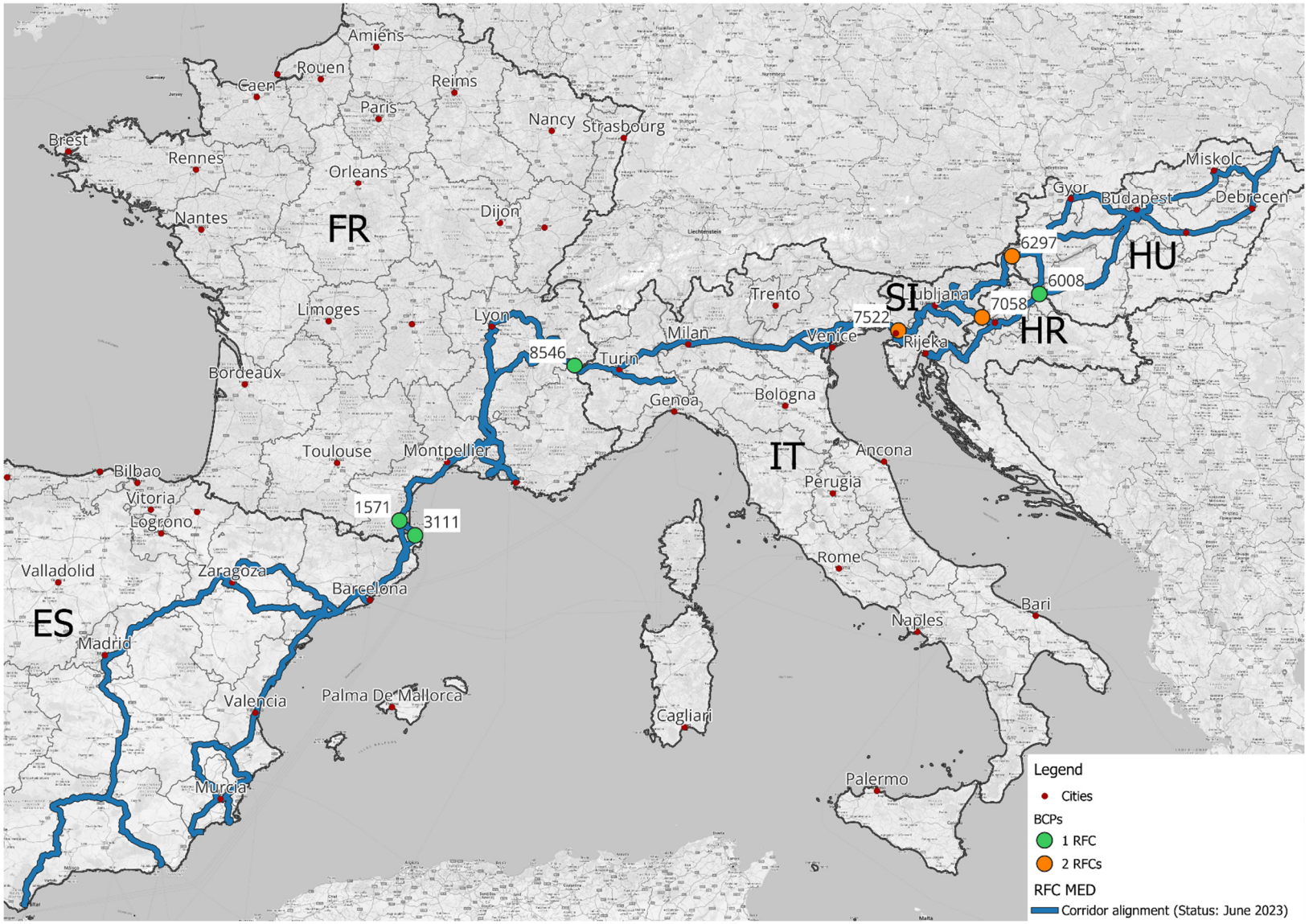
The total amount of unique trains on the BCPs in 2022 is approximately 40,000 trains. In the Reference situation this would be approximately 45,000. In the Projects scenario, this is 46,000 trains, while in the Sensitivity scenario, this is also 45,000 trains (due to extra volume per train, a bit less than the Projects scenario).

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



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

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



Source: CIP June 2023 and RFC MED 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 EU Network of Infrastructure Managers (IMs) 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 (IMs) is also considered the best-fitting governance solution to bring operational efficiency issues forward.
- The respondents' opinions about the changes that occurred within the capacity management area are predominantly negative. Notwithstanding the market's negative opinion of the progress made since the establishment of the RFCs in this area, the expectations on the future impact of the programmes and activities by the RFCs are rather positive with regard to all the investigated aspects related to capacity management. The best governance solution for capacity management

improvements is deemed to be the cooperation between the RFCs and an EU Network of Infrastructure Managers (IMs).

Occurred and expected market developments

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

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 an 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. Also, in line with the findings from the previous RFC MED TMS,

these measures seem to be particularly important to support competitiveness and growth of rail freight transport along the RFC MED;

- *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[6] regulatory measures facilitating market opening appear also to be relevant in increasing the competitiveness of rail transport (e.g. enforcement of antitrust regulations; unbundling of subsidised public service operations from open market business; and ending direct subsidies to or recapitalization of state-owned freight railway undertakings).

INSTITUTIONAL AND OPERATIONAL DEVELOPMENTS

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

- *Improve capacity management*. Capacity management is considered by the market and also by the analyses and studies at the basis of the proposal for the new capacity regulation, a key area for improvement. Progress was made in the management of Temporary Capacity Restrictions, however capacity planning remains an issue. Digital Capacity Management as an integral part of the European program “Timetable Redesign (TTR) for Smart Capacity Management” is at the core of the proposal

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

for the new capacity regulation, and it is paramount to reaching the Green Deal's targets for the transport sector and the rail freight segment within it;

- *Monitor operational performance*. The revised TEN-T regulation identifies new operational requirements, related to punctuality and dwell times at borders. Furthermore, some infrastructure requirements also depend on operations, such as 740 meter long trains. Investing in infrastructure, albeit needed, is long-lasting and capital-intensive. The competitiveness of international rail freight transport also depends on the improvement of cross-border operations and integrated/coordinated planning and management of the rail network at a European scale. An RFCs common KPI framework is already in place, and RNE is also already monitoring infrastructure KPIs, as also graphically represented in CIP. Such activities might be continued in the light of the new set of requirements foreseen in the TEN-T Regulation (EU) 1679/2024, and RFC governance structure, also defined in the Art. 67 of this regulation;
- *Balance network and corridor governance approach*. The analysis of the RFC catchment areas shows that international trains using at least one corridor BCP may actually use more than one RFC. A network approach is more fitting to the planning and management of the network capacity. 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 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 (RNE).

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

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 the contract (June 2023). The future market analysis also considers any possible expected lines that are currently foreseen to be operational in 2030.

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

1.3 REPORT STRUCTURE

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

- Chapter 2, describing the RFC alignment and infrastructure, the existing bottlenecks and the ongoing and planned projects to solve 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-allocated Path
PCS	Path Coordination System
RAG	Railway Undertaking Advisory Group
RFC	Rail Freight Corridor
RFC AMBER	Rail Freight Corridor Amber
RFC ATL	Rail Freight Corridor Atlantic
RFC AWB	Rail Freight Corridor Alpine-Western Balkan
RFC BA	Rail Freight Corridor Baltic-Adriatic
RFC MED	Rail Freight Corridor Mediterranean
RFC NS-B	Rail Freight Corridor North Sea-Baltic
RFC NSM	Rail Freight Corridor North Sea-Mediterranean
RFC OEM	Rail Freight Corridor Orient/East-Med
RFC RALP	Rail Freight Corridor Rhine-Alpine
RFC RD	Rail Freight Corridor Rhine-Danube

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

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

2 CORRIDOR PRESENTATION

2.1 CORRIDOR CHARACTERISTICS

The Rail Freight Corridor Mediterranean (onwards RFC MED) crosses six Member States of the European Union, namely Spain, France, Italy, Slovenia, Croatia and Hungary. For the purposes of the Joint TMS Update, the description of the RFC MED 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 MED diversionary and principal lines is 7,779 km. Most of this network is located in Spain (3,255 km), France (1,515 km) and Hungary (1,428 km), followed by Italy (749 km), Slovenia (457 km) and Croatia (375 km).

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

Member State	Length in km
Spain	3,255
France	1,515
Italy	749
Slovenia	457
Croatia	375
Hungary	1,428
Total	**7,779**

Source: Authors based on RFC Implementation Plan

2.1.1 CORRIDOR LINES

The following table summarises the length of the RFC MED lines by type of RFC line, i.e. principal, diversionary, connecting A and B, and expected.

Table 2 RFC MED - Corridor extent by type of RFC lines

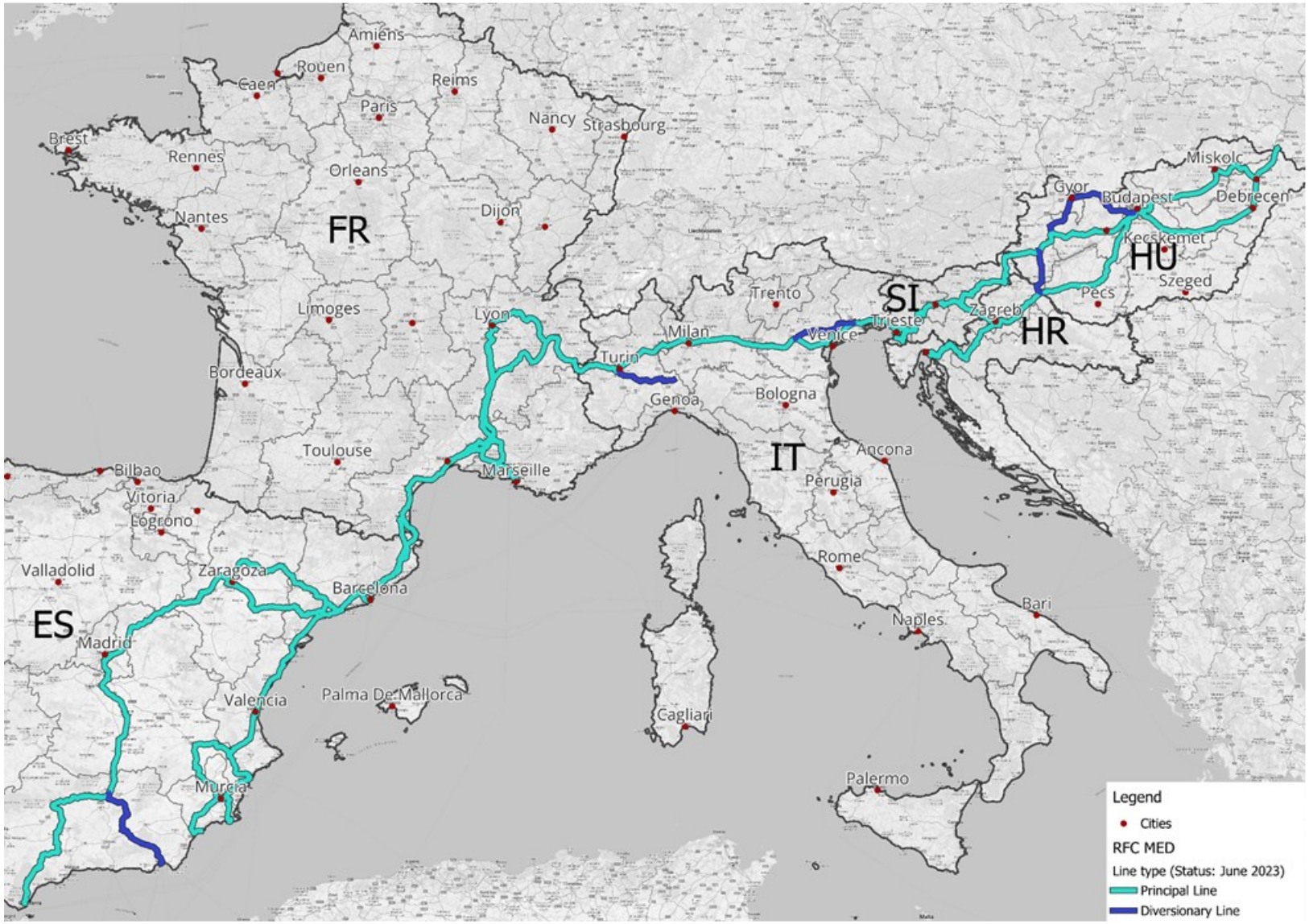
Principal Lines	Diversionary Lines	Connecting Lines	Expected Lines	Total
7,141	638	128	142	8,049

Source: Authors based on RFC Implementation Plan

The RFC MED at June 2023 consists of 7,141 km of principal lines and 638 km of diversionary lines.

The RFC MED shares its network with other corridors such as Atlantic, Baltic-Adriatic, Alpine-Western Balkan, Amber, Orient/East-Med, Rhine-Danube, North Sea-Med, Rhine-Alpine and ScanMed. The longest overlapping is with North Sea-Med corridor.

Figure 1 RFC MED - Type of RFC lines



Source: Authors based on CIP

2.1.2 CORRIDOR TERMINALS

The table below lists the terminals active along the RFC MED also indicating overlapping corridors where applicable. Over 100 terminals are in operation on the RFC MED territory.

Table 3 List of terminals on the RFC MED

Name	Country	Common to other RFCs according to CIP
Algeciras Port	Spain	ATL
Algeciras Terminal	Spain	ATL
Apartadero de CELSA	Spain	
Córdoba Mercancías	Spain	ATL
DP World Tarragona S.A.	Spain	
Ford Almusafes	Spain	
Gonvauto	Spain	
Granollers Mercaderies	Spain	
Grisén	Spain	
Madrid Abroñigal Terminal	Spain	ATL
Madrid Vicálvaro Terminal	Spain	ATL
Murcia Mercancias	Spain	
Port de Barcelona	Spain	
PortBou	Spain	
Puerto de Alicante	Spain	
Puerto de Castellon	Spain	
Puerto de Escombreras	Spain	
Puerto de Tarragona	Spain	
Puerto Seco Azuqueca	Spain	
Puerto Seco de Madrid	Spain	ATL
Puerto de Valencia	Spain	
REPSOL QUIMICA	Spain	
Sagunto Mercancías	Spain	
San Roque Terminal	Spain	ATL
SEAT Martorell	Spain	
Silla Terminal	Spain	
Solvay	Spain	
Tarragona La Boella	Spain	
Tarragona Mercancias	Spain	
Terminal Intermodal de Monzón	Spain	
Terminal Marítima de Zaragoza	Spain	
Valencia La Font de San Luis	Spain	
Zaragoza Plaza	Spain	ATL
Aiton-Autoroute ferroviaire Alpine	France	
Ambérieu	France	NSM
Ambrogio Le Boulou	France	
Ateliers d'Occitanie	France	
Chasse sur Rhone	France	NSM
Compagnie Nationale du Rhone Salaise	France	NSM
GIE-OSIRIS SALAISE	France	NSM
Grenoble intermodal terminal	France	

Name	Country	Common to other RFCs according to CIP
Le Teil	France	NSM
Lyon Port Edouard Herriot	France	NSM
Perpignan Saint Charles	France	
Port de Marseille	France	NSM
Port de Sète	France	
Portes - CNR	France	NSM
Portes (T)	France	NSM
Saint-Avre-la-Chambre	France	
St-Jean de Maurienne	France	
St-Rambert-d'Albon	France	NSM
Vénissieux	France	NSM
VIIA Le Boulou	France	
Brescia Scalo	Italy	
Cereal Docks	Italy	BA
Cervignano Interporto	Italy	BA
Cittadella Terminal	Italy	BA
Eni	Italy	BA
Euro gateway Novara	Italy	RALP
Grandi Molini	Italy	BA
Hupac (RoLa)	Italy	RALP
Hupac RoLa Novara @ CIM	Italy	RALP
Interporto di Novara - CIM	Italy	RALP
Interporto Quadrante Europa	Italy	SCANMED
Milano Smistamento (MY)	Italy	RALP
Padova Interporto SpA	Italy	BA
San Marco Petroli	Italy	BA
Società Interporto Torino	Italy	
Sogemar	Italy	RALP
Terminal Intermodale Adriatico	Italy	BA
Terminal Intermodale Venezia	Italy	BA
Terminal Multiservice	Italy	BA
Terminal Rinfuse Venezia	Italy	BA
Terminali Italia Milano-Smistamento	Italy	RALP
Terminalitalia/Terminal Intermodale Milano Segrate	Italy	RALP
Torino Orbassano	Italy	
Transped	Italy	BA
Trieste Marine Terminal	Italy	BA
VeCON	Italy	BA
Venice Ro Port	Italy	BA
Verona Quadrante Europa	Italy	SCANMED
Celje tovorna kontejnerski	Slovenia	BA, AMBER, AWB
Gorenje Velenje	Slovenia	BA, AMBER
Koper Luka KT	Slovenia	BA, AMBER
Ljubljana Moste KT	Slovenia	BA, AMBER, AWB
Ljubljana Zalog ranžirna	Slovenia	BA, AMBER, AWB
Revoz Novo mesto	Slovenia	BA, AMBER
Kontejnerski Terminal Brajdica	Croatia	

Name	Country	Common to other RFCs according to CIP
Kontejnerski Terminal Vrapče	Croatia	AWB
Luka Rijeka	Croatia	
Robni Terminali Jankomir	Croatia	AWB
Robni Terminali Žitnjak	Croatia	AWB
Terminal Škrljevo - Skladišni kompleks	Croatia	
Terminal za rasute terete - Bakar	Croatia	
Zagreb Ranžirni Kolodvor	Croatia	AWB
BI-KA Logistics Center	Hungary	OEM, RD
Budapest Szabadkikötő (port)	Hungary	OEM, RD, AMBER
Győr / ÁTI Depo	Hungary	OEM, RD, AMBER
Győr-Gönyű Kikötő	Hungary	OEM, RD, AMBER
METRANS Terminal Budapest	Hungary	OEM, RD, AMBER
RailCargo Terminal - BILK Zrt.	Hungary	OEM, RD, AMBER
Railport Győr	Hungary	OEM, RD, AMBER
Szolnok Indust. Park and Logistics Service Center	Hungary	OEM, RD
Törökbálint DEPO Intermodal Logistic Centre	Hungary	OEM, RD, AMBER
Trans-Sped Logisztikai Központ és Ipari Park	Hungary	
ZÁHONY-PORT Zrt.	Hungary	

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 MED, there are in total 7 BCPs identifiable along the corridor as detailed in the following table.

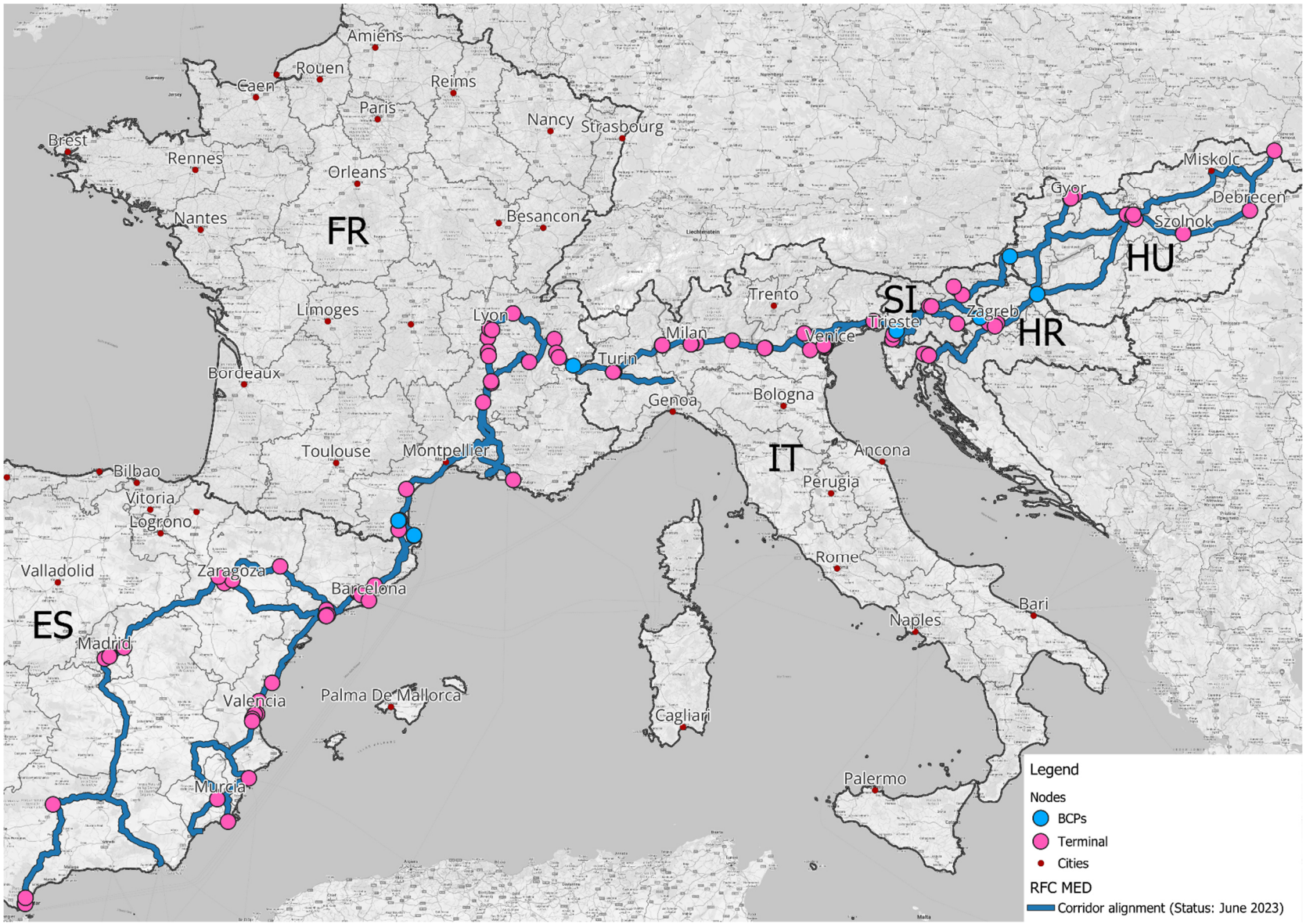
Table 4 RFC MED BCPs

Bordering Member States		Border Crossing Point
ES	FR	Figueres Vilafant/Perpignan (UIC Track Gauge)
ES	FR	Portbou/Cerbère
FR	IT	Modane/Bardonecchia
IT	SI	Villa Opicina/Sežana
SI	HR	Dobova/Savski Marof
SI	HU	Hodoš/Őriszentpéter
HR	HU	Koprivnica/Gyékényes

Source: Authors based on CIP

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

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



Source: Authors based on CIP

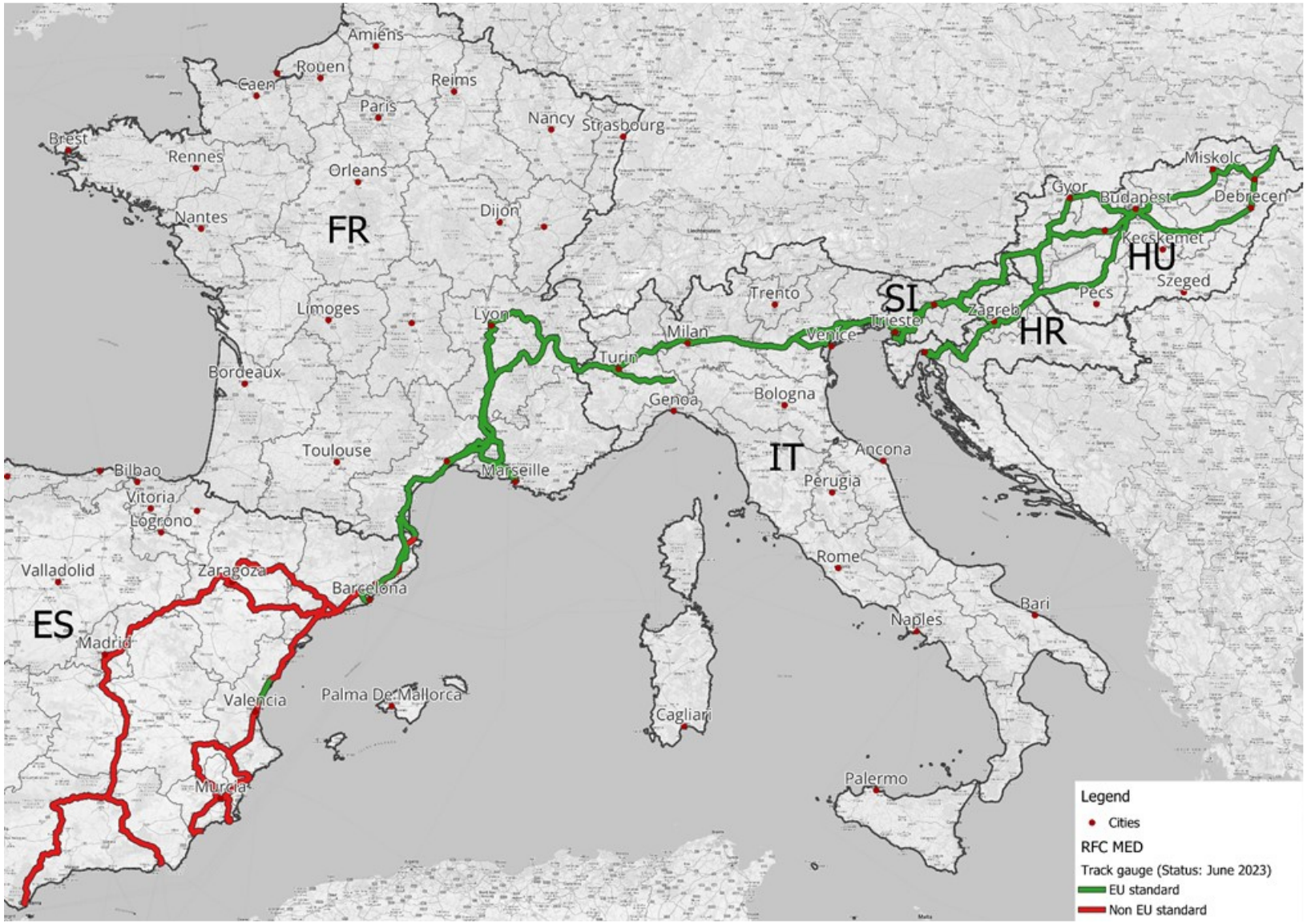
2.1.4 CORRIDOR INFRASTRUCTURE PARAMETERS

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 is assume to reflect 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:

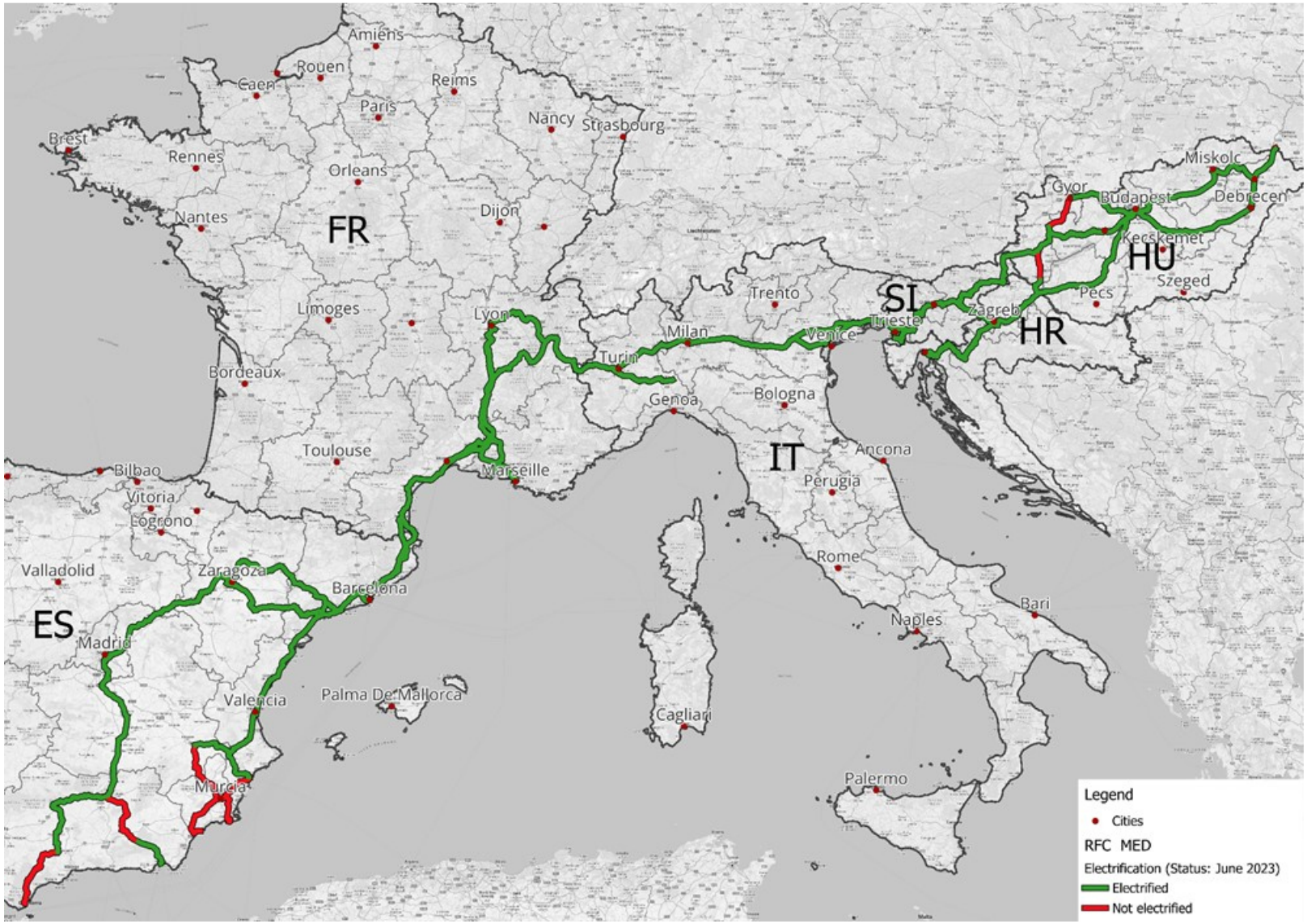
- The RFC MED is affected by lack of homogeneous track gauge as in the Iberian peninsula the Iberian gauge is the dominant standard;
- The RFC MED is almost entirely electrified except for some sections in Spain and Hungary;
- Concerning axle load, the RFC MED is entirely at standard;
- Speed limitations exist along the RFC MED including along cross-border itineraries between Hungary and Slovenia and Slovenia and Italy;
- The operation of 740 m long trains is limited along RFC MED, this is only possible in France, and in Hungary on some sections, where it can be subject to traffic conditions and permissions (operational compliance). However, even if feasible from the infrastructural point of view in some countries, normally 740m trains are not running along RFC MED lines;
- Finally, ERTMS starts to be available along the RFC MED, particularly in Hungary and Slovenia and more limited in Italy, Spain and France.

Figure 3 RFC MED - Track gauge



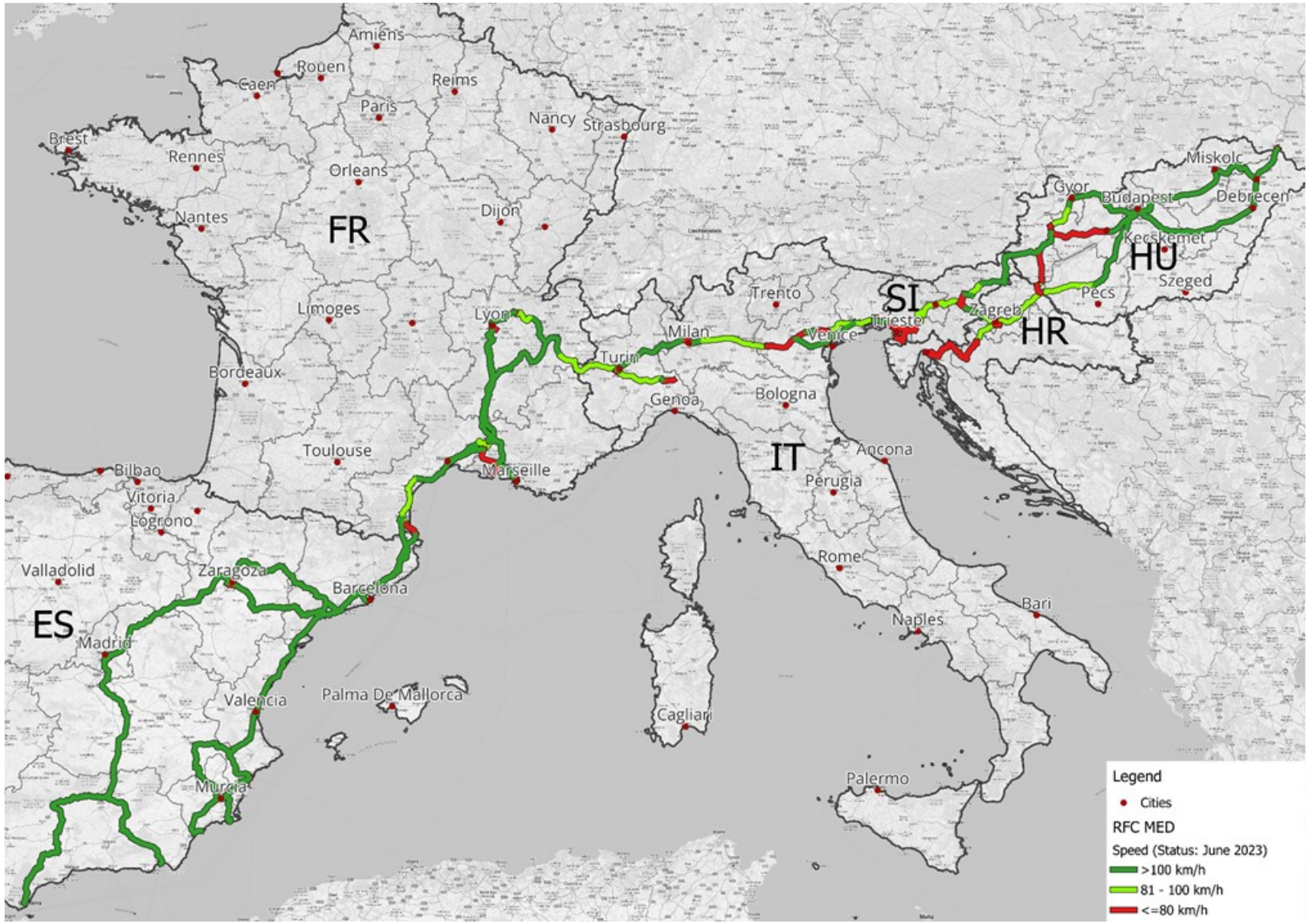
Source: Authors based on CIP: Note: the section between Valencia and Castellon is dual track gauge, one track is at EU standard, the other one is Iberian gauge, allowing for continuity of operation of trains within the Iberian peninsula

Figure 4 RFC MED – Electrification



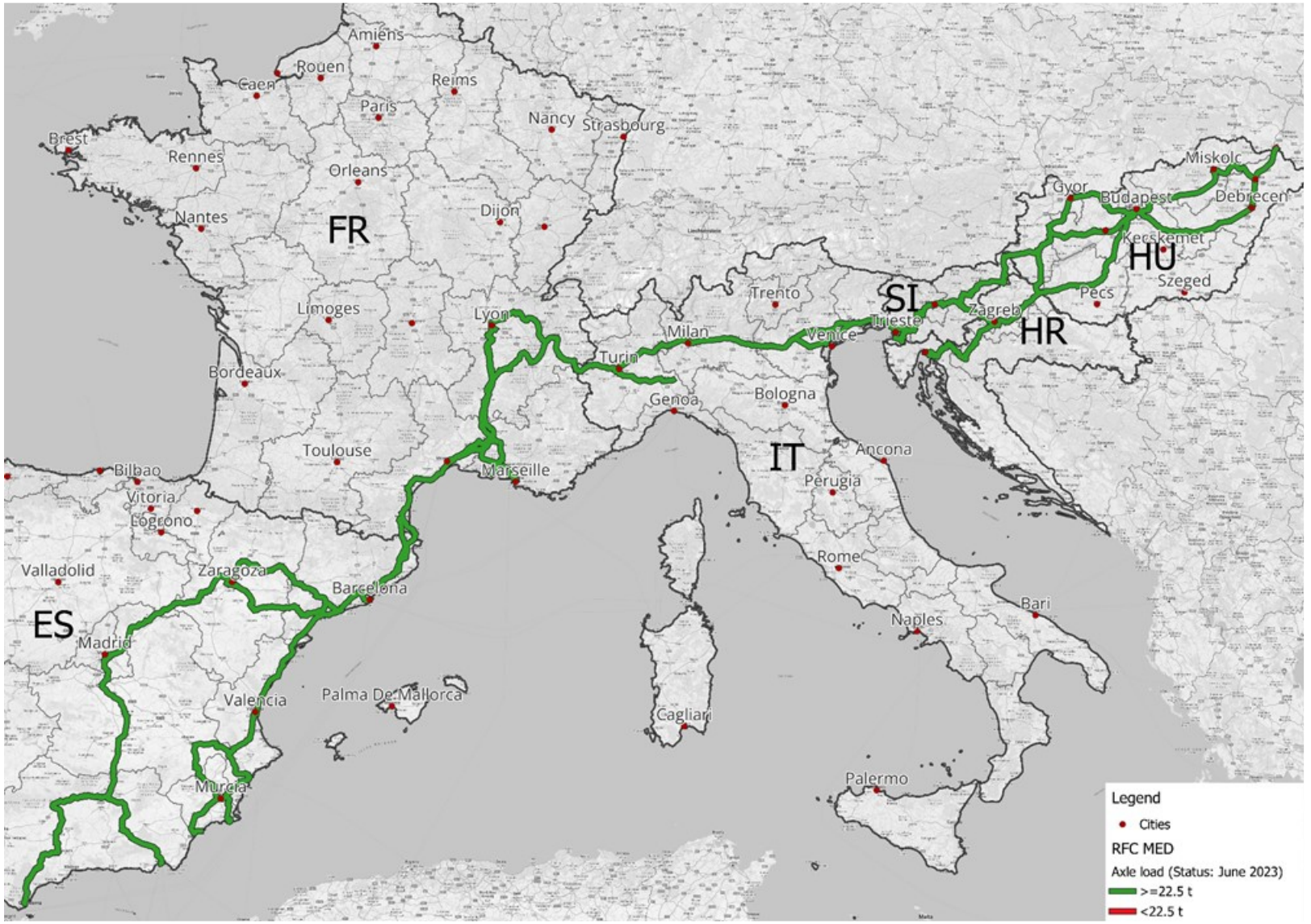
Source: Authors based on CIP

Figure 5 RFC MED - Speed



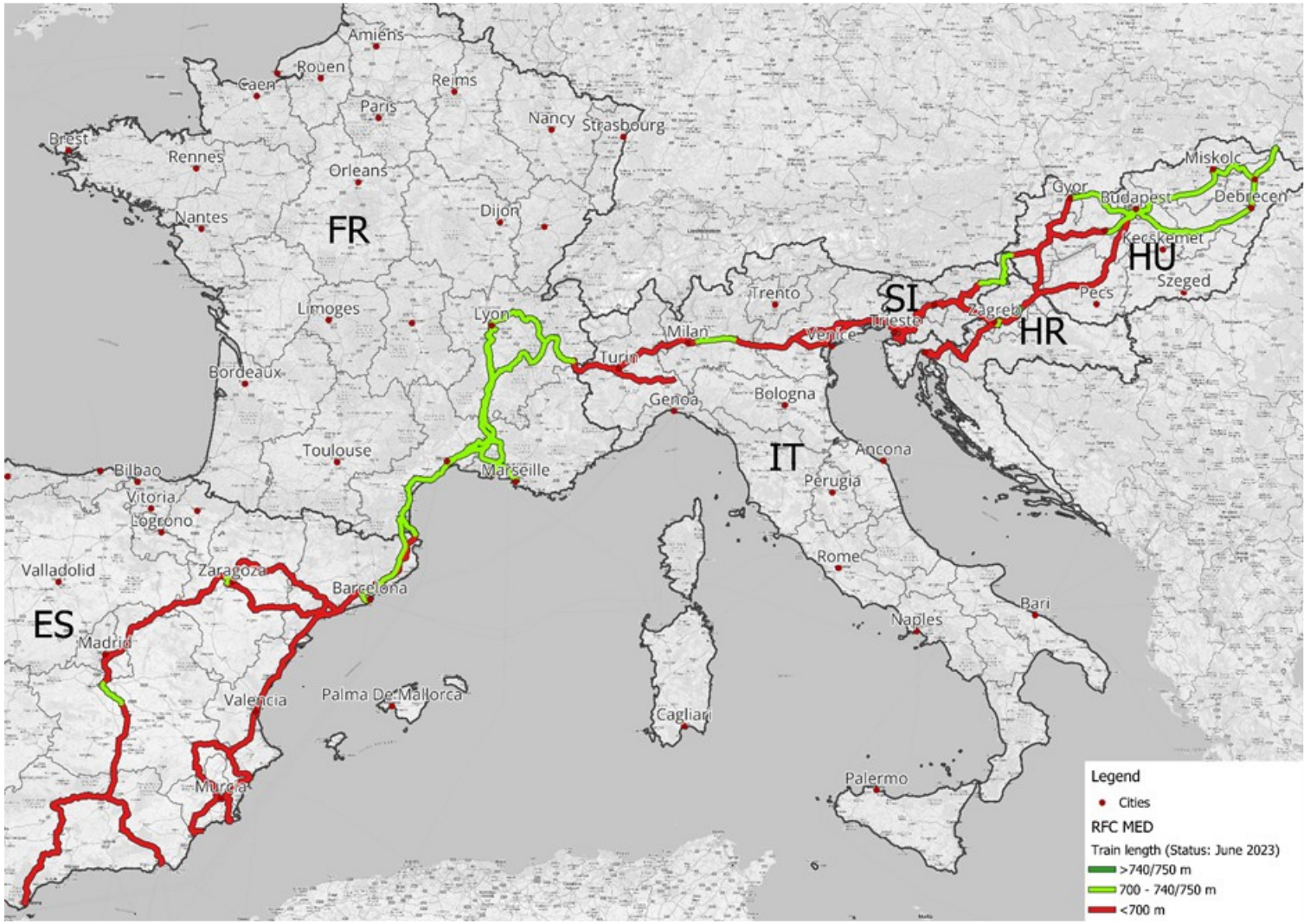
Source: Authors based on CIP

Figure 6 RFC MED – Axle load



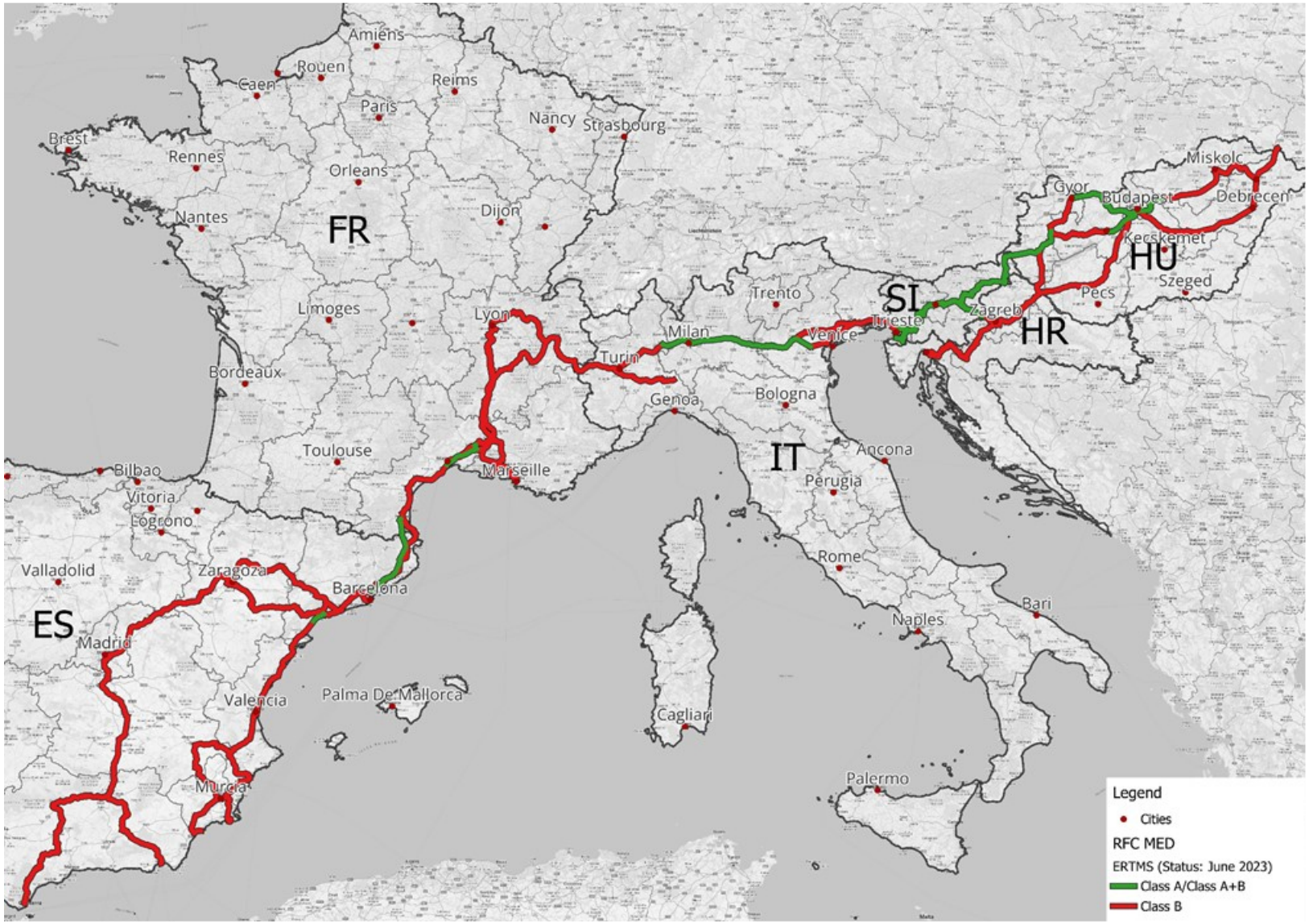
Source: Authors based on CIP

Figure 7 RFC MED - 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". The operational compliance concept also applies to railway lines in Slovenia, though the map represents the infrastructure compliance*

Figure 8 RFC MED - ERTMS



Source: Authors based on CIP

2.1.5 INFRASTRUCTURE BOTTLENECKS, ONGOING AND PLANNED PROJECTS

The RFC MED Implementation Plan includes a detailed description of infrastructure bottlenecks, together with the list of investments currently identified for their removal. Such bottlenecks are mainly related to the interoperability issues illustrated in the previous section above, which on some sections of the corridor may also affect the capacity of the lines.

Concerning the identification of the bottlenecks, RFC MED carried out a Capacity Study in 2014, adopting the same definition of bottlenecks as set in point 15 of Article 2 of Regulation (EU) No 1316/2013. 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, which could bring significant improvements which will solve the bottleneck constraints. The key technical parameters, infrastructure requirements set in Article 39 of Regulation (EU) No 1315/2013, were considered obligatory and common part of the future elements of the transport infrastructure for both passengers and freight transport capacity:

- Full electrification of the line tracks and sidings;
- At least 22,5 t axle load;
- 100 km/h line speed;
- Freight trains with a length of 740 m;
- Full deployment of ERTMS;
- Track gauge for railway lines 1.435 mm (it applies only to new lines formally).

Further to the bottlenecks related to the compliance to the TEN-T requirements, the following definition of congested infrastructure is considered by RFC MED to identify bottlenecks related to congestion. As per the provision of Directive 2012/34/EU Congested infrastructure means an element, a section of infrastructure for which demand for infrastructure capacity cannot be fully satisfied during certain periods even after coordination of the different requests for capacity. In these cases, after a thorough capacity analysis a capacity-enhancement plan should be elaborated by the concerned infrastructure manager, to identify measures to solve capacity constraints and their implementation time-schedule.

The following paragraphs provide a description of the bottlenecks identified along the RFC MED by country, whereas Table 5 to

Table 10 provide the detailed lists of ongoing and planned investments by country. The lists include details in terms of expected project benefits with reference to existing bottlenecks. The development and implementation of these projects are critical to increase rail services and improve performance of rail freight sector.

The list of projects has been drafted taking into account the overlapping sections (where it is relevant). The Corridor members checked the coherence of the information included in the list of projects with the same information provided for other corridors sharing the same overlapping sections. The projects in the overlapping sections are identified with this symbol under the country's symbol: OS-N (Number of Corridor having the section in common).

SPAIN

Track gauge

The Iberian gauge in most of the Spanish sections of RFC MED penalizes rail transportation competitiveness. It is remarkable the effort to be carried out to overcome this situation along the RFC MED coastline, also considering that works have to be carried out keeping passengers and freight services in operation.

Track gauge change works are already ongoing between Castellón and Vandellós (Tarragona), this line representing the first section of the conventional rail network in Spain to be equipped with UIC track gauge. The finalization of this project is aligned with all the ongoing projects for the implementation of the UIC gauge in Spain, by adding a third track along the coastline of the RFC MED. Works for the improvement of the TEN-T parameters for freight traffic along the Sagunto – Teruel line, are also being implemented, which once the Castellón – Vandellós line will be equipped with UIC tracks, may be used as a diversionary route for Iberian gauge traffic along the RFC MED.

The map in the following figure represents the outlook of the RFC MED in 2030, with reference to track gauge. At this time horizon the RFC MED is required to be entirely compliant with the UIC track gauge requirement set by the TEN-T Regulation. An update (together with map will be given, later this year)

Figure 9 Track gauge along the RFC MED: 2030 outlook

Source: RFC MED

Maximum train length

Existing limitations to train length, do not allow in part of the Corridor, the operation of 750 meter freight trains harming rail transportation competitiveness.

Lack of capacity for international Rail Transport

In order to manage the expected growth of traffic on the new High Speed Line between Barcelona and the French Border, the conventional line between Barcelona and Portbou could be used. To this purpose the line should be upgraded to TEN-T parameters. Actually, section Can Tunis – Castellbisbal – Mollet and Girona Mercaderies – Figueres of this line was already equipped with the UIC track gauge during the 2010 decade. During 2023, some stakeholders proposed to consider equipping the FR-ES cross-border route with UIC gauge as well. This option could enhance connection to Barcelona and the rest of the Corridor equipped with the UIC gauge. The feasibility of such an option should be assessed, considering not only market needs but also resilience of the rail network infrastructure.

Access to Ports and Terminals

The Spanish sections have been grouped into priority sections ensuring continuity of traffic operations to major destinations: French border to Barcelona, Tarragona, Zaragoza and Castellón, Valencia, Madrid to Algeciras, and diversionary lines. The access to ports and terminals will be adapted to UIC Gauge in parallel with the equipment of UIC gauge of the corridor lines. A key milestones is the improvement of the current UIC gauge access to the Port of Barcelona. The first steps of the administrative process by the Spanish Ministry, related to this initiative already started, and in June 2023 the so-called “Proyecto Básico” was approved, paving the way to the construction design phase.

Traffic along multimodal logistics chains involving the Mediterranean Ports of Spain and North of Africa, require improvement of rail hinterland connections. Accordingly different actions are foreseen to improve connection to Algeciras and Seville ports aimed at increasing capacity as well as infrastructure performance and reliability. Regarding the capacity of the Algeciras port interconnecting line, a Working Group led by the Ministry is promoting a common approach on improving line technical capacity. Studies by the Port and ADIF, are being compared in order to ensure the coordinated implementation of the proposed solutions. Looking at the whole route from Andalucía towards Zaragoza further to France, capacity improvement measures might be considered for implementation on the Córdoba – Madrid section.

Abroñigal Logistic Terminal is the heart of Madrid’s intermodal traffic but lacks capacity in its facilities to absorb the traffic demand. A new infrastructure expansion project in ongoing to enhance Vicálvaro Multimodal Terminal, to address growing market demand for logistics services from the Madrid Belt South-East Industrial Belt. The terminal has direct connection to Zaragoza, Barcelona and Valencia. Improvement of the capacity of the South part of the Madrid Belt could be key to optimise freight traffic in the Madrid area.

Finally, the line interconnecting the port of Valencia to Zaragoza via Teruel is being upgraded to alleviate national traffic along the RFC MED coastline and also to improve its characteristics to be used in case of restrictions to traffic.

Congested infrastructure

There is no infrastructure declared congested on the network of RFC MED, in Spain. Nonetheless, RUs operating in Spain consider terminals availability and capacity a possible issue to deserve specific attention for the correct functioning of the rail and intermodal logistics chains.

FRANCE

New line Montpellier-Perpignan

This new line will be the link to the Spanish High-Speed Line Barcelona-Figueres and its connection with Perpignan via the new bypass between Nîmes and Montpellier and the lines to Lyon, will be operational in consequential phases:

- a first phase between Montpellier and the east of Béziers: this phase corresponds to the sections of the rail network currently registering higher levels of traffic. This section is planned to be in operation by 2035;
- subsequent phase between Béziers and Perpignan. It is planned to be in operation by 2045.

Rail link Lyon - Turin

The project to link Lyon, Chambéry and Turin includes the construction of a 140 km long line. A real alternative to the road, this new route will facilitate exchanges and travel for all train users. It represents a key driver for local economic development and it will also be an open door to Europe. Civil engineering works are expected to be completed by 2032.

This major project will be carried out in several phases.

The Lyon railway junction

This junction is:

- on the Northern Europe - Mediterranean axis and on 2 European freight corridors (RFC MED and RFC NSM);
- at the heart of national and international high-speed links;
- on a territory involving 7.9 million inhabitants in Auvergne-Rhône-Alpes, with a strong demographic growth.

Located at the convergence of 15 European, national and regional railway lines, the Lyon railway junction is extremely busy, and its infrastructure is operated at capacity limit. A short and medium-term mobilization plan has been elaborated with the objective of restoring the system's capacity focussing on all components: operations and standards, equipment, regeneration of installations and investment works.

Congested infrastructure

There is no infrastructure declared congested on the network of RFC MED, in France.

ITALY

New High-Speed Line Milano - Venezia

The main works for the upgrading of the Treviglio-Brescia line to four tracks were completed in 2016, representing the first phase of construction of the new High-Speed line Milano-Verona.

Works for the section Brescia – Verona and Verona – Vicenza have already started. Works to build an independent new line through the Brescia and Verona nodes are expected to be completed in the coming years. The first phase of the upgrading of the Verona node (West Node) will be completed in 2028.

The High-Speed / High-Capacity line between Milano and Vicenza will enhance capacity on the Mediterranean Corridor both for freight and passenger trains. The line will be equipped with four tracks, separating trains according to their speed to increase performance of the line and reliability of the services. This is particularly relevant in the Verona node where long distance passenger train operations will be separated from regional passenger train and freight train operations. The works will also allow for a reduction of long-distance passenger train travel times between Milano and Venezia.

The new line will have the following technical characteristics:

Brescia – Verona:

- Maximum speed 300 km/h;
- Maximum gradient 12 0/00;
- Signalling: ERTMS level 2;

Verona – Vicenza (First Phase):

- Maximum speed 250 km/h;
- Maximum gradient 12 0/00;
- Signalling: ERTMS level 2;

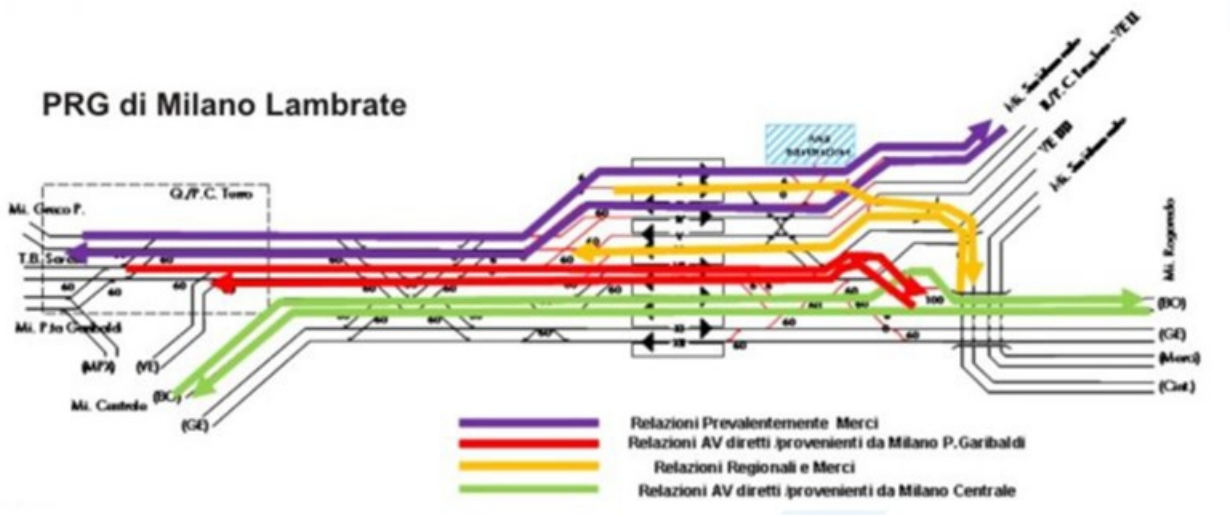
Milano node upgrading (Milano Lambrate, Porta Garibaldi, Monza, Rho)

The node of Milano is used by a mix of rail services, i.e. metropolitan, regional, long distance and freight trains. The mix of services, combined with a high volume of traffic, obstacle the further increase of regional traffic, and undermines freight transport development.

Within the framework of the Torino – Padova project, many actions are foreseen related to the node of Milano, such as a new interlocking system that provides shorter headways in the sections where Mediterranean and Rhine-Alpine corridors overlap. These measures will allow an optimization of traffic management and an increase of the capacity offered by the existing infrastructure.

The growing rail traffic experienced in recent years, require modernisation of stations further to improvement and upgrading of the railway lines. This is the case also of the Milano Lambrate station, currently representing a bottlenecks, affecting both passenger and freight traffic. One of the initiatives considered a priority to strengthen the capacity of Milan Lambrate node regards the dedicated use of the of lines by traffic type. A new project has been elaborated in this respect to separate passenger from freight rail operations by limiting as much as possible mixed use of the infrastructure.

Figure 10 Upgrading Nodo di Milano



Upgrading of Venezia-Trieste (speed increase of existing line)

The upgrading of the Venezia – Trieste existing line is one of the most important projects in the Northeast area of Italy. The main goal of the project is to reduce the travel times between Venezia and Trieste and to improve capacity between Venezia Mestre and Monfalcone up to 10 trains per hour per direction. The upgrading will remove also the actual speed limitation for trains with axle load of 22,5 tonnes and it will also improve the layout of some station to allow operating 750 m long trains.

The number of block sections will be increased with the installation of the new signalling system. These will allow improving both capacity and speed. The actual signalling system permits maximum speed of 160 km/h.

The project will be developed according to the following construction phases:

- New Signalling System (2025);
- Removal of level crossings (2025/2027);
- Route optimisation between Mestre and Ronchi dei Legionari (2030);
- New line between Ronchi dei Legionari and Bivio d'Aurisina (2031).

The project is partially funded (only phase 1).

New Torino - Lione line

The main bottleneck for traffic between Italy and France is the Frejus line, that is very steep (freight trains often use 3 locomotives, limiting train mass and length) and with a narrow loading gauge. At the time being freight traffic cannot be considered economically competitive on the line.

A new cross-border basis tunnel is under construction between Susa and St.-Jean-de-Maurienne, by the dedicated Infrastructure Manager TELT. Its completion is expected by 2032. RFI is upgrading the line between the Turin node and Susa, by building a new additional line between Torino and Avigliana, mostly in tunnel alignment, and by upgrading the existing line between Avigliana and Bussoleno/Susa, enhancing loading gauge and train length.

Moreover, a new freight terminal is considered for development and implementation on the site of the previous Torino Orbassano marshalling yard.

Congested infrastructure

Only Milano Centrale, the main passenger station of Milano, is congested. Alternative route and stations are available in Milano node, to accommodate passenger traffic operations. RFI is also constructing a new station interlocking, enabling accommodating additional station paths, thus enhancing the terminus' capacity.

SLOVENIA

Lack of capacity in lines

The rising volume of traffic and increasing market demand require improving the network to the TEN-T standards.

The Slovenian network is affected by temporarily capacities restrictions on the Divača-Koper /single track line. With a capacity utilization over 102 % - in 2018, the section was declared as congested, whereas the Ljubljana-Divača /double track line has also a capacity utilization over 83 %.

Railway junctions affected by capacity limitations are the Ljubljana and Zidani Most railway nodes /both due to peak hours passenger trains traffic, coupled with limited number of tracks or short tracks.

Measures to increase infrastructure capacity and eliminate bottlenecks along the critical railway sections and nodes have already been identified and are under development and implementation as follows:

- Divača-Koper: the second new track is under construction. Works are going to be completed in 2026;
- Ljubljana-Divača: the main purpose of the project is to raise the throughput and capacity of the line, thereby facilitating the transport of the expected volumes of passenger and freight trains, to improve travel speed, allow for better traffic management and increase transport safety. The works are foreseen to be implemented in the period 2021 – 2027;
- Ljubljana railway node: works include upgrading of the tracks involving track, signalling, safety and telecommunication equipment, as well as reconstruction of the station building and platform roofs. Reconstruction of the main passenger station Ljubljana is foreseen in the first phase. The second phase also includes the renovation of all stations inside the Ljubljana railway node;
- Ljubljana-Zidani Most: the main purpose of the project is construction of new platforms at the stations and under/over passes to platforms for passengers, as well as of noise barriers;
- Zidani Most railway node: preparation of the documentation for the project to improve the technical and technological parameters of the station and hub, and eliminate the operational bottlenecks. Studies are in progress.

Axle load

Category D3 (Load per unit length 7,2 tonnes/m and axle load 22,5 tonnes) is ensured on the entire RFC MED in Slovenia.

Train length

Limitations are present which do not allow for full interoperability of the RFC MED concerning 740 meter long trains. Goal is to adopt measures to allow the operation of long trains on all lines of the RFC MED by 2030.

Tunnel Restrictions

The loading profile on the section Gornje Ležeče – Pivka is limited due to tunnel configuration constraints. P/C 82/412 improvement works are in progress.

Congested infrastructure

According to Infrastructure Manager Declaration No 403-6/2015-18 of 17 July 2018, two sections of the RFC MED are currently declared as congested infrastructure in Slovenia – Line 60, which runs between Divača and Prešnica junction, and Line 62, linking Prešnica junction with Koper.

Pursuant to Article 28 of the Decree, on train path allocation, infrastructure charges and the performance regime on public railway infrastructure, the IM carried out a capacity analysis on the RFC MED section between Divača and Koper.

A capacity-enhancement plan was subsequently produced in July 2019, which identified reasons for the congestion, the likely future development of traffic, the constraints on infrastructure development, and the options and costs for capacity enhancement, including likely changes to access charges. The plan includes a number of short- and long-term measures to reduce congestion.

After consultation with the applicants and other interested parties and coordination with the concerned Ministry, the proposed measures are to be adopted to enhance infrastructure capacity, along with an implementation timeline.

Pursuant to the Act Regulating the Construction, Operation and Management of the Second Track along the Divača-Koper Railway Line, the mark-up was levied to fund the activities of the company established for the development and implementation of the project.

CROATIA

Considering the current traffic volumes there is no real bottleneck on the RFC MED lines. Nonetheless, some limitations affect the existing infrastructure that could results in future bottlenecks if the traffic volumes will significantly increase.

Section line Rijeka – Skrad

RFC MED section Rijeka – Lokve is affected by huge inclines/declines due to the very unfavourable relief features of the line and major ruling line resistance of up to 29 daN/t. Consequently, train mass is limited and there is a need for deployment of two locomotives or a powerful one. Up until the Skrad station, tracks for the reception and dispatching of trains at the railway stations are furthermore less than 500 meters long. This limits the market potential and the capacity of the line. A possible solution to improve interconnectivity to Rjieka would be the construction of a new railway line bypassing the hills, so-called “lowland line”, for which studies are under elaboration.

Section line Zagreb RK – Karlovac

To enhance the competitiveness of RFC MED line from the port of Rijeka to Central Europe and beyond, there is a plan to build a second track on the line Hrvatski Leskovac – Karlovac in period 2022 – 2026. Such a new infrastructure would positively impact on the performance of the connection to the port and meet the quality expectations of the market.

Section line Dugo Selo – Koprivnica – St. Border

To enhance the competitiveness of RFC MED line from the port of Rijeka to Central Europe and beyond, there is a plan to build a second track on the line Dugo Selo - Koprivnica – State border – (Hungary) in the period 2016 – 2025. Such a new infrastructure would positively impact on the performance of the connection to the port and meet the quality expectations of the market.

Section line Karlovac-Oštarije

To enhance the competitiveness of RFC MED line from the port of Rijeka to Central Europe and beyond, there is a plan to build a new double railway line on the section Skradnik-Karlovac by the year 2032.

Congested infrastructure

There is no infrastructure declared congested on the network of RFC MED, in Croatia.

Hungary

MAV considers as bottlenecks a section of line where train traffic at peak times is at or above 80% of theoretical capacity. The bottlenecks have been identified mainly on the basis of a Detailed Feasibility Study on this subject. The same study also identified the measures needed to remove bottlenecks. Further to the study bottlenecks were identified/confirmed with customers and conclusions also drawn based on the analysis of traffic management statistics.

Budapest – Miskolc line section

RFC MED section Ferencváros – Miskolc between Rákos and Hatvan stations, is subject of major reconstruction works, which will enable the running of trains with axle load 22,5t. The track, the catenary system renewal and the GSM-R 2 project have been completed whereas ETCS installation is still under progress. Upon completion of the works the capacity of the line, currently affected by the works will be restored, and the performance of the RFC MED improved.

Székesfehérvár – Boba line section

On this RFC MED line limitations affect the section between Boba and Ukk, where intermittently the available slots for freight trains are very limited and the number of passenger trains increasing.

Modernization of the Southern Link Railway Danube Bridge

The project includes the construction of the structure of a new (third) bridge, as well as the design and implementation of the whole superstructure, tracks and associated railway facilities for the three bridges. The project was finalised in 2022, as the first step of the Budapest circular railway.

Budapest – Százhalombatta section

Section between Kelenföld and Százhalombatta of this RFC MED line is being completely rebuilt for about 20.4 km. The existing speed restrictions will be eliminated, the design speed for most sections will increase to 120 km/h and the axel load upgraded to 225 kN. The catenary system is being rebuilt in the entire length of the line and remote-control system will be installed. The 120/25 kV transformer substation in Érd is going to be upgraded. Finally, a new electronic interlocking and ETCS 2 train control system is being installed on the line.

Százhalombatta – Pusztaszabolcs section

A new 12.1 km long track section has been built between Százhalombatta station and Ercsi junction, which interconnects with the existing line between Ercsi and Iváncsa stations. The existing track has also been upgraded. The track has been designed for a speed of 160 km/h and an axle load of 225 kN. A new electronic interlocking and the ETCS 2 automatic train control system have been installed on the line.

Zalaszentiván–Nagykanizsa section

The design speed of the section is 100/80 km/h. The aim of the project is to maintain the existing speed standard. Axle load will be upgraded to 225 kN, excluding in station sidings, where the standard will remain 210 kN. All stations on the section are equipped with D55 signalling system, with light-signal, single-centre, relay-dependent, train route on-train control system.

Budapest circular railway (Kelenföld-Kőbánya)

The project involves the construction of a new (third) superstructure and the preparation at design level of the relayed railway tracks and associated railway facilities, and implementation.

Additionally, a third track is currently under construction between Kelenföld and Ferencváros stations as well as Közvágóhíd and Nádorkert stations. In addition, a four-track section on the Buda side is also planned.

Budaepest–Budaörs

This RFC MED line is going to be upgraded to 120/140 km/h speed and 225 kN axle load. The capacity of the line will increase by adding a 3rd / 4th track on the right-hand side of the current track at-grade crossings. Safety will be improved by means of renovation/construction of separate level crossings (where necessary). The Budaörs station will be rebuilt together with additional stops. Finally, the foreseen improvement measures include upgrading of the catenary system and overhead power supply and safety equipment, as well as upgrading of missing or substandard passenger facilities.

Almásfüzitő–Komárom

This RFC MED line is going to be upgraded to 160 km/h speed and 225 kN axle load on the whole section, also rebuilding the multi-level crossing of main road No. 1. The foreseen improvement measures involve curve corrections and station reconstructions and upgrading of the overhead line and power supply system, upgrading of signalling system to the high-speed requirements, missing or outdated passenger facilities upgrading.

Expected results in case of elimination of bottlenecks

The elimination of the bottlenecks mentioned above will help to achieve a possible increase of around 50% in rail freight traffic. A higher increase in passenger volumes is expected if passenger train capacity increases and the performance of scheduled services improves substantially.

A detailed timetable for the implementation of the necessary measures can be found in the project list provided in

Table 10.

Congested infrastructure

If on a certain railway section even in the framework of a coordination process it is not possible to satisfy train path requests, and as a consequence of this, train path requests rejected run up to or go beyond 10% of the monthly theoretical capacity of a certain railway section, or if train path requests to be foreseeable submitted within a year are very likely not to be satisfied, in Hungary the concerned part of the railway network is required to be declared by the Hungarian Transport Research and Logistics Institute Nonprofit, as a congested railway section. In such a circumstance the infrastructure manager shall develop a capacity analysis and make proposals to remove congestion.

Track section congested in the 2023/2024 timetable period includes section Szeged-Rendező - Röszke - Röszke border line, which is not part of RFC MED.

Table 5 List of ongoing and planned projects for Spain

N°	Country	Region (If required)	Railway section	Nature of Projects		Benefits for RFC MED	Start date of the works	End date of the works	Actual step (% Completion)	Estimation of the costs in M€	Comments
1	SP		Tarragona - Castellon	UIC gauge access to Castellón Port on Mediterranean Corridor	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	2020	December 2025	(60%)	335,5 M€	
2	SP		Castellon - Valencia	New line, double track UIC gauge in Mediterranean Corridor	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	APROX 2026	APROX 2032	Planned	1.170,00	
3	SP		Castellon - Valencia	Valencia Node railway connection. Pass-through station, north access by-pass tunnel and completion of the south access tunnel	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	APROX 2026	APROX 2032	Planned	2.039,00	A new railway station is included
4	SP		Imería - Huéneja - Dólar Almería - Granada	Almeria connection upgrade to UIC standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	APROX 2027	2030	Planned	900 M€	
5	SP		La Encina - Alicante	La Encina - Alicante: Adaptation to TEN-T requirements (750 m), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	12/2024	12/2027 3/2028	Planned (Finished design phase)	161,6	
6	SP		Murcia Cargas - Almería	Murcia Cargas - Almería: New line compliant with TEN-T requirements	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	December 2025	45% (only infrastructure works)	2.000,00	
7	SP		Valencia - La Encina Node	Valencia - La Encina Node: Adaptation to TEN-T requirements (750 m), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	April 2025	70%	541,00	
8	SP		Bif Calafat -Tarragona	Vilaseca Node - Calafat branch (Vandellós by-pass): New line compliant with TEN-T requirements	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	2025	100% (new branch)0% UIC gauge change	659,00	Since 2020 January new branch is running (now it has been awarded contract works for UIC gauge change)
9	SP		Castellbisbal- Vilaseca	Implementation of UIC gauge on Mediterranean Corridor. Section Castellbisbal- Nudo Vilaseca	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	11/2013	2024	75%	232,00	ERTMS works are not included
10	SP		Castellón – Sagunt – Valencia (Ford factory, Ports and Fuente SanLuis terminal)	Castellón – Sagunt – Valencia: Adaptation to TEN-T requirements (750 m), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	12/2025	69%	313,00	
11	SP		Bif Calafat - Castellón	Calafat branch - Castellón: Adaptation to TEN-T requirements (750 m), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	12/2025	20%	248,68	Put into service of these works means any more Iberian gauge in this stretch. So, they

N°	Country	Region (If required)	Railway section	Nature of Projects		Benefits for RFC MED	Start date of the works	End date of the works	Actual step (% Completion)	Estimation of the costs in M€	Comments
											must be strongly coordinated with the ones between Castellón and Valencia.
12	SP		El Reguerón - Cartagena/Escombreras	El Reguerón - Cartagena/Escombreras: Adaptation to TEN-T requirements (750 m, electrification), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	2028	5%	540	It is included rail works inside Port Authority Zone
13	SP		Madrid - Zaragoza - Barcelona - Portbou	Madrid - Zaragoza - Barcelona - Portbou (IB): Enlargement of train length to 750 m and upgrade of the line	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	01/2023	01/2026	0%	50,00	At the moment this project is detailed design phase
14	SP		Vicálvaro - San Fernando	Vicálvaro - San Fernando. Creation of sidings and extra tracks	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	12/2030	25%	40,00	
15	SP		La Llagosta (Barcelona)	Implementation of intermodality and UIC gauge in La Llagosta Terminal and connection to the corridor.	Multimodal	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	12/2022	12/2025	15%	81,13	
16	SP		Murcia El Carmen - Murcia Cargas	Murcia El Carmen - Murcia Cargas: Adaptation to TEN-T requirements (electrification), plus standard gauge	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	December 2025	50%	158,80	It belongs to Nonduermas Sangonera section
17	SP		Barcelona Can Tunis Terminal	Developing and upgrading freight rail-road terminal in Barcelona Can Tunis Terminal	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	02/2014	December 2024	1st phase completed. Pending on 2nd to lay out UIC gauge on six tracks	7,7	
17 bis	SP		Barcelona Port	New UIC access connecting directly Port to the main line	Rail/Multimodal	Commercial Facility at Irún in tender process. Together with dual gauge axle by wagon keepers, is going to lead forward the commercial put on march of the service.	6/2023 (Basic Design approved)	2030 (to be confirmed in the upcoming design phase)		600	12/2023 tender process for Constructive Design
18	SP		ERTMS deployment on sections of the RFC MED in Spain	ERTMS deployment on sections of the Mediterranean corridor in Spain	Rail ERTMS	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	Phase 1 December 2021 Phase 2 December 2030	25%	84.17 M€. 350.08 M€.	To see other word file ERTMS
19	SP		Alicante - Port of Alicante branch (San Gabriel) - San Isidro:	Alicante - Port of Alicante branch (San Gabriel) - San Isidro: Adaptation to TEN-T requirements (750 m,	Rail	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	01/2024	2027	Planned	566,00	It is considered as Torrellano new branch

N°	Country	Region (If required)	Railway section	Nature of Projects		Benefits for RFC MED	Start date of the works	End date of the works	Actual step (% Completion)	Estimation of the costs in M€	Comments
				electrification), standard gauge							
20	SP (OS-RFC ATL)		Madrid-Alcázar-Algeciras	Conventional rail line Madrid-Alcázar-Córdoba-Algeciras. Implementation of ERTMS	Rail ERTMS	Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	12/2030	28%		To see other word file ERTMS
21	SP (OS-RFC ATL)		Madrid-Alcázar-Algeciras	Algeciras-Bobadilla. Conventional rail line. Interoperable side-tracks to allow train length 750m		Bottleneck relief Interoperability Capacity improvement Punctuality improvement	05/2015	2026	15%		
22	SP (OS-RFC ATL)		Bobadilla -Algeciras	Bobadilla - Algeciras. Conventional rail line. Electrification 25KV AC		Bottleneck relief Interoperability Capacity improvement Punctuality improvement	2024	12/2027	Planned		It is still in preliminary design
23	SP (OS-RFC ATL)		Algeciras – San Roque	Upgrading of the existing Bahia de Algeciras Port - San Roque RRT railway line (Implementation of Double track)		Bottleneck relief Interoperability Capacity improvement Punctuality improvement	01/2015	12/2030	Planned		
24	SP (OS-RFC ATL)		Innovative technology for Automatic Standard/Iberian gauge changing system on tracks and freight wagons	Automatic Standard/Iberian gauge changing system on tracks and freight wagons		Bottleneck relief Interoperability Capacity improvement Punctuality improvement	-	2030	Commercial Facility at Irún in tender process. Together with dual gauge axle by wagon keepers, is going to lead forward the commercial put on march of the service.	4.63	Pilot facility operating already at Córdoba.
25	SP (OS-RFC ATL)		Innovative technology for Automatic Standard/Iberian gauge changing system on tracks and freight wagons	Variable Gauge for Freight Transport		Bottleneck relief Interoperability Capacity improvement Punctuality improvement	-	2030	25%	2.28	

Source: RFC MED 2025 Implementation Plan

Table 6 List of ongoing and planned projects for France

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
1	FR	SOUTH EAST	Rail access TELT (Tunnel Euralpin Lyon-Turin)	Infrastructure	Capacity increase	2019	2029		228	SNCF Réseau				Secured
2	FR	SOUTHEAST	ERTMS INSTALLATION SNCF RÉSEAU	Infrastructure	Interoperability		12/2030			SNCF Réseau				Information provided in the NIP which is under construction with SNCF Réseau
3	FR	SOUTHEAST	GRENOBLE - VOREPPE:	Infrastructure	Capacity increase	2022	2030	Study	591	SNCF Réseau				Secured

			creation of 2 track on 12 km											
4	FR	SOUTHEAST	DIJON MARSEILLE LNPCA - Phase 1	Infrastructure	Capacity increase	2022	2030	Study	295	SNCF Réseau	State	Region	EU	Secured
5	FR	SOUTHEAST	DIJON NIMES PORTBOU: Track renewal Villeneuve- Nîmes	Infrastructure	Maintenance of performance	2023	2029	Study	136	SNCF Réseau				Secured
6	FR	SOUTHEAST	DIJON NIMES PORTBOU: Track renewal Perpignan Cerbère	Infrastructure	Maintenance of performance	2023	2029	Study	119	SNCF Réseau				Secured
7	FR	SOUTHEAST	NARBONNE MARSEILLE: Track renewal Pont St Esprit à Racc Sud de Villeneuve	Infrastructure	Maintenance of performance	2022	2027	Study	131	SNCF Réseau				Secured
8	FR	SOUTHEAST	NARBONNE MARSEILLE: Béziers and Sètes Modernisation of the PRCI	Infrastructure	Maintenance of performance	2024	2030	Study	194	SNCF Réseau				Secured

Source: RFC MED 2025 Implementation Plan

Table 7 List of ongoing and planned projects for Italy

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Financial Status	Funder 1	Funder 2	Funder 3	Comments
1	ITALY		TRIESTE PORT AREA	Infrastructure and technological enhancement	Capacity		12/2024 “first phase” over 12/2027 “last phases”	Work Phase	1648	Planned	State			Railway works inside and outside the port area. Upgrading of Trieste Campo Marzio station (layout and a new electronic interlocking PRG and ACC) and of the railway line “Linea di cintura” to Campo Marzio/Trieste Aquilinia. Intermodal integration. Upgrading Trieste Servola e Trieste Aquilinia stations (layout and a new electronic interlocking PRG ed ACC
2	ITALY		VENICE PORT	Infrastructure and technological enhancement	Capacity		31/12/2030	Project Phase	21,7	Planned	State			The project includes the upgrading of the station of Venezia Marghera Scalo with the construction of new tracks for running trains with length of 740 m
3	ITALY		VERONA RRT	Infrastructure	Capacity/train length		31/12/2030	Project Phase	93	Planned	State	CEF		Upgrading of Verona Quadrante Europa transfer station in order to allow 750m train length and increase the current capacity and accessibility
4	ITALY		NOVARA NODE	Infrastructure and technological enhancement	Capacity/train length		over 12/2027	Project Phase	190,50	Planned	State			Phase 1a) Railroad Terminal Upgrading including a new terminal connection with the railway line of the Novara node to guarantee no interchange in the Novara C.Le station; upgrade of the intermodal terminal for “Rolling Highway” (Ro-La).

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Financial Status	Funder 1	Funder 2	Funder 3	Comments
5	ITALY		UPGRADING OF MILANO SMISTAMENTO RAILROAD TERMINAL	Infrastructure and signalling	Capacity		31/12/2024	Work Phase	22	Secured	State			Terminal upgrading including signalling, demolition, and new tracks to optimize the connection with the new "Alptransit" intermodal terminal. The new terminal will be built in the Milano Smistamento area. The project aims to increase the terminal's capabilities and handle trains up to 740 m in length.
6	ITALY		UPGRADING OF VERONA QUADRANTE EUROPA RAILROAD TERMINAL VERONA RRT	Infrastructure	Train length		Over 27/12/2030	Preliminary Study	154	tbd				Construction of a new terminal with 750 m long tracks
7	ITALY		VERONA PORTA NUOVA	Infrastructure and technological development	Capacity		06/2025		137	Secured	State			Technological and infrastructural upgrading of the Verona Porta Nuova Station. The planned interventions in Verona Porta Nuova station, both infrastructural and technological, allow an increase in the overall capacity of the Node, intermodal integration and an improvement of the railway circulation's management of railway circulation. The project is necessary to the new high speed line Brescia – Verona.
8	ITALY (OS-RFC BA)		BRESCIA - VERONA	Infrastructure and technological development	Capacity		31/12/2026	Work Phase	3.626	Planned	State			New HS line between Brescia and Verona
9	ITALY		VERONA – VICENZA JUNCTION (HS)	Infrastructure and technological development	Capacity		Verona – Vicenza Junction: over 2026 Verona Est phase: over 2028	Work Phase	3.264	Secured	State			New HS line between Verona and Vicenza Junction
10	ITALY		ATTRAVERSAMENTO VICENZA (HS)	Infrastructure and technological development	Capacity		2032	Preliminary Study	2.180	Planned				New HS section (26 km), the intersection with the existing line will be realised through two interconnections in Vicenza and Padova. Resolution of physical bottleneck
11	ITALY		VICENZA – PADOVA (HS)	Infrastructure and technological development	Capacity		Over 2030	Preliminary Study	1.500	tbd				New HS section (26 km), the intersection with the existing line will be realised through two interconnections in Vicenza and Padova. Resolution of physical bottleneck

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Financial Status	Funder 1	Funder 2	Funder 3	Comments
12	ITALY		TORINO –PADOVA (CONVENTIONAL LINE)	Infrastructure / technological development	Capacity/train length		31/12/2024	Work Phase	901	Planned	State	Region	CEF	Technologic and infrastructural upgrading of the conventional line and some stations between Turin and Padova. The planned interventions are necessary to improve the overall quality of the service. The new electronic interlocking and control allow a better performance related to the circulation management
13	ITALY		VENICE NODE	Infrastructure	Capacity		11/03/2027	Project Phase	180	Planned	State	Region		Upgrade of the “Linea dei Bivi” in order to support freight traffic flows. Passing through Venice node and resolve physical interferences and bottlenecks
14	ITALY		VENICE-TRIESTE (CONVENTIONAL LINE)	Infrastructure	Capacity		Technological Upgrading - scenario 2023/2025Phase 1 and 2 - Scenario from 2025 (removal level crossing) Phase 32 - Scenario 2030 (variant between Mestre and Ronchi) Phase 43 - Scenario 2031 (Variant Ronchi Aurisina)	Project Phase	1.800	Planned	State	Region	CEF	Upgrading of Venezia-Trieste – Phase 1 and 2 consists of a technological upgrading and elimination of the actual speed limitations due to the axial load. Phases 3 and 4 include two new alignments between Venezia Mestre and Ronchi and Ronchi and Aurisina. The existing level crossing will be removed in Phase 3.
15	ITALY		ALL CORRIDOR SECTIONS	Infrastructure	Train length		1st Phase Scenario 2022 (forecast) 2nd Phase Scenario 2026 3rd Phase Scenario After 2026 (forecast)	Work Phase	52,90	Planned	State			Allowing circulation without special permission of trains up to 740 m long on the CNC lines Upgrade to 750 meter track length of some Mediterranean Corridor lines (Lines: Torino - Trieste/Villa Opicina and alternative routes). Torino - Milano Verona - Padova - Venezia Venezia - Trieste Bologna - Padova Milano - Piacenza – Bologna Genova - Ventimiglia The project also includes the upgrading to 750 m-long tracks of

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Financial Status	Funder 1	Funder 2	Funder 3	Comments
														the Bologna Interporto transfer station
16	ITALY		TURIN NODE	Infrastructure	Capacity		31/01/2027	Works Phase	219	Planned	State			Technological upgrading of Torino Node and new rail connection between Torino Porta Nuova and Torino Porta Susa. The project includes preliminary upgrading works of the Torino Orbassano terminal and layout changes in Torino Lingotto
17	ITALY		MILANO NODE	Infrastructure and technological development	Capacity		Upgrading nodo scenario 2024/2026	Work Phase	552	Planned	State	CEF		Upgrading of the Milan Node. of Milano (including the PRG and ACC of Lambrate, Centrale, Porta Garibaldi, Certosa, Gallarate, upgrade of safety distance systems within the node) These interventions consist of technological upgrading, new interlockings and layout changes in the stations of the Milan Node
18	ITALY		TORINO - MODANE; TORINO - NOVARA; MILANO - PIACENZA; MONFALCONE - TRIESTE; PADOVA - VENEZIA	ERTMS	Interoperability		31/12/2030	Project Phase	237	Planned				Technological Upgrade preparatory for ERTMS on some Mediterranean Corridor Sections except for those sections where are already projects for infrastructural and technological upgrading: Torino - Modane; Torino - Novara; Milano - Piacenza; Monfalcone - Trieste; Padova - Venezia
19	ITALY-SLOVENIA		ERTMS IMPLEMENTATION-MEDITERRANEAN CORRIDOR - FIRST PHASE - NOVARA - MILANO: MILANO - BRESCIA- VERONA - VICENZA - PADOVA - VENEZIA; VICENZA - TREVISO - PORTOGURARO - VILLA OPICINA/TRIESTE	ERTMSs	Interoperability		31/12/2023	Work Phase	116	Secured	State	CEF		Implementation of ERTMS on priority section of Mediterranean Corridor: Novara - Milano: Milano - Brescia-Verona -Vicenza - Padova - Venezia; Vicenza -Treviso - Portoguraro - Villa Opicina/Trieste
20	ITALY		ERTMS IMPLEMENTATION-MEDITERRANEAN CORRIDOR - COMPLETION PHASE TORINO - MODANE; NODO DI TORINO; TORINO - NOVARA; BOLOGNA PADOVA;	ERTMS	Interoperability		31/12/2030	Project phase	137	Planned				Implementation of ERTMS on sections of Mediterranean Corridor (Other phases) The estimation of cost includes also the implementation along the section: Genova Ventimiglia; Genova - La Spezia; Piacenza - Bologna

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Financial Status	Funder 1	Funder 2	Funder 3	Comments
			NODO DI BOLOGNA; BOLOGNA - RAVENNA; VENEZIA – PORTOGRUARO,											
21	ITALY (OS-RFC BA)		TRIESTE-DIVAČA	Infrastructure and technological enhancement	Capacity		2026	Project Phase	66	Planned	State	CEF		Upgrading of the railway line Trieste-Divača
22	ITALY		TORINO-ALESSANDRIA	Infrastructure	Gauge Upgrading		Over 2027	Work Phase	62	Planned	State			Upgrading to Gauge loading gauge P/C 80
23	ITALY		TORINO - ALESSANDRIA	Infrastructure	Train Length (Second Phase)		Over 2024	Work Phase	28	Planned	State			Upgrading to Train Length 740 m (Asti Station)
24	ITALY		TORINO - ALESSANDRIA	Infrastructure and technological enhancement	Increasing Speed and Train Length (First Phase)		2024	Work Phase	175	Planned	State			
25	ITALY		BRESCIA FREIGHT STATION	Infrastructure	Capacity/train length		2024 (phase) Completion expected in 2026	Project Phase	82	Secured	State			Upgrading of the Freight Station of Brescia, modification of the layout of the station allowing the circulation of trains with length of 740 m
26	ITALY		BUSSOLENO - AVIGLIANA	Infrastructure and technological enhancement	Capacity/train length/Gauge Upgrading/Interoperability		Over 2027	Project Phase	1.905	Planned	State	CEF		Connection of Torino belt to the new line Torino-Lione, priority interventions: line section Avigliana-Orbassano and Torino Orbassano railyards (1st phase). Infrastructural upgrading of the existing conventional line (Bussoleno-Avigliana)
27	ITALY		CERVIGNANO RRT	Infrastructure	Capacity/Train Length		12/2023	Project Phase	6,35	Secured				Improvement of the railway connections to the Cervignano Core RRT (First Phase)
28	ITALY		PADOVA INTERPORTO	Infrastructure	Capacity		tbd	Project Phase	1 (Only design)	Secured	State			Railway link for direct connection between Padova Interporto RRT and Padova – Venice Line – Only Design
29	ITALY		TORINO - MILANO	Infrastructure	Train Length		12/2027			Planned	State			Layout changes and new electronic interlocking system in Chivasso station for the circulation of up to 740m long trains
30	ITALY		PADOVA	Infrastructure	Train Length		Over 12/2027	Preliminary Studies	700	Planned				Layout of Padova Node

Source: RFC MED 2025 Implementation Plan

Table 8 List of ongoing and planned projects for Slovenia

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
1	SI (OS-RFC BA) (OS-RFC RALP)		Ljubljana - Divača	Modernisation, upgrade of railway infrastructure (more energy for traction, signalling, longer station tracks, required speed). to meet the required TEN-T standards regarding interoperability.	Capacity increase & upgrade	2020	2030	in process	500					
2	SI (OS-RFC BA) (OS-RFC RALP)		Divača - Sežana	Upgrading of existing structure, signalling safety devices (Automatic Block Signalling) and catenary system.	Capacity increase & upgrade	2021	2027	in process	110					
3	SI (OS-RFC BA) (OS-RFC RALP)		Divača – Koper	Construction of the second track Divača – Koper. An additional track on other route (shorter track) but not parallel, creation of new structure (line, tunnel, bridge, leapfrog) - 2TDK	Capacity increase	2017	2025	in process	1.2					
4	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most - Ljubljana	Modernisation, upgrade of railway infrastructure, Signalling, longer station tracks,	Capacity increase & upgrade	2019	2027	design phase	230					
5	SI (OS-RFC RALP0)		Dobova – Zidani Most	Modernisation, upgrade of railway infrastructure, Signalling, longer station tracks	Capacity increase & upgrade	2019	2027	design phase	210					
6	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Ljubljana	New section assuring direct connection and increase abilities of train station in Ljubljana	Bottleneck removal		2024	Preparation for works	80					
7	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Ljubljana	Modernisation, upgrade of railway station Ljubljana Lack of capacity, longer station tracks, signalling… Emonika	Capacity increase & upgrade	2022	2026	Preparation for works	200					
8	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Pragersko	Modernisation, upgrade of railway station Pragersko. Creation of siding, passing tracks, longer station tracks, catenary system, …	Capacity increase & upgrade	2017	2024	completion phase	63					
9	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most - Šentilj	Upgrading signalling safety devices (from electronic technology on electronic) on section Zidani Most - Šentilj.	Upgrading SV	2018	2024	in process	70	SI	EU			

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
10	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Ljubljana (up to and including station Laze)	Introduction of traffic remote control in RS (first phase)	Upgrading SV	2021	2025	design phase	137					
11	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Šentilj (up to and including station Šentjur)	Renovation of the station (new covered platform with non-grade access, installation of lifts …)	Upgrading SV	2022	2024	in process	7.5					
12	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Ljubljana (up to and including station Zagorje)	Renovation of the station (new covered platform with non-grade access, installation of lifts, toilets car park …)	Upgrading SV	2022	2024	in process	19.5					
13	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Šentilj (up to and including station Rače)	Renovation of the station (new covered platform with non-grade access, installation of lifts …)	Upgrading SV	2022	2024	in process	4.5					
14	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Ljubljana (up to and including station Litija)	Renovation of the station (new covered platform with non-grade access, installation of lifts, toilets car park …)	Upgrading SV	2023	2024	design phase	14					
15	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Ljubljan	Renovation of the station (new covered platform with no-grade	Upgrading SV	2024	2025	design phase	6.5					

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
			a (up to and including station Trbovlje)	access, installation of lifts, toilets car park …)										
16	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most-Ljubljana (up to and including station Hrastnik)	Renovation of the station (new covered platform with nongrade access, installation of lifts, toilets car park …)	Upgrading SV	2025	2026	design phase	6.5					
17	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Zidani Most	Modernisation, upgrade of hub and railway station Zidani Most. Creation of siding, passing tracks, longer station tracks, catenary system, …	Capacity increase & upgrade	2025	2030	design phase	??					
18	SI (OS-RFC BA) (OS-RFC RALP0) (OS-RFC RALP)		Dobova-Zidani Most-Ljubljana/Šentilj (up to and including station Trbovlje)	Construction of nongrade accesses, new covered platforms, installation of lifts, upgrade of signal and safety equipment with traffic remote control)	Remote traffic control	2023	2025	preparation of tender documentation	??					

Source: RFC MED 2025 Implementation Plan

Table 9 List of ongoing and planned projects for Croatia

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
1	HR		Dugo Selo – Križevci	Construction of second track	Bottleneck relief	2016	2025	Works in progress	198	EU	State			
2	HR		Križevci – Koprivnica – State Border	Reconstruction of existing and construction of second track	Bottleneck relief	2021	2024	Works in progress	350	EU	State			
3	HR		Zagreb ZK – Zagreb GK	Reconstruction, renewal of tracks	Bottleneck relief	2023	2024	Works in progress	27	EU	State			
4	HR		Hrvatski Leskovac – Karlovac	Construction of second track	Bottleneck relief	2022	2026	Works in progress	315	EU	State			

Source: RFC MED 2025 Implementation Plan

Table 10 List of ongoing and planned projects for Hungary

N°	Country	Region (if required)	Railway section	Nature of Projects	Benefits for RFC MED	Start date of the works	End date of the works	Actual step	Estimation of the costs in M€	Funder 1	Funder 2	Funder 3	Funder 4	Comments
1	HU		Budapest–Hatvan	New interlocking systems + ETCS L2 deployment	Interoperability Reliability	2018	2025	Under constuction	67	EU	State			
2	HU		Érd connecting line (Érd – Érd also)	New line	Reliability	2019	2023	Completed	25	EU	State			
3	HU		Budapest–Miskolc–Nyíregyháza Püspökladány–Záhony Székesfehérvár–Boba	GSM-R deployment	Interoperability	2018	2023	Completed	168	EU	State			
4	HU		Zalaszentiván–Nagykanizsa	Reconstruction Electrification	Interoperability Bottleneck relief	2023	2028	Preparation		EU	State			
5	HU (OS-RFC 7) (OS-RFC 9) (OS-RFC 11)		Budapest traverse (Kelenföld–Kőbánya)	3rd track	Bottleneck relief	**2023**	**2025**	Under construction		EU	State			

Source: RFC MED 2025 Implementation Plan

2.1.6 ERTMS DEPLOYMENT PLAN

The European Rail Traffic Management System (ERTMS) is a single European signalling system that ensures interoperability of the national railway systems, reducing the purchasing and maintenance costs of the signalling systems as well as increasing the speed of trains, the capacity of infrastructure and the level of safety in rail transport.

ERTMS comprises of the European Train Control System (ETCS), i.e., a cab-signalling system that incorporates automatic train protection, the Global System for Mobile communications for Railways (GSM-R) and operating rules.

Technical specifications for ETCS and GSM-R are published in the Control Command and Signalling (CCS) Technical Specification for Interoperability (TSI). GSM-R provides voice communication for train drivers and signallers and provides data communication for ETCS. ERTMS and GSM-R rules are published in the Operation and Traffic Management TSI (OPE TSI).

The deployment plan related projects include all ERTMS projects foreseen for development of infrastructure along Mediterranean Rail Freight Corridor. Specific details concerning ERTMS deployment plans of the individual Infrastructure Managers are included in the RFC MED 2025 Implementation Plan, Section 6.3.

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 11 provides the number of trains per BCP along the RFC MED (i.e. the number of commercial freight trains crossing selected border points), whereas Table 12 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 11 Number of trains per BCP along the RFC MED

Border		BCP	2020	2021	2022	2023
ES	FR	Figueres Vilafant/Perpignan	1,192	1,182	1,571	1,431
ES	FR	Portbou/Cerbère	3,586	3,380	3,111	2,247
FR	IT	Modane/Bardonecchia	7,530	8,271	8,546	3,352
IT	SI	Villa Opicina/Sežana	8,455	8,973	7,522	7,940
SI	HR	Dobova/Savski Marof/	7,300	7,161	7,058	8,009
SI	HU	Hodoš/Őriszentpéter/	6,097	6,755	6,297	6,544
HR	HU	Koprivnica/Gyékényes	8,001	7,091	6,008	9,741

Source: RFC MED KPIs; Notes: the drop in the number of trains at the Modane/Bardonecchia BCP is attributable to the closure of the line as of 27/08/2023

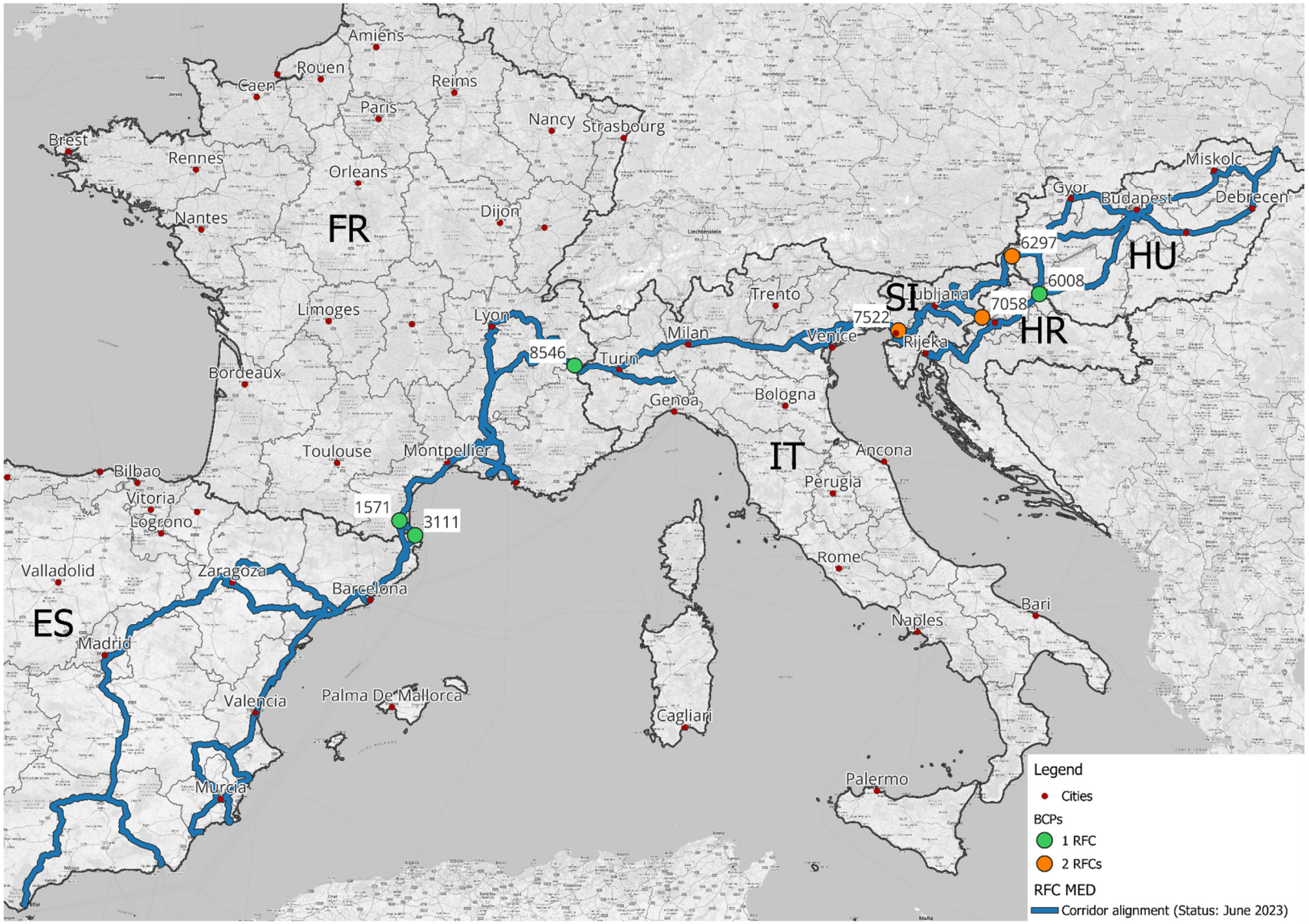
According to the available data (averages for the past four years), the highest traffic was registered at Villa Opicina/Sežana/, between Italy and Slovenia, Modane/Bardonecchia, between France and Italy, Koprivnica/Gyékényes, between Croatia and Hungary, Dobova/Savski Marof/ between Slovenia and Croatia, and Hodoš/Őriszentpéter, between Slovenia and Hungary. Train traffic data/trends at BCPs include all international trains crossing a border along the RFC and may vary according to traffic management solutions and traffic conditions on the accessing/interconnected lines, as well as traffic capacity restrictions on these lines, due to temporary/permanent maintenance and/or construction works. Furthermore, the COVID Pandemic first and Russian aggression to Ukraine later also affected traffic on the European network for competitive rail transport. The number of corridor trains reported in the table below seems to be showing an overall stable trend, albeit decreased in 2022.

Table 12 Corridor trains crossing at least one RFC MED BCP

	2020	2021	2022	2023
Number of trains crossing a border along RFC MED	28,457	29,848	24,984	24,823

Source: RFC MED KPIs

Figure 11 RFC MED – Trains at BCPs along the RFC MED



Source: CIP June 2023 and RFC MED KPIs

Further to the number of trains at BCPs, the set of common indicators also includes capacity management related parameters, for which data are collected and provided for all RFCs. Figures for the RFC MED are provided in Table 13 below.

Table 13 Capacity Management KPIs

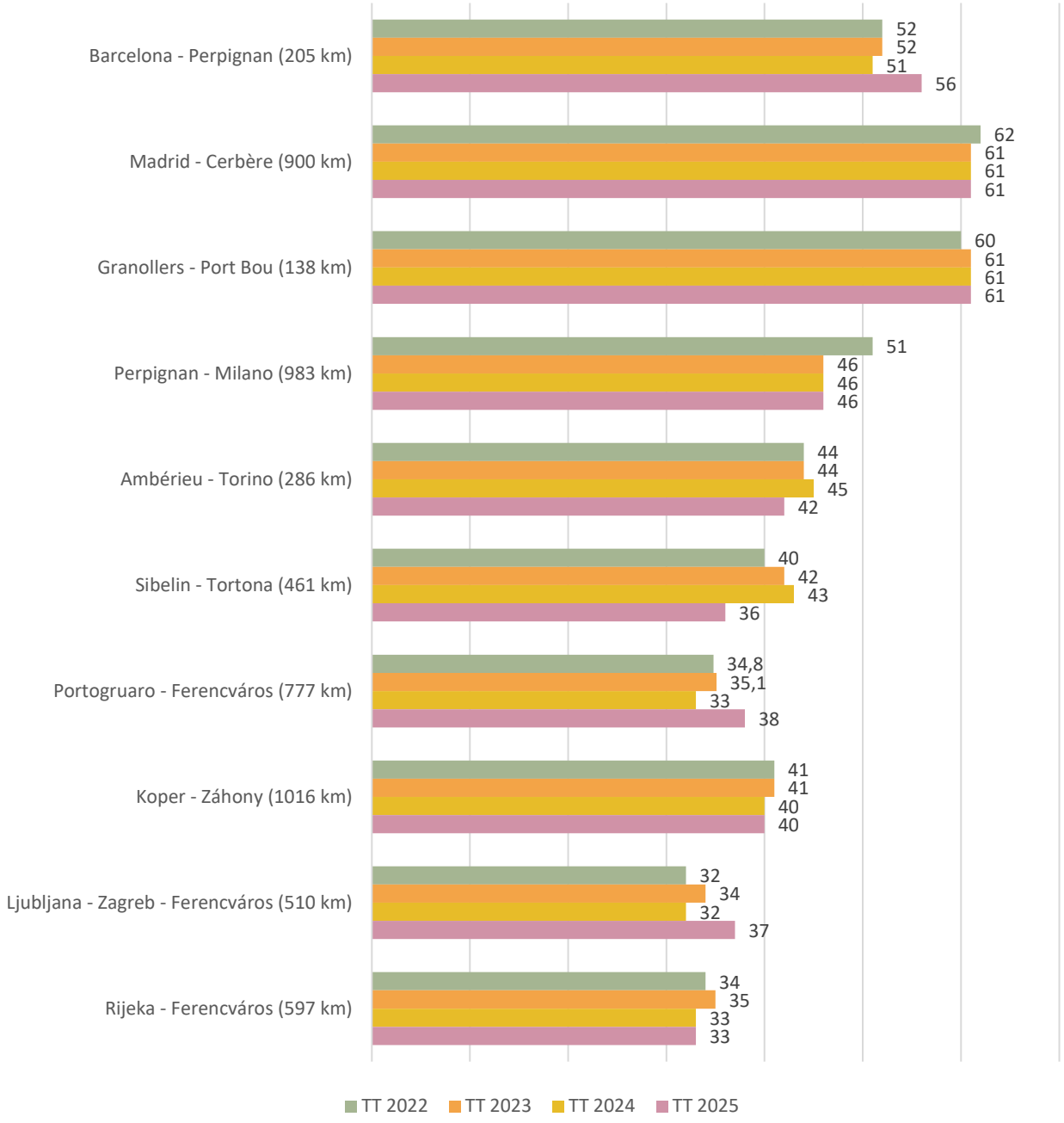
Parameter	TT 2022	TT 2023	TT 2024	TT 2025
	2021	2022	2023	2024
Volume of offered capacity – PaPs (at X-11), mio (path) km	14	16.2	16.5	19.1
Common approach to all Volume of requested capacity – PaPs (at X-8), mio (path) km	5.3	6	8.7	9
Number of requests – PaPs (at X-8)	78	75	88	87
Number of conflicts – PaPs (at X-8)	10	0	6	0
Volume of pre-booked capacity– PaPs (at X-7.5), mio (path) km	5.2	5.9	8.5	9
Ratio of pre-booked capacity (to the volume of capacity offered at x-11)	37.3%	36.7%	51.6%	47.1
Volume of offered capacity – Reserve Capacity (at X-2), mio (path) km	1.4	2.35	2.34	N/A
Number of requests – Reserve Capacity (at X+12) (number of PCS dossiers)	2	0	N/A	N/A
Volume of requested capacity – Reserve Capacity (at X+12), mio (path) km	0.02	0	N/A	N/A

Source: RFC MED KPIs

The commonly adopted KPI framework additionally includes indicators to measure the average planned speed of the offered Pre-allocated Paths (Figure 12) and punctuality of freight services along the RFCs (Table 14).

The indicators seem to show a steady/slightly improving 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 slightly declining trend compared to TT 2022, except for paths Ambérieu-Torino and Sibelin-Tortona.

Figure 12 Average planned speed of PaPs, km/h



Source: RFC MED KPIs

Table 14 Punctuality

				(delay ≤ 30 minutes)
	2020	2021	2022	2024
Punctuality at origin (RFC entry)	64.0%	60.0%	55.0%	52.7%
Punctuality at destination (RFC exit)	52.0%	48.0%	41.0%	39.0%
				(delay ≤ 15 minutes)
Punctuality at origin (RFC entry)	59.0%	55.0%	49.0%	47.7%
Punctuality at destination (RFC exit)	48.0%	44.0%	37.0%	34.9%

Source: RFC MED KPIs

2.2.2 SPECIFIC PERFORMANCE OBJECTIVES AND TARGETS

Further to the monitoring activities associated with the common KPIs applicable to all RFCs, specific objectives have been also adopted by the RFC MED, associated with quantified targets.

The objectives of RFC MED are in line with the Sustainable and Smart Mobility Strategy of the EC. Free movement of goods across the (internal) borders is a fundamental and basic aim of a Single European Rail Market, as a part of a Single European Transport Area. Improving connectivity and access to the internal market for all regions of the RFC MED catchment area is a pivotal intention based on an efficient and interconnected multimodal transport system, for freight, together with supporting the idea to increase the rail freight traffic by 50% by 2030.

To support growth and competitiveness of international rail freight traffic, RFC MED aims at:

- Strengthening the cross-border coordination among the stakeholders;
- Performing a better overall management of the rail freight corridor for the benefit of the customers;
- Improving interconnectivity to multimodal terminals and establish an end-to-end approach.

Specific targets have been defined for selected objectives as follows:

- Capacity objectives:
  - Annual growth of 5% of the Volume of Offered Capacity
  - Annual growth of 5% of the Volume of Requested Capacity
  - Maintain a stable ratio of the Capacity Allocated by the C-OSS and the Total Allocated Capacity, as *number* of trains per border (7 border points), saved the consideration of overall days spent with modernisation or upgrading on tracks/section.
- Punctuality objective:
  - Achieve 50% punctuality at destination (RFC Exit) with max. delay ≤30 minutes, by December 2026.

Similarly to other RFCs, RFC MED also undertakes Train Performance Management tasks (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 MED

The Train Information System (TIS) tool developed by RNE includes a detailed database of train operations. An analysis of the TIS dataset for the year 2022 has been made as part of this study aimed at producing statistical information on train operations along the RFCs. However, train operations encoded in TIS do not correspond to individual trains by Origin and Destination as more Railway Undertakings can be involved in the operation of international trains. A train along an RFC can be operated by more Railway Undertakings from origin to destination. 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 15 Railway Undertakings operating international rail freight trains in 2022

N. 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 considerations made in the previous paragraphs concerning the market size and shares of rail transport in the countries crossed by the RFCs. 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 16 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 17 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

Source: RNE – TIS

51 RUs operated trains on the RFC MED in 2022. Most of them operated trains on more corridors and registered up to 1,000 operations. Still, 2 RUs operated more than 5,000 trains along the RFC MED in 2022.

2.2.4 PASSENGERS TRAIN OPERATIONS ALONG THE RFC MED

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 250 registered international trains per direction.

Table 18 Main international passengers' cross-border relations encoded in TIS using RFC MED in 2022

Involved RFC	Origin		Destination	
RFC MED	Milano	IT	Paris	FR
RFC MED	Budapest	HU	Zagreb	HR
RFC MED	Wien/Salzburg	AT	Zagreb GK	HR
RFC MED;	Budapest	HU	Ljubljana	SI

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

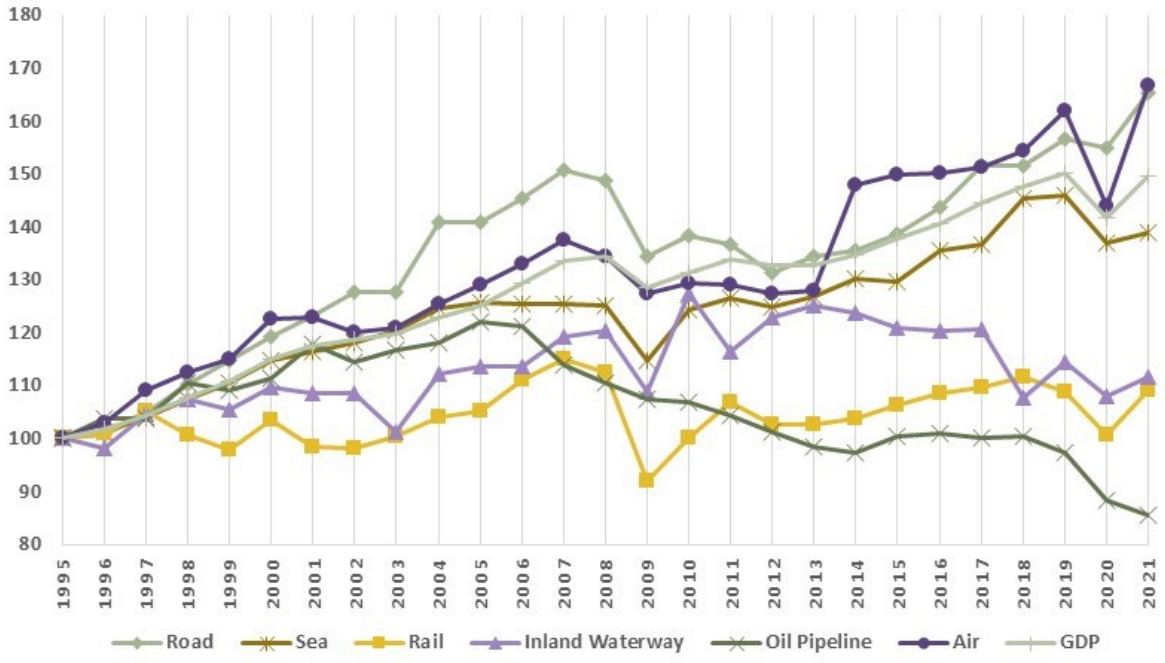
The first section of this chapter provides a statistical framework on the main socio-economic and transport developments on a European scale over the past decades. The second section reports on the main indicators monitored at the European level regarding the rail transport market and its liberalisation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

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

3.1 TRANSPORT MARKET TRENDS IN EUROPE

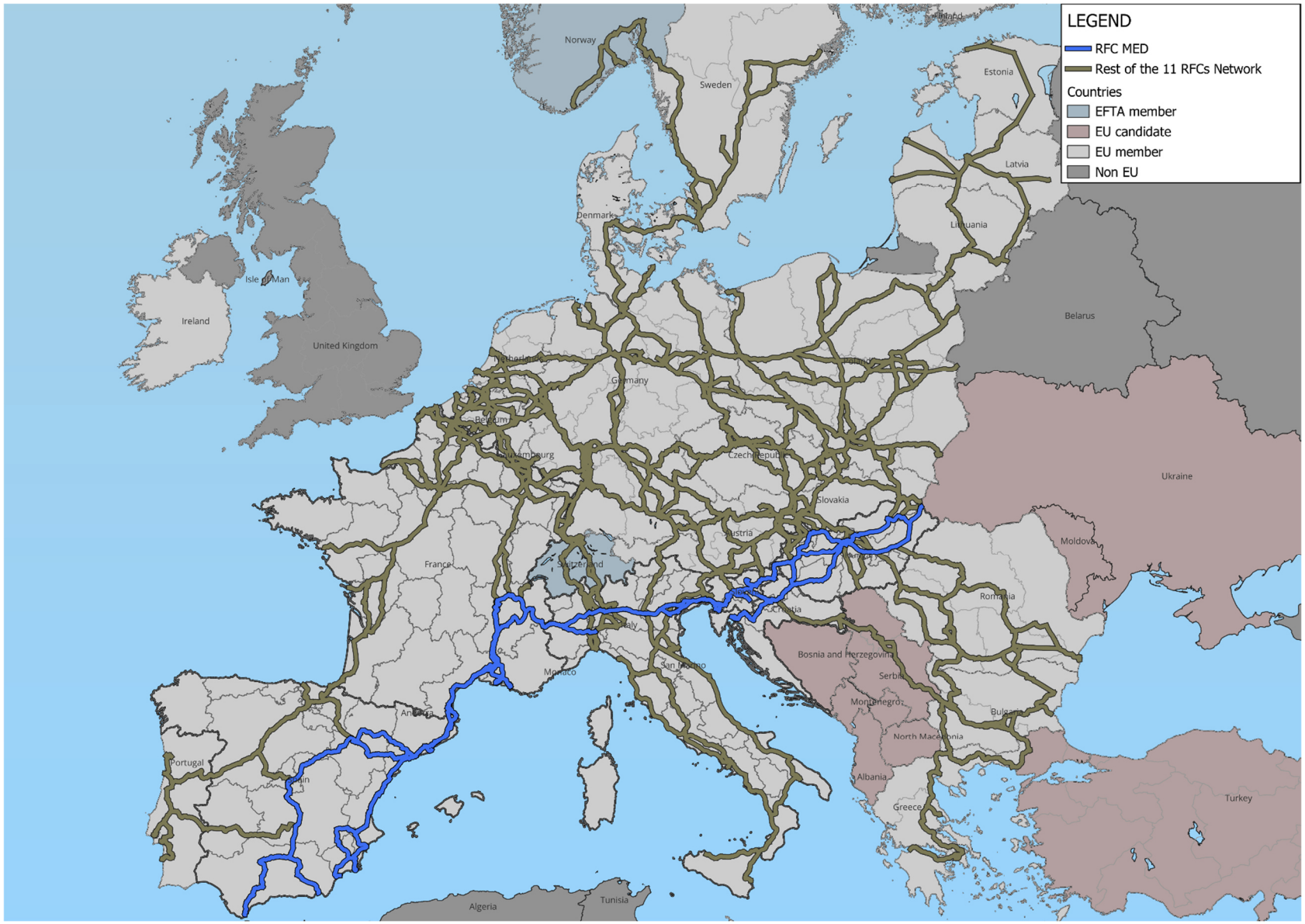
This section briefly reports the main transport statistics from the Statistical Pocketbook 2023, produced by the EC – DG MOVE and Eurostat. The analysis provides an overview of the development of the European rail freight sector since the middle of the 1990s when the rail freight market liberalization 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 13 Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE – Statistical Pocketbook 2023

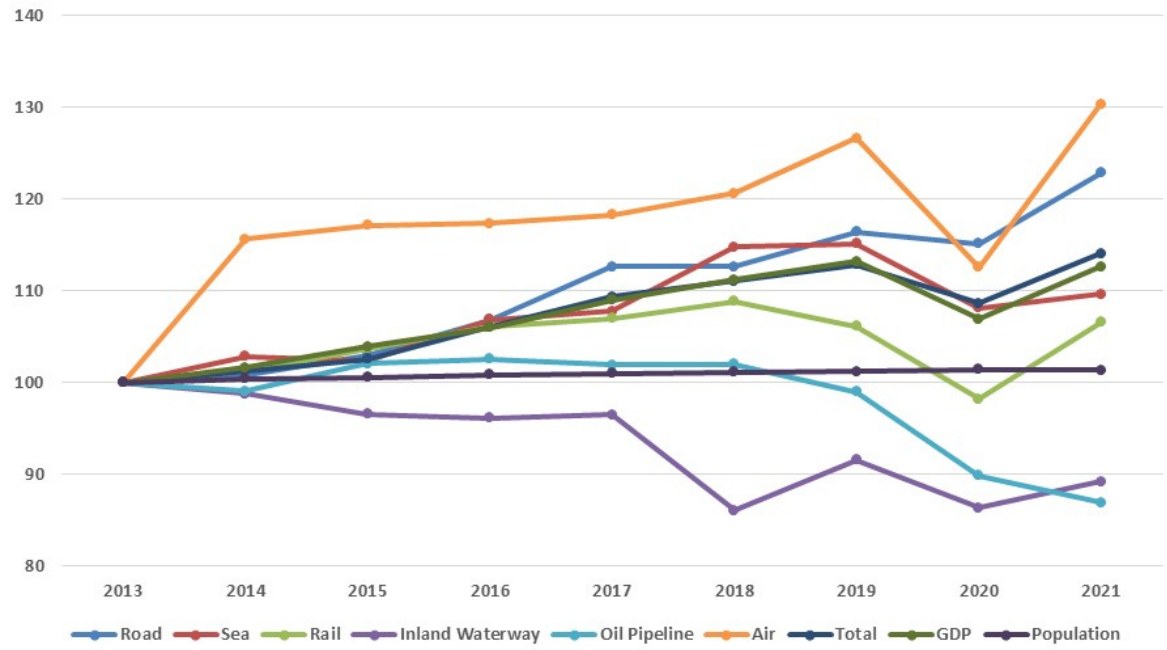
Figure 14 The RFC MED within the 11 RFCs Network



Source: Authors based on CIP

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

Figure 15 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 19 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 Table 19), combined transport more than doubled from about 41 billion tkm to 100 billion tkm (Table 19).

Table 20 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 MED concerned countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates (Table 21).

Table 21 RFC MED 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	606.5	706.7	742.8	2.6%	2.6%	5.1%
Railways	76.2	84.5	89.8	1.7%	2.1%	6.2%
Inland waterways	12.0	11.0	10.1	-1.4%	-2.2%	-8.7%
Oil pipelines	34.1	36.2	30.3	1.0%	-1.5%	-16.3%
Total	**728.8**	**838.4**	**872.9**	**2.4%**	**2.3%**	**4.1%**

Source: EC – DG MOVE – Statistical Pocketbook 2023

The share of rail in total freight transport based on tkm varies significantly across the EU. Data in Table 22 shows that the rail share is generally higher in Eastern and Central European countries than in Western Europe. Austria and Switzerland are among the top ten countries also due to the support these countries give

to rail transport to reduce the impact of freight transport on the environment, with a focus on the Alpine crossings.

Table 22 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 is lower in Greece, Ireland, Portugal and Spain.

The RFC MED countries are among the ones registering an intermediate rail modal share in the EU. Two out of six RFC MED countries are indeed positioned within the ten first-ranking EU countries for rail modal share in 2022. However, some countries, especially Hungary, are also among the ones that are registering a decline in rail modal share over time, especially compared to 2013. A trend that is likely related to the change in the commodity basket trade.

Table 23 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes '000) in the EU 27

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

Source: Eurostat [rail_go_grpgood__custom_10416020]

Table 24 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tkm '000.000) in the EU 27

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

Source: Eurostat [rail_go_grpgood__custom_10416020]

Table 25 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tonnes '000) in the RFC MED 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	25,326	70,479	90,150	95,377	64,824	19,671	5,227	12.0%	26.5%	30.6%	31.4%
Metal ores and other mining and quarrying products; peat; uranium and thorium	35,191	28,925	25,894	27,036	-9,297	-3,031	1,142	16.7%	10.9%	8.8%	8.9%
Products of agriculture, hunting, and forestry; fish and other fishing products	15,658	23,118	23,122	28,430	7,464	4	5,308	7.4%	8.7%	7.8%	9.4%
Chemicals, chemical products, and man-made fibers; rubber and plastic products ; nuclear fuel	15,595	14,839	15,697	14,419	102	858	-1,278	7.4%	5.6%	5.3%	4.8%
Basic metals; fabricated metal products, except machinery and equipment	25,846	37,615	32,676	29,042	6,830	-4,939	-3,634	12.3%	14.1%	11.1%	9.6%
Coke and refined petroleum products	14,546	16,052	13,536	13,703	-1,010	-2,516	167	6.9%	6.0%	4.6%	4.5%
Coal and lignite; crude petroleum and natural gas	7,031	13,190	12,414	9,480	5,383	-776	-2,934	3.3%	5.0%	4.2%	3.1%
Other goods	71,531	61,864	81,387	85,882	9,856	19,523	4,495	33.9%	23.2%	27.6%	28.3%
Total transported goods	**210,724**	**266,082**	**294,876**	**303,369**	**84,152**	**28,794**	**8,493**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Eurostat [rail_go_grpgood__custom_10416020]

Table 26 Goods transported by group of goods - from 2008 onwards based on NST 2007 (Tkm '000.000) in the RFC MED 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	13,395	18,787	23,342	28,231	9,947	4,555	4,889	20.3%	25.7%	28.2%	31.7%
Products of agriculture, hunting, and forestry; fish and other fishing products	9,176	5,961	5,289	6,026	-3,887	-672	737	13.9%	8.2%	6.4%	6.8%
Chemicals, chemical products, and man-made fibers; rubber and plastic products ; nuclear fuel	4,913	6,761	6,186	6,982	1,273	-575	796	7.5%	9.3%	7.5%	7.9%
Metal ores and other mining and quarrying products; peat; uranium and thorium	4,782	4,544	4,961	4,621	179	417	-340	7.3%	6.2%	6.0%	5.2%
Coal and lignite; crude petroleum and natural gas	8,020	10,416	10,692	9,947	2,672	276	-745	12.2%	14.3%	12.9%	11.2%
Basic metals; fabricated metal products, except machinery and equipment	3,856	4,347	3,979	3,919	123	-368	-60	5.9%	6.0%	4.8%	4.4%
Coke and refined petroleum products	1,475	1,987	1,593	1,459	118	-394	-134	2.2%	2.7%	1.9%	1.6%
Other goods	20,282	20,236	26,856	27,749	6,574	6,620	893	30.8%	27.7%	32.4%	31.2%
Total transported goods	**65,899**	**73,039**	**82,898**	**88,934**	**16,999**	**9,859**	**6,036**	**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 23 and Table 24). Products such as *chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel, and particularly metal ores and other mining and quarrying products; peat; uranium and thorium; coal and lignite; crude petroleum and natural gas; basic metals; fabricated metal products, except machinery and equipment; and coke and refined petroleum products;* are gradually declining, whereas unidentifiable goods, i.e. goods which for some reason cannot be identified and therefore cannot be assigned to groups 01-16 of the NST 2007 (Standard goods classification for transport statistics abbreviated as NST), are growing, which are usually transported as unitised cargo and moved across intermodal logistics chains. Such trends are also visible in the RFC MED concerned countries (see Table 25 and Table 26).

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[7]. 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[8].

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

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

Table 27 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 6), 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 MED concerned countries, the market share of the domestic incumbent in 2021 was about 60% on average, 70% considering national and international incumbents.

Table 28 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 29). 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 in two RFC MED 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 29 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 30) aligns with the one concerning train-km. The COVID-19 pandemic seems to have had different impacts on rail freight traffic measured in net tkm, with

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

Table 30 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 31). The RFC MED-concerned countries show stable/marginally positive growth.

Table 31 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 (Table 32). 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 32 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 rail freight 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 HGV;
- 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, infrastructure 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.

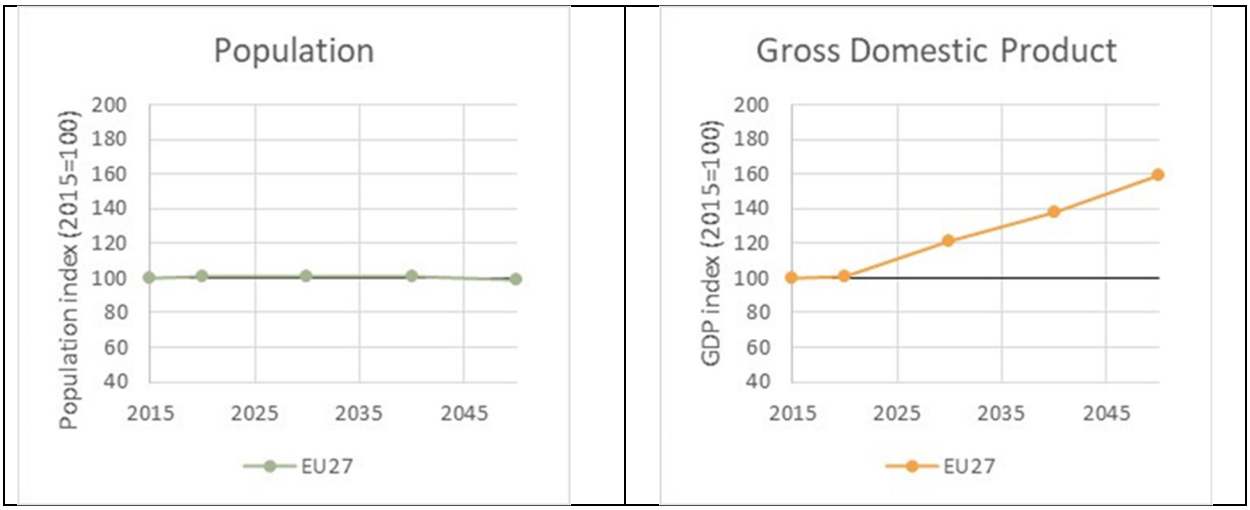
For a complete list of included transport and energy policies, we refer to the report on the EU Reference Scenario published by the EC[9]. The central model behind the EU Reference Scenario is the PRIMES model, an energy system model that produces projections for energy, transport and CO_2 emissions.

Figure 16 and Figure 17 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 17 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.

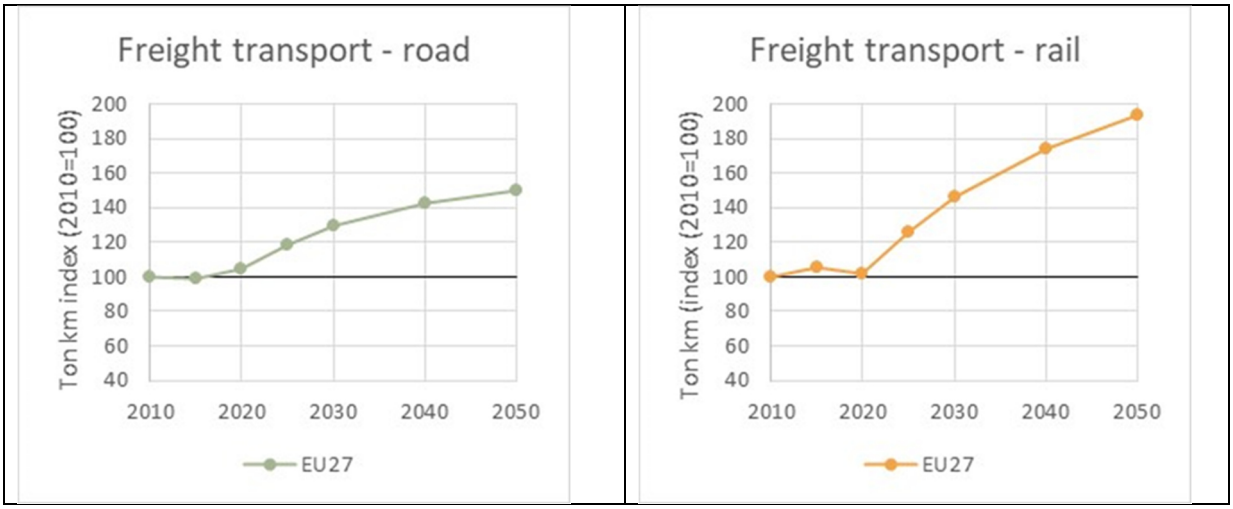
Figure 16 Forecasts population and GDP development in the EU27 between 2015 and 2045



Source: EC (2021)

[9] 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

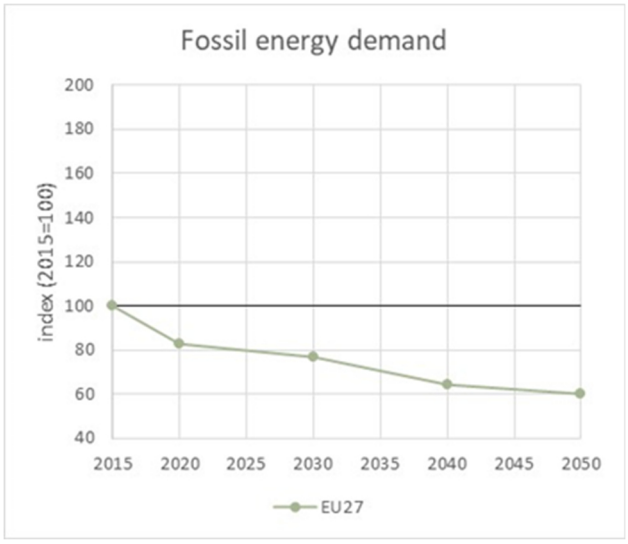
Figure 17 Forecasts on freight transport by road and rail (tkm, index 2010=100) for the EU27



Source: EC (2021)

Figure 18 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.

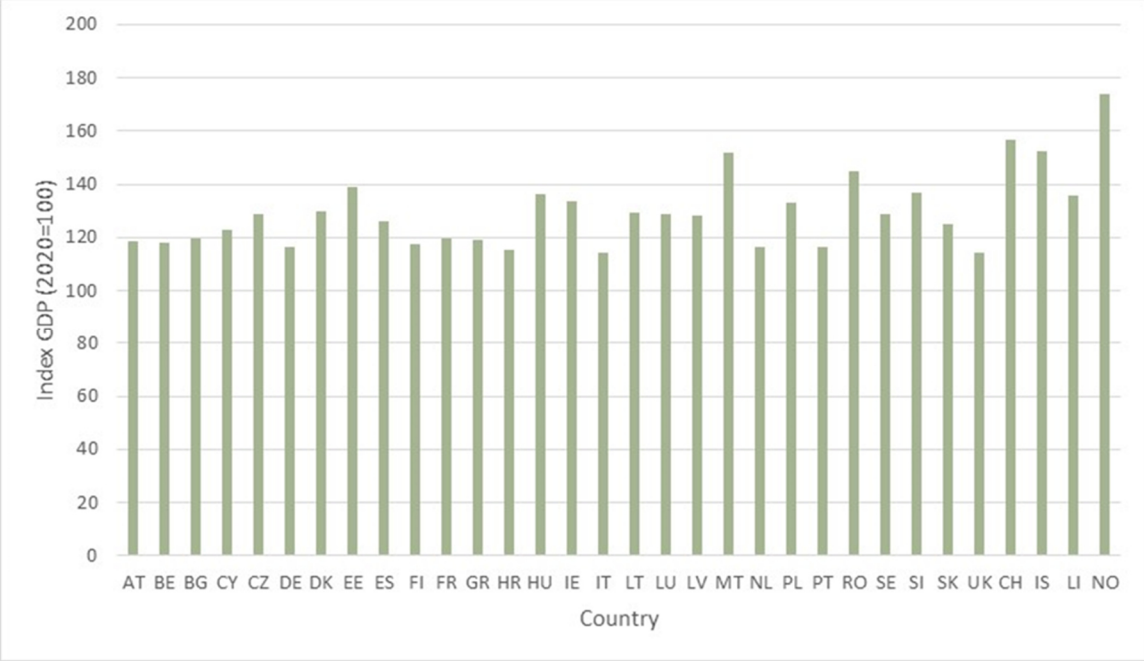
Figure 18 Forecasts on fossil energy demand for the EU27



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 19 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 19 Development of GDP (Index 2020=100) for European countries according to the EU Reference Scenario



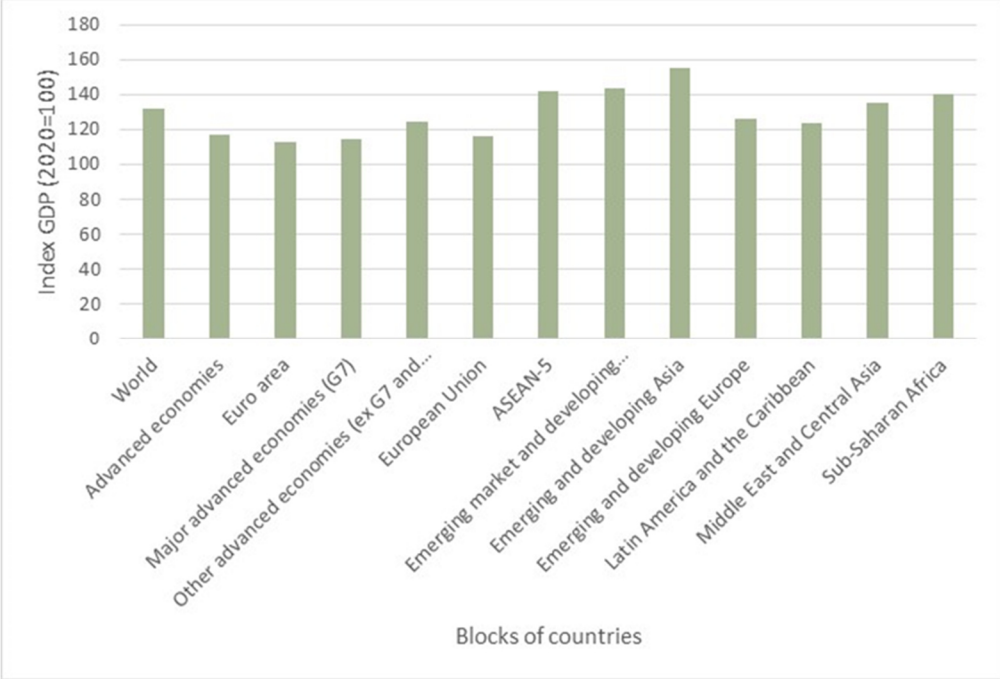
Source: EC (2021)

World Economic Outlook

Concerning the World Economic Outlook[10], 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 23 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.

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

Figure 20 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 31 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 33 Rail projects considered in the Projects scenario 2030

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

Project	End date	RFC
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

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[11]. 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 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

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

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[12], it was found that, on average, **the average train volume will increase by 15%,** leading to a reduction in rail freight transport costs of approximately 5%. It is assumed that the 15% increase will take place **between *all* origins and destinations in Europe**. The increase will not always be possible, but as this scenario is hypothetical, we neglect these details for reasons of efficiency.

- ***European standard gauge in the Iberian Peninsula.*** The Projects scenario already includes the development of the Rail Baltica Project, which among others integrate the rail system of the Baltic Member States into the EU one, with reference to the European standard track gauge. The sensitivity scenario 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.

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.

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

4 ANALYSIS OF THE CURRENT RFC MED TRANSPORT MARKET

This chapter provides an overview of the analysis of the current freight transport market along the RFC MED in 2022. 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 a correct assessment and understanding of the current RFC MED market, a top-down approach has been adopted. Before exploring the specifics of the RFC MED, an overview of the European international (rail) freight market is given. This is appropriate as on the one hand the RFC MED is used by trains with origins and destinations outside the RFC concerned countries; on the other hand, the RFC MED overlaps with other RFCs. The analysis of the current market is presented as follows:

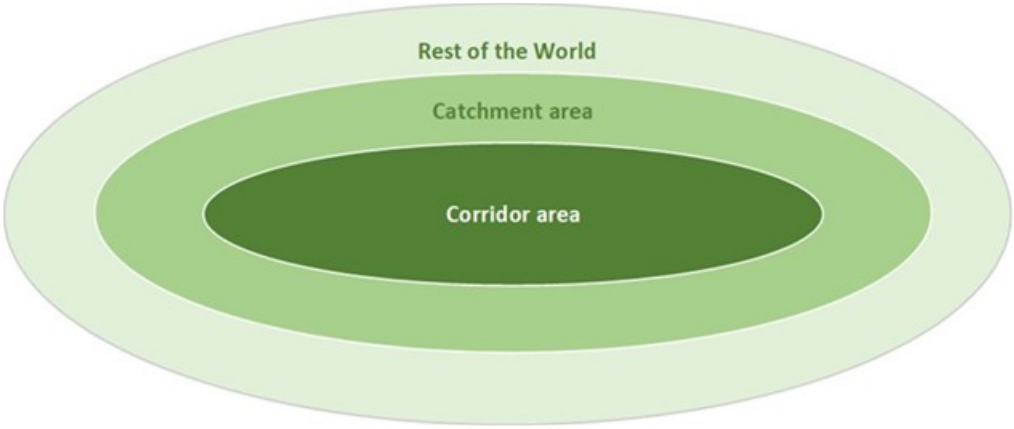
- Section 4.1 presents the **definition of the catchment area and corridor area**. It shows the importance of both definitions and lays a basis for the rest of the chapter.
- Section 4.2 presents the **international freight transport for the 11 RFCs Network**:
  - Section 4.2.1 gives an overview of the **catchment area of the 11 RFCs Network**.
  - 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**. 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**.
- Section 4.3 provides the **international (rail) freight transport along the RFC MED**:
  - Section 4.3.1 gives an overview of the **RFC MED corridor and catchment areas**;
  - Section 4.3.2 provides **a general overview of all international freight transport in the RFC MED catchment area**. This includes total volumes by mode and cargo type. Furthermore, the volumes by main origin and destination countries are described, as well as the main relations for all freight transport. Finally, a volume-distance distribution by mode is presented.
  - Section 4.3.3 illustrates the **international rail freight transport in the catchment area of the RFC MED**. This provides a general overview of the origins and destinations of rail freight for the RFC MED.
  - Section 4.3.4 describes the **international rail freight transport along the RFC MED**.

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[13] regions that are being served by a specific RFC. Figure 21 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 21 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 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.

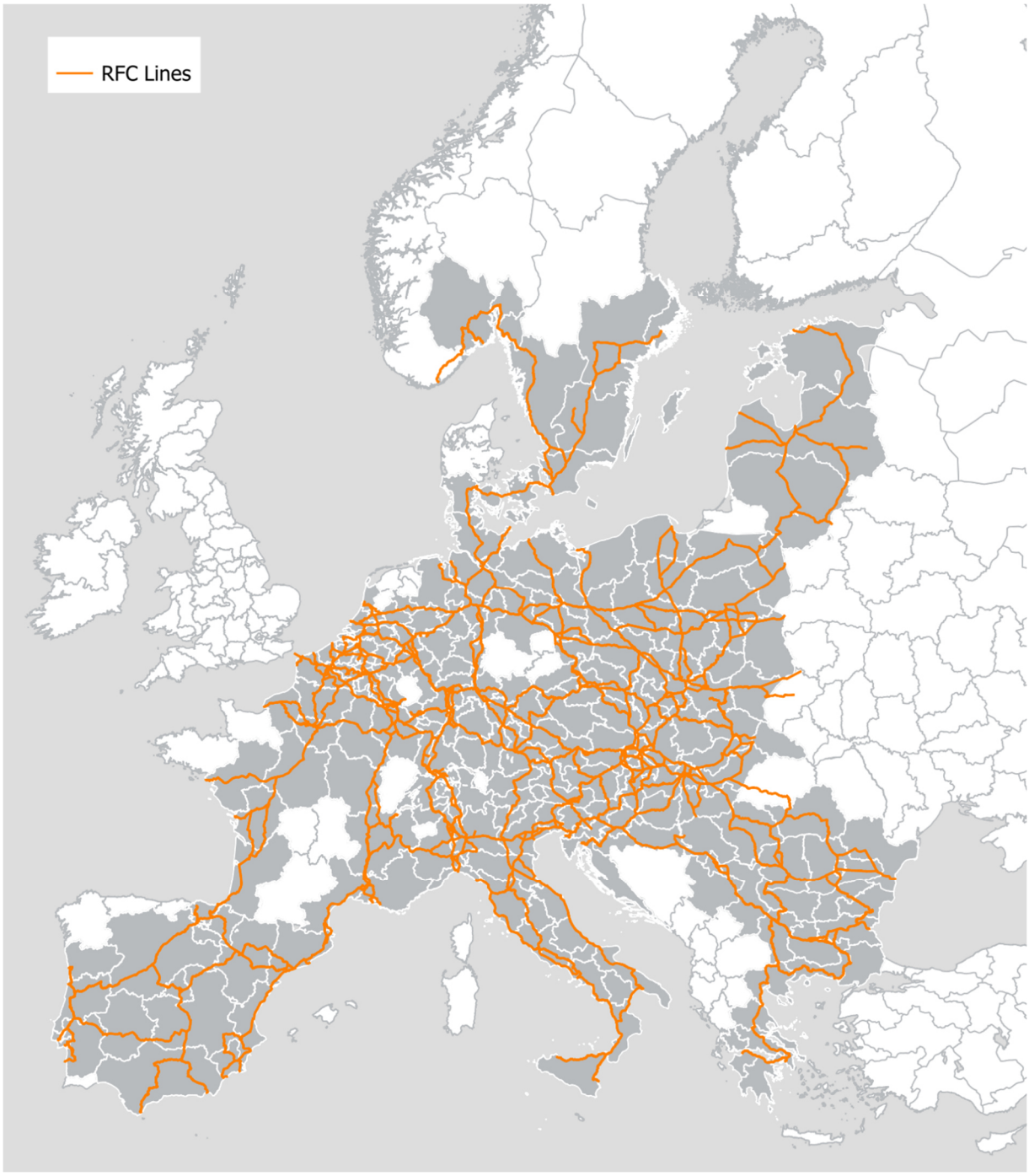
[13] A NUTS 2 zone refers to a level within the Nomenclature of Territorial Units for Statistics (NUTS), a hierarchical system developed by the European Union to divide the economic territory of the EU into territorial units for the purpose of collecting, developing, and harmonising statistical information. 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.

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 22 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*[14] 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.

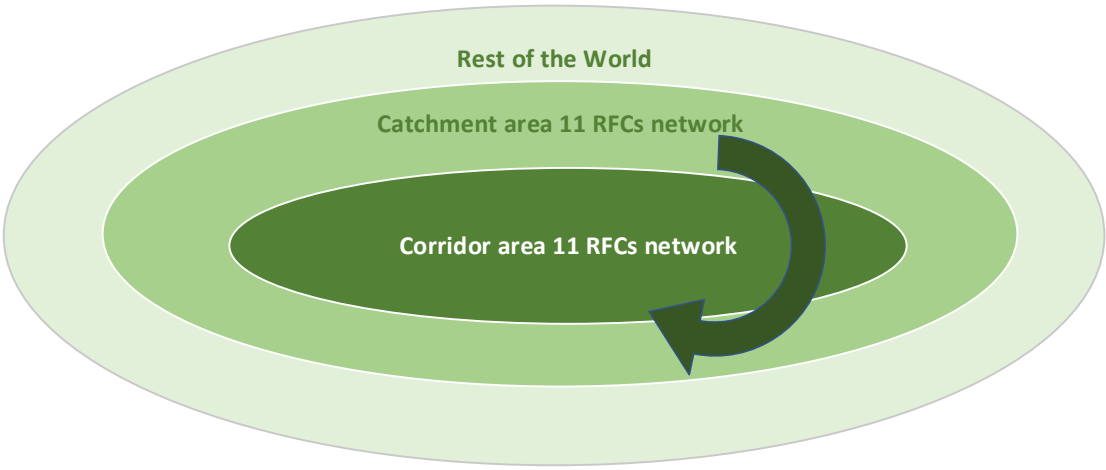
Figure 22 Corridor area and railway lines of the 11 RFCs Network



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

Figure 22 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[15]. For the RFC specific part, also sea transport receives attention.

Figure 23 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[16]

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[17]), 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[18], 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.

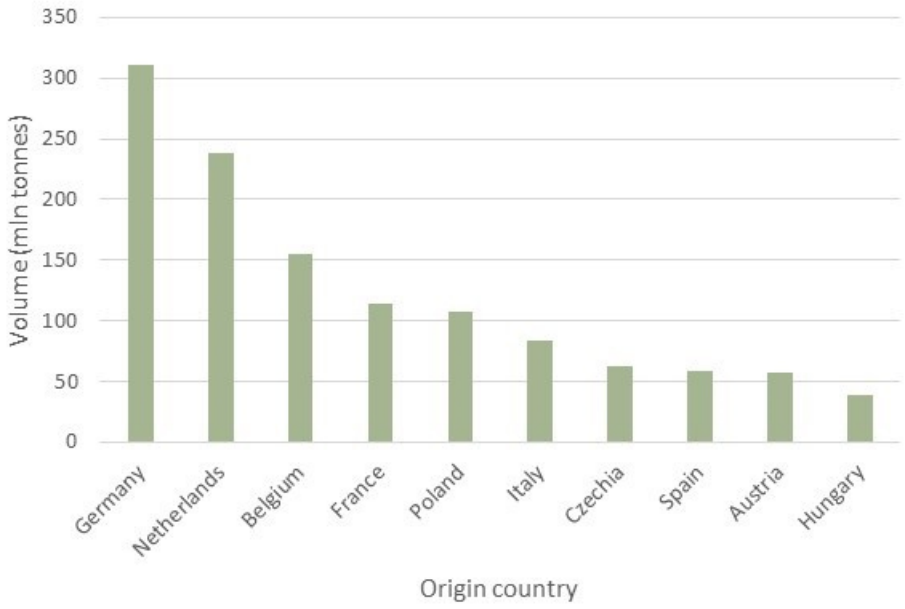
[15] Maritime transport is left out, as it makes the interpretation of the results challenging. As we only consider the rail catchment area, several other maritime relations are not considered, which might easily lead to misinterpretations. Therefore, we only consider land modes in the rail transport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

Figure 24 Estimated volume (million tonnes)[19] of international freight transport over land by mode and cargo type within the catchment area of the 11 RFCs Network in 2022.

Source: NEAC estimations

Figure 25 and Figure 26 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.

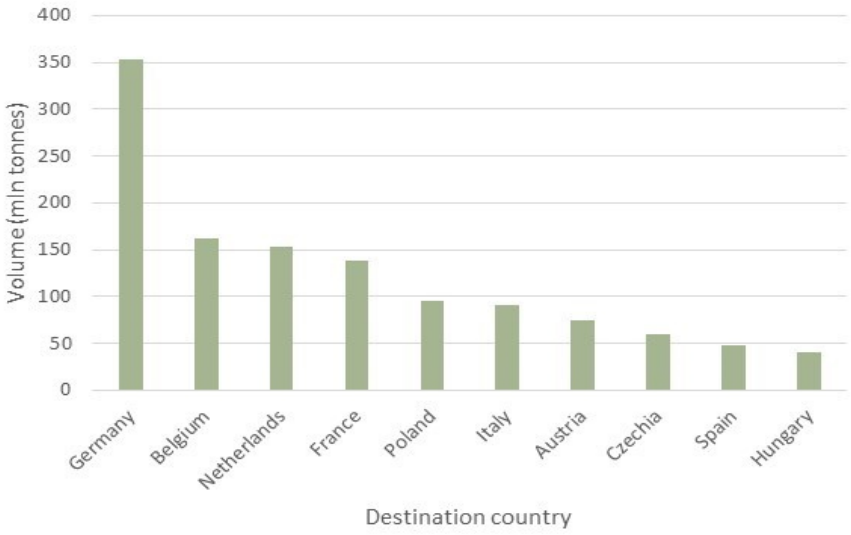
Figure 25 Estimated volume (million tonnes) of *all* international freight transport over land by *origin* in 2022 for the top 10 origin countries



Source: NEAC estimations

[19] 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 26 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 34 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). Together the freight transport relations between these 3 countries show once more 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 corridor area concerns the relationship between these 3 countries.

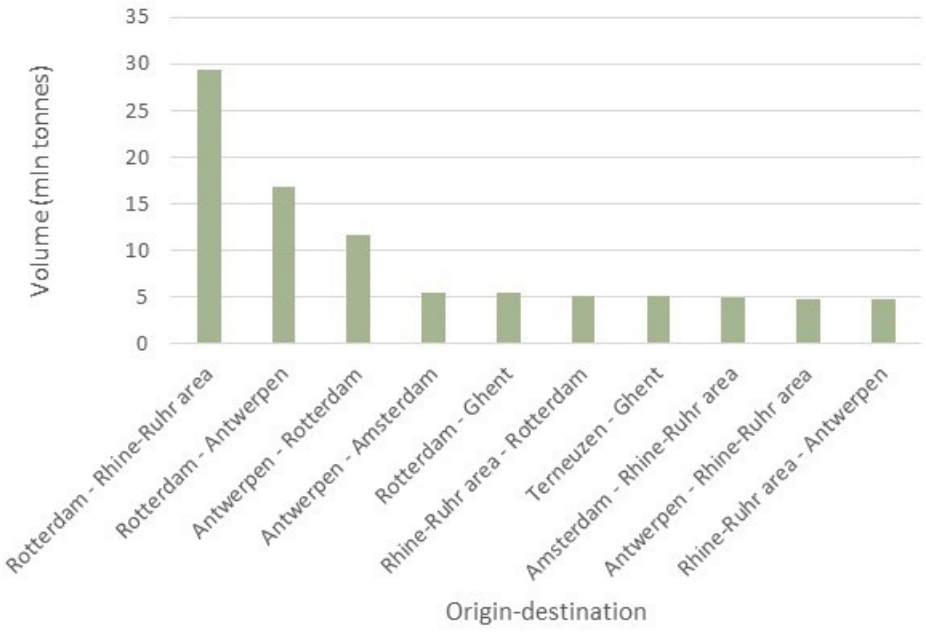
Table 34 Freight volumes (million tonnes) between the 15 most important origin and the 15 most important destination countries in 2022.

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 27 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).

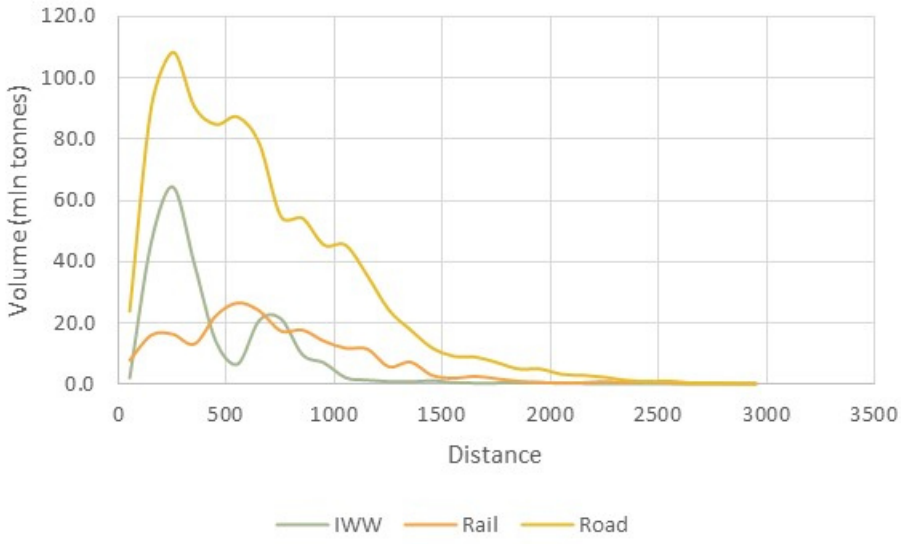
Figure 27 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of all international freight transport over land in 2022 within the catchment area of the 11 RFCs Network



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 28. 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 28 Volume distribution (million tonnes) by distance (km) *within* the catchment area of the 11 RFCs Network in 2022



Source: NEAC estimations

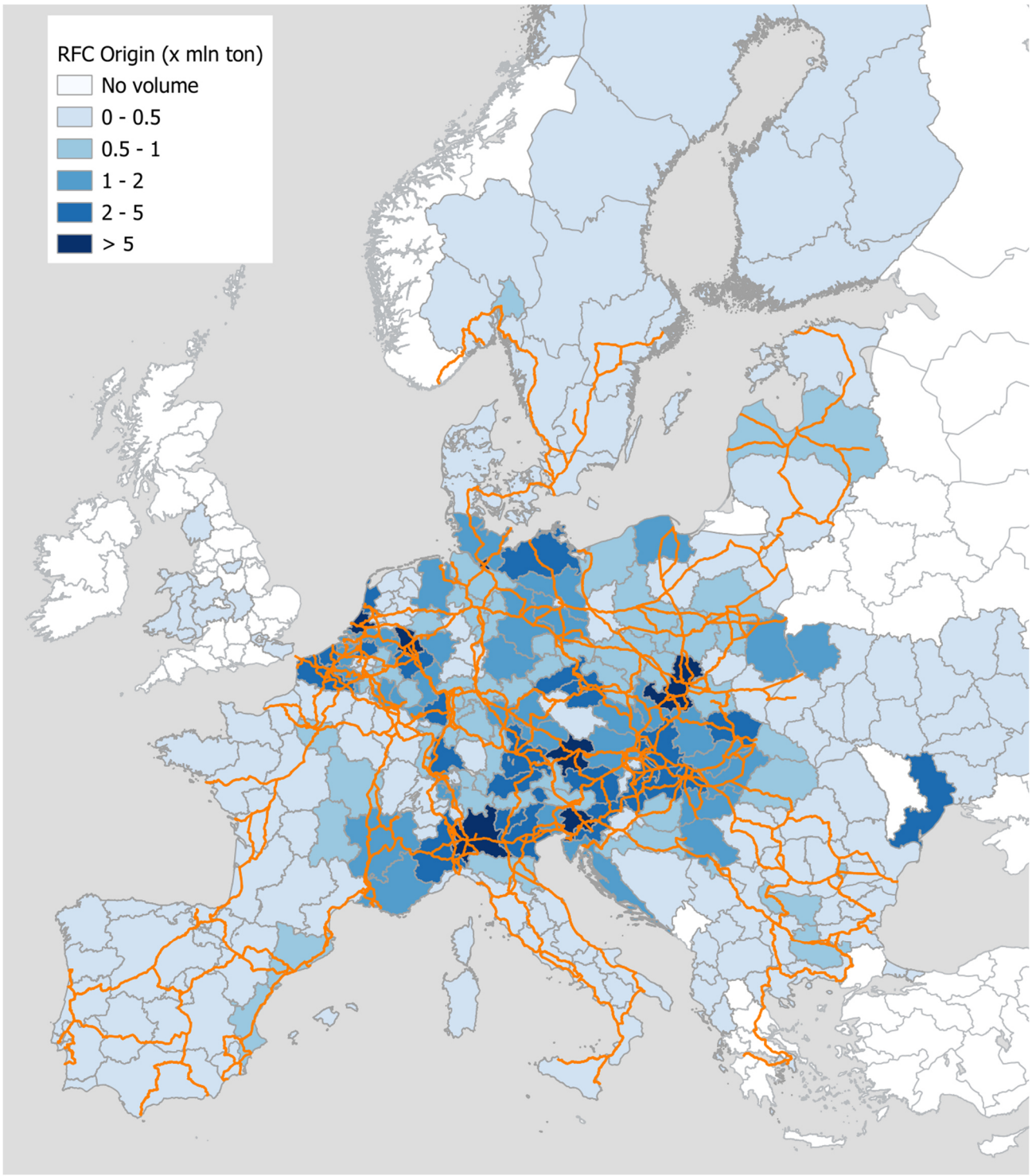
4.2.3 INTERNATIONAL RAIL FREIGHT TRANSPORT IN THE 11 RFCS NETWORK CATCHMENT AREA

Figure 22 provides an overview of the corridor area of the 11 RFCs Network. The corridor area of the 11 RFCs Network covers a vast part of Europe but excludes countries such as the UK, Ireland, Finland, Northern Scandinavia, and parts of the Balkan. The 11 RFCs Network catchment area covers a much wider area. It includes the previously mentioned countries, as well as countries east of Europe such as Ukraine, Moldova, Kazakhstan, and China. The rail freight transport catchment area of the 11 RFCs Network is shown in Figure 29 and Figure 30. Figure 29 provides an overview of the volumes by origin, while Figure 30 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[20] 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.

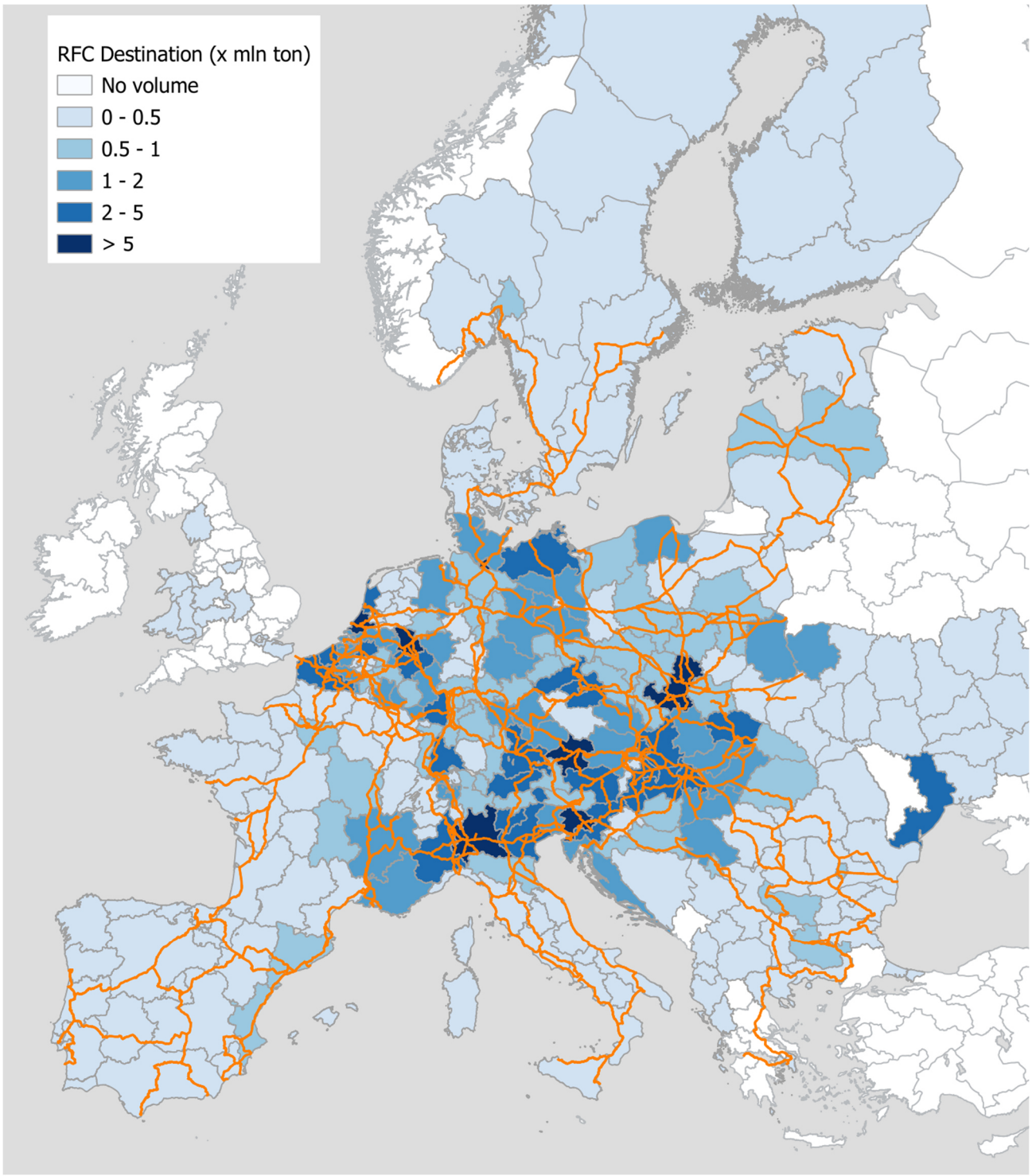
[20] We present the NUTS2 regions by mentioning the main cities in these regions, to make it easier to understand the results.

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



Source: NEAC estimations

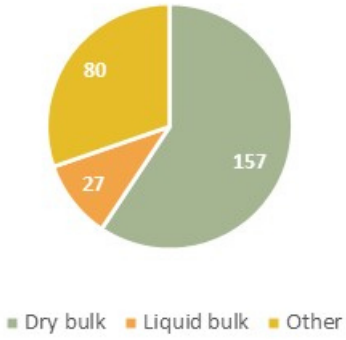
Figure 30 Destinations of international rail freight transport (in million tonnes) for the 11 RFCs Network catchment area in 2022



Source: NEAC estimations

Figure 31 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.

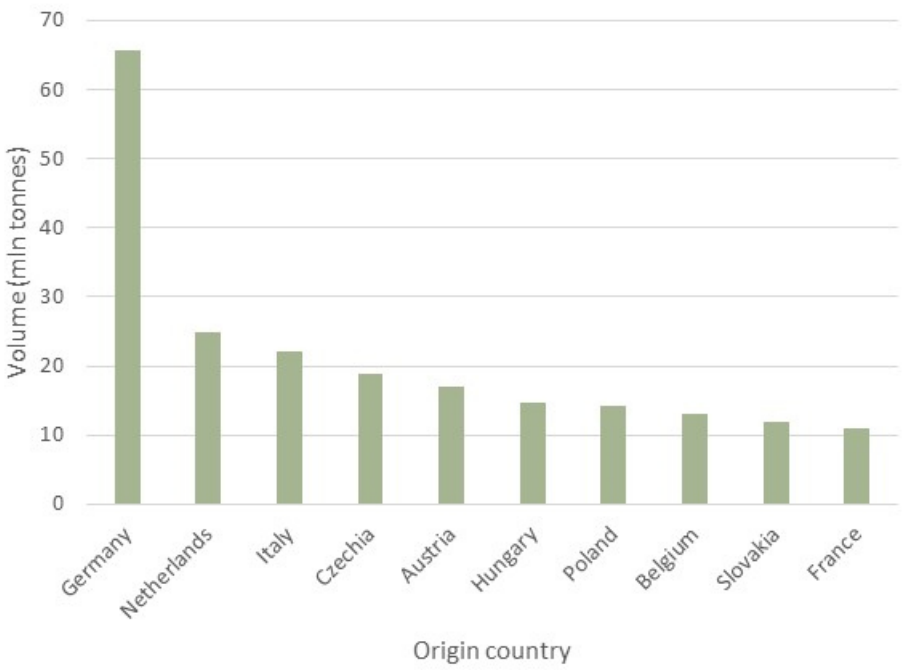
Figure 31 Estimated volume of international rail freight transport (million tonnes) by cargo type in 2022, in the 11 RFCs Network catchment area



Source: NEAC estimations

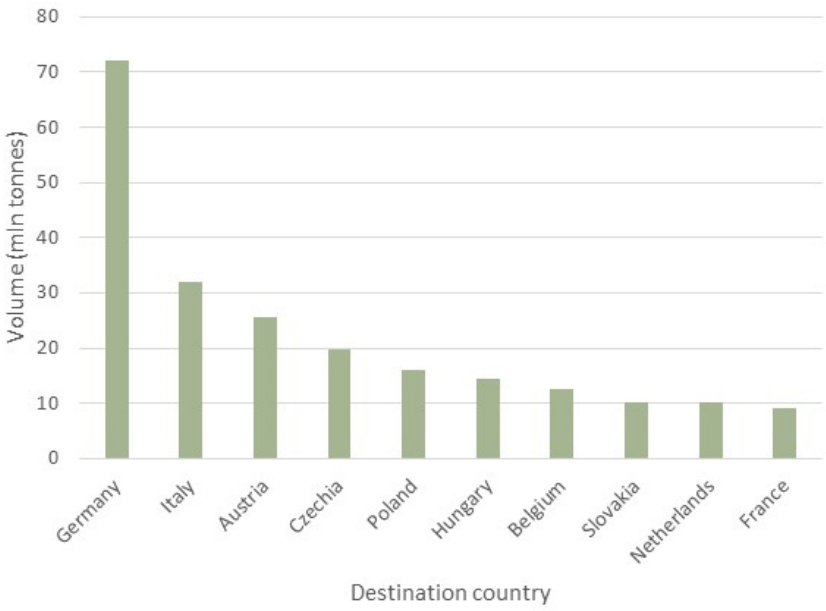
The most important origin and destination countries for rail transport are provided in the Figures 32 and 33 below. Concerning both origin and destination, Germany is the country with the highest international rail freight transport volumes. As an origin country it ships 66 million tonnes, while as a destination it receives 72 million tonnes of international rail freight transport. Other important origin countries are the Netherlands and Italy (25 and 22 million tonnes). Concerning destination, Italy and Austria are number 2 and 3 with respectively 32 and 26 million tonnes of international rail freight transport.

Figure 32 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the 11 RFCs Network catchment area



Source: NEAC estimations

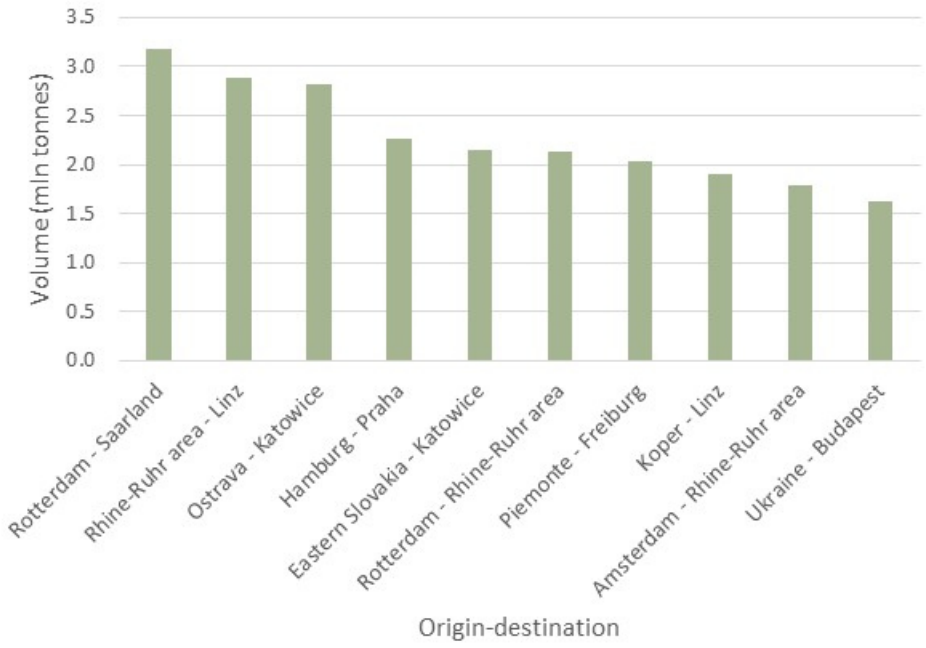
Figure 33 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the 11 RFCs Network catchment area



Source: NEAC estimations

Figure 37 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 34 Estimated volume of international rail freight transport (million tonnes) on the top 10 relations in 2022 in the 11 RFCs Network catchment area



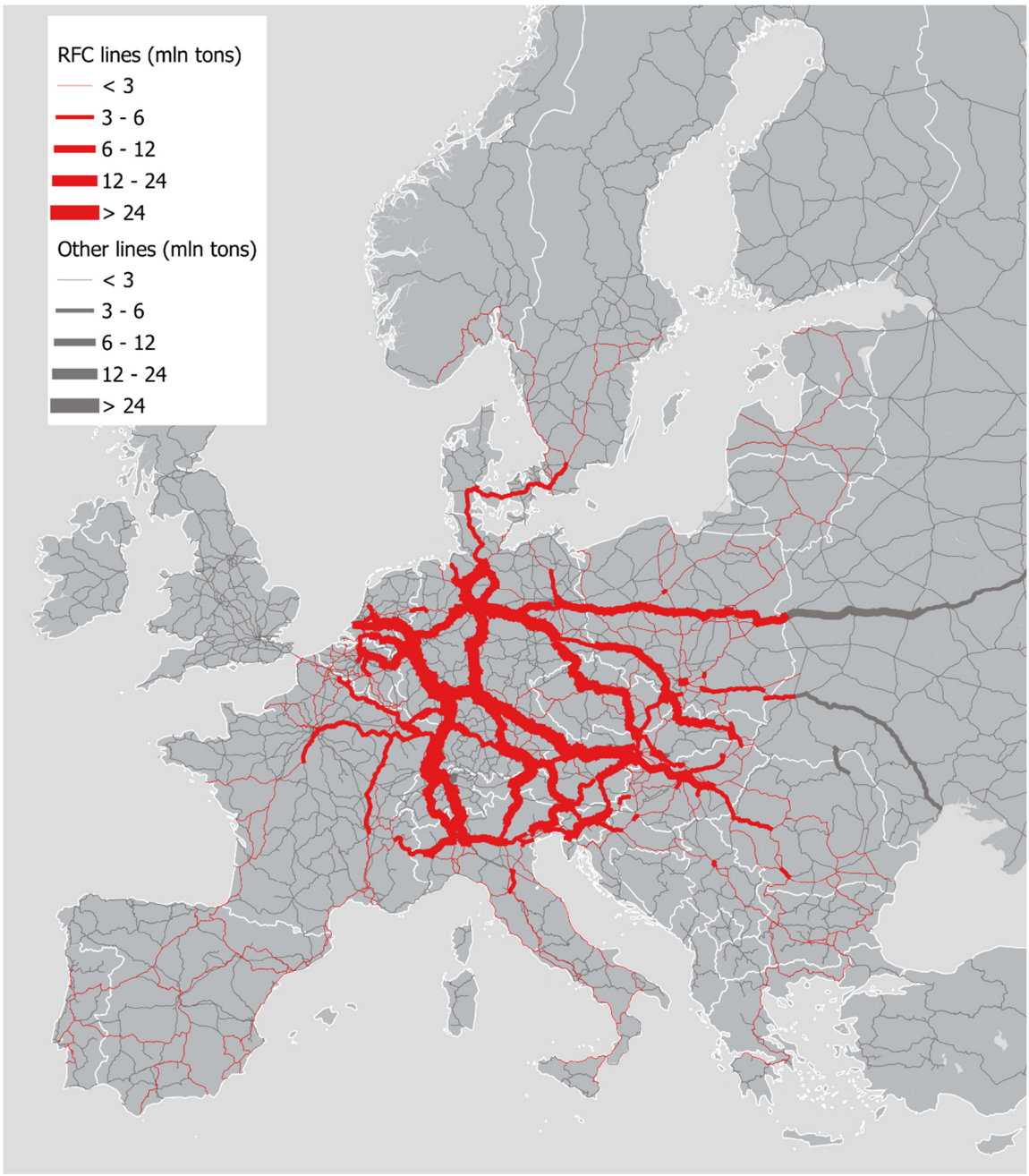
Source: NEAC estimations

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

Figure 38 shows the estimated international rail freight flows (in tonnes) for the corridor area of the 11 RFCs Network. 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 35 Estimated Volume of international rail freight transport (million tonnes) in 2022



Source: NEAC estimations

4.3 INTERNATIONAL FREIGHT TRANSPORT IN THE RFC MED

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

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

4.3.1 CORRIDOR AND CATCHMENT AREA OF RFC MED

In section 4.1, a definition of corridor and catchment areas is given. This section details the corridor area for the RFC MED. Figure 36 provides an overview of the RFC MED network within its corridor area, in relation to the rest of the European rail network. The RFC MED 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 MED is also dependent upon rail transport to and from locations outside the corridor area of the RFC MED, as further elaborated in later sections.

Figure 36 Corridor area and rail network of the RFC MED

4.3.2 ALL INTERNATIONAL FREIGHT TRANSPORT FOR THE RFC MED

The total volume of international freight transport in the *catchment* area of the RFC MED is estimated at 147 million tonnes, transported by road, rail, inland shipping and sea shipping. The international rail freight transport volume in this area is estimated at 36 million tonnes (about 40.000 trains). This is 24% of the total amount of transport for the RFC MED. The share of inland shipping is 1%, the share of road transport 54%, and the share of sea shipping 21%.

Concerning the cargo types, *Other* (General cargo, including intermodal transport and container) dominates the international freight transport within the catchment area of the RFC MED, with a volume of 76 million tonnes. This is about 52% of all international freight transport for the RFC MED. Dry bulk is the second largest cargo type at 37%. Liquid bulk has a share of 12% in the total volume of international freight transport over all modes in the corridor area of the RFC MED.

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

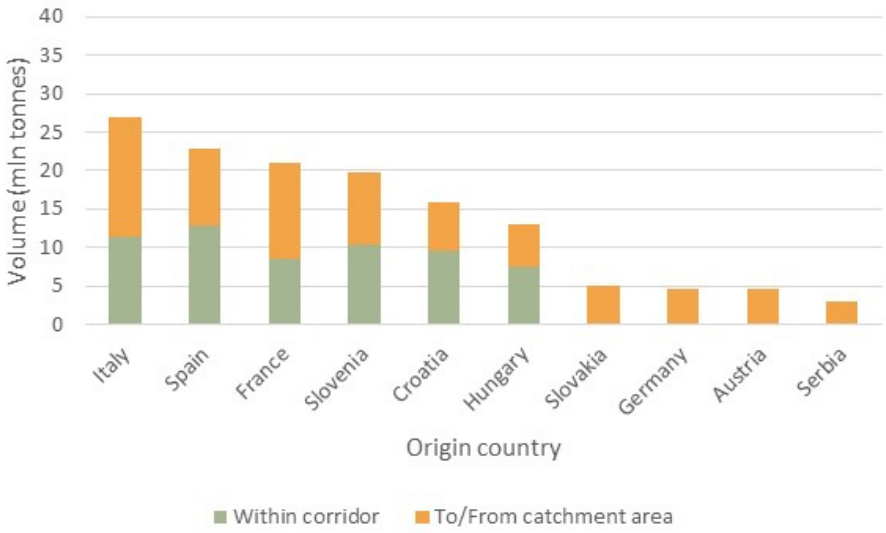
Source: NEAC estimations

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 MED. The green colour shows the origin and destination within the corridor area of the RFC MED. The orange colour shows the international freight transport to and from the rest of the catchment area. As can be seen, only Italy, Spain, France, Slovenia, Croatia, and Hungary have green-coloured bars beside the orange ones, as these are the corridor countries.

The main origin countries for international freight transport over land in the RFC MED are Italy, Spain, and France. This concerns transport by road, rail, inland shipping, and sea shipping. A volume of 27 million tonnes of international freight transport has its origin in Italy. Of this volume, 42% (11 million tonnes) is transported to other countries within the RFC, such as France or Slovenia. Spain comes in second place with 23 million tonnes originating from this country. In this case, 13 million tonnes go to other countries within the RFC.

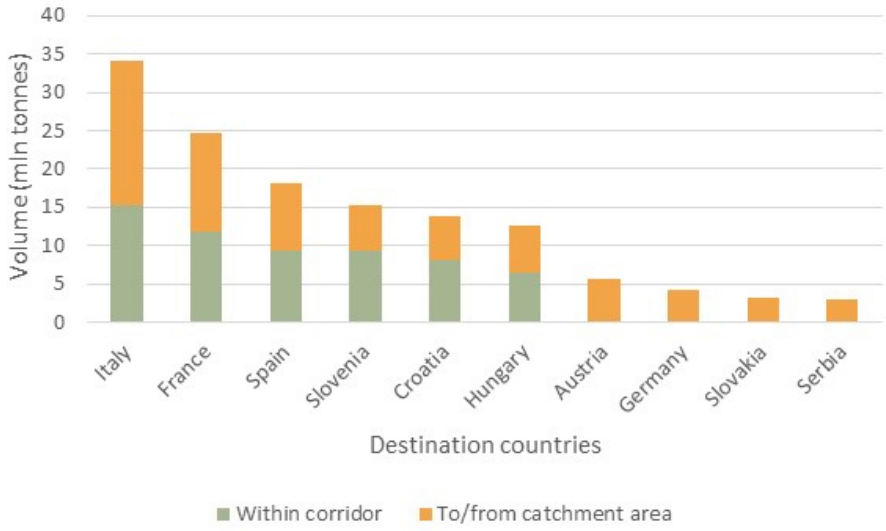
The main destination countries are Italy, France, and Spain. Italy receives 34 million tonnes, of which 15 million tonnes stem from other RFC MED countries. France is second, with a volume of 25 million tonnes, of which 12 million tonnes have their origin in other RFC MED countries. Spain receives 18 million tonnes, with 9 million tonnes coming from other RFC MED countries.

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



Source: NEAC estimations

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



Source: NEAC estimations

The following table shows all international freight volume between the countries *within the corridor area* of RFC MED for the *land* modes. The total amount of freight volume is 48 million tonnes within the corridor area. The most important freight transport relation is between locations in Spain and France at 6 million tonnes of freight transport by all land modes. The reverse direction has 4 million tonnes. Another important relation concerns Hungary – Italy (4 million tonnes). NB, the zero's indicate a small amount of volume.

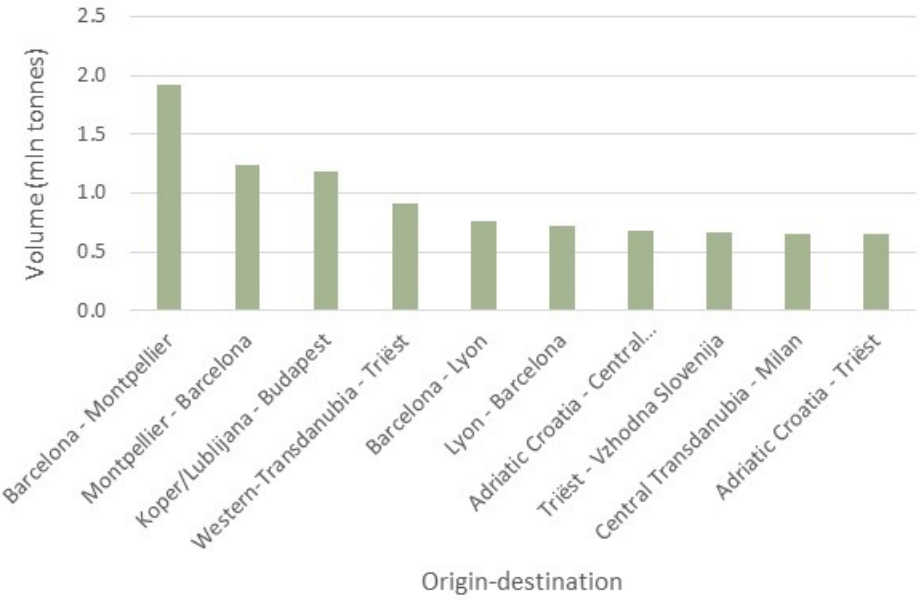
Table 35 Total freight volume (million tonnes) between the countries for land modes within the corridor area of the RFC MED

From/To	ES	FR	HR	HU	IT	SI	Total
ES		6	0	0	3	0	9
FR	4		0	0	2	0	7
HR		0		2	2	3	6
HU	0	0	2		4	2	8
IT	2	2	1	2		3	10
SI	0	0	2	3	3		8
Total	7	9	5	6	14	7	48

Source: NEAC estimations

The chart below depicts the main origins and destinations for all *land* modes. The most important relation is Barcelona-Montpellier, at 1.9 million tonnes. The reverse direction is in second place, at 1.2 million tonnes, followed by Koper/Ljubljana-Budapest(at 1.6 million tonnes).

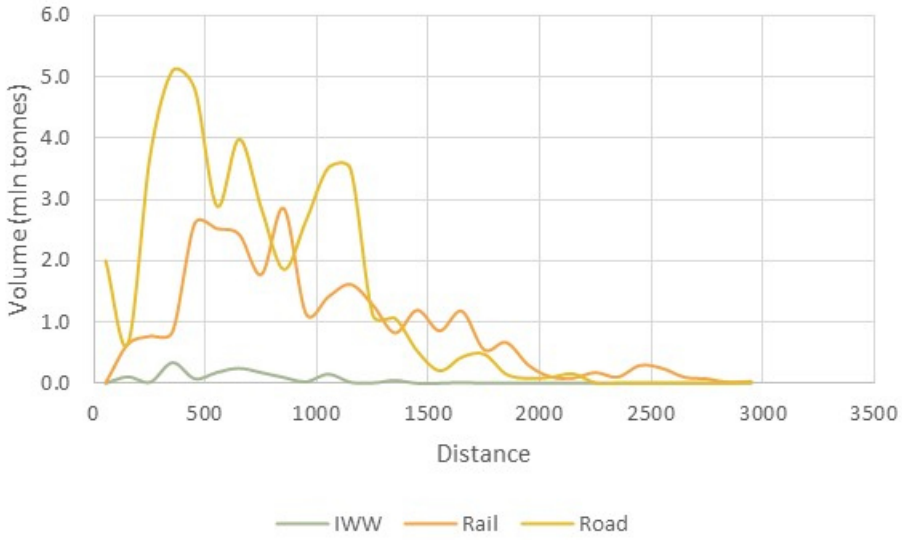
Figure 40 Estimated volume (million tonnes) for the 10 relations (at NUTS2 level) of *all* international freight transport over land in 2022 within the corridor area of RFC MED



Source: NEAC estimations

The 'volume' distance distribution for international freight transport within the corridor area of RFC MED is shown in the figure below (in million tonnes) by distance (in km). The peak for road (5.1 million tonnes) is around 350 km. Inland shipping has a small volume and peaks around 350 km (0.3 million tonnes). For international rail transport the peak is around 850 km at 2.9 million tonnes. As can be seen, after 2000 km the volume of rail and road transport is small. This notion is important as it shows there might be a potential for a shift from road to rail on longer distances.

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

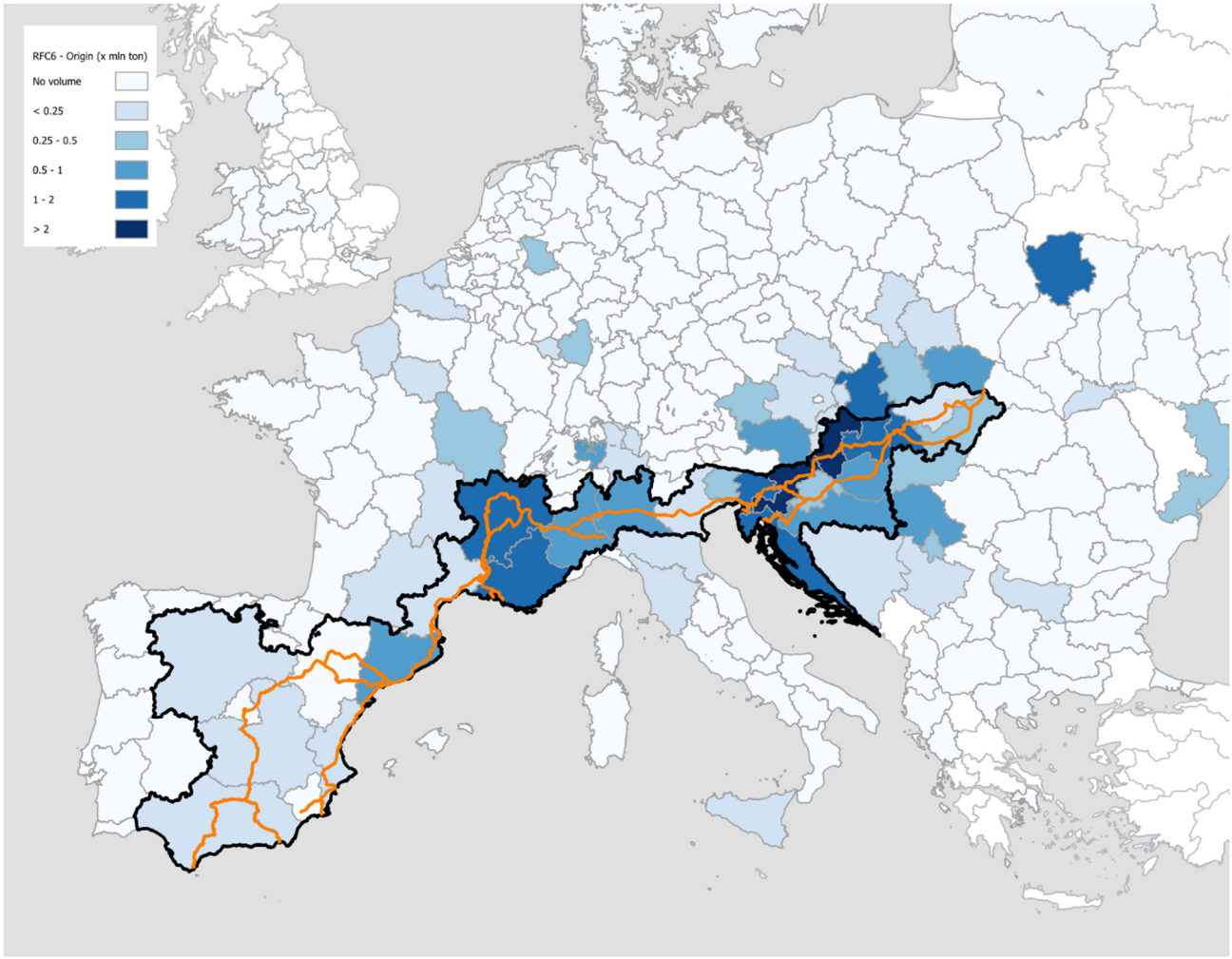


Source: NEAC estimations

4.3.3 INTERNATIONAL RAIL FREIGHT TRANSPORT IN THE RFC MED CATCHMENT AREA

The catchment area for international rail freight transport of the RFC MED exceeds the corridor area. It captures large parts of France, Austria, Slovakia, Ukraine and Serbia. A large proportion of the rail freight transport uses the RFC MED, 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 MED, with important origins such as Trieste, Rhône-Alpes (Lyon), Western-Hungary, Adriatic Croatia and Budapest.

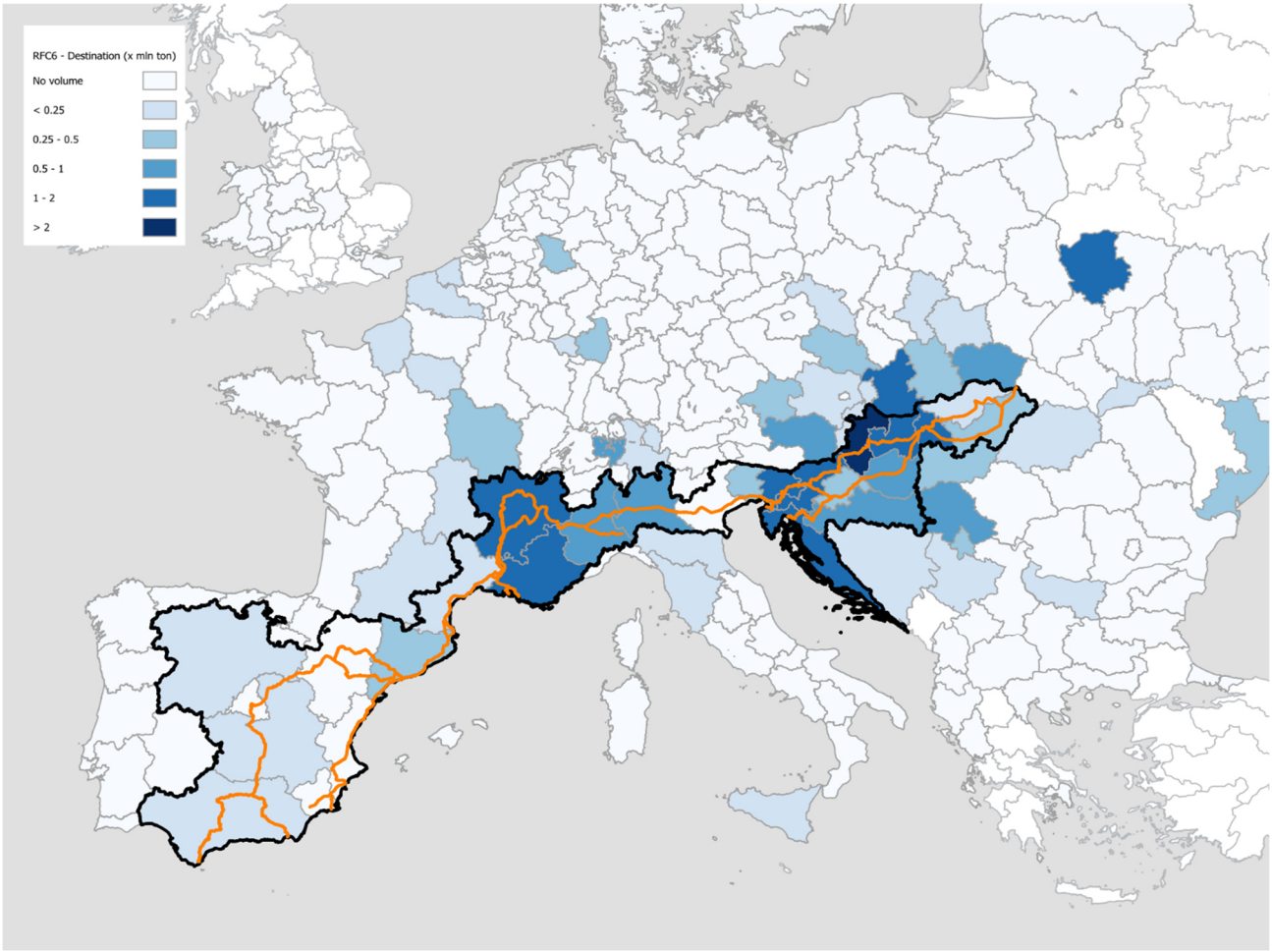
Figure 42 Origins of international rail freight volume (in million tonnes) that use the RFC MED rail network and the delineation of the potential RFC MED catchment area



Source: NEAC estimations; Legend: Orange = rail tracks of RFC MED. Blue = Volume by origin. Black = Delineation of potential catchment area

The next figure presents the destinations within the RFC MED catchment area. The figure highlights similar zones in France, Italy, Slovenia, and Hungary exhibit the highest freight volumes dispatched from these destinations. It is evident from the figure that numerous zones benefiting from RFC MED's services fall outside the corridor area, such as areas in France, Austria, Czechia and Ukraine. Within the corridor area, there are also a few zones with limited rail volumes for international transport.

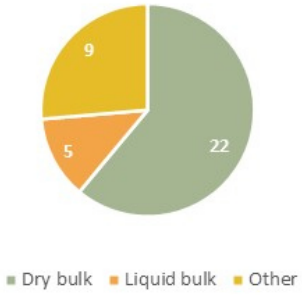
Figure 43 Destinations of international rail freight volume (in million tonnes) that use the RFC MED rail network and the delineation of the potential RFC MED catchment area



Source: NEAC estimations; Legend: Orange = rail tracks of RFC MED. Blue = Volume by origin. Black = Delineation of potential catchment area

Looking at the volumes of international rail freight transport by cargo type within the catchment (and corridor) area of the RFC MED, *Dry bulk* is the most important cargo type. It has a share of 61%, with 22 million tonnes. The category *Other* has a share of 26% and liquid bulk of 13% in the total volumes of international rail freight transport in the RFC MED.

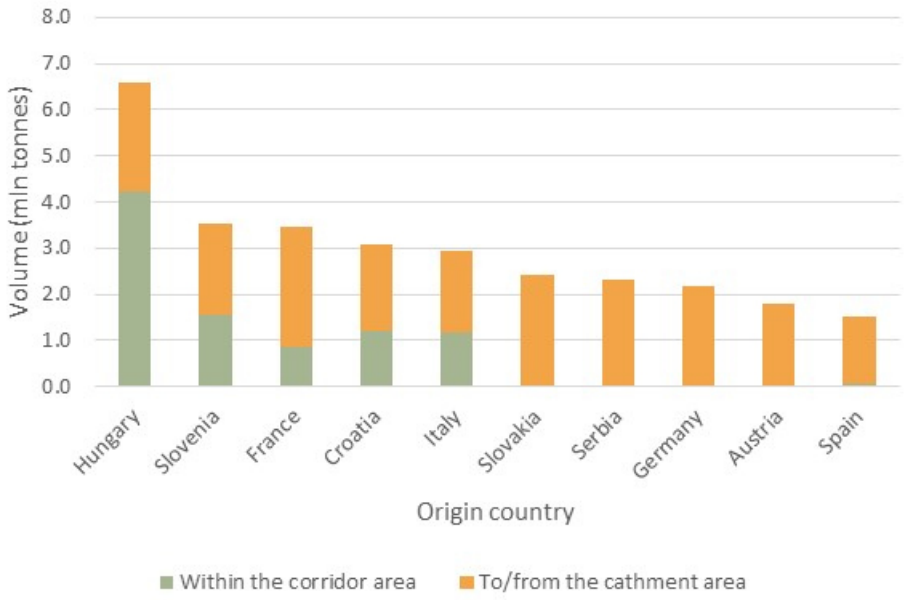
Figure 44 Estimated Volume of international rail freight transport (million tonnes) by cargo type in 2022 within the catchment (and corridor) area of the RFC MED



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, Hungary is the country with the highest international rail freight transport volume. As an origin country, it ships 6.6 million tonnes. This country is an important origin for countries in the RFC MED, 64% of the rail freight is transported to locations in other RFC MED countries. In second place comes Slovenia with 3.5 million tonnes. Third comes France at 3.5 million tonnes of international rail freight transport volume. Note that the share of rail freight transport within the corridor area of the RFC MED is about 30% (which relates to the green bars in the graph).

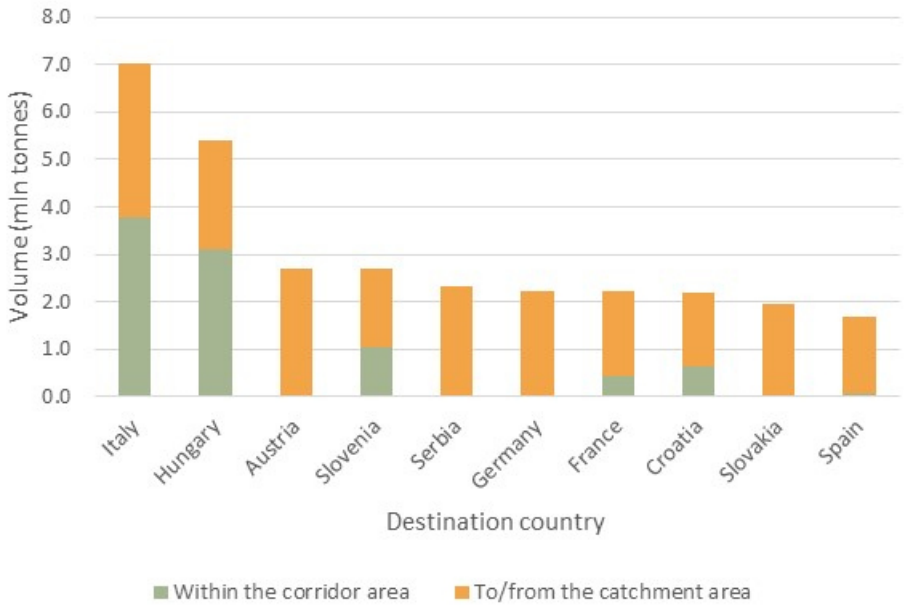
Figure 45 Estimated volume of international rail freight transport (million tonnes) by *origin* country in 2022 in the catchment and corridor area of the RFC MED



Source: NEAC estimations

The most important destination country is Italy. It receives 7.0 million tonnes of rail transport. Other important origin countries are Hungary (5.4 million tonnes) and Austria (2.7 million tonnes). Note that locations in Austria are not part of the RFC MED. The volume stemming from other countries is 70%. It shows that the RFC MED is a rail freight corridor with an important international position.

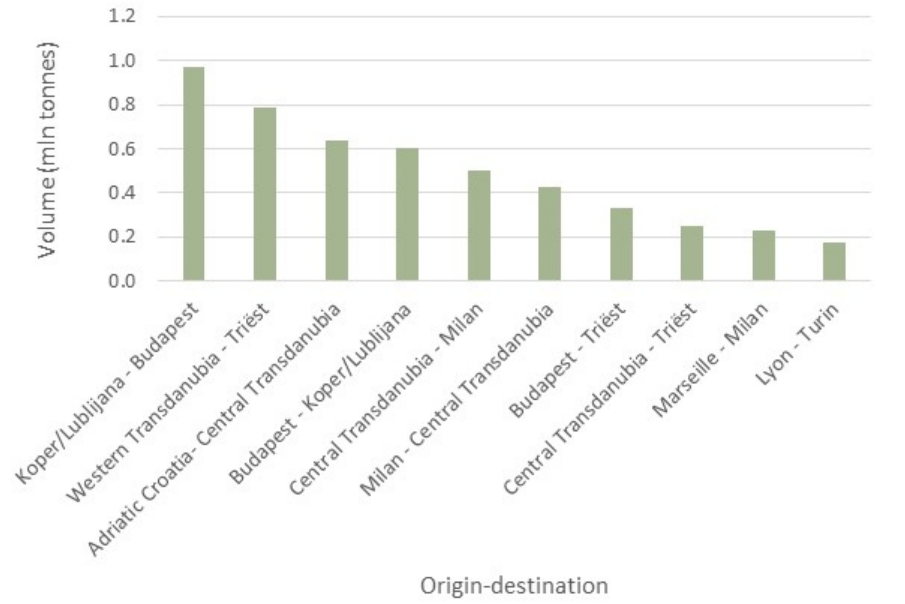
Figure 46 Estimated volume of international rail freight transport (million tonnes) by *destination* country in 2022 in the catchment and corridor area of the RFC MED



Source: NEAC estimations

The figure below shows the top 10 most important international rail freight transport relations within corridor area of the RFC MED. The relation between Koper and Budapest is the most important one, with almost 1.0 million tonnes. This concerns mostly liquid bulk transport. Western Transdanubia (Győr/Szombathely, Western Hungary) - Triest comes in second place, which is mostly dry bulk (0.8 million tonnes). Adriatic Croatia (Split) – Central Transdanubia (Székerfehérvar, Hungary) comes in third place at 0.6 million tonnes of international rail freight transport with.

Figure 47 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 MED



Source: NEAC estimations

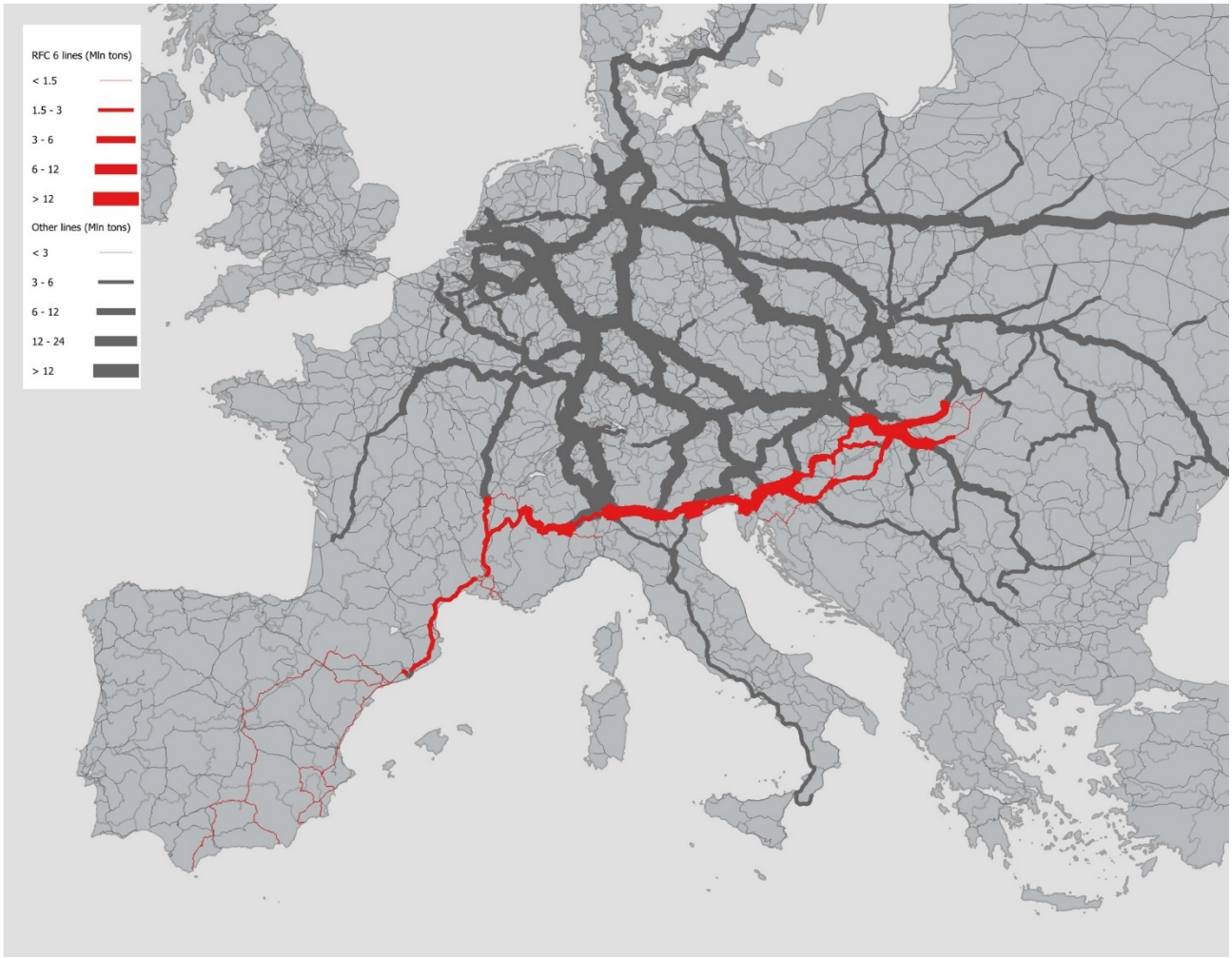
4.3.4 INTERNATIONAL RAIL FREIGHT TRANSPORT FLOWS IN THE RFC MED

The figure below shows the estimated international rail freight flows (in tonnes) for the RFC MED. This provides a general overview of the use of the main rail lines in the corridor area. The volumes on the RFC MED cannot be understood if we present them isolated. The rail volumes on the different tracks of the RFC MED often have an origin or destination elsewhere in Europe. Looking at the map, we see 2 distinct locations with higher volumes:

- In the first place, we see rail tracks with high volumes in between France, Italy, and Slovenia;
- Secondly, we see high volumes on rail tracks in Hungary;

A point of attention is the use of rail tracks with lower volumes of international freight transport, such as in Spain. Based on the modernisation of the lines to the standard gauge, a potential shift from road to rail could be expected in the future.

Figure 48 Estimated Volume of international rail freight transport (million tonnes) in 2022



Source: NEAC estimations

5 ANALYSIS OF THE FUTURE RFC MED (RAIL) TRANSPORT MARKET

The future market analysis has been performed for the three scenarios for 2030 described in Section 3.3 above and compared to the Base year 2022 (BAS), i.e. the Reference scenario (REF), the Projects scenario (PRO) and the Sensitivity scenario (SEN). The results for these three scenarios have been produced for 2030. The future freight transport market is presented in steps to help understand the importance of international freight transport in general and rail freight transport in particular. First, results for the 11 RFCs Network catchment area are presented, then we zoom in on results for the RFC MED catchment area.

- Section 5.1 presents all **international freight transport in the 11 RFCs Network catchment area**:
  - Section 5.1.1 provides a **general overview of *all* international freight transport for the 11 RFCs Network catchment area**. This includes the 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 11 RFCs Network catchment area**, with the volume by cargo type, the flows on the rail network, the rail volumes by origin and destination countries and the top 10 relations for international rail freight transport.
- Section 5.1 provide **international rail freight transport in the RFC MED.**
  - Section 5.2.1 provide **a general overview of all international freight transport in the RFC MED**. 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 MED** is presented. This provides a general overview of the origins and destinations of rail freight for the RFC MED. 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 MED.

5.1 FUTURE TRANSPORT MARKET IN THE 11 RFCS NETWORK CATCHMENT 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.

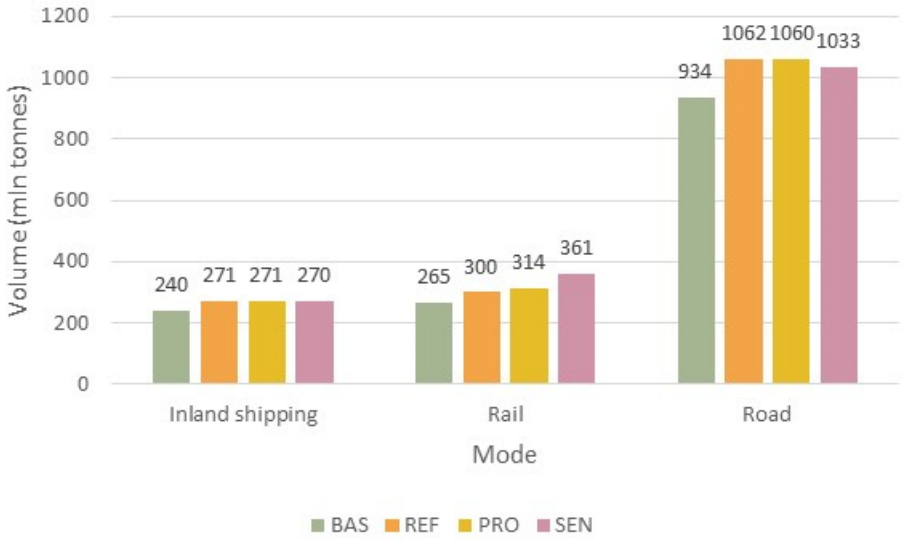
5.1.1 FUTURE OF INTERNATIONAL FREIGHT TRANSPORT FOR THE 11 RFCS NETWORK CATCHMENT AREA

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 49 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 would decrease by 1 million tonnes for inland shipping and 27 million tonnes for road transport.

Figure 49 Development of volume (in million tonnes) by mode and scenario for the 11 RFCs Network catchment area

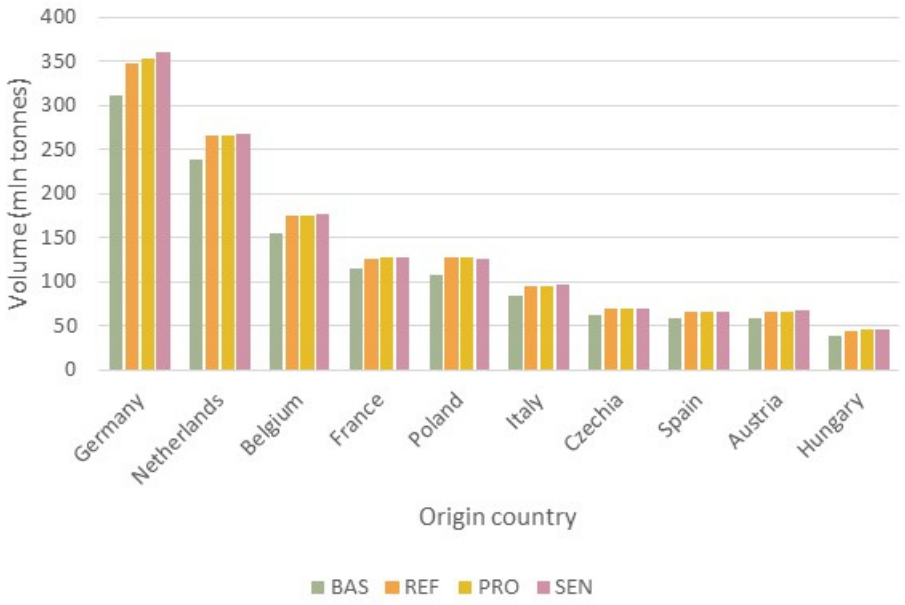


Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

Source: NEAC estimation

Figures 53 and 54 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 (Figure 28). 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 50 Development of volume (in million tonnes) of *all* international freight transport for the top 10 origin countries within the 11 RFCs Network catchment area

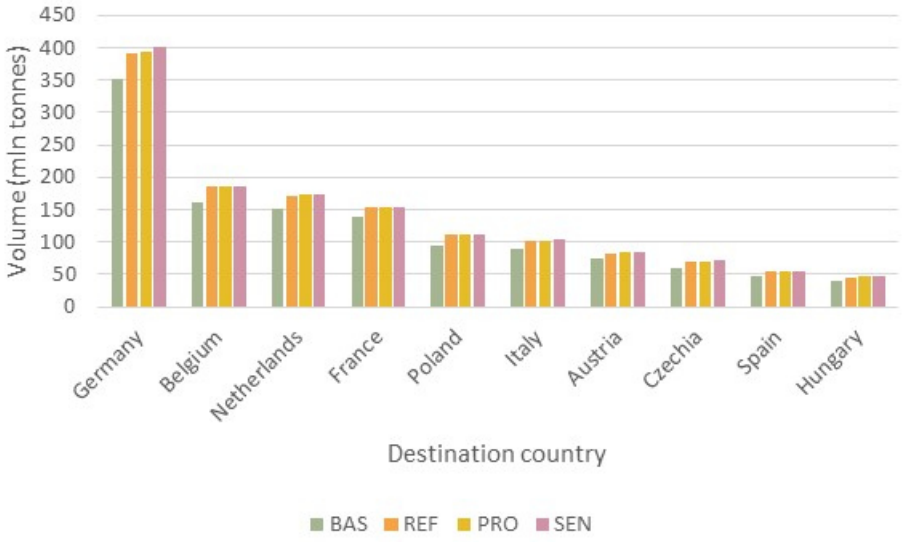


Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

Source: NEAC estimation

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 (see Figure 29).

Figure 51 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



Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

Source: NEAC estimation

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

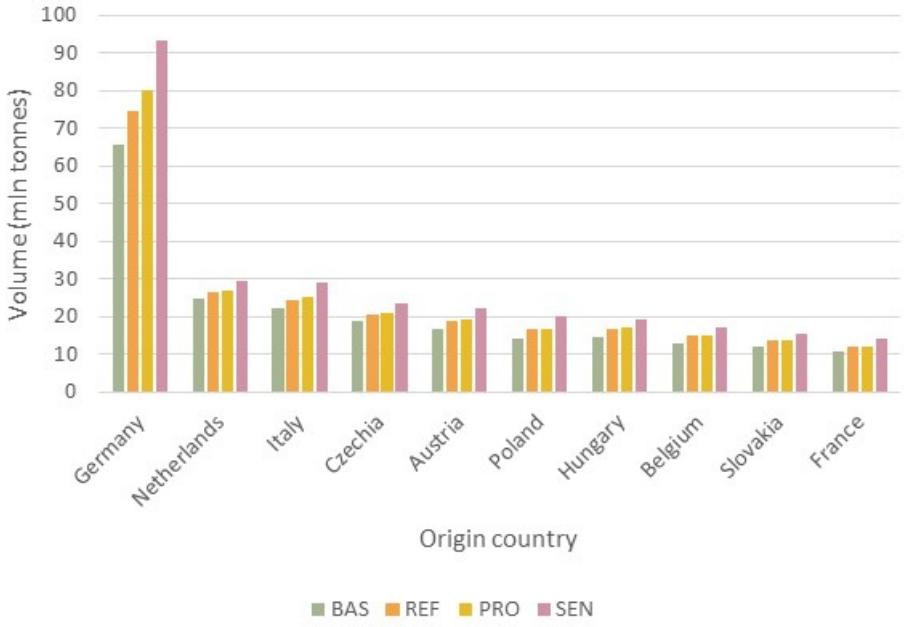
Figures 55 and 56 show the development of the volume in international rail freight transport for origins and destinations in the top 10 countries within the corridor area of the 11 RFCs Network. The changes are more prominent for international rail transport than for *all* international rail freight 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* shows 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).

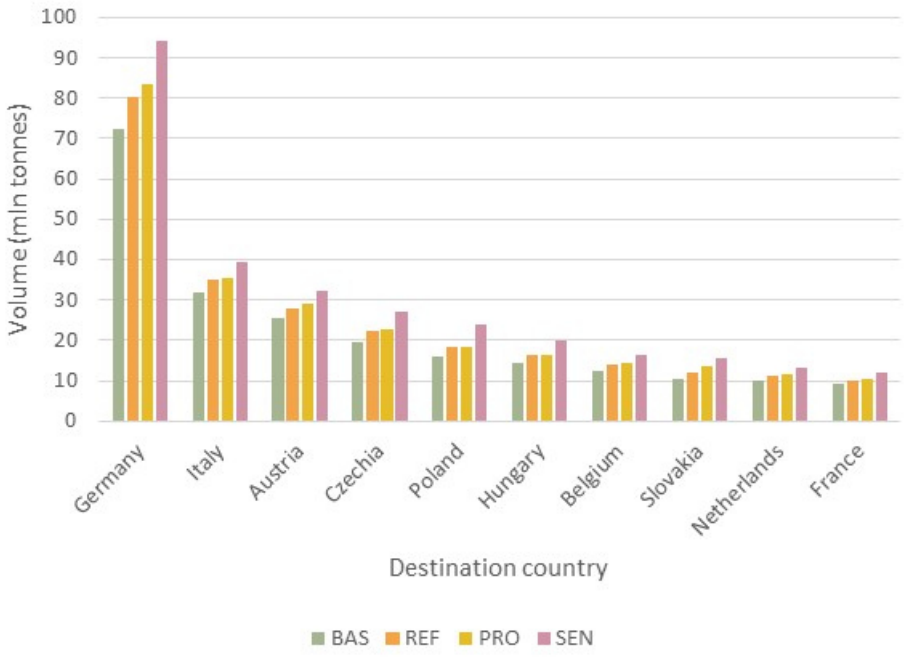
Figure 52 Development of volume (in million tonnes) of all international rail freight transport by the top 10 origin countries within the 11 RFCs Network catchment area.



Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

Source: NEAC estimation

Figure 53 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.



Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

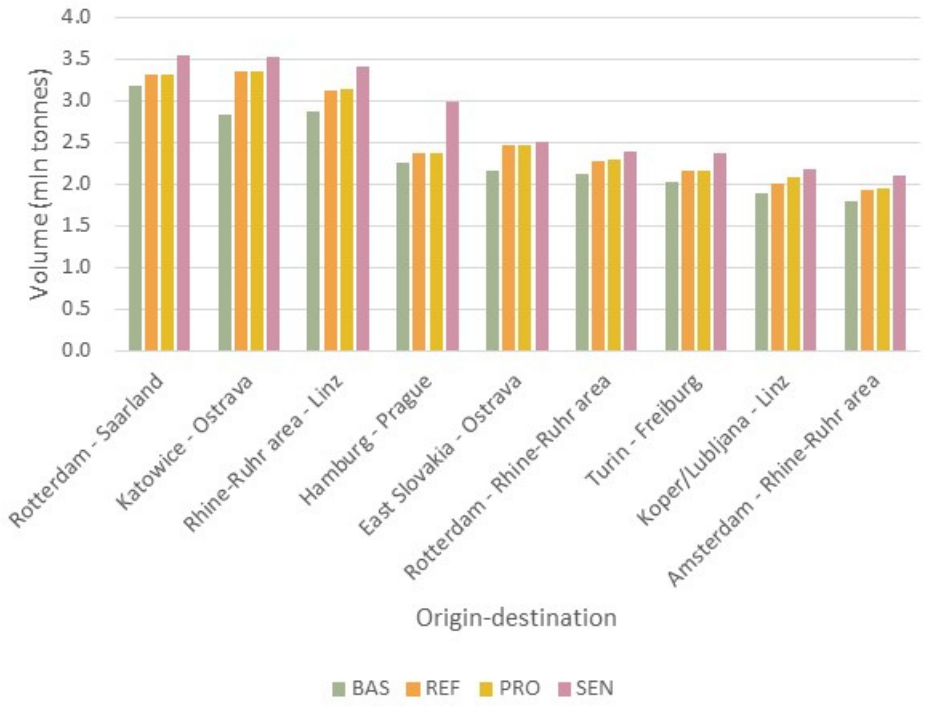
Source: NEAC estimation

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 54 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



Legend: BAS=2022, REF=Reference, PRO=Projects, SEN=Sensitivity

Source: NEAC estimation

5.2 FUTURE OF THE INTERNATIONAL FREIGHT TRANSPORT FOR RFC MED

5.2.1 FUTURE OF ALL INTERNATIONAL FREIGHT TRANSPORT FOR RFC MED

This section shows the results of the future market analysis for the RFC MED. Figure 55 shows the overall developments by mode and scenario in the catchment and corridor area of RFC MED.

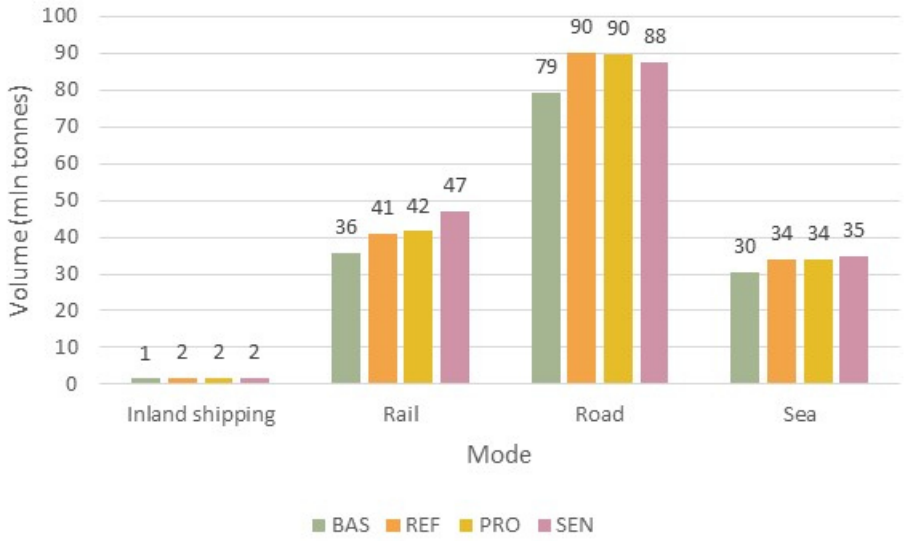
Between the 2022 Base year and 2030 Reference scenarios, all modes grow due to economic developments. Inland shipping grows by 24%, road by 14%, rail transport by 14%, and sea shipping by 11%. In absolute terms, international road freight transport grows most, by 11 million tonnes (from 79 to 90 million tonnes). Rail transport grows by 5 million tonnes from 36 to 41 million tonnes. Sea shipping grows from 30 to 34 million tonnes. Inland shipping does not play an important role in the corridor area of RFC MED.

The implementation of different rail projects across Europe, does not lead to a significant growth of rail transport in the RFC MED. There is some modal shift between road and rail. In the RFC MED large projects such as the Second Track Koper-Divača, Rijeka-Zagreb-Koprivnica HR/HU border account for this shift. Also, infrastructure projects outside the RFC MED contribute due to mode shift or rerouting. Road transport decreases a bit (road transport by 1%), while rail transport grows by 1 million tonnes. Sea shipping remains stable.

The third scenario shows a hypothetical development for rail transport. Compared to the base year situation, a growth of 17% in volume (million tonnes) is estimated. The introduction of longer trains (740 meters) has an important impact on this result. This scenario can be regarded as a maximum potential for rail transport. The growth has different causes, such as rerouting, 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 MED grows by 32% compared to the base situation. This is a substantial achievement compared to the 14% forecasted for the Reference scenario.

Figure 55 Development of volume (in million tonnes) by mode and scenario for the corridor area of RFC MED

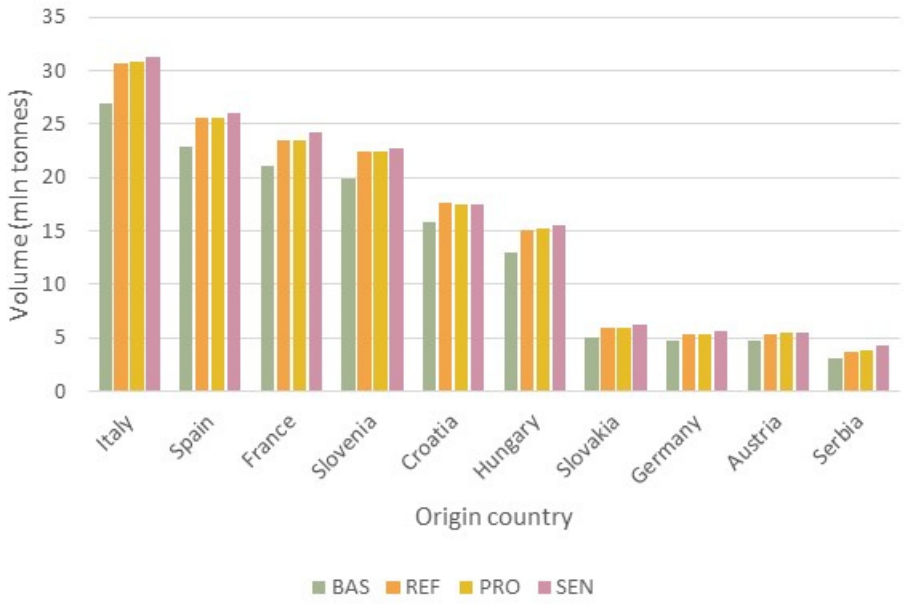


Source: NEAC estimations

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

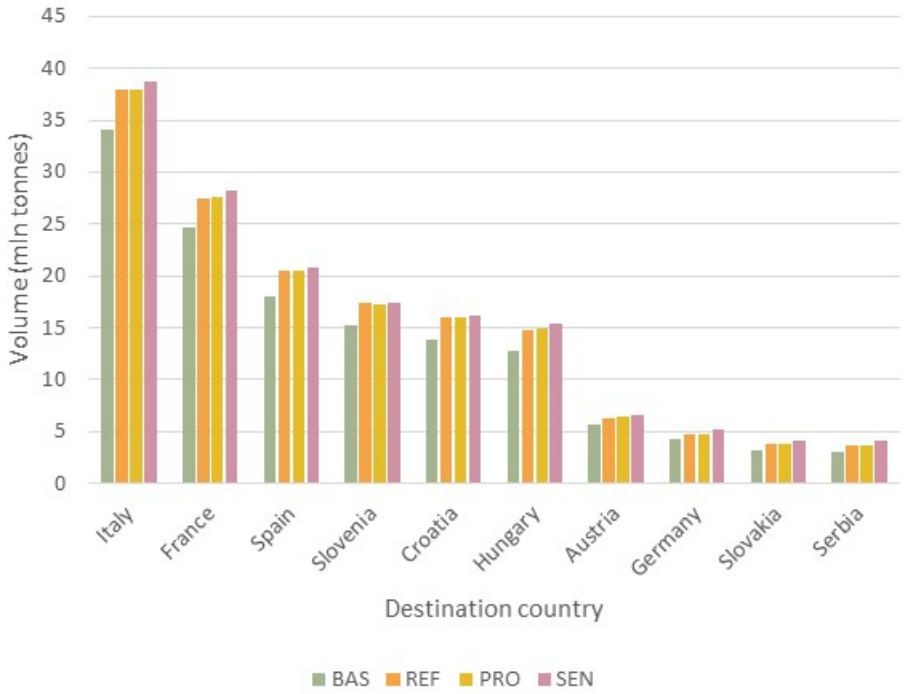
Concerning the top 10 origins, these are the same as for the base year. The growth for the Reference scenario varies from 11% (France) to 23% (Serbia). Italy, Spain, and France are the top 3 origin countries. Concerning the Projects scenario, in general the average growth rate does not deviate from the Reference scenario. Concerning the Sensitivity scenario, a slightly higher volume is registered.

Figure 56 Development of volume (in million tonnes) of all international freight transport by origin countries in the catchment area of the RFC MED



Source: NEAC estimations

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



Source: NEAC estimations

The picture for the destination countries is like the one for the origin countries. The overall growth in the top 10 countries is approximately 13% for both the Reference and Projects scenarios. The growth between the 2022 Base year and the Reference scenario varies from 11% to 18%.

5.2.2 FUTURE OF INTERNATIONAL RAIL FREIGHT TRANSPORT FOR RFC MED

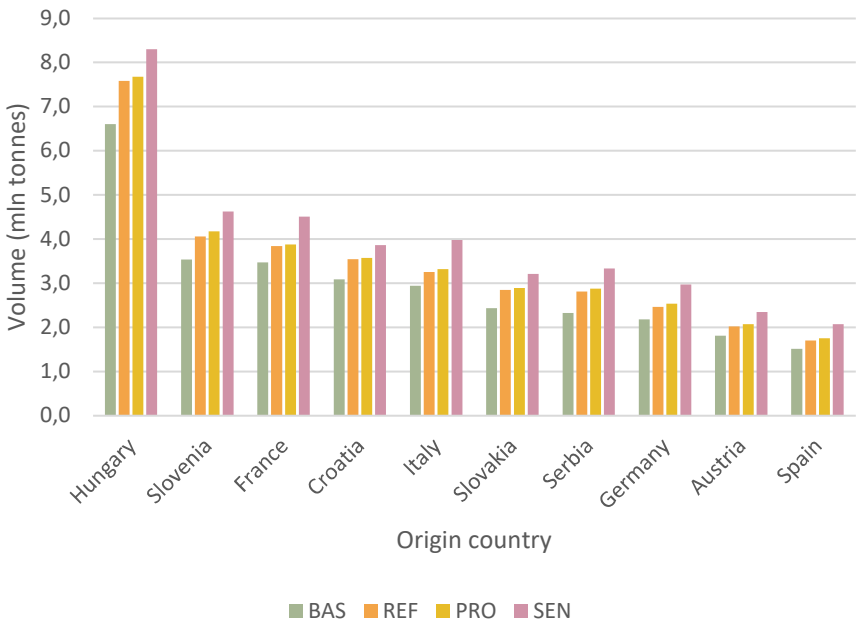
As concerns the RFC MED, we see a growth from 36 million tonnes to 41 million tonnes in the Reference situation. Expressed in trains, this would mean a growth from about 40,000 international trains to about 45,000 trains. The Projects scenario adds another 1 million tonnes to the total volume with a total number of trains of 46.000. The sensitivity scenario will finally lead to a volume of 47 million tonnes, which is about 50.000 trains. Depending on the number of longer trains utilized (740 m out of the total), the number of trains can vary.

The next two graphs show the development of volume in international rail freight transport for origin countries for the RFC MED. International rail freight transport is highest in Hungary (7.6 million tonnes in the Reference scenario). Slovenia and France come in second and third place (at 4.1 and 3.8 million tonnes).

The Projects scenario shows a limited impact on the volume of international rail freight transport. Overall, the growth in international rail volume for the countries is about 2% compared to the Reference scenario. The potential extra volume as shown by the Sensitivity scenario is overall 15% on the total volume compared to the Reference scenario. In Spain, Italy, and Slovenia we see a more substantial growth. 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 and the transition to the standard gauge.

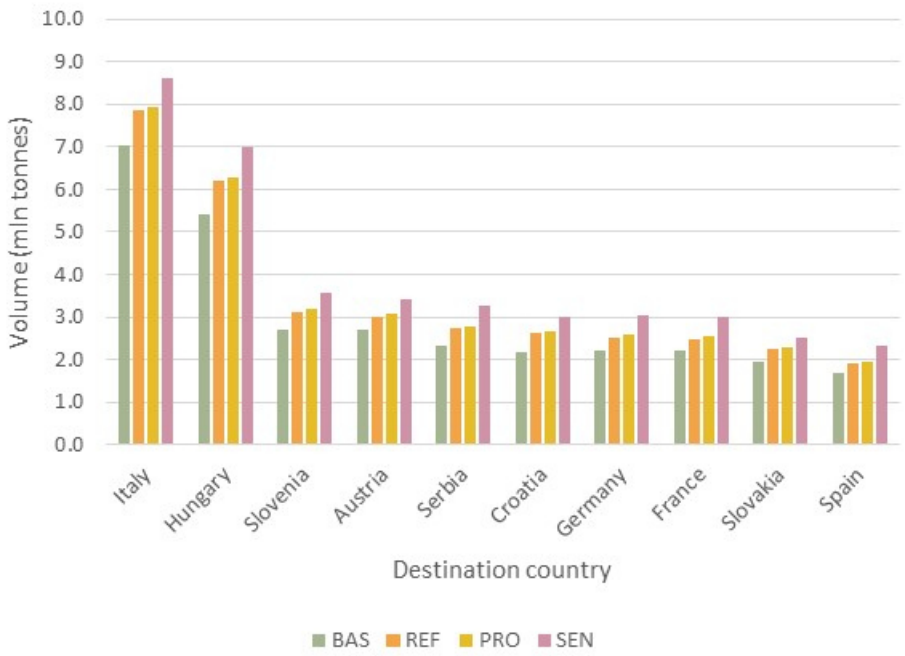
For destinations, a similar picture can be noticed. In this case, Italy shows a number 1 position in the RFC MED concerning international rail freight transport. Slovenia and France are ranked 2 and 3 for international rail freight transport. The impact of the Projects scenario is limited, whereas the Sensitivity scenario shows higher effects. Compared to the 2022 Base year situation, the growth varies from 22% (Hungary) to 40% (Serbia).

Figure 58 Development of volume (in million tonnes) of all international rail freight transport by the origin countries in the RFC MED



Source: NEAC estimations

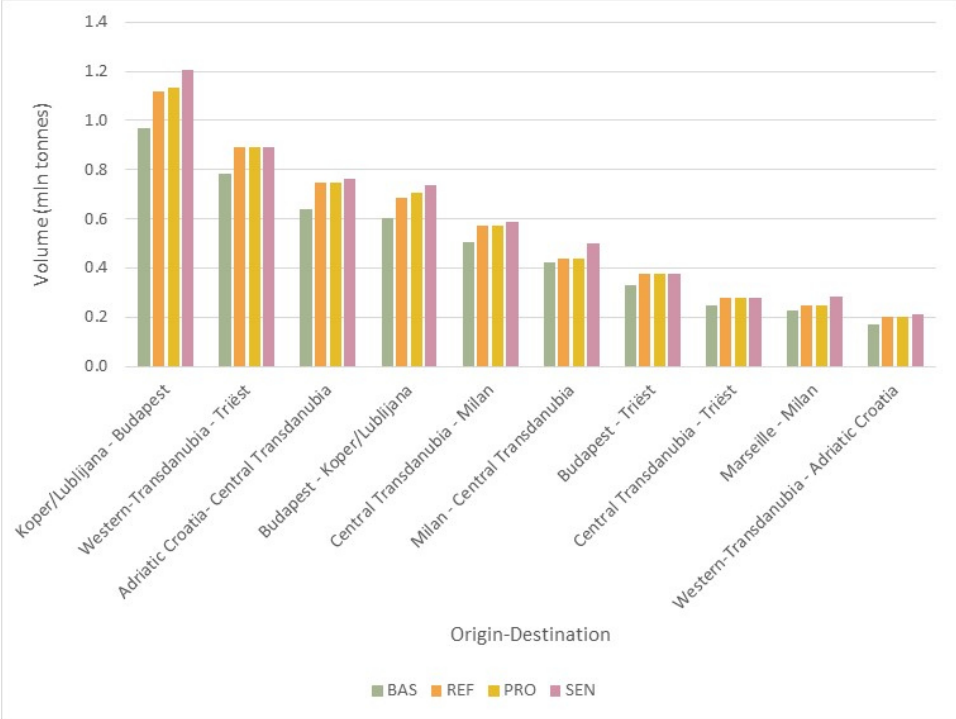
Figure 59 Development of volume (in million tonnes) of all international rail freight transport by destination countries in the RFC MED



Source: NEAC estimations

Looking at the top 10 relations within the RFC MED, the main relation is between Koper/Ljubljana and Budapest. This relation is important for liquid bulk (oil products) to Hungary. In second place comes Western-Transdanubia (with cities such as Györ and Szombathely, Hungary) to Trieste, which is mainly dry bulk. Another important relation concerns Adriatic Croatia (Split/Rijeka) to Central-Transdanubia (Székesfehérvár, Hungary). In this case the type of cargo is varied, but the transport of liquid bulk is also important. The other relations show similar volumes.

Figure 60 Development of volume (in million tonnes) of all international rail freight transport by the top 10 relations within the corridor area of RFC MED



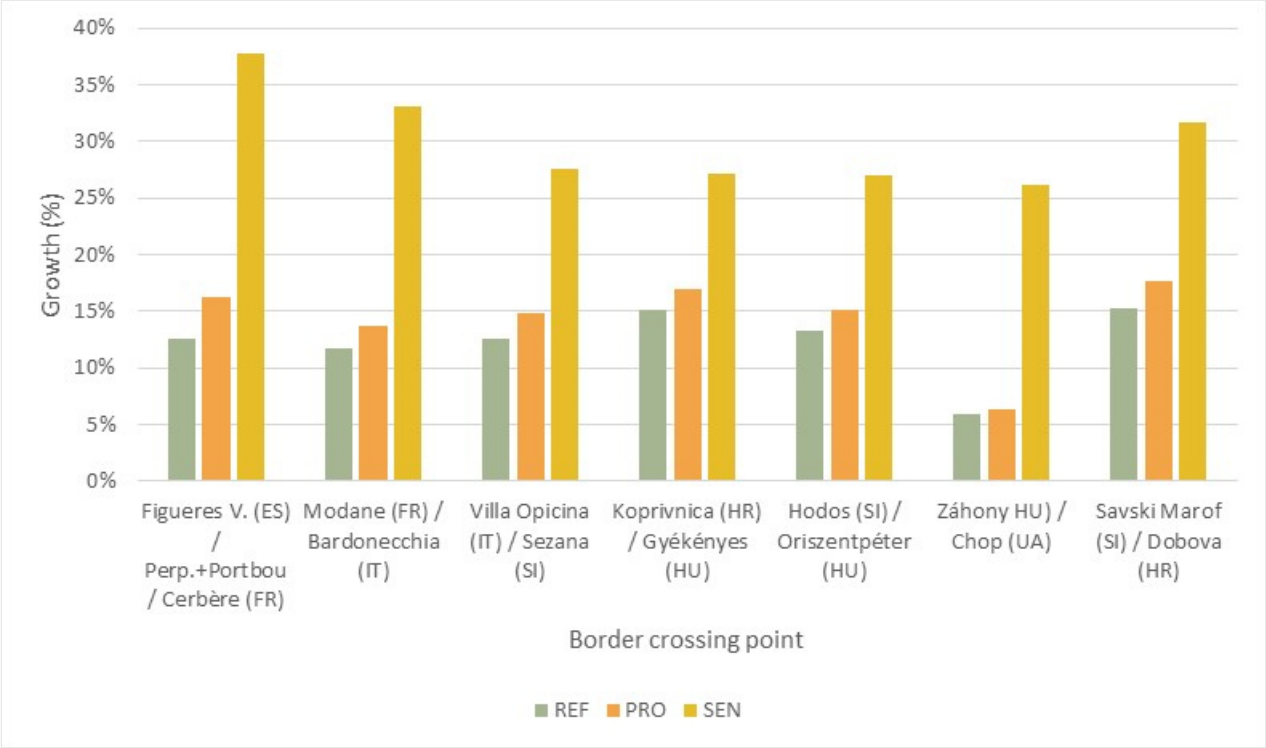
Source: NEAC estimations

5.2.3 DEVELOPMENT OF THE MOST IMPORTANT BCPS IN THE RFC MED

The different border crossing points in the RFC MED each show different growth rates between the 2022 Base year and 2030 Reference, Projects and Sensitivity scenarios. Overall, the Reference scenario shows a growth in volume of 12%. This is in line with the general growth for rail transport between the 2022 Base year and 2030 Reference scenario. The completion of different projects by 2030 leads to different growth patterns; on average, the growth in relation to the base is 14% more volume, which translates into 14% more trains. The sensitivity scenario leads to 30% more volume, which is 13% more trains compared to 2022. Due to the extra train length, there is less growth in number of trains.

The total amount of unique trains on the BCPs in 2022 is approximately 40,000 trains. In the Reference situation this would be approximately 45,000. In the Projects scenario, this is 46,000 trains, while in the Sensitivity scenario, this is also 45,000 trains (due to extra volume per train, a bit less than the Projects scenario).

Figure 61 Development of volume (in million tonnes) of international rail freight transport on some border crossing points of the RFC MED

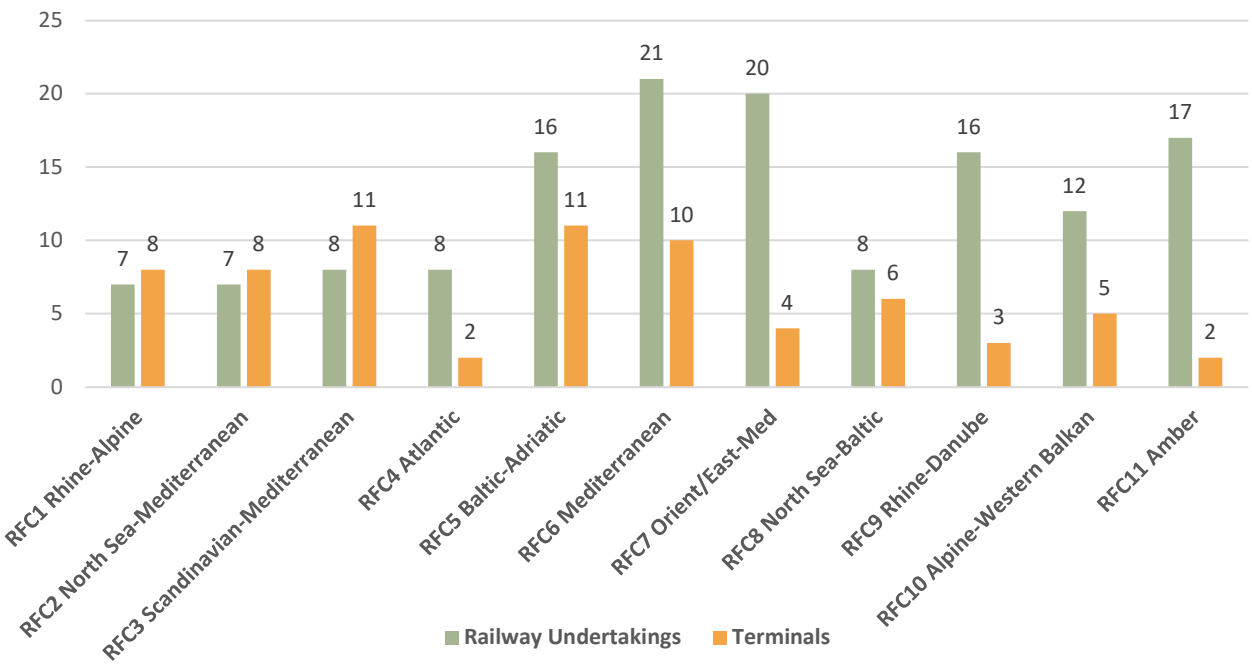


Source: NEAC estimations; Legend: REF=Reference, PRO=Projects, SEN=Sensitivity

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

No relevant time series data are available supporting a consistent appraisal of the occurred and expected changes associated with the establishment of the 11 RFCs. It's worth adding that the current 11 RFCs started operating in different years, 5 in 2013, 3 in 2015 and 3 after 2018, and their alignment was adjusted over time to market needs. To assess the occurred and expected changes associated with their establishment, an e-survey (2023 11 RFCs Joint TMS Update Survey) has been conducted, submitting a questionnaire to the members of the Railway Undertaking Advisory Groups (RAGs) and the Terminal Advisory Groups (TAGs) of the 11 RFCs. Questionnaires were collected via the EUSurvey platform of the 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 62).

Figure 62 RFCs usage by respondents operating or serving trains at terminals crossing at least one border crossing point(s) in any RFCs



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

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

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

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

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

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

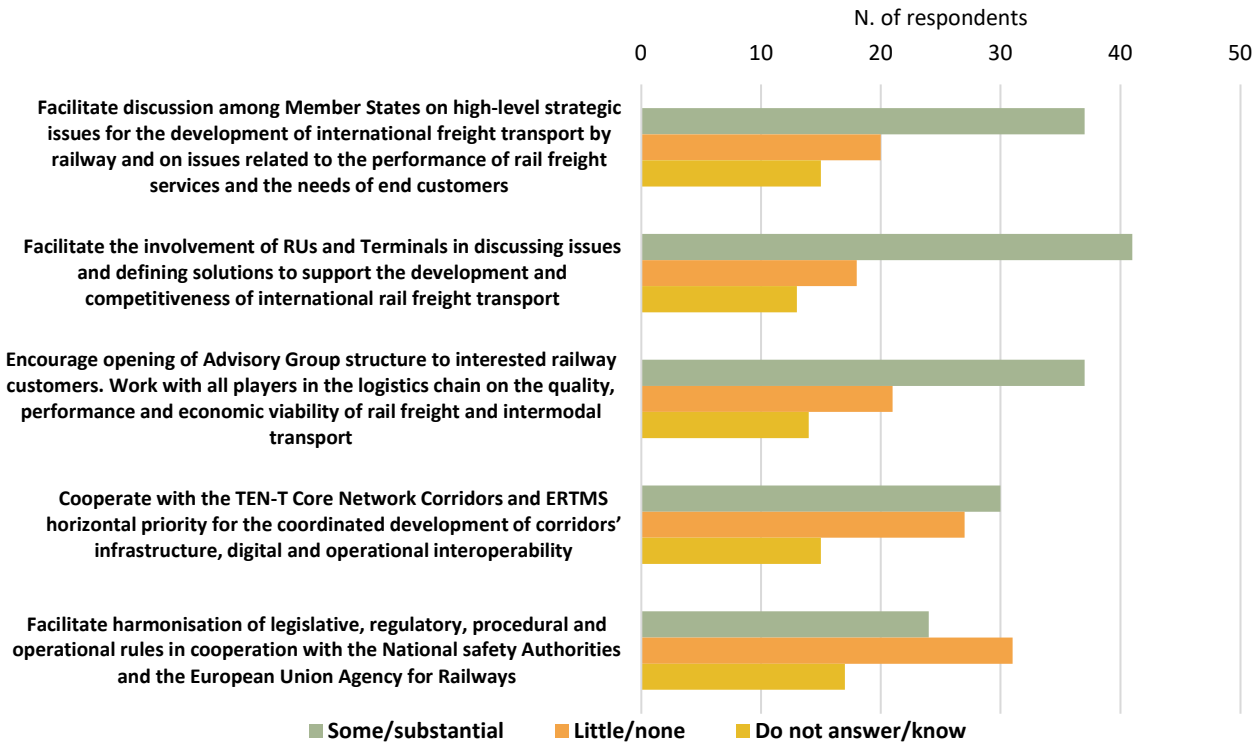
6.1 CHANGES OCCURRED SINCE THE ESTABLISHMENT OF THE RFCS AND EXPECTED CHANGES CONCERNING THE FACILITATION OF INTERNATIONAL RAIL FREIGHT TRANSPORT

Occurred and expected changes have been investigated as part of the survey around three main areas of activity of the Rail Freight 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[21]

6.1.1 GOVERNANCE ISSUES

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

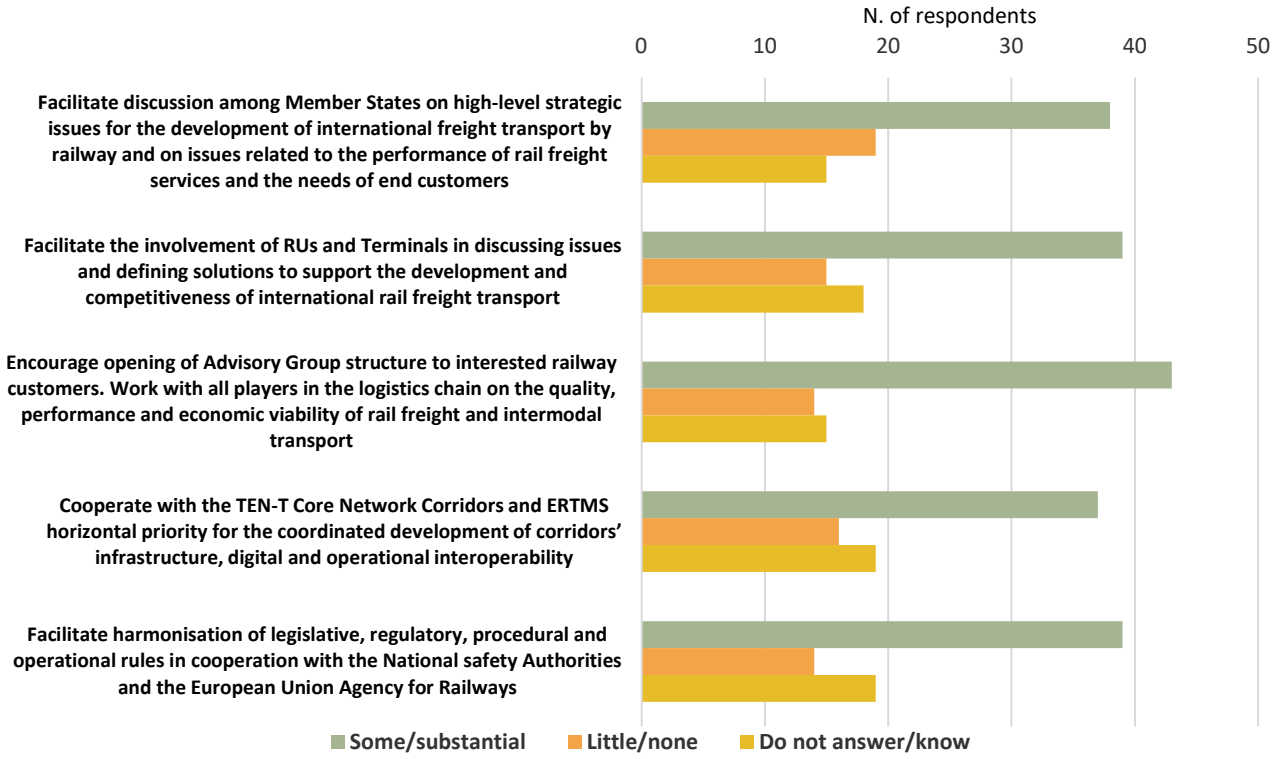


[21] https://ec.europa.eu/transparency/documents-register/detail?ref=SEC(2023)443&lang=en

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

The respondents' opinion about the changes within the governance area is positive, especially in terms of cooperation with the market, including but not limited to RUs and terminal operators, as well as concerning facilitation of discussion among Member States about the issues affecting the competitiveness of international rail freight transport (Figure 66). 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.

Figure 64 Expected changes based on current programmes/initiatives - Governance Issues

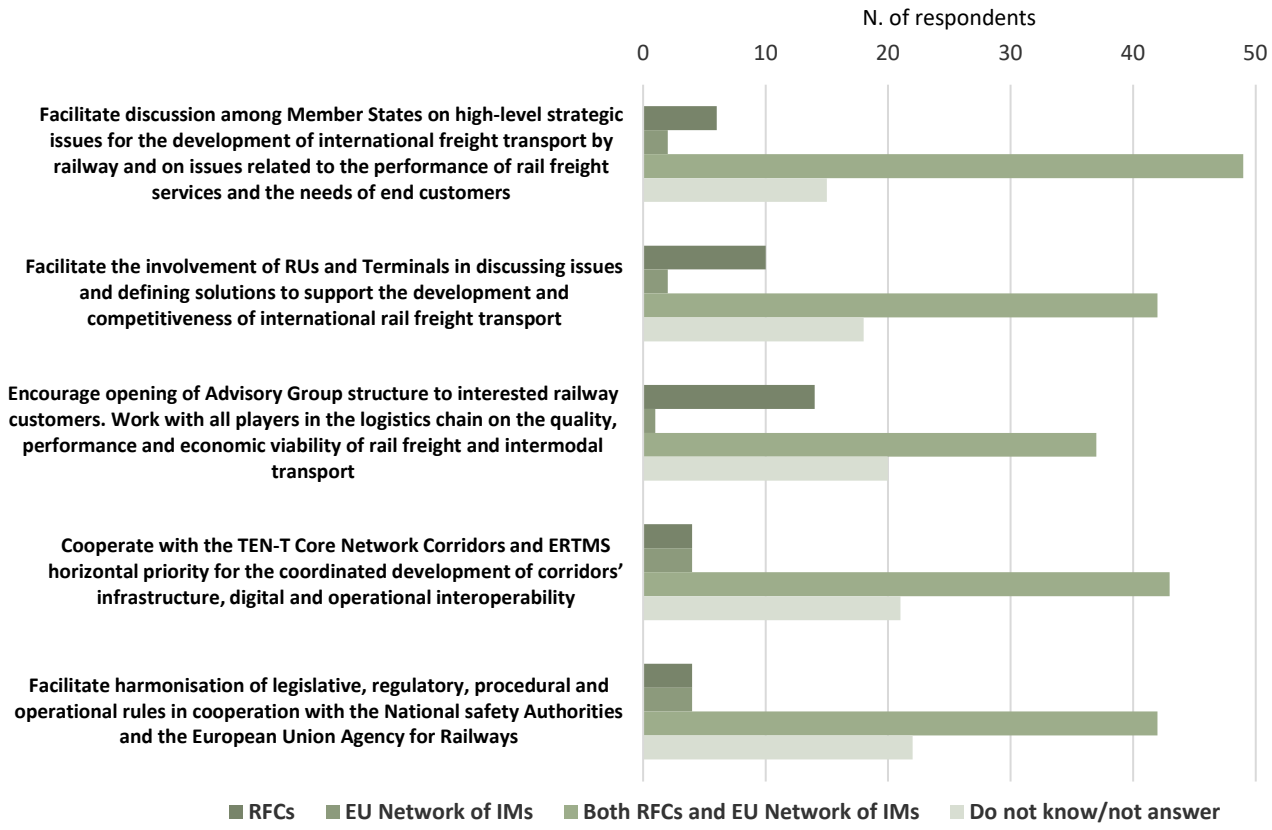


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 1.RT

The expectations of the market players concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all issues (Figure 67).

Respondents consider the cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) to be the best governance solution for bringing issues forward (Figure 68).

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

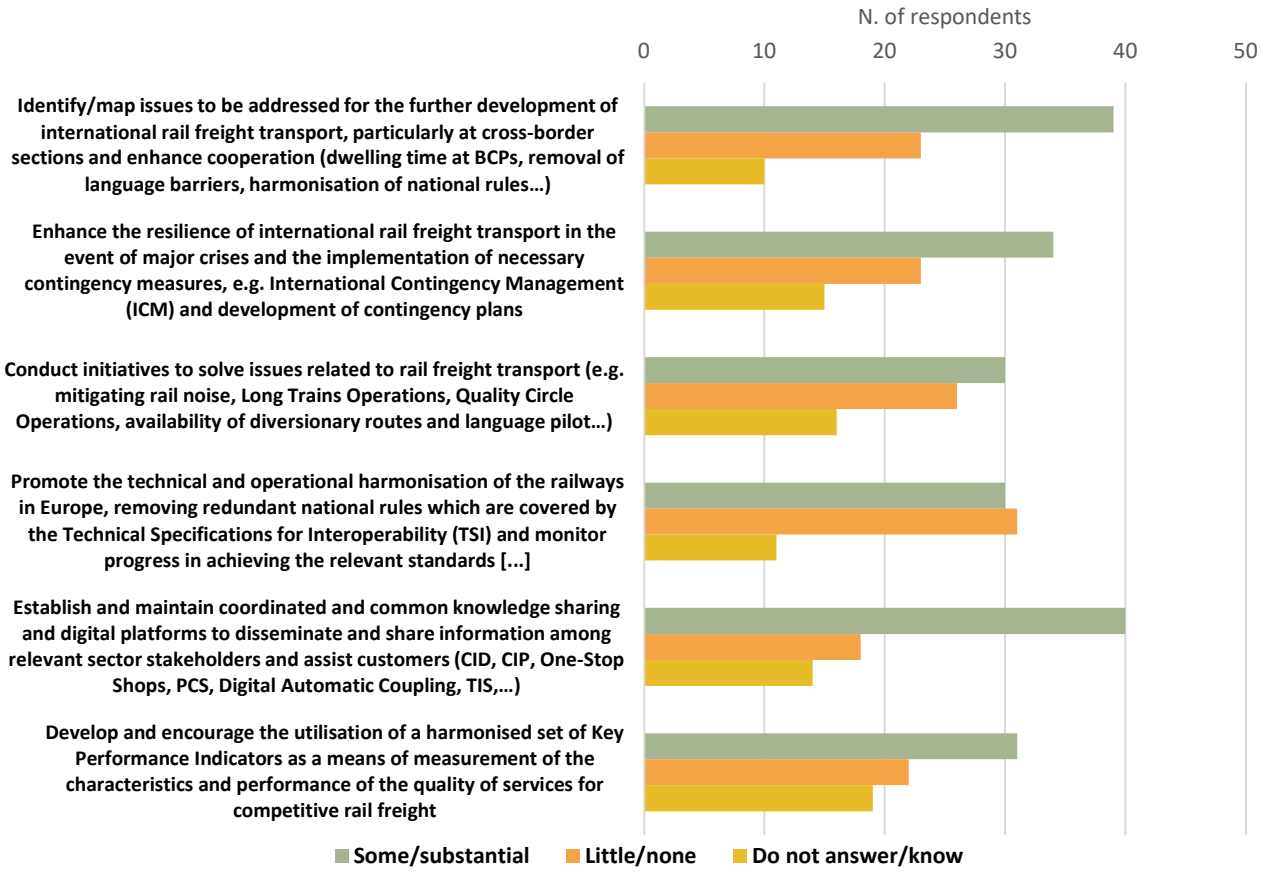


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 1.RT

6.1.2 OPERATIONAL EFFICIENCY ISSUES

The market opinion about the changes that occurred within the operational efficiency area is also generally positive, except for the progress made in the promotion of technical and operational harmonisation of the European railway transport system towards its interoperability (Figure 66).

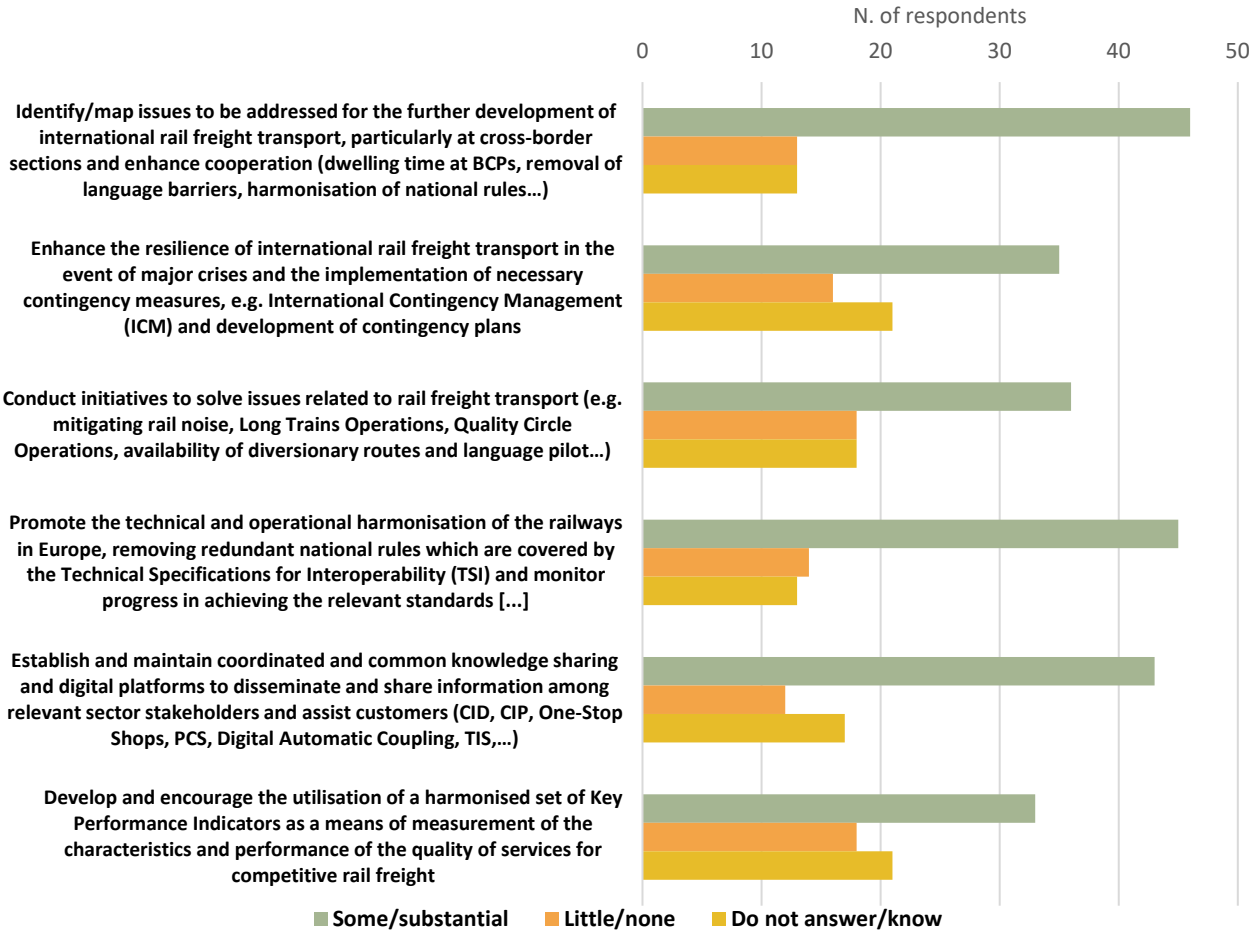
Figure 66 Progress made to date since the establishment of the RFCs - Operational Efficiency Issues



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

The respondents' expectations concerning the future impact of the programmes and activities of the RFCs are relatively positive concerning all issues (Figure 67).

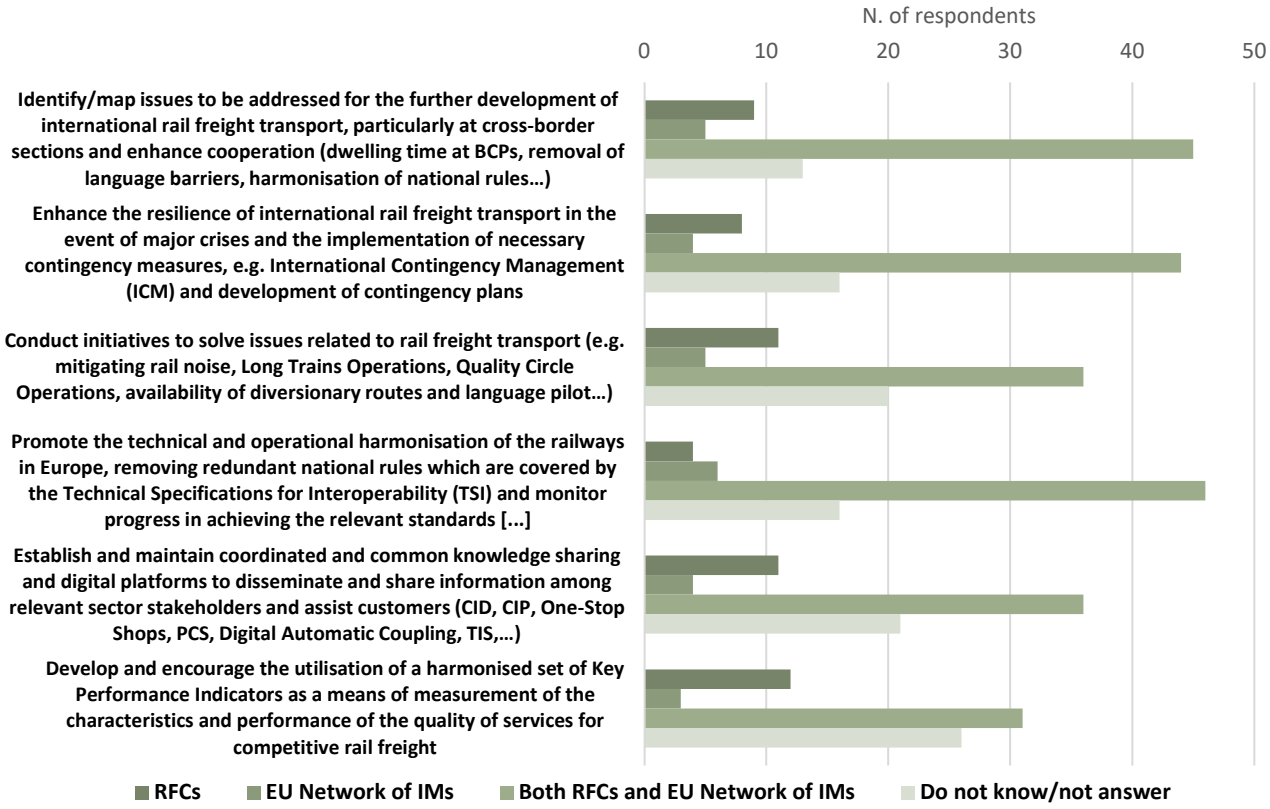
Figure 67 Expected changes based on current programmes/initiatives by RFCs - Operational Efficiency Issues



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

Cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) is also considered the best-fitting governance solution to bring operational efficiency issues forward (Figure 68).

Figure 68 Best fitting governance to bring the issue forward - Operational Efficiency Issues

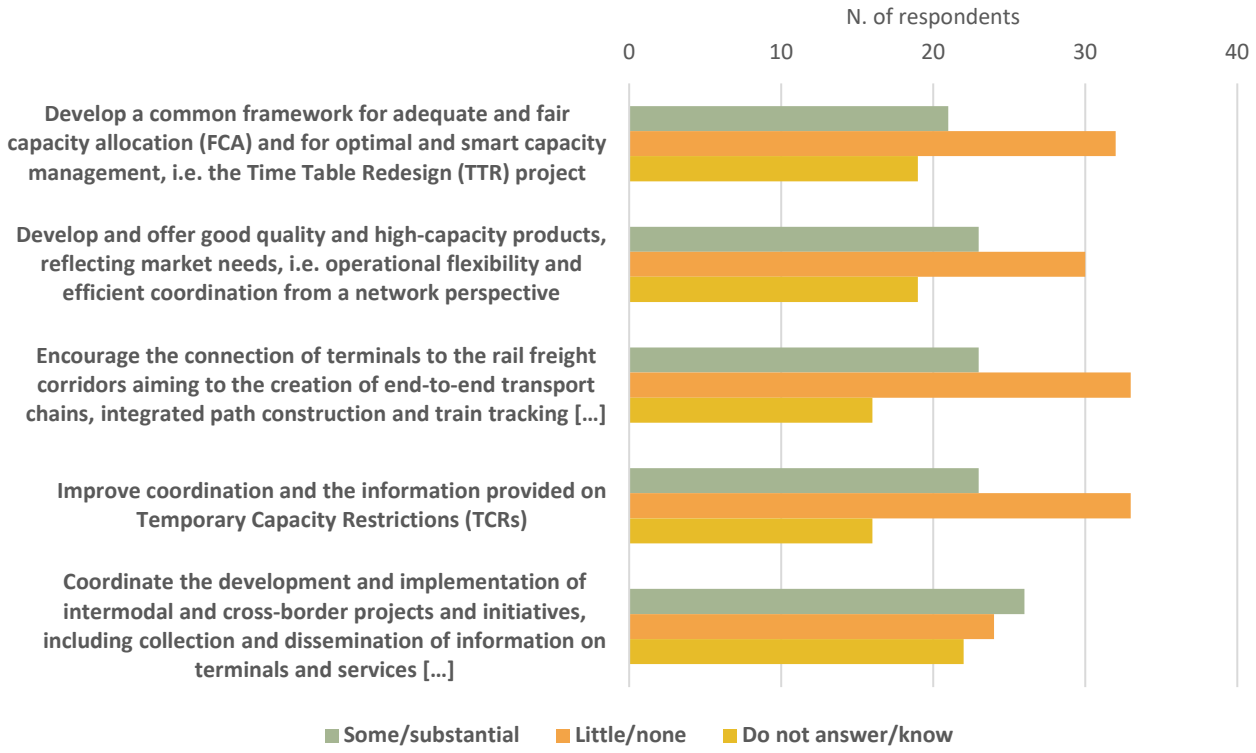


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 2.RT

6.1.3 CAPACITY PLANNING ISSUES

The respondents' opinions about the changes that occurred within the capacity management area are predominantly negative, except for the coordination of the development and implementation of cross-border projects and initiatives (Figure 69).

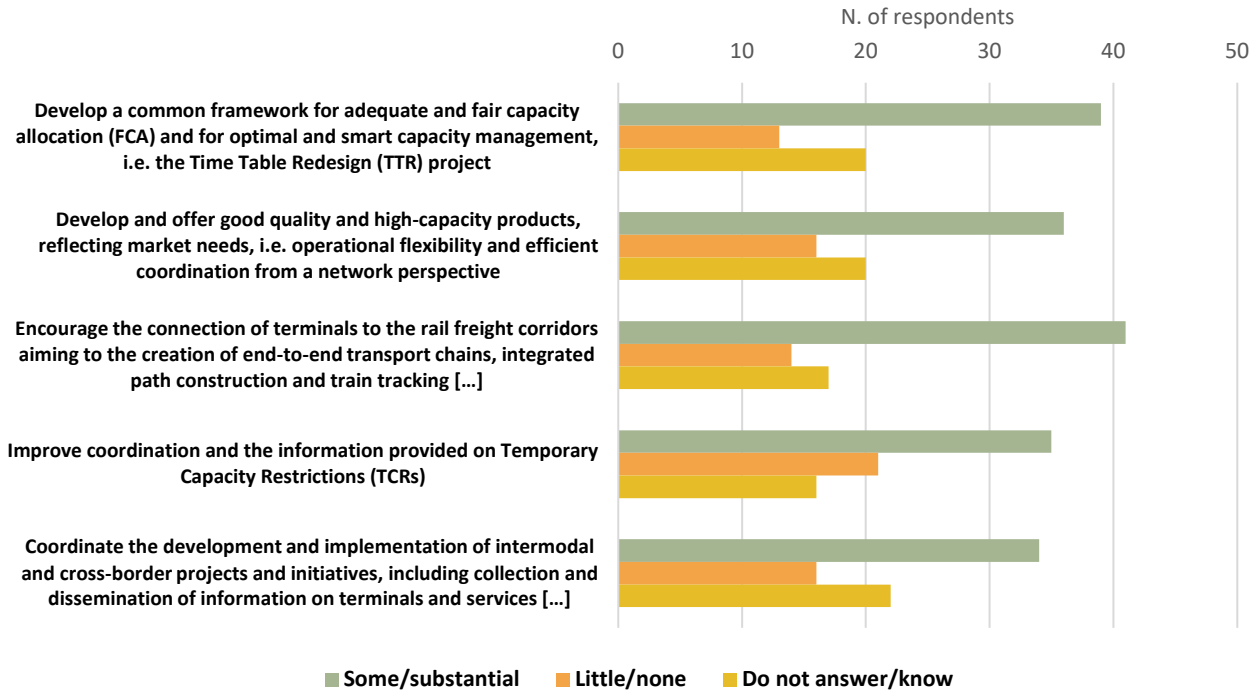
Figure 69 Progress made to date since the establishment of the RFCs - Capacity Planning Issues



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

Notwithstanding the market's opinion that little or no progress made since the establishment of the RFCs, the expectations on the future impact of the programmes and activities by the RFCs are rather positive with regard to all issues (Figure 70).

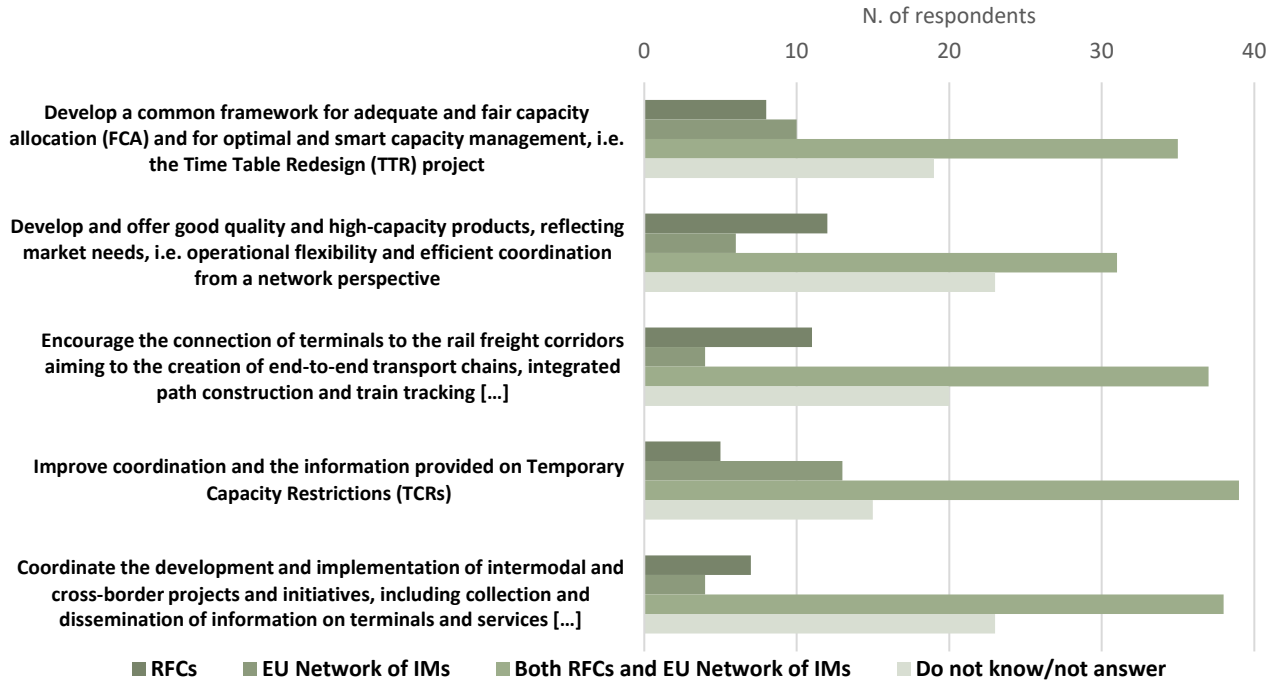
Figure 70 Expected changes based on current programmes/initiatives - Capacity Planning Issues



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

Also, for the improvement of capacity management-related issues, the best governance solution is deemed to be the cooperation between RFCs and an EU Network of Infrastructure Managers (IMs) (Figure 71).

Figure 71 Best fitting governance to bring the issue forward - Capacity Planning Issues

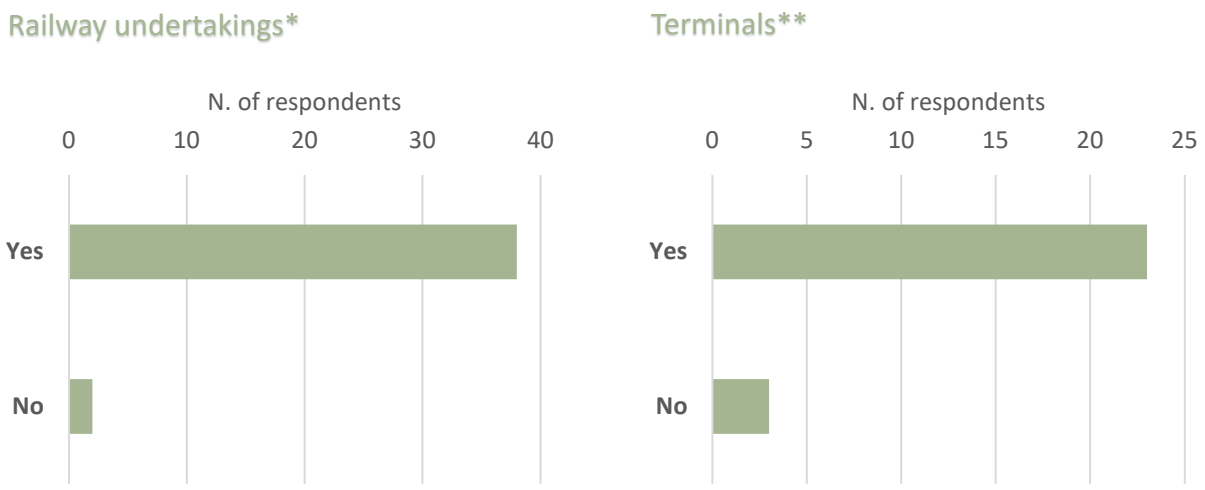


Source: 2023 11 RFCs Joint TMS Update; Notes: Question B) 3.RT

6.2 EXPERIENCED AND EXPECTED MARKET DEVELOPMENTS

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

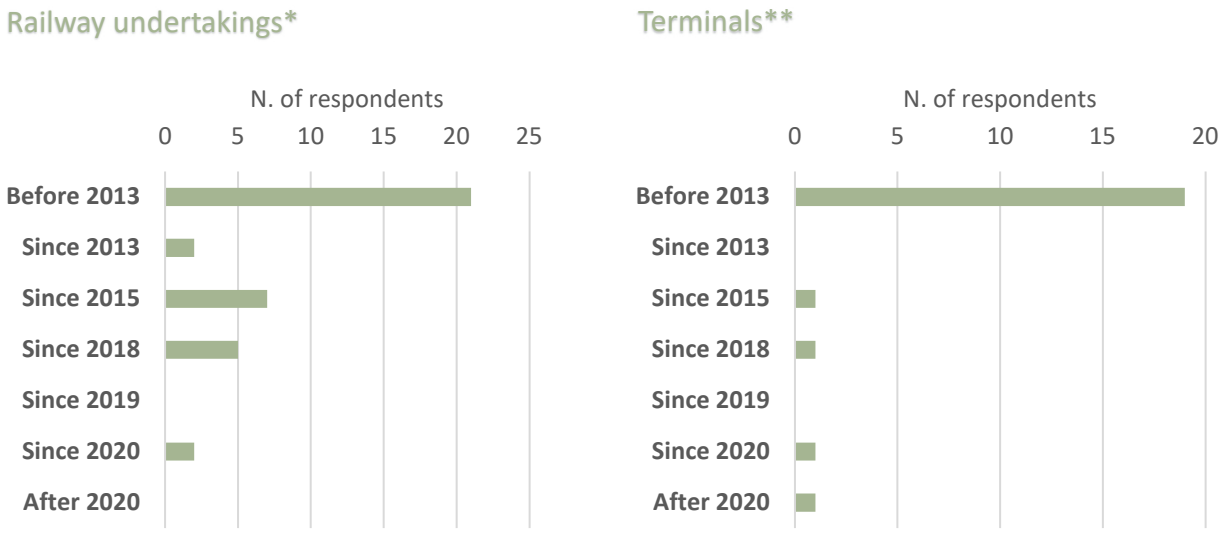
Figure 72 Respondent has operated/operates rail services or manages/operates terminals serving trains across at least one border crossing point(s) on any RFC



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

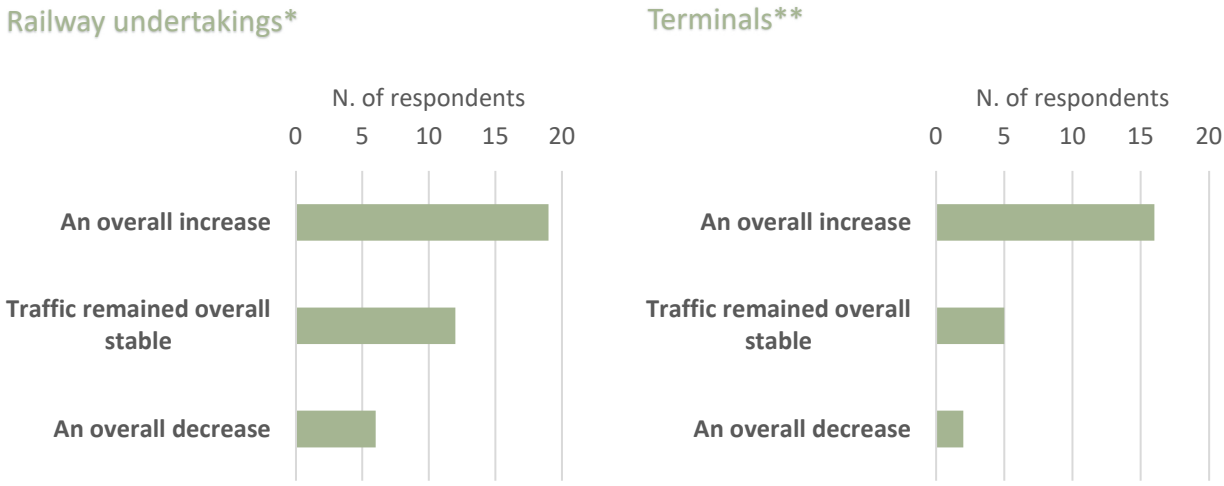
The vast majority of the respondents who participated in the survey operated or still operates rail services or manage/operate terminals serving trains across at least one border crossing point(s) on any RFC. Most of them also operated or served international rail freight transport before the establishment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

Figure 73 Respondent has operated/operates rail services or manages/operates terminals serving trains across at least one border crossing point(s) on any RFC



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

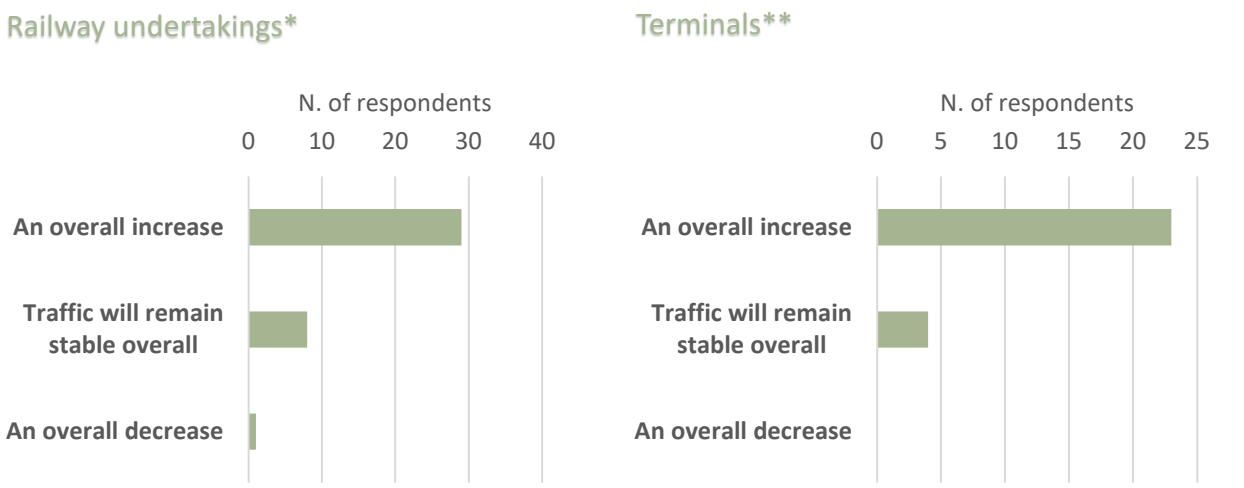
Figure 74 Variation in the operation of trains and in serving trains crossing at least one border crossing point(s) on any RFC since 2013



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

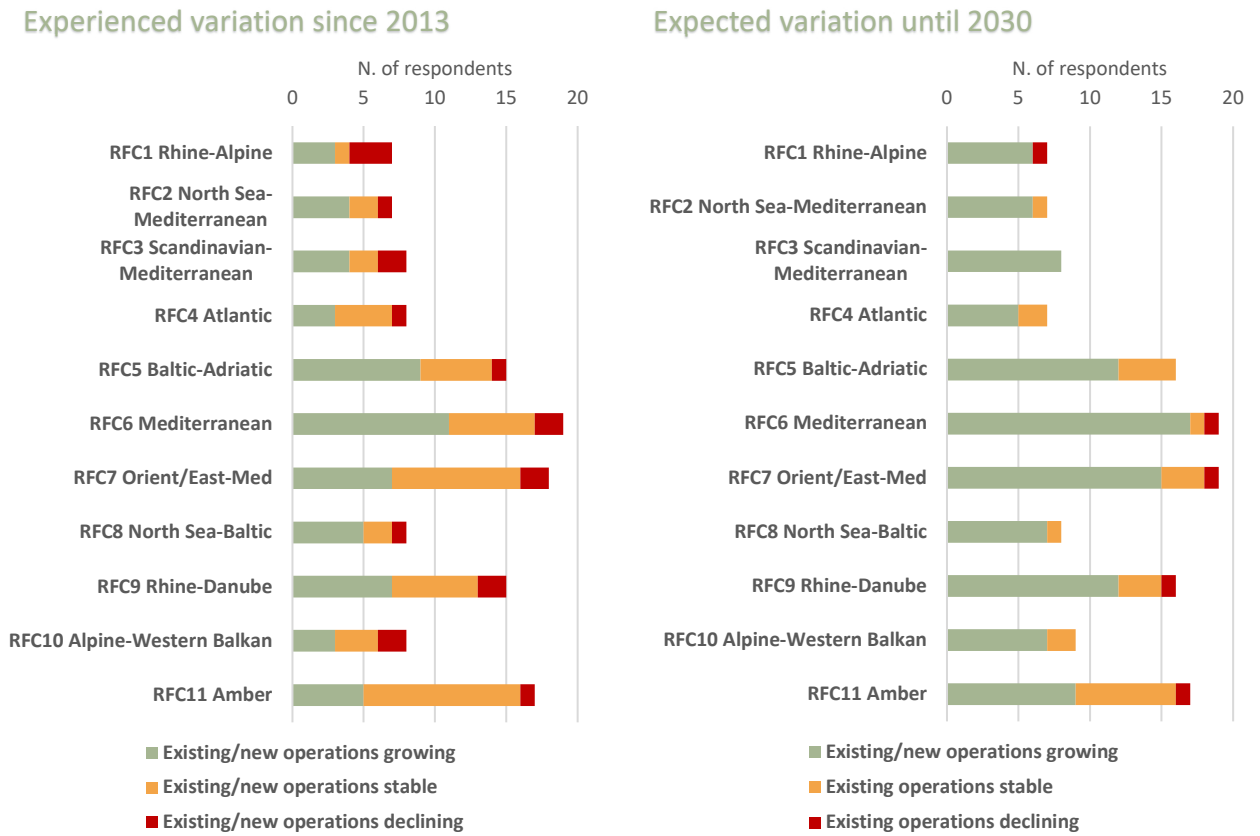
The majority of the respondents declare they experienced an increase in their operations since 2013 (Figure 74), and most of them also have a positive expectation about the future, expecting overall market growth (Figure 75).

Figure 75 Variation in the operation of trains and in serving trains crossing at least one border crossing point(s) on any RFC in the short term until 2030



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

Figure 76 Experienced and expected traffic trends according to the trains operated by RUs, crossing at least one border crossing point(s) on any RFC

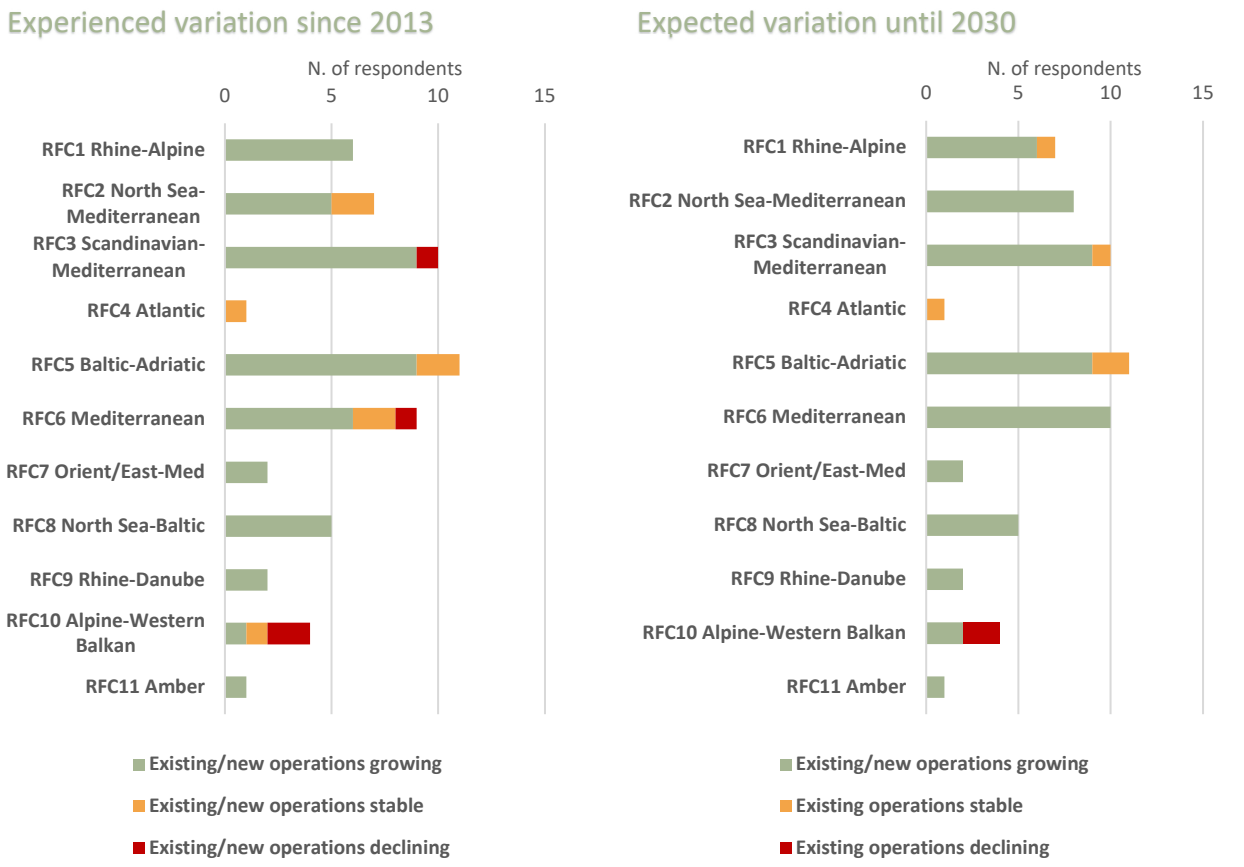


Source: 2023 11 RFCs Joint TMS Update; Notes: Question C) 3.R

The variation in traffic experienced by RUs since 2013 differs from RFC (Figure 76). 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 77 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; Notes: Question C) 3.T

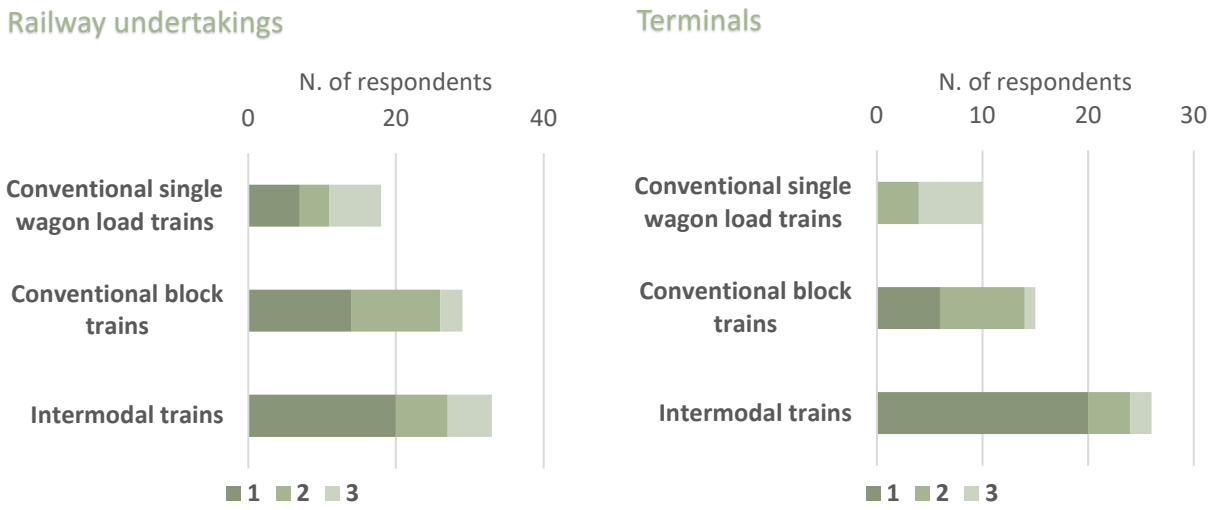
The variation in traffic experienced by terminal operators since 2013 and the expected growth are generally positive, except for the ATL and AWB RFCs (Figure 77). The prevailing response is pessimistic about the experienced variation, whereas the number of growing and declining registered trends is similar regarding future expectations.

Figure 78 Type of trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs

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

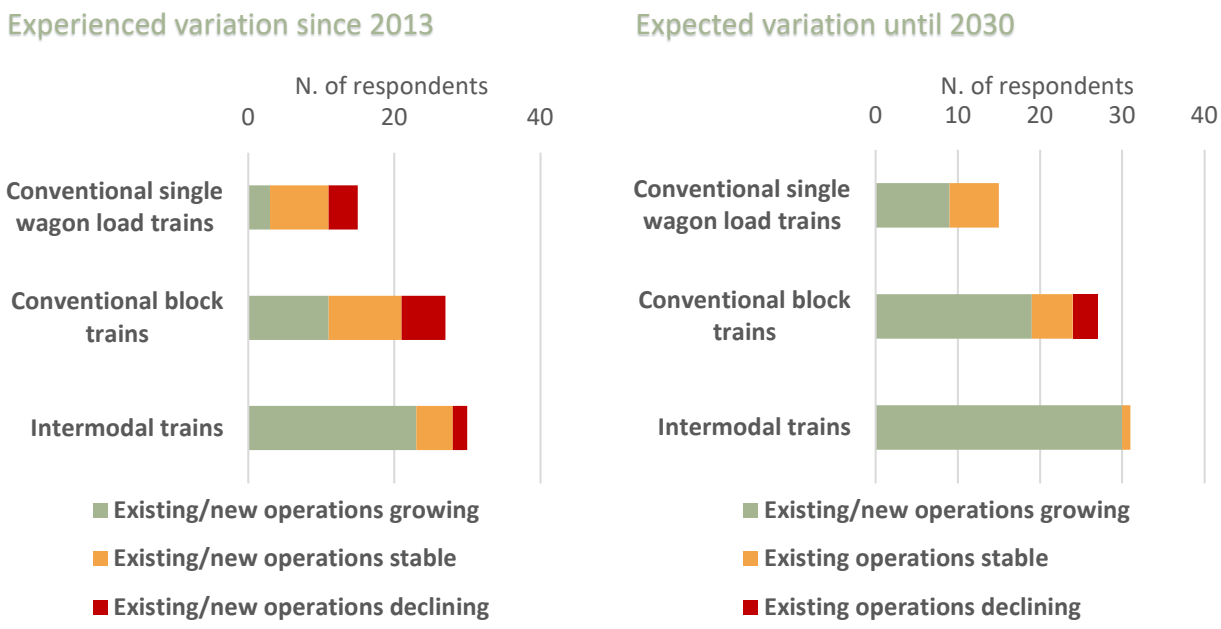
The prevailing type of international trains operated on the 11 RFCs Network consists of intermodal trains, followed by conventional block trains and single wagonload trains (Figure 78 and Figure 79).

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



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

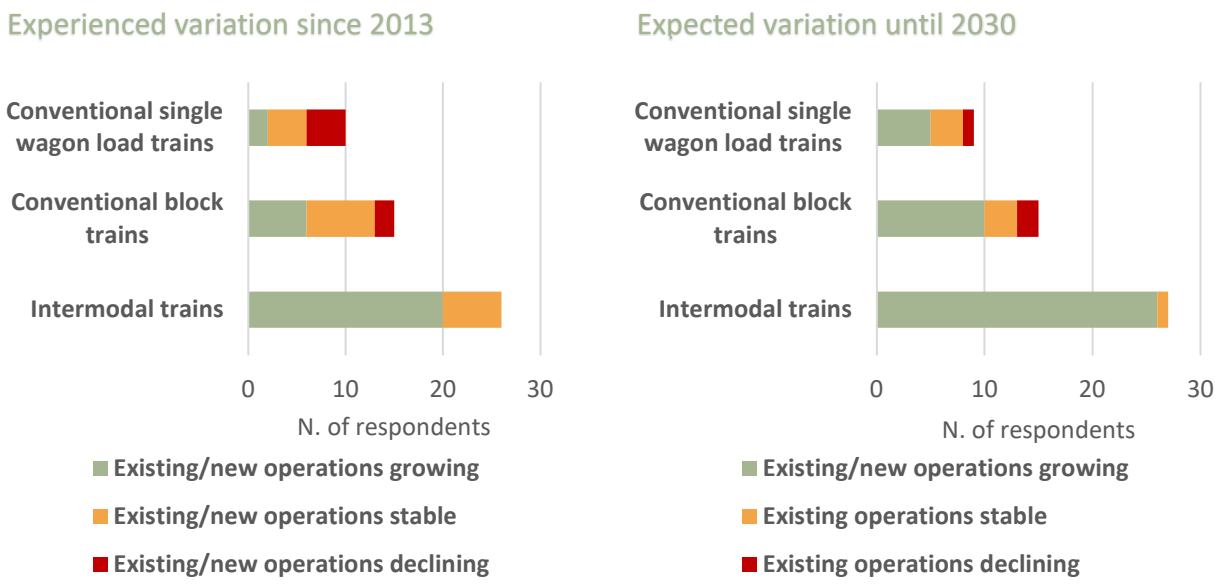
Figure 80 Experienced and expected traffic trend on the type of trains operated by RUs crossing at least one border crossing point(s) in any RFCs



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

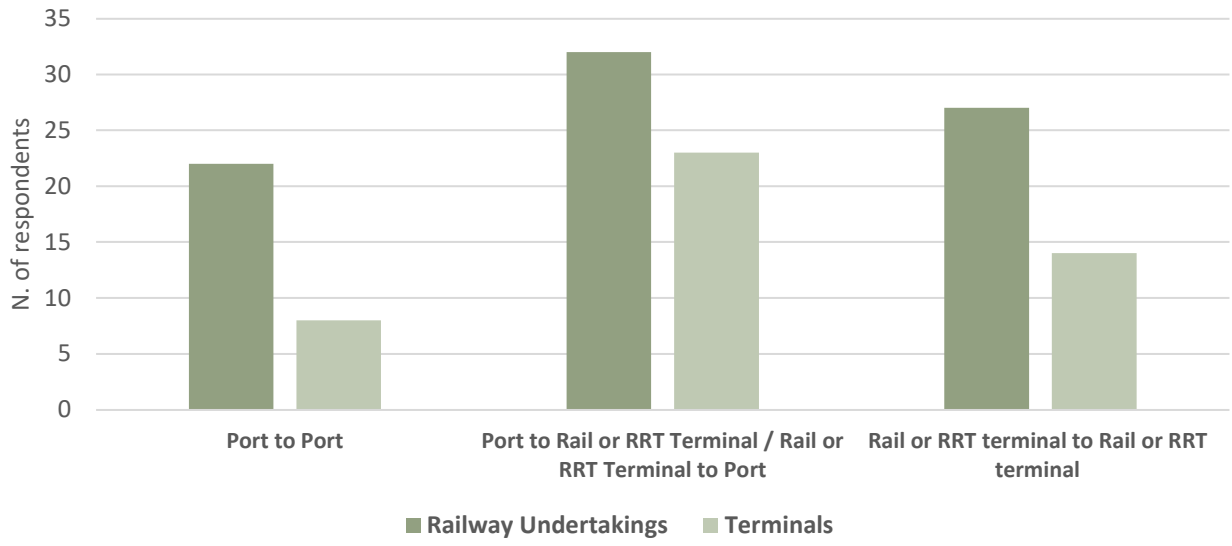
Most RUs and terminal operators experienced growth in intermodal train operations in the past years (Figure 80 and Figure 81), whereas the trend for conventional block and single wagonload trains is predominantly stable. Most respondents have a positive expectation for the future in terms of traffic growth for all market segments.

Figure 81 Experienced and expected traffic trend on the type of trains served at terminals crossing at least one border crossing point(s) in any RFCs



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

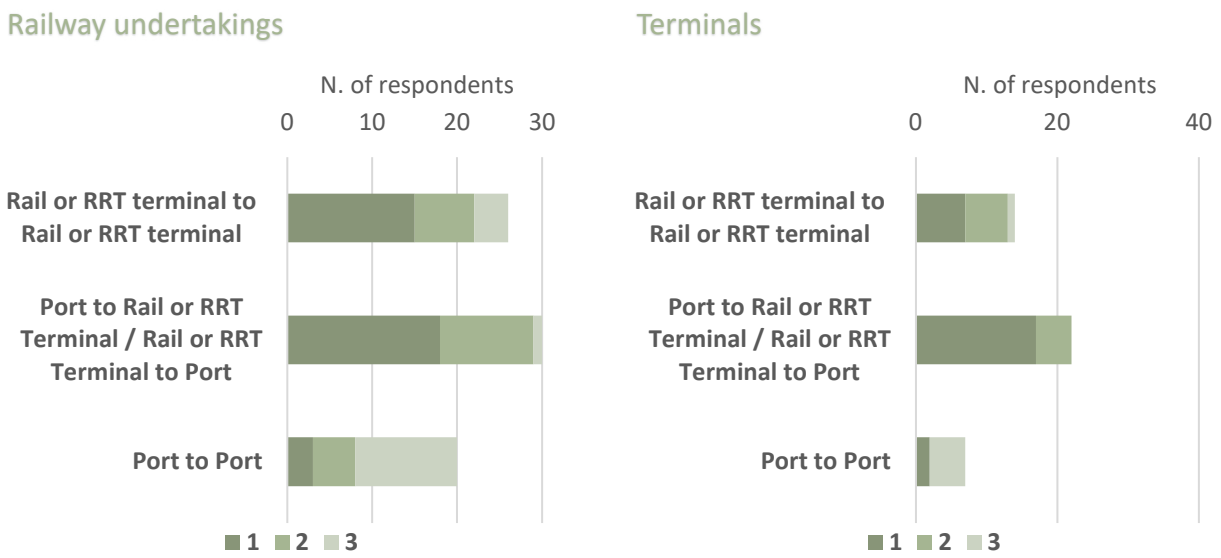
Figure 82 The type of O/Ds of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) on any RFC



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

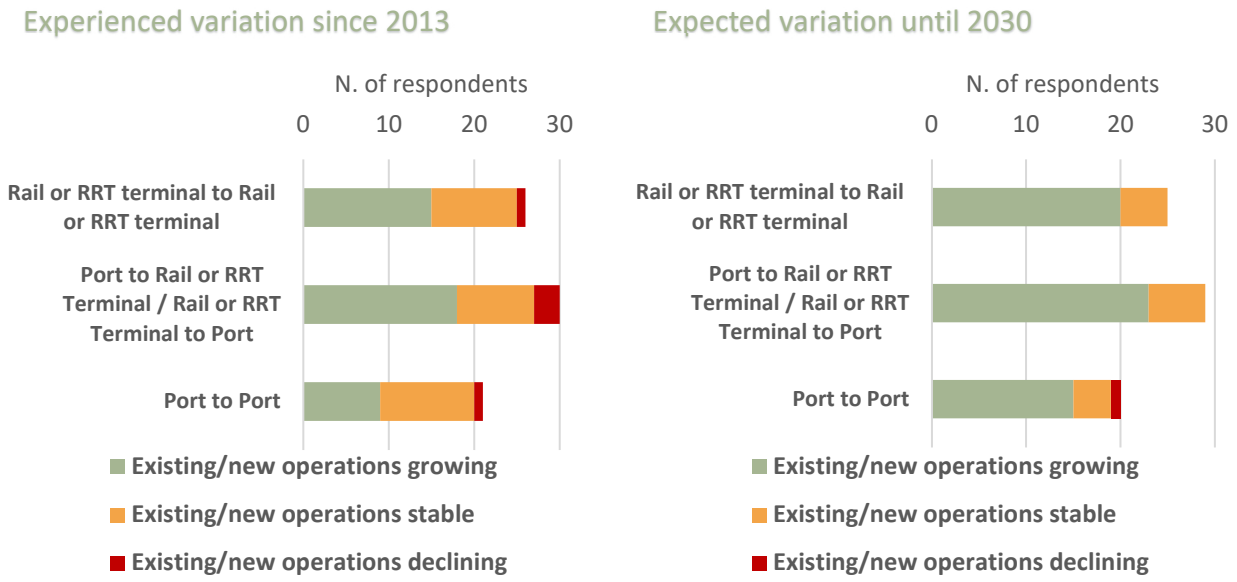
Most operations relate to Port to Rail-Road Terminal (RRT) transport, followed by RRT to RRT services and Port to Port operations (Figure 82 and Figure 83).

Figure 83 Ranking of the types of O/Ds of the trains operated by RUs or served at terminals crossing at least one border crossing point(s) on any RFCs



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

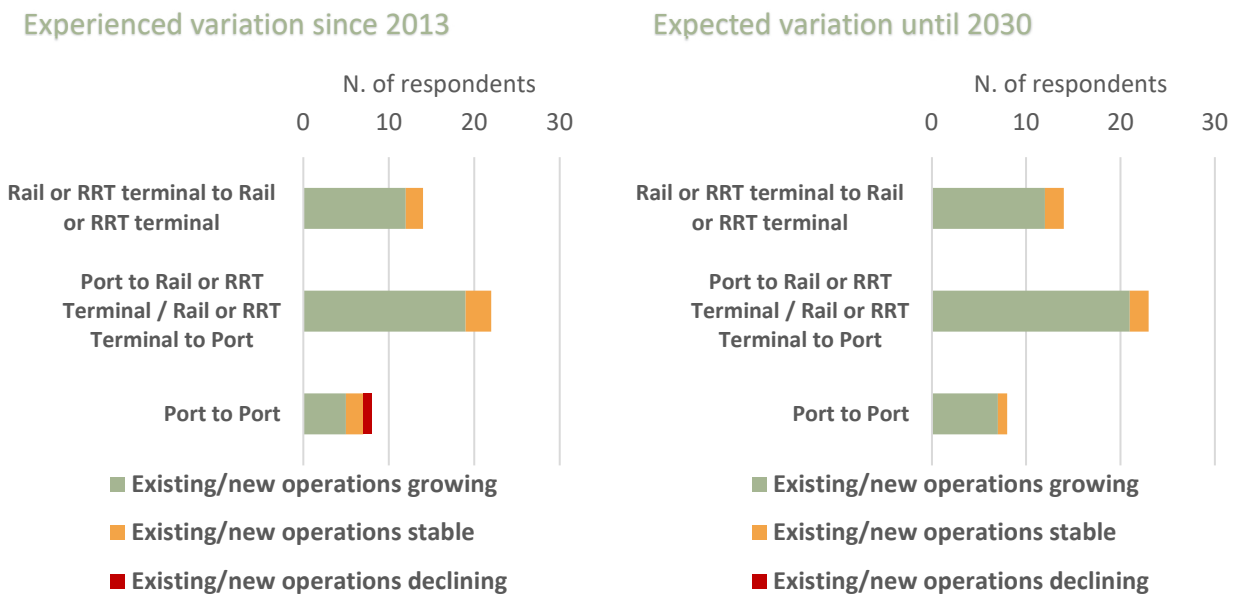
Figure 84 Experienced and expected traffic trend on the type of O/Ds of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



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

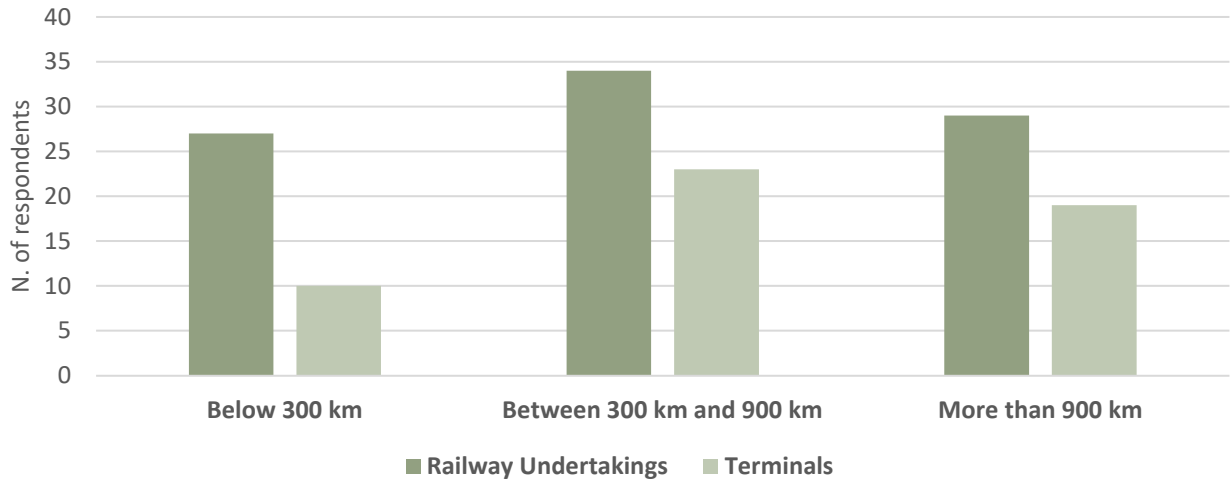
Experienced variations by RUs were mostly positive for the Port to RRT or RRT to RRT segments and stable for the Port to Port one (Figure 84). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure 85). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments (Figure 84 and Figure 85).

Figure 85 Experienced and expected traffic trend on the type of O/Ds of the trains served at terminals crossing at least one border crossing point(s) in any RFCs



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

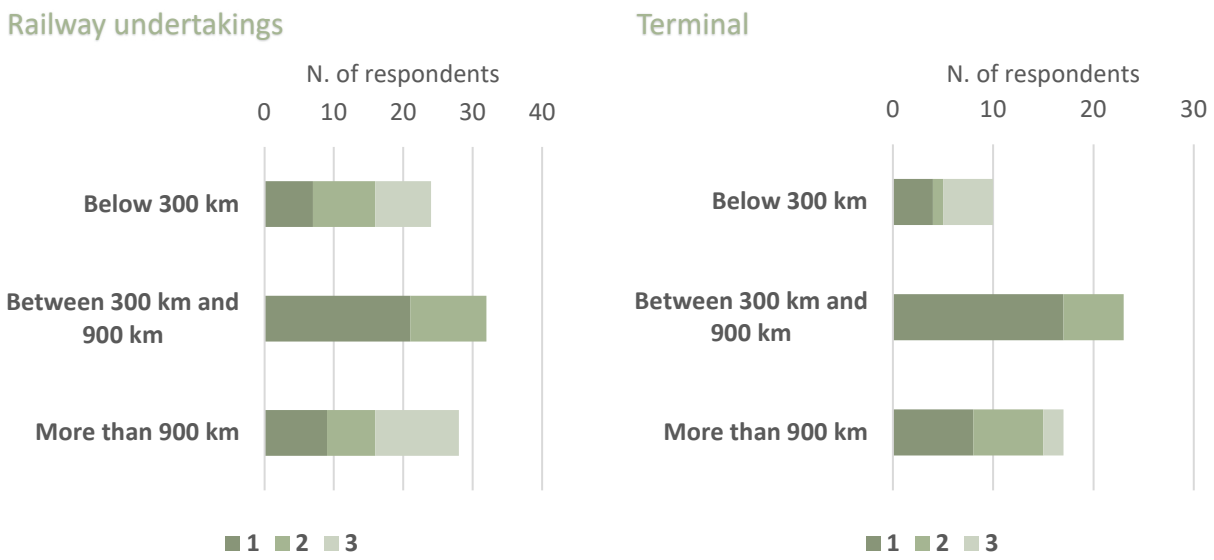
Figure 86 Type of distances of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



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

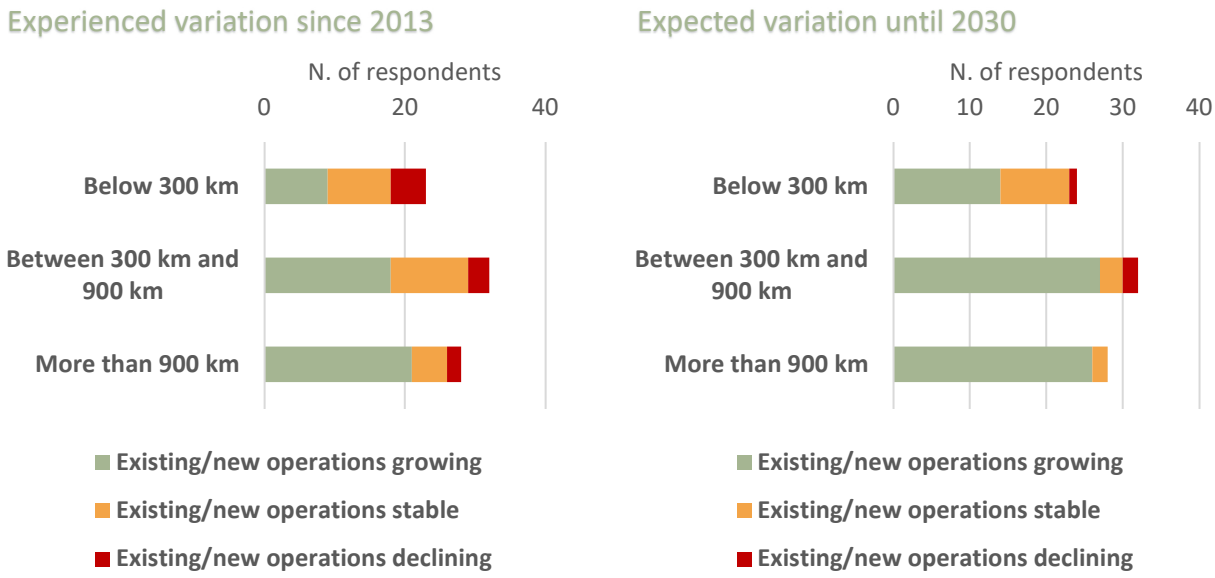
Most international train operations cover distances between 300 km and 900 km, followed by services covering distances longer than 900 km and below 300 km (Figure 86 and Figure 87).

Figure 87 Ranking of types of distances of the trains operated by railway undertakings or served at terminals crossing at least one border crossing point(s) in any RFCs



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

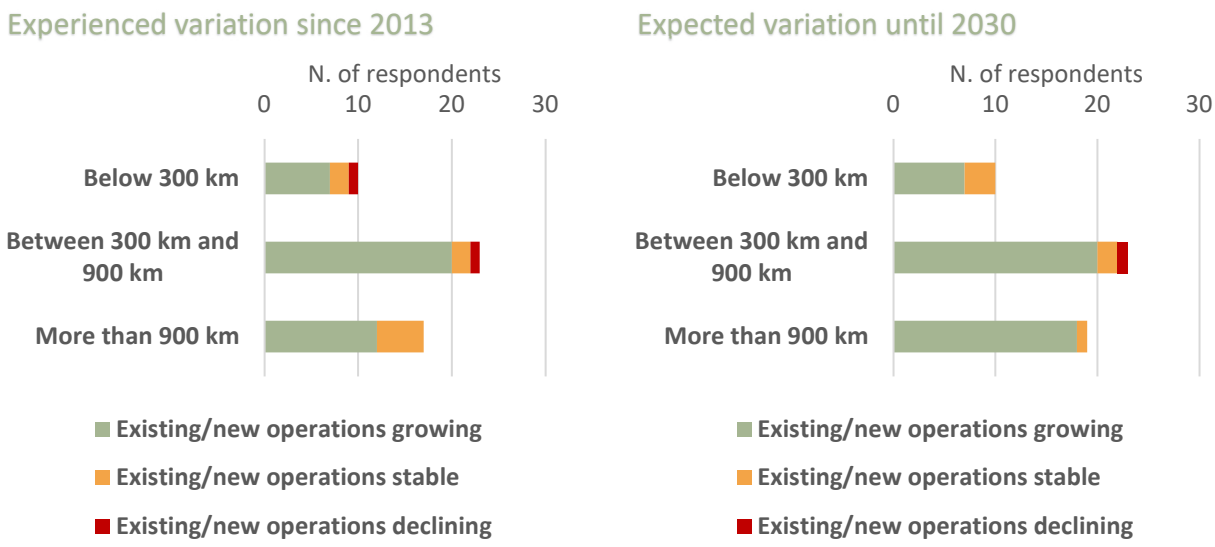
Figure 88 Experienced and expected traffic trend on type of distances of the trains operated by RUs crossing at least one border crossing point(s) in any RFCs



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

RUs experienced mostly positive variations for services covering distances longer than 300 km and declared the market is stable for operations below 300 km (Figure 88). Terminal operators have predominantly experienced growing trends in all market segments in the past years (Figure 89). The vast majority of RUs and terminal operators are expecting positive future trends for the three market segments.

Figure 89 Experienced and expected traffic trend on type of distances of the trains or served at terminals crossing at least one border crossing point(s) in any RFCs

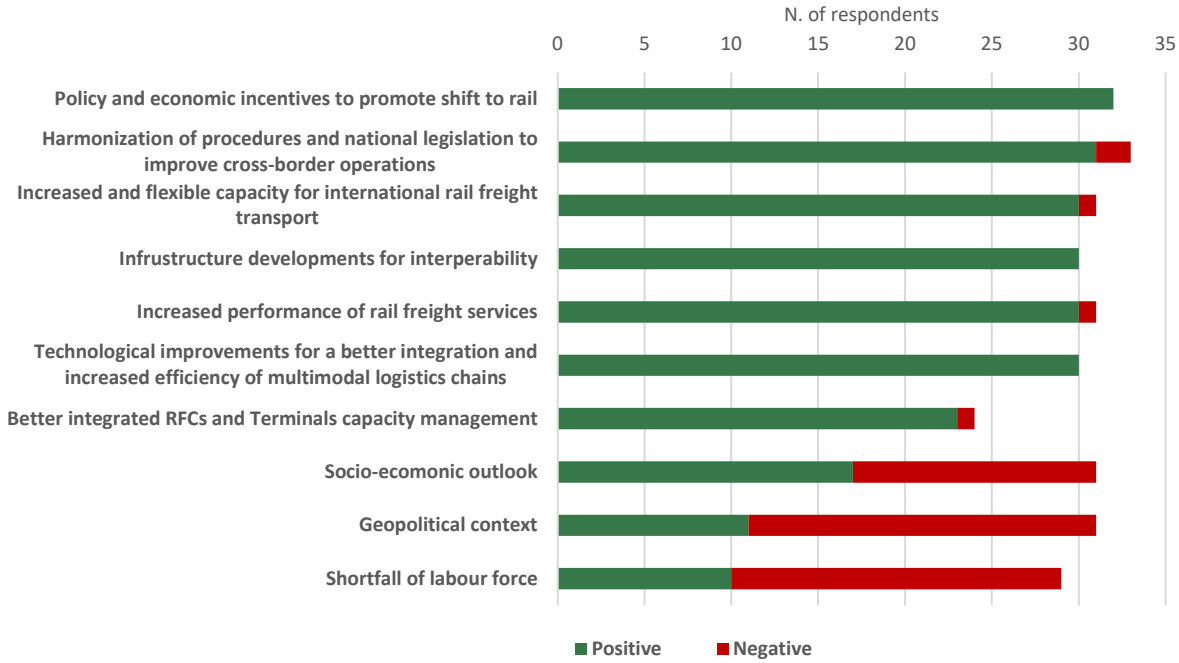


Source: 2023 11 RFCs Joint TMS Update; Notes: Questions C) 6.T

6.3 MARKET DRIVERS

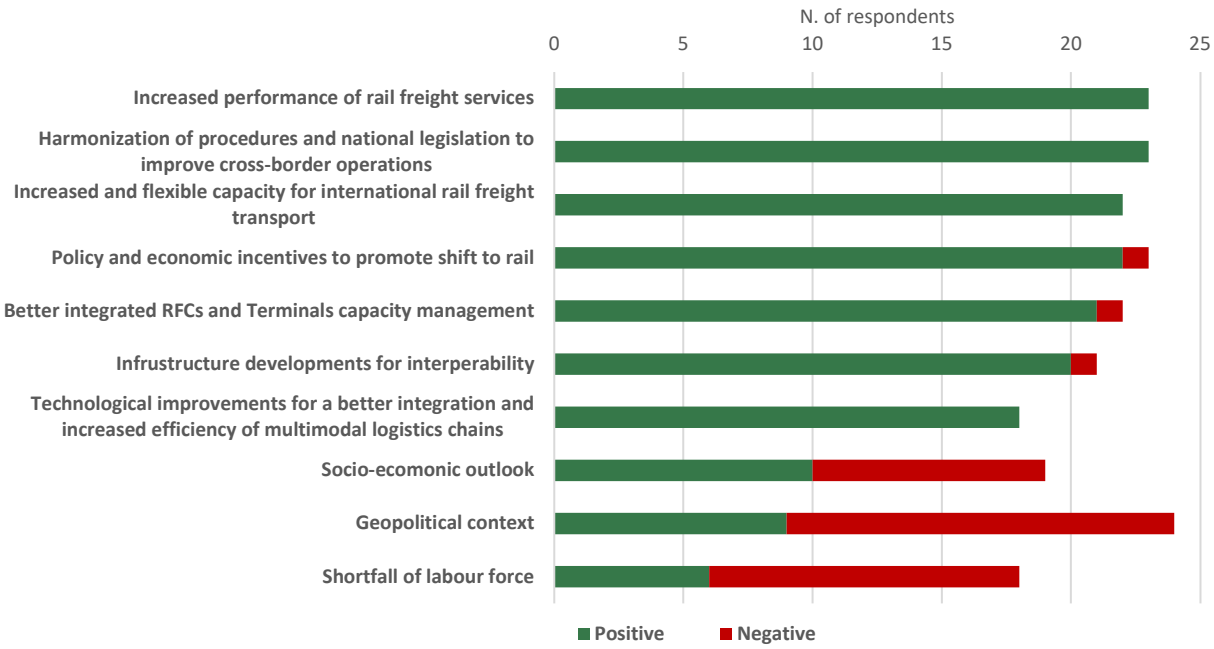
RUs and terminal operators have very similar views about the effects of the main market drivers on the growth of international rail freight transport in the short term, i.e., up until 2030 (Figure 93 and Figure 94). Most identified drivers are expected to have positive effects as they are assumed to 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 90 Potential effect of market drivers on the evolution of international rail freight transport operated by RUs until 2030



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

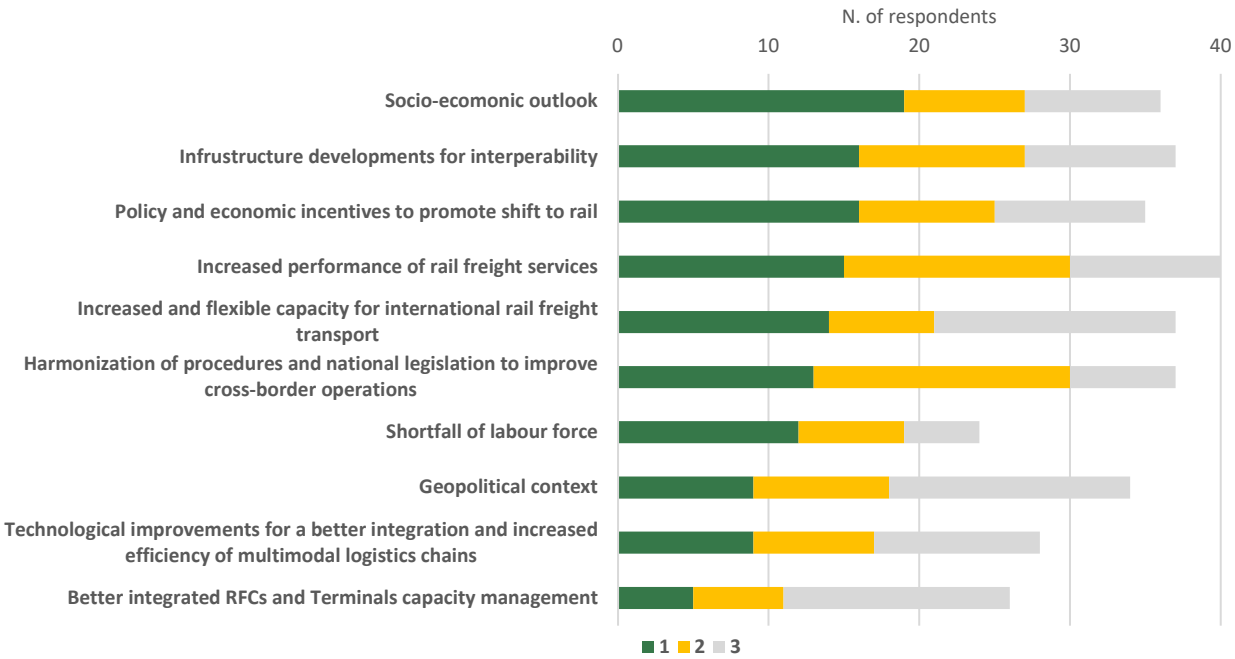
Figure 91 Potential effect of market drivers on the evolution of international rail freight transport served at terminals until 2030



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

Market players rank as most relevant market driver the socio-economic outlook (Figure 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 92 Ranking of the most relevant short-term market drivers for RUs and Terminals



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

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

7 CONSIDERATIONS AND REMARKS ON FACILITATING AND STRENGTHENING RAIL FREIGHT MARKET ALONG THE 11 RFCS NETWORK AND THE RFC MED

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[22] 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[23]. 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

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

of zero-emission powertrains (further to improving driver comfort and safety). The proposal also provides clarity on the use in cross-border traffic, in certain conditions, of heavier and longer vehicles than allowed today in some Member States. This includes clarifying that Member states who allow European Modular Systems (EMS) in their territories will also be able to use them in international operations among the neighbouring Member States, without a need for a bilateral agreement and without a restriction of crossing only one border. As a 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[24], 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 36 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

[24] 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

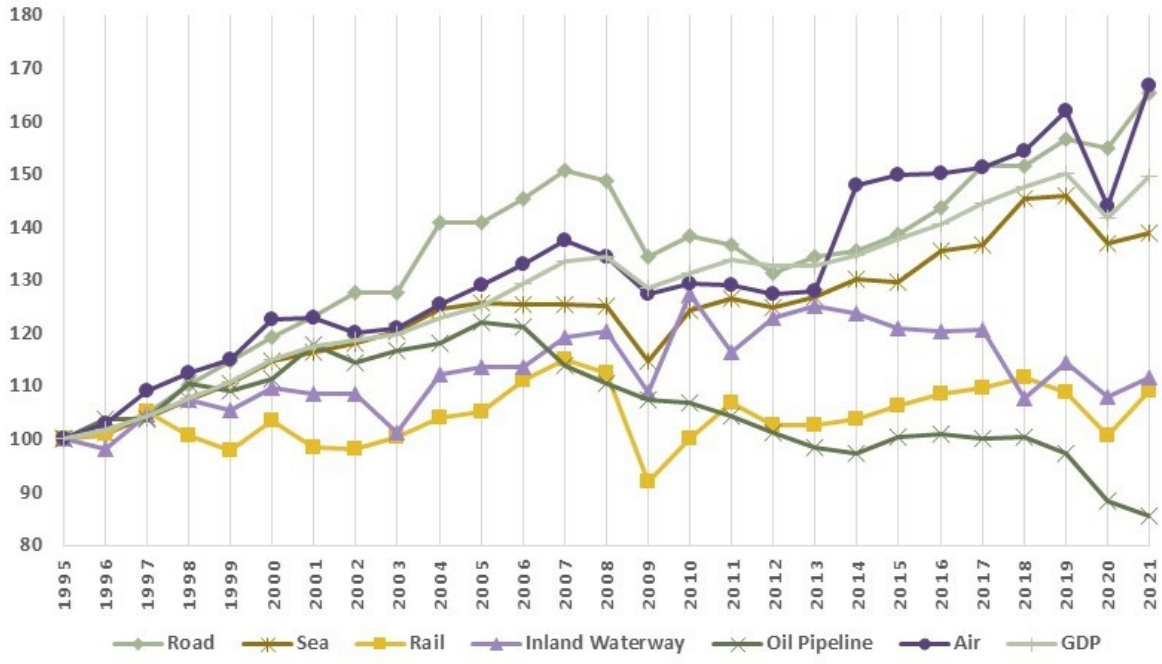
7.1.1 THE RAIL FREIGHT MARKET IN EUROPE AND ON THE RFC MED

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

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

Transport trends in billion tkm EU27 (1995=100)



Source: EC – DG MOVE – Statistical Pocketbook 2023

- Rail freight transport between 2013 and 2021 marginally grew in the EU27 from about 385 billion tkm to 410 billion tkm, i.e. 7%, which is only half 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 MED concerned countries are similar to the EU ones, specifying that the growth of rail freight transport registered higher rates. In the RFC MED concerned countries, rail freight transport grew indeed from about 76 to 90 billion tkm, i.e. 18%.
- The rail modal share varies significantly among the RFC MED countries. It is over 25% in Hungary and Slovenia, it is around 3-4% in Croatia, France and Italy. It is less than 1% in Spain, primarily due to the Iberian track gauge. The market share seem to be stable over time with positive marginal increases in Hungary and Slovenia. At both EU 27 and RFC MED 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.
- 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. The RFC MED 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-Ukrainian war in 2022. In fact, EU sanctions implemented with Belarus and Russia following the start of the Ukrainian conflict 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 MED concerned countries, the trend of the market share by domestic incumbents continued to decline in the period 2013-2021. In the RFC MED concerned countries, the market share of the domestic incumbent in 2021 was about 60% on average, 70% considering national and international incumbents.

Analysis of the current and future freight transport market

As part of the 2024 Joint TMS Update, an analysis of the current and future market has been done using an EU-wide NEAC model, combining transport and economic statistics at the EU scale with rail traffic data available from RNE databases. 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 MED amounts to 147 million tonnes, transported by road, rail, inland shipping and sea shipping. Overall, most transport concerns both cargo type *Other* (52%, 76 million tonnes) and *Dry bulk* (37%, 54 million tonnes). On relations within the catchment area of RFC MED, rail freight transport has a share of 24% in the total amount of international freight transport. This is a volume of 36 million tonnes. The total amount of international rail freight transport of 36 million tonnes relates to approximately 40,000 trains within the corridor area of RFC MED.

Looking at the corridor area of the RFC (rail transport to and from relations within the corridor area only), rail transport amounts to 9 million tonnes. This is equivalent to approximately 10.000 trains from and to locations within the corridor area of the RFC MED (which is 25% of all rail transport in the RFC MED).

The most important rail transport origins and destinations can be found in locations such as Barcelona, Montpellier, Koper, Budapest, Western Transdanubia, Lyon, Adriatic Croatia, and Trieste. The ports of Barcelona, Koper and Trieste serve as a gateway to the hinterlands in the RFC MED. Both ports have overlaps in their hinterlands. The most important rail transport relations however are between inland locations and not between ports and hinterland.

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 MED specifically. Mainly due to autonomous economic growth, the increase in general is about 13%, in the RFC MED slightly more at 14%. This is in line with the GDP growth for the EU27 which is 17%. In the RFC MED, inland shipping shows a growth of 24%, road and rail have a growth of 14%, and sea shipping 11%. In the absence of further developments, the rail freight market is expected to grow at the same pace compared to GDP and to the overall transport sector, therefore keeping its market share. For all land freight transport, the Projects scenario and the sensitivity scenario have an impact on the overall growth of international freight transport, especially in the RFC MED.

In the RFC MED, for the Reference scenario, a growth of international rail transport is expected at 14%, which is approximately 5 million tonnes extra compared to the 2022 situation (from 36 to 41 million tonnes). This would be (rounded) 5,000 extra international freight trains in the RFC MED (from 40,000 to 45,000 trains). *Within the corridor area* of the RFC MED (to and from locations within the corridor area) in 2022 the total amount of unique international freight trains is estimated at about 10,000. The total number of international trains would then be some 11,000 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 2% compared to the reference scenario. In total it is estimated that this is approximately 1 million tonnes of extra international rail freight transport (from 41 to 42 million tonnes). This gives (rounded) 1,000 extra trains in the RFC MED. Together with the Reference scenario results, this would be approximately 45,000 trains for the RFC MED.

The Sensitivity scenario shows that there is another potential of 6 million tonnes rail freight transport (from 41 to 47 million tonnes) due to longer trains, ERTMS, and standard gauge in Spain and Portugal. The total number of unique international freight trains would then be around 45,000. Compared to the 40,000 unique trains in 2022, this is a growth of around 13%.

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 36 to 47 million tonnes i.e. by 31%, 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 competitivity of rail transport on the 11 RFCs Network, and thus on each RFC, including the RFC MED. Further to these projects, completing an interoperable network in line with the TEN-T requirements is key to increase the rail market share. This is particularly important for the RFC MED, as the market growth potential of this corridor is currently hampered by the Iberian track gauge.

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 36) and expected for the time frame 2023-2030 (+31%) still lags below the target. Therefore the development of a high-quality 11 RFCs Network in line with TEN-T standards does not seem to be sufficient to achieve the ambitious targets set in the relevant European transport policies; an outcome that would hardly change even assuming that additional mega cross-border projects would be completed like Turin-Lyon tunnel.

Such targets remain challenging to meet in the absence of a significant change in the structure of the costs of road and rail transport. Internalising external costs of road transport and/or incentives to reduce the costs of rail transport might be needed. The potentially negative impact on the rail market share of measures such as improving the efficiency of road transport shall also be considered, as also reported in a recent study by the Community of European Railway and Infrastructure Companies (CER) – *Study on Weights and Dimensions: Impacts of the Proposed Amendments to the Weights and Dimensions Directive on Combined Transport and Rail Freight Transport*[25]. Market opening appears also to be relevant in increasing the competitiveness of rail transport. A recent study by the European Rail Freight Association (ERFA) – *The European Rail Freight Market; Competitive Analysis and Recommendations*[26] – considers how non-incumbent operators, 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 to road, which can be partially explained by the business model of the 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.

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 and their alignment was adjusted over time to 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. The survey involved the Railway Undertaking Advisory Groups (RAGs) and Terminal Advisory Groups (TAGs) of the 11 RFCs. In total, 42 representatives of the RAGs and 30 members of the TAGs submitted valid questionnaires between September 2023 and January 2024.

The survey was conducted to collect the opinion of the 11 RFCs market on three main areas: occurred and expected impact of the RFCs, occurred and expected market developments along the RFCs, and market

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

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

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

Occurred and expected market developments

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

- The variation in traffic experienced by RUs and terminal operators since 2013 is positive for the RFC MED. 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 corridors and terminal capacity management do not seem to be considered priority issues by the RUs and terminal operators.

7.2 STUDY RECOMMENDATIONS ON FACILITATING AND STRENGTHENING THE RAIL FREIGHT MARKET ALONG THE 11 RFCS AND THE RFC MED

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 an 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. Also, in line with the findings from the previous RFC MED TMS, these measures seem to be particularly important to support competitiveness and growth of rail freight transport along the RFC MED.
  - *Support intermodal and combined transport*. The intermodal market is the most promising international rail freight market segment, requiring improvement of interconnectivity between main railway lines and terminals, increasing the capacity of the existing terminal infrastructure, investing in technologies to facilitate and speed up transport and transhipment operations, and tracking and making more reliable the transport of intermodal units along logistics chains and within logistics clusters.
  - *Stronger cooperation between all involved parties for better effectiveness in the availability and the use of funds and the definition of investment implementation strategies focussed on those*

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

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

Institutional and operational developments

Recommendations on institutional and operational developments are formulated as follows, according to the findings from the market consultation (2023 11 RFCs Joint TMS Update Survey), conducted as part of 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 identifies new operational requirements, related to punctuality and dwell times at borders. Furthermore, some infrastructure requirements also depend on operations, such as 740 meter long trains. Investing in infrastructure, albeit needed, is long-lasting and capital-intensive. The competitiveness of international rail freight transport also depends on the improvement of cross-border operations and integrated/coordinated planning and management of the rail network at a European scale. An RFCs common KPI framework is already in place, and RNE is also already monitoring infrastructure KPIs, as also graphically represented in CIP. Such activities might be continued in the light of the new set of requirements foreseen in the TEN-T Regulation (EU) 1679/2024, and RFC governance structure, also defined in the Art. 67 of this regulation.

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

- *Balance network and corridor governance approach*. The analysis of the RFC catchment areas shows that international trains using at least one corridor BCP may actually use more than one RFC. A network approach is more fitting to the planning and management of the network capacity. Geographical specificities and logistics clusters and chains exist that still make the corridor concept useful, especially to support discussion and coordination among IMs and Member States and for a customer-oriented approach aimed at involving RUs and Terminal Operators. This consideration also seems to be in line with the opinions expressed by the 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, Ukraine war or pricing at both European and national level. These are typically topics that play an important role in shaping the future of Europe. Scenarios for the Green Deal or the EU Reference 2020 scenario are used to look at the impact.

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

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

ANNEX 2 – 2023 11 RFCS JOINT TMS SURVEY COMPLETE RESULTS

This annex is enclosed as a separate file.