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IMPACT ASSESSMENT REPORT

Accompanying the document

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

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Glossary

Term or acronym	Meaning or definition
CEF	Connecting Europe Facility
ENIM	European Network of Infrastructure Managers
ENRRB	European network of rail regulatory bodies
FTE	Full-time equivalent
GHG	Greenhouse gases
IM(s)	Rail infrastructure manager(s)
IRG-Rail	Independent Regulators' Group - Rail
Network Coordinator	Operational entity supporting the European Network of Infrastructure Managers
One-stop shop	A joint body for applicants to request and to receive answers, in a single place and operation, regarding infrastructure capacity for freight trains crossing at least one border along a rail freight corridor
OPE TSI	Technical specification for interoperability relating to rail operations and traffic management. See also TSI(s) below.
PaP(s)	Pre-arranged train path(s). Rail infrastructure capacity primarily allocated by the rail freight corridors via one-stop shops.
PCS	Path Coordination System (IT tool for capacity management of RailNetEurope)
PSO(s)	Public Service Obligations are State-supported public passenger transport services that transport companies would not provide on their own initiative for lack of economic viability.
Recast Directive	Directive 2012/34/EU establishing a single European railway area
RFC(s)	Rail freight corridor(s) as established under Regulation (EU) 913/2010
RFC Regulation	Regulation (EU) 913/2010 concerning a European rail network for competitive freight
RINF	EU Register of railway infrastructure. A web-based

Term or acronym	Meaning or definition
	application acting as a single entry point for the publication of Member States' infrastructure information.
RMMS	Rail market monitoring report
RNE	RailNetEurope
RU(s)	Railway undertaking(s)
SERA	The Single European Railway Area is a comprehensive EU approach to railways aimed at achieving a single EU market for railway services, implemented by Directive 2012/34/EU, which includes, *inter alia*, EU rules for the management of railway infrastructure, the provision of railway services, the coordinated management of railway infrastructure and traffic, as well as regulatory supervision of rail stakeholders and services.
SSMS	Sustainable and smart mobility strategy
TAF TSI	Technical specification for interoperability relating to telematics applications for freight services. See also TSI(s) below.
TAP TSI	Technical specification for interoperability relating to telematics applications for passenger services. See also TSI(s) below.
TCR(s)	Temporary capacity restriction(s) of the availability or the parameters (e.g. reduced speed or train length) of rail infrastructure, due to planned works
TEN-T	Trans-European Transport Network
TEN-T Regulation	Regulation (EU) No 1315/2013 on Union guidelines for the development of the trans-European transport network
TIS	Train Information System (RailNetEurope's IT tool for traffic management)
Tonne-kilometre, tkm	A unit of measure of freight transport which represents the transport of one tonne of goods (including packaging and tare weights of intermodal transport units) by a given transport mode (road, rail, air, sea, inland waterways, pipeline etc.) over a distance of one kilometre.
TPS	Train Planning System – an IT tool of the company Hacon used, inter alia, for constructing timetables

Term or acronym	Meaning or definition
TSI(s)	Technical specifications for interoperability are technical and operational standards, which must be met to allow the safe and uninterrupted movement of trains
TTR	'Timetable Redesign for Smart Capacity Management' project
UIRR	International Union for Road-Rail Combined Transport

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

This impact assessment accompanies a legislative proposal amending the rules for rail infrastructure capacity allocation and rail traffic management[1] for domestic and cross-border passenger and freight trains with the purpose of improving the performance of railway transport, particularly of cross-border trains.

1.1. Political context

Transport by railway is an environmentally friendly mode of transport. In 2020, it performed 5.1% of intra-EU passenger transport and 11.5% of intra-EU freight transport while being responsible for only 0.4% of transport greenhouse gas emissions in the EU[2]. This can be explained by the energy efficiency of rail transport – which accounts for only 1.5% of transport energy consumption – and by the fact that most train kilometres are performed on electrified lines[3]. In view of these and other favourable characteristics, such as its high level of safety, EU policy consistently promotes railway transport.

Several Commission strategic policy documents refer to the general objective of boosting freight and passenger railway transport, as well as to the need to address specific aspects that are relevant to railway performance. One of these aspects is the management of capacity of and traffic on the rail network, which is the topic of this initiative.

The **European Green Deal Communication**[4] confirmed the EU's goal of achieving climate neutrality by 2050 and the need to reduce transport emissions by 90% by 2050. It called for a strong boost to multimodal transport and for a substantial part of the 75% of inland freight carried today by road to shift onto rail and inland waterways, recognising that this '…will require measures to manage better, and to increase the capacity of railways…'. The **sustainable and smart mobility strategy**[5] referred to the need to strengthen cross-border coordination and cooperation between rail infrastructure managers, to have a better overall management of the rail network and to deploy new technologies to boost rail freight. In the strategy, the Commission announced that it would propose improved rules on rail capacity allocation in line with the ongoing rail sector initiatives. In the **action plan to boost long distance and cross-border passenger rail**[6], the Commission further detailed its intentions by announcing that it would work on an initiative to improve capacity allocation and traffic management processes, aiming at better coordination of the capacity allocation within the overall rail system, covering passenger and freight services.

The initiative contributes towards Sustainable Development Goal 13 ('Take urgent action to combat climate change and its impacts') by contributing to the increased availability of rail – an environmentally friendly mode of transport.

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1 For the purpose of this document, 'capacity allocation' refers to the attribution of train paths to railways transport operators up until a few days ahead of the train operation, while 'traffic management' means all actions, in particular allocation and amendment of train paths, carried out by infrastructure managers close to or during the train operation, with the purpose of ensuring the safe and smooth circulation of trains on the rail network.

2 Source: Statistical pocketbook 2022, EU transport in figures - Publications Office of the EU (europa.eu).

3 COM(2021) 810 final of 14 December 2021.

4 COM(2019) 640 final of 11 December 2019.

5 COM(2020) 789 final of 9 December 2020.

6 COM(2021) 810 final of 14 December 2021.

1.2. Interaction with other EU policy instruments

This initiative complements other measures that aim to reduce emissions from transport and promote the use of more sustainable modes including railways, like the introduction of carbon pricing on road transport and the facilitation of multimodal travel via better ticketing. Together with measures that improve the performance and attractiveness of railway transport – such as the implementation and enforcement of the Single European Railway Area and the ongoing work on technical specifications for the interoperability of the railway system – all these initiatives contribute to boosting demand for railway transport, which, however, the railway network must be capable of accommodating.

The present proposal will help to ease congestion and generate additional capacity on the existing network. In parallel, the proposed revision of the TEN-T Regulation[7] creates the conditions for expanding and improving transport infrastructure, building an effective EU-wide and multimodal transport network.

1.3. Legal context

Directive 2012/34/EU[8] establishing a single European railway area (hereafter 'the Recast Directive') sets up the Union's legal framework for the Single European railway area. In particular, it lays down the rules on: i) the management of railway infrastructure and the activities of the railway undertakings; ii) the licencing of railway undertakings; and iii) the principles and procedures applicable to railway infrastructure charges and to the allocation of railway infrastructure capacity. The latter part, which provides the general framework for allocation of network capacity, is directly relevant to the present initiative.

Regulation (EU) 913/2010[9] concerning a European rail network for competitive freight (hereafter 'the Rail Freight Corridors Regulation' or 'the RFC Regulation') intends to address the specific needs of rail freight and constitutes a *lex specialis* for freight. Based on it, Member States established 11 rail freight corridors including lines crossing the territory of at least two Member States and linking two or more terminals (see Figure 23 in Annex 5). The RFC Regulation provides for a dedicated governance structure of these corridors and for special rules on capacity management and allocation, including the use of a one-stop shop for capacity requests. Corridor one-stop shops are another key feature of the RFC Regulation whose objective is to provide railway undertakings and other applicants with a single point of contact for the submission of requests for capacity on corridors spanning more than one network.

1.4. Economic context

The technical characteristics of rail imply that the capacity of and the traffic on the rail infrastructure must be managed at network level by a single actor to ensure the high level of coordination needed for safe operations and efficient use of the network[10]. The management and operation of rail infrastructure thus constitutes a natural monopoly that

[7] COM(2021) 812 final of 14 December 2021.

[8] Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area (OJ L 343, 14.12.2012, p. 32).

[9] Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight (OJ L 276, 20.10.2010, p. 22).

[10] This must be done throughout different stages: long and medium-term strategic planning; short-term definition of the timetable; real-time dispatching of trains and management of train circulation.

requires detailed regulation and oversight, as provided in EU legislation. These tasks are assigned to rail infrastructure managers (IMs), who supply rail infrastructure services to railway transport operators.

The provision of rail transport services, on the contrary, has been liberalised in a gradual manner since 2007[11]. The operators of railway transport services, referred to as 'railway undertakings' (RUs), benefit from open and non-discriminatory access to the railway infrastructure and compete not only in the market for transport of passengers and freight, but also with respect to access to the network. Availability of train paths is indispensable for the provision of RUs' services, but network capacity is a scarce resource, since not all train paths are of equal quality and certain lines are congested.

The quality of infrastructure services provided by IMs has direct and significant impacts on the performance and quality of rail transport services. Poor management of capacity does not fully exploit the network and limits the volume of transport services that RUs can offer. Poor management of traffic implies longer times to return to normal operations after any deviation from the plan and results in unnecessary delays to transport services.

Rail infrastructure capacity availability, quality and issues differ between EU regions and Member States. These differences reflect geographical, topographical and historical circumstances and transport policy decisions about developing and using rail. To begin with, the density of the rail network differs considerably between Member States and a clear difference is noticeable between the central and peripheral regions of the EU, with the former having a denser network (see Annex 5, Figure 21). Traffic density also differs considerably, as does the predominant use (domestic vs cross-border and passenger vs freight) as shown by the data in Annex 5,section 10. Whereas passenger traffic is dominated by domestic services, freight is split almost in equal parts between domestic and cross-border.

The rail freight market can be better analysed by dividing it into three broad segments: block trains, intermodal trains, and single wagon business. The market share of these different market segments depends on economic structure of a Member State or a region and in particular on the presence of heavy industry, which is a traditional user of rail freight.

A block train transports many wagons carrying a single, generally bulky, commodity between two sidings. These are the trains that typically carry metal ores, coke, coal and lignite, basic metals, chemicals, agriculture products, and wood. To a large extent this is a captive and profitable market since road transport does not represent a viable alternative. It is, however, a slowly declining market considering the progressive dematerialisation of the economy.

Intermodal trains carry intermodal loading units, such as containers or semi-trailers, between transhipment terminals. There is no available data on what is being transported in the units, but this is the segment that competes more directly with road transport. It is also a segment that is growing strongly. Data indicates that intermodal rail freight has grown

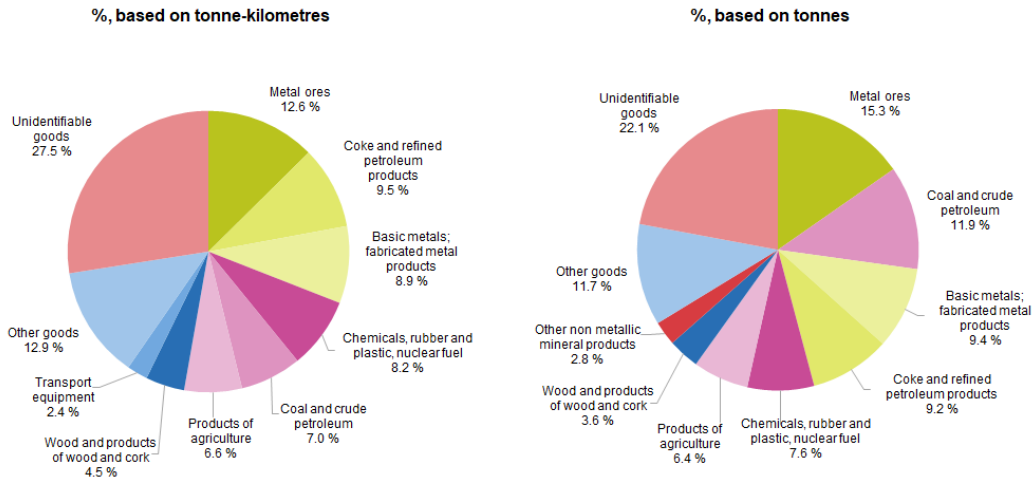
[11] Rail freight transport has been completely liberalised in the EU since 2007, for both national and international services. The EU market for rail passenger services has been liberalised since 2010 for international services and since 2019 for domestic services.

by over 50% in tonne kilometres in the period 2011-2021[12] and its share expressed in rail freight tonne kilometres in the EU is growing steadily. The greater the distance that goods must travel, the greater the advantage of rail with respect to road-only transport. The break-even point is generally considered to be at 300-400 km.

Single wagon load trains are long distance trains that are assembled from various locations and then distributed to various destinations. The need to accompany these trains with feeder and distribution traffic, and the time and complexity of the shunting operations, makes them particularly costly and generally unprofitable. This segment is declining sharply, although there are technologies that could greatly reduce the cost of shunting operations (digital automatic coupling) and could revive this market sector.

The main types of goods transported by rail in 2021, based on tonne-kilometers, were 'metal ores and other mining and quarrying products; peat; uranium and thorium' (12.6%), 'coke and refined petroleum products' (9.5%), 'basic metals; fabricated metal products, except machinery and equipment' (8.9 %), and 'chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel' (8.2%). In terms of weight (in tonnes), the main type of goods transported were 'metal ores and other mining and quarrying products; peat; uranium and thorium' (15.3%), followed by 'coal and lignite; crude petroleum and natural gas' (11.9%), 'basic metals; fabricated metal products, except machinery and equipment' (9.4%), 'coke and refined petroleum products' (9.2%), and 'chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel' (7.6%). Unidentifiable goods, which can be assumed to be indicative of the volume of traffic for intermodal trains, represented the highest share of 27.5% of the total measured in tonne-kilometres and 22.1% of the total measured in tonnes, as shown in Figure 1[13].

Figure 1: Rail freight transport by type of goods



Note: data for Belgium are not included.
Source: Eurostat (online data code: rail_go_grpgood)

[12] UIC Freight Department, 2022 Report on Combined Transport in Europe, January 2023 (https://uic.org/IMG/pdf/2022_report_on_combined_transport_in_europe.pdf). Analysis based on Eurostat data.

[13] Railway freight transport statistics - Statistics Explained (europa.eu)

There are strong differences in the Member States in the relative size of these segments, which largely reflect the structure of the economy.

Rail transports some 1.6 billion tonnes of freight and 7.1 billion passengers every year in the EU[14]. National transport represents more than 90% of the total rail passenger transport traffic for all EU Member States, with a few exceptions (e.g. Luxembourg and Lithuania close to 70%, Austria with 77% and Slovenia with 80%) (see Annex 5, section 10, Table 80). For freight, at EU level the share of national transport is more or less half of the total freight (2018 figures indicating domestic traffic at 48% of total rail freight, see Annex 5, section 10, Table 81). At Member State level, countries that registered the highest shares of cross-border rail freight are located on key corridors within the European market and have a relatively small territory (Slovenia, the Baltic Member States, Denmark, Slovakia, etc.). The Netherlands, strategically situated in the heart of the European market, has a share of over 80% of cross-border freight measured as share of the total tonne-kilometres. The key port of Rotterdam, with large sea/rail transfers of goods dispatched within the EU, is one of the main driver for this large share. The Baltic States, and in particularly Latvia and Estonia, also have a very high share of cross-border rail freight above 90% (Annex 5, section 10, Table 81). The network in the Baltic States has the Russian track gauge and not the European standard gauge, which means that until now the vast majority of the rail transit freight traffic flows in the Baltic States originated in Russia and Belarus[15].

The EU rail network consists largely in mixed-use lines that serve different passenger and freight transport markets on the same infrastructure. The key exception are high-speed lines which are used exclusively for long-distance in some Member States and some freight-only lines in industrial regions and logistics hubs. The construction of new rail infrastructure has differed significantly between Member States as do the resources dedicated to maintenance and renewal of the network.

In terms of differences between different EU regions, it should be noted that the regional distribution of railway infrastructure is shaped by specific historical developments, economic developments and the geographical characteristics of regions. For example, some large EU Member States that have considerable distances between major cities have developed high-speed rail infrastructure (e.g., Germany, Spain, France and Italy). Some of the Member States that are more densely populated, such as Belgium or the Netherlands, have a higher frequency of (generally less rapid) trains. Several eastern European Member States have relatively extensive rail networks, reflecting a legacy from the communist or Soviet era when there was often a greater reliance on rail (compared with road) for transporting passengers and goods. Figure 22 in Annex 5 presents rail freight transport by NUTS2-level region in 2020 – as measured by the quantity of goods loaded. In general, the lowest levels of rail freight transport were recorded in rural and peripheral regions of the EU (where rail infrastructure was often less extensive). The highest levels of rail freight transport were in a cluster of regions centred on Germany and its neighbours. Many of these regions are characterised as manufacturing centres, where goods are loaded onto railways to be transported within the EU and also to the EU's main ports. Others, such as Hamburg and Zuid-Holland, are regions with major maritime ports, whereby goods arriving by sea are loaded onto railways to be transported to distribution and/or manufacturing centres. Based on available information, the highest levels of rail freight

[14] SWD(2021) 1 final of 13 January 2021.
[15] https://www.railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf

transport in 2020 were recorded in the German regions of Düsseldorf, Sachsen-Anhalt, Hamburg and Braunschweig (each had 26.9–29.9 million tonnes of goods loaded), as well as the Dutch region of Zuid-Holland (which includes the EU's largest port of Rotterdam; 18.9 million tonnes)[16].

As a result of demand and supply-side developments, the challenges with respect to rail infrastructure capacity differ significantly between Member States. As a general tendency, Member States in the centre and north-west of the EU have well-developed and maintained rail infrastructure but face congestion issues due to high levels of demand and limited infrastructure expansion in the last decades. By contrast, in Member States at the periphery of the EU, capacity is often abundant but the quality of the infrastructure and its management is often poor, due to deferred maintenance/renewal and a general under-financing of the rail sector. In addition, expenditure on maintenance and renewals increased in the past decade across the EU. While improving the situation in the medium to long-term, the surge in infrastructure works poses important challenges for the provision of sufficient capacity in the short term.

The total length of railway tracks that was declared congested in the EU has more than tripled between 2015 and 2020. Germany, Romania and Lithuania in particular were the Member States reporting the highest number of kilometres of freight corridors congested (620, 320 and 309 km respectively). These figures on congestion, although indicative of the different situation in terms of available capacity in different Member States, may underrepresent the scale of the problem as some infrastructure managers appear to refrain from declaring lines as congested.

This initiative consists mainly in reviewing the legal rules applicable to IMs and to the services they provide. However, since the performance of rail transport services is the combined result of the activities of all the operators involved, it will also consider providing adequate incentives to other stakeholders, in particular the RUs, to make best use of the network's capacity.

1.5. Ex-post evaluation

In 2018, the Commission produced a report on the application of the RFC Regulation[17], followed, in 2021, by an evaluation[18]. The conclusions of the evaluation are that there had been limited use of the corridors' structures and a general failure to attain the goals of the Regulation. Meanwhile, the developments during the COVID-19 pandemic – when more capacity became available to freight following the collapse of passenger transport – confirmed that there is much unexploited potential for cross-border rail freight and therefore measures to improve rail freight's access to infrastructure capacity remain relevant.

On the positive side, the evaluation found that the RFC Regulation contributed to the objective of improved cooperation, and also – but to a lesser extent – to the objective of increasing the competitiveness of rail freight in the multimodal transport system. Rail freight corridors also provided fertile ground for initiatives aiming to remove technical and operational bottlenecks, modernise timetabling, and predict train arrival times.

[16] Railway freight transport statistics - Statistics Explained (europa.eu)

[17] COM(2018) 189 final of 16 April 2018. The report was preceded by a European Court of Auditors' report (European Court of Auditors, Rail freight transport in the EU: still not on the right track, Special Report No 8, Luxembourg, Publications Office of the European Union, 2016).

[18] SWD(2021) 134 final of 2 June 2021.

The evaluation identified the following weaknesses:

- The use of one-stop shops and pre-arranged train paths was lower than expected and therefore the Regulation failed to provide better quality and more infrastructure capacity for cross-border rail freight.
- The Regulation did not harmonise tools and procedures, which were in use at national level, thus failing to facilitate cross-border rail freight.
- The contribution of the Regulation to coordinating cross-border investments was limited at best.
- The main stakeholders failed to monitor thoroughly the performance of rail freight services with a view to developing and implementing effective plans to improve performance.
- There was limited progress at best on improving traffic management and coordination with terminals.

Table 1 summarises the weaknesses identified by the evaluation and the way in which this impact assessment addresses them, together with more general improvements to the current provisions on capacity allocation.

Table 1: Summary of the conclusions of the evaluation of the RFC Regulation and links to the IA

Main ex post evaluation conclusions	Impact assessment
Conclusions on relevance	
Lack of good quality and quantity of rail infrastructure capacity for rail freight remains a key problem for rail freight's performance and stands in the way of achieving EU's policy goals.	The impact assessment analyses tools and measures to improve the quality and quantity of infrastructure capacity by improving planning, allocation procedures and traffic management.
The main tools and procedures of the Regulation that deal with rail capacity allocation are of limited relevance.	The policy options include clarifying the legal provisions to support the use of the existing tools and consider new tools for capacity management and allocation.
The Regulation is of limited relevance for addressing the different needs of rail freight in the EU, including those for high quality capacity requested at shorter notice, of a simple and applicant-friendly process of capacity allocation (covering the whole path) and of appropriate digital tools to facilitate all of this.	The impact assessment tests several policy options to better accommodate the needs of different types of traffic, both freight and passengers, in the capacity allocation process. The increased use and interoperability of digital tools for capacity planning and allocation are also included in the policy options.
Conclusions on effectiveness	
The governance structure of the rail freight corridors did not succeed in overcoming the prevailing focus on national approaches to managing international rail freight transport, possibly due to the lack of an independent entity or process representing EU level interests.	The impact assessment studies the possibility to introduce an entity or entities at EU level with a varying scope of tasks, in order to improve coordination and ensure better services for cross-border rail by the infrastructure managers.
The scope of the Regulation is limited to cross-border freight traffic, which does not allow a comprehensive optimisation of capacity and traffic management on the EU rail network, which consists predominately in mixed lines used by all types of rail traffic (passenger / freight; domestic / cross-border).	The impact assessment includes policy options that define a single framework for capacity and traffic management covering all types of rail traffic (passenger / freight; domestic / cross-border).
The governance of RFCs did not involve relevant stakeholders: combined transport operators, logistic service providers or shippers from industry.	The policy options provide for the involvement of these groups via the RFC governance or via a consultation process to be undertaken by the entities at EU level.
Investment planning by RFCs did not result in coordination.	This issue is addressed by the Commission proposal for revision of the TEN-T Regulation.
The instruments set up by the Regulation (the one-stop shop, pre-arranged train paths and capacity reserve) did	Possible changes to existing instruments or new tools and measures replacing them are included in the policy options.

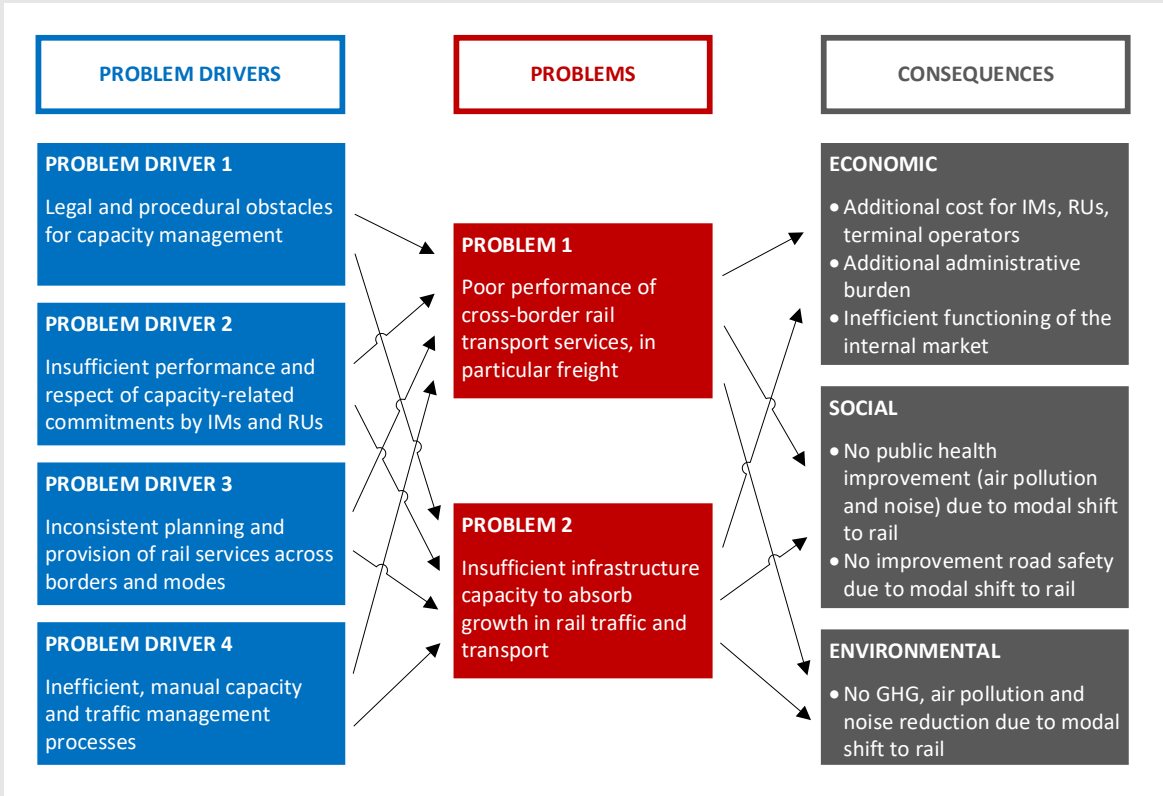
Main ex post evaluation conclusions	Impact assessment
not produce significant improvements in the quality of capacity for rail freight.	
The tools of the Regulation do not cover all the processes and interactions necessary to plan and operate international rail freight services. Their performance remains lower than that of the equivalent national systems in terms of functionalities and completeness or accuracy of information.	Lack of appropriate digital tools has been identified as a problem driver and measures are put forward in the policy options to address it.
The Regulation does not provide legal competences to the regulatory bodies to supervise the consultation of potential applicants on capacity needs and there was no indication that monitoring the competition in the rail freight corridors has taken place. The Regulation did not clarify the role of regulatory bodies for capacity handled by the one-stop shop.	The policy options either clarify the role of regulatory bodies for cross-border services or provide for additional rules on supervision and the processing of complaints related to capacity allocation for cross-border rail.
Implementing measures to boost intermodality have been limited to a few pilot projects addressing specific aspects or local improvements rather than a general improvement of coordination between rail and other modes along the entire supply chain.	Measures on cooperation (collaborative decision making) and on providing joint capacity offers (rail infrastructure and terminals) are included in the impact assessment.
Conclusions on efficiency	
The Regulation did not provide a framework for efficient performance of common tasks, which would be better carried in a broader set-up than on single corridors.	All policy options contain measures that introduce actions at network level with a varying scope.
Conclusions on coherence	
Overall the Regulation is coherent with EU legislation, but there is room to improve the interrelations in order to ensure effective and efficient implementation (namely with the TEN-T Regulation, the Recast Directive and secondary legislation adopted on its basis).	Some policy options envisage changes to Directive 2012/34/EU. The Commission proposal for revision of the TEN-T Regulation addresses some issues as well.
Conclusions on EU added value	
The governance of the freight corridors was instrumental in launching several projects that improved cooperation on a single corridor (work on interoperability, on border crossing delays), on cross-corridor (the Customer Information Platform describing the conditions for use of RFCs) and even on the whole EU rail network (like the Timetable Redesign Project pilots).	All policy options reinforce the aspects of cross-border cooperation and some build upon the result of cooperation projects launched by the sector's stakeholders, notably the Timetable Redesign initiative.
The lack of a true network approach hampered the achievement of a more integrated operating rail network for competitive freight. In the absence of legal obligations for network solutions, voluntary structures were set up at the level of the RFC network, but they lacked the necessary effectiveness and efficiency to contribute to the achievement of the objectives of the Regulation and to overcome the persistent problems of the sector in terms of competitiveness.	Several policy options contain measures at network level with varying scope.

2. PROBLEM DEFINITION

2.1. What are the problems?

The problems, underlying problem drivers and consequences that are relevant for this initiative are presented in Figure 2. The public consultation and the targeted stakeholder consultation carried out as part of the impact assessment support study ('the support study')[19] indicated overall agreement with this analysis.

Figure 2: Overview of drivers, problems and their consequences



Problem 1: Poor performance of cross-border rail services, in particular freight

At present, cross-border rail services (in particular freight) suffer from poor reliability, punctuality, and predictability; slow speed; and long transit times[20]. The information available from the evaluation of the RFC Regulation suggests that freight trains' punctuality at departure is relatively poor and cannot be rectified during the train run, with punctuality at destination being even worse[21]. The evaluation concluded that: 'Data shows that a considerable number of trains running on the rail freight corridors start with a delay of over 30 minutes'[22]. This makes rail services less attractive than other modes of freight

[19] See Annex 2.
[20] See Annex 5, sections on punctuality, reliability, speed and on border crossing times for more details.
[21] The data showed that on some freight corridors only 50% of the trains were punctual at departure while the best performing corridor had results just above 80% (SWD(2021) 134 final of 2 June 2021, p 125).
[22] SWD(2021) 134 final of 2 June 2021, p. 56. See also Annex 5, section on punctuality of RFC trains.

transport[23]. The demand for rail transport services depends on the available alternatives and is driven by various factors whose relative importance differs between market segments. The cost of the transport service is an obvious determinant, but in freight transport – particularly in the context of complex supply chains (e.g. just-in-time production) – reliability and predictability play a major role in the choice of mode.

65% of the respondents (80 out of 97) who expressed opinions during the open public consultation appeared supportive of this problem, mirrored by similar views collected during the targeted survey (60 out of 88 respondents).

Problem 2: Insufficient infrastructure capacity to absorb growth in transport/traffic

Railway transport not only struggles to attract additional customers, particularly for freight, but also faces difficulties in accommodating existing (and prospective) demand owing to the limits of rail infrastructure capacity, especially on certain parts of the network. Indeed, the total length of railway tracks that was declared congested[24] in the EU has more than tripled between 2015 and 2020[25]. In total, in 2020, congestion affected 2 934 km of tracks[26], more than half of which affected rail freight corridors (cross-border traffic), namely 1 816 km[27]. It is worth noting that the available figures may understate the scale of the problem, as IMs may be inclined to underreport congestion[28], which would automatically trigger the need for corrective action on their part[29].

The effects of congestion extend beyond the congested section: the entire train path (from origin to destination) suffers from the bottleneck effect created by the congestion, which severely limits the number of available train paths[30]. Congestion implies that certain trains are either denied a train path or redirected to less favourable routes/times that do not correspond to the needs of demand. Accordingly, growth of rail transport is not only hindered by shortfalls in service quality that thwart potential demand (Problem 1), but also by lack of available capacity on the network (Problem 2) that act as physical limit to supply.

The vast majority of respondents who expressed opinions during the open public consultation (77 out of 93) agreed with this problem, supported by similar views collected during the targeted survey (83 out of 88 respondents).

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[23] While rail passenger transport grew in terms of modal share and volume, freight rail modal share stagnated at around 17% (17.9% of all land freight for 2018 and 16.9% for 2019) (see Statistical pocketbook, EU transport in figures for 2020 and 2021).

[24] Directive 2012/34/EU provides a legal definition of 'congested infrastructure' and sets the rules for declaring and managing congestion (see Article 47 thereof). Apart from this legal definition, even infrastructure that is not declared congested might be insufficient to meet applicants' needs and accommodate all requests for given train paths.

[25] Data does not take into account developments for congestion in Italy due to a change in reporting, reflecting the new criteria imposed by the Italian rail regulator ART to declare a section of the network saturated and making the 2020 figure not comparable with previous years.

[26] Plus 5 294 km for Italy alone, according to the new criteria to declare a section congested.

[27] Excluding Italy.

[28] See Annex 5, section on congestion.

[29] See Articles 47(2), 50 and 51 of Directive 2012/34/EU.

[30] Depending on the approach and the methodology employed, the length of congestion and its share on the network can drastically change. See impact assessment support study report (Ecorys et al., 2023) on the differences in congestion reported by the German IM and unofficial figures used by it for the purpose of planning.

2.2. What are the problem drivers?

Trains can run on the rail network only after requesting and receiving a 'train path', that is availability of infrastructure along a specific route over a given period. IMs are responsible for allocating train paths following requests from train operators, RUs, and other applicants. It is important to note that the allocation of train paths does not consist of a simple attribution of slots based on clearly defined priority criteria. It is a complex process of optimising the use of a network where freight and passenger trains use the same lines but have different destinations and different driving characteristics (speed, acceleration and deceleration profiles, weights and lengths). In addition, IMs are responsible for maintaining and renewing the infrastructure and, for this purpose, must schedule time windows to carry out the necessary works[31].

The quality of allocated capacity is not uniform. Capacity is considered of good quality when is in line with the applicants' needs in terms of train characteristics (e.g. speed and weight), routings, timings, and stability vis-à-vis external disturbances such as accidents (e.g. availability of buffer times and alternative routes). Typical indicators of quality include the commercial speed that is guaranteed to an applicant[32] [33]. The quality of capacity also depends on when it is assigned: rail passenger operators need advanced availability to enable early-on tickets sales; freight transport operators need capacity available on short notice in line with the volatile customer demand imposed by today's fast-paced supply chains.

Therefore, effective capacity management pursues three objectives: (i) maximisation of rail traffic and network use; (ii) provision of train paths of high quality; and (iii) balanced allocation of capacity to different services (passengers and freight, domestic and cross-border) matching society's needs to the best extent possible. In the planning phase, a compromise between these three goals must be found. Currently, several factors (described in the following sections as problem drivers) prevent effective capacity management and result in sub-optimal utilisation of infrastructure capacity. Freight transport and cross-border traffic are the market segments that suffer the most from these shortcomings.

2.2.1. Problem driver 1: Legal and procedural obstacles for capacity management

Problem driver 1 is linked to problem 1 and problem 2. The capacity management procedure imposed by the Recast Directive is centred around an annual exercise – the definition of the annual working timetable – that allocates most capacity based on simultaneous requests from all applicants. Requests for capacity under the annual timetable need to be made 8 months before the start of the annual timetable (second Saturday of December at midnight). The IM is obliged to meet, as far as possible, all

[31] Capacity restrictions mean that rail lines and nodes are partially or completely unavailable for traffic.

[32] A more detailed analysis in Morvant, C. (2015). *Le processus de répartition des capacités sur le réseau ferré français : quelle place pour le fret ?*, Architecture, aménagement de l'espace: Université Paris-Est.

[33] Technical aspects of quality are addressed by the Union's TEN-T policy, which sets infrastructure standards for key rail lines (core network), such as electrification of lines, maximum allowed axle load, minimum line speed, minimum requirements for train length, etc. The Commission proposal for revision of the TEN-T Regulation includes additional standards like loading gauge and more ambitious requirements for the core and comprehensive network (COM(2021) 812 final of 14 December 2021).

requests and must adhere to the schedule for capacity allocation set out in the Directive[34]. This procedure does not enable a more strategic approach to maximise capacity utilisation through upfront planning, nor does it respond to the different time horizons of demand for rail transport services, as services might start after the annual timetable has been adopted and run into the next timetabling period.

IMs have the possibility to allocate capacity on a multi-annual basis, via so-called 'framework agreements', as well as to reserve capacity for 'ad hoc' requests for individual train runs[35]. However, the design of these instruments does not promote more efficient capacity management. Framework agreements must be concluded long before the operation of trains and are subject to a complex set of criteria. Ad hoc requests are only possible for individual train runs, which even in the case of freight traffic remain a niche segment (e.g. agricultural goods during the harvest period)[36]: most of capacity needs materialising after the deadline for application are for more than one train run.

A different approach, whereby the IM would withhold a bigger part of the capacity for later allocation to meet the needs of different rail market segments including cross-border freight, is not compatible with the current regulatory framework.

The RFC Regulation derogates from the rules of the Recast Directive by providing a special regime covering the allocation of capacity for cross-border freight traffic. In particular, the RFC Regulation allows concerned IMs to jointly define and organise international pre-arranged train paths (PaPs) and establishes one-stop shops for applying for cross-border capacity. While this approach addresses the issue of cross-border coordination on an individual corridor, it does not consider the need for coordination between the corridor and the rest of the network. However, cross-border freight transport requires train paths that include stretches going beyond the lines designated to corridors. As a result, the one-stop shops did not do away with the need for freight service operators to interact with national IMs. Instead of facilitating operations, one-stop shops ended up as an additional administrative layer, further complicating the process. Moreover, the framework established by the RFC Regulation attributes capacity in a similar fashion to the Recast Directive: as part of the annual timetabling process (in the form of PaPs) and for ad hoc requests (in the form of reserve capacity). It therefore suffered from similar shortcomings as the capacity provided by the Recast Directive[37]. Since much of the capacity is allocated at the planning stage in the annual timetable, this approach favours rail market segments (such as intermodal trains), which run predictable, regular services and can bid early for precisely the capacity that they need. However, it leaves other segments that can only plan a train run on relatively short notice (block trains, single wagonload, etc.), struggling to obtain the remaining rail infrastructure capacity.

In the stakeholder consultation, on the one hand, the majority of the representatives of the railway undertakings indicated the ineffective rail capacity management as one of the most

[34] See Article 43(1) of and Annex VII to Directive 2012/34/EU.

[35] See Article 42 and Article 48 of Directive 2012/34/EU.

[36] 'Individual freight trains' are trains which do not have a recurrent schedule; they are organised for ad hoc needs (e.g. transport of agricultural products) and represent only a very small share of the rail freight market. Considering the large quantity of cargo, which is needed to justify the arrangement of a freight train, it is reasonable to expect that this market segment will remain a 'niche' in the foreseeable future.

[37] The evaluation of the Regulation showed that these instruments could not produce a major improvement in the quality of the capacity for cross-border freight.

important problem drivers, while on the other hand the majority of the representatives of the infrastructure managers did not identify this as the most important problem driver. The explanations for these results are two-fold. The consultation used a different definition of the problem driver (PD1: ineffective rail capacity management and PD2: ineffective rail traffic management), so it did not identify the legal framework as the problem driver, but rather its implementation. Therefore, the question was perceived as an assessment and self-assessment of the performance of IMs.

In terms of the detailed issues that contribute to problem driver 1, which was presented in the consultation process more as a performance issue, rather than a legal issue, stakeholders highlighted the lack of complete overview on the cross-border lines and the traffic situation, which considered to contribute to problem driver 1 to a large extent by 31% and to a moderate extent by 40% of respondents. For 20% of the stakeholders this factor contributes to a small extent (15%) or not at all (5%) to the driver. Differences in priority rules in operations adopted on the two sides of a border are considered contributing from a large to a moderate extent to ineffective rail traffic management by 67% of respondents and to a small extent by an additional 17% of them. Inadequate response to major traffic disruptions is considered as contributing to ineffective rail traffic management, with 61% of respondents believing its contribution is either large or moderate and 22% believing that it results in a small contribution. Stakeholders' opinion on the contribution brought by the low priority given to cross-border freight traffic (vis-à-vis national traffic) is more varied, with 51% of respondents believing that it contributes from a large to a moderate extent, 18% to a small extent, 19% attributing no contribution at all, while 13% does not know.

The representatives of railway undertakings have largely identified the factors suggested in the questionnaire as contributing to a large or moderate extent to the ineffective rail traffic management. The representatives of the infrastructure managers are more sceptical and their opinions vary. With regard to the specific factors, a large majority of the representatives of the railway undertakings deem that all factors influence problem driver 2. In particular, the inadequate response to major traffic disruptions and the differences in priority rules in operation adopted on the two sides of a border are the two more recurring responses. On the other hand, the infrastructure managers believe that the poor sharing of information among all the concerned stakeholders and the lack of complete overview on the cross-border network and traffic situation contribute to the problem driver of ineffective rail traffic management. Finally, one can note that the responses of the representatives of the regulatory bodies follow the same patterns as those of infrastructure managers.

2.2.2. Problem driver 2: Insufficient performance and respect of capacity-related commitments by IMs and RUs

Problem driver 2 is linked to problem 1 and problem 2.

Priority criteria in the allocation of capacity and performance targets

Passenger services constituted 80% of the traffic expressed in train-km on average in the EU in 2019[38]. Freight operators complain that IMs give priority to passenger services and

[38] See 7th RMMS Report (https://transport.ec.europa.eu/transport-modes/rail/market/rail-market-monitoring-rmms_en).

that this is a major contributor to disadvantaging freight in capacity planning and allocation. This is confirmed by experts' findings[39].

Priority rules differ considerably between Member States, but mostly define passenger traffic operated under public service obligations as the highest priority (Figure 3). Cross-border freight traffic, which makes up half of all freight traffic and requires coordination between IMs, is typically lower in the priority ranking. In addition, different criteria applied by IMs in different Member States multiply the risks that cross-border trains do not fulfil the conditions to be allocated capacity as a priority in at least one of the segments of a cross-border train path. Moreover, a survey conducted by regulatory bodies indicates that only a very few IMs allocate scarce capacity based on socio-economic criteria and on the assessment of the specific situation of competing requests[40]. **This can result in situations where certain rail segments are systematically (de)prioritised regardless of the merits of individual services and cross-border trains face significant difficulties to get high quality capacity for the whole train run**. For example, a rule that always gives priority to passengers over freight, might imply that a passenger train off-peak with very low occupancy rate, crowds out a fully loaded freight train. Better results could be achieved if infrastructure managers were instructed or given incentives to base their decisions on socio-economic criteria and on the assessment of the specific situation of competing requests. Public Service Obligations (or 'PSO') are State-supported public passenger transport services that transport companies would not provide on their own initiative for lack of economic viability. They are often given the highest priority because of the State's decision to fund them as services of general economic interest, which does not mean that profitable services operated on market terms are less valuable to the society.

Neither the legal framework nor other mechanisms provide sufficient incentives for IMs to base their prioritisation decisions on criteria that better account for societal needs and the merits of all rail segments. Part of the problem may be that the financing and performance agreements[41] concluded between Member State authorities and IMs are limited to the question of financing infrastructure managers and lack effective incentives to reduce the cost of infrastructure provision, user-oriented performance targets and a strategic vision for the development of the rail infrastructure[42]. This means that Member States may not fully exploit the potential of economic incentives to orientate IMs' efforts to reduce the cost of infrastructure provision while improving the quality of infrastructure services.

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[39] See figure Principal types of services prioritised by infrastructure managers (number of MS assigning each priority, 2018) below and also Vassallo, Manuel and Fagan, *Nature Or Nurture: Why Do Railroads Carry Greater Freight Share In The United States Than In Europe?*, Harvard University, Taubman Center Research Working Paper Series, 2005, p. 19 and European Parliament (2015), *Freight on Road: Why EU Shippers Prefer Truck to Train*, pp. 31 and 33.

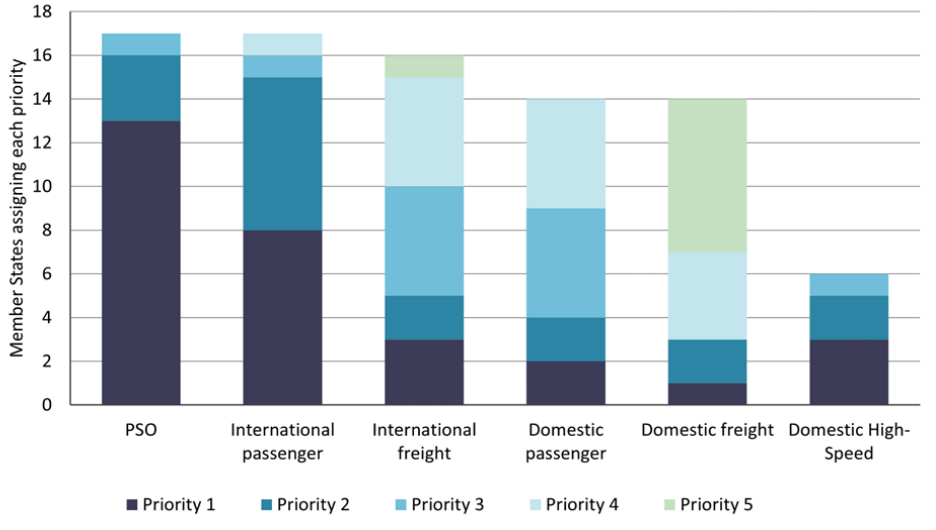
[40] See IRG-Rail (2019) A survey of congested infrastructure, priority criteria and capacity charges in Europe (IRG-Rail (19) 4). At the moment, only Trafikverket (Sweden) and Banenor (Norway) carry out a situation-specific socio-economic evaluation of different timetable scenarios as a 'last resort', i.e. only if the coordination process defined in Article 46 of Directive 2012/34/EU has failed to resolve all conflicts. In some other cases, e.g. Austria, socio-economic evaluations have been made to establish priority rankings between different types of traffic (e.g. passenger versus freight traffic); however, these rankings are applied mechanically to specific conflicts, without consideration of the specific situation

[41] Article 30 of the Recast Directive requires Member States to conclude financing and performance agreements, which must include incentives to IMs to reduce the costs of providing infrastructure and the level of access charges and user-oriented performance targets.

[42] See for example the analysis of the French regulatory body on the draft performance agreement between the French State and SNCF Réseau: Autorité de Régulation des Transport (2022). Avis n° 2022009 du 8 février 2022 relatif au projet de contrat de performance entre l'État et SNCF Réseau pour la période 2021–2030.

The RFC Regulation introduced performance monitoring as an explicit task of the management boards of the freight corridors. However, the evaluation of the Regulation[43] showed that performance monitoring focuses on the volume of capacity offered, without taking into account adequately other aspects relevant to rail freight customers (e.g. door-to-door punctuality) or to policy makers (e.g. modal share of rail along the corridors). For this reason, performance monitoring failed to induce significant performance improvements.

Figure 3: Principal types of services prioritised by infrastructure managers (number of MSs assigning each priority, 2020)



Source: Data from the draft 8th Rail Market Monitoring report (RMMS)

Respect of commitments in the allocation process

Apart from shortcomings in the allocation of capacity, capacity management suffers also from failure of both RUs and IMs to respect the commitments taken during the definition of the annual working timetable.

For RUs, requesting and not using the capacity does not result in costly penalties. As a result, many freight RUs request capacity months before they know the details of the train services that they intend to run[44] and end up modifying or cancelling the request later in the process. This generates administrative efforts and costs for both applicants and IMs[45]. In some cases, capacity reserved but not in line with actual needs cannot be utilised for other purposes and is wasted. Information from stakeholders indicates that **only 20-25% of all capacity requests remain stable until the actual train run, while 75-80% are modified at one or more points in the process**. The number of modifications of annual timetable requests by freight applicants is more than twice the number of similar requests by passenger applicants owing to the volatility of demand for freight transport. A stakeholder study indicates that **any change requires an additional administrative**

[43] SWD(2021) 134 final of 2 June 2021, pp. 60-62. The evaluation contains an extensive analysis of the weaknesses in the implementation of performance monitoring.

[44] Passenger trains and freight trains forming part of intermodal transport normally can adhere to a strict annual schedule (supply-driven service). Block and single wagonload trains depend on individual contracts (demand-driven service) and capacity requests are often known only close to the train run.

[45] See Annex 5, Changes / modifications of timetable requests and Evidence of requested, allocated and used capacity.

effort of at least 25% of the request's cost[46].This practice, combined with the legal obligations for IMs to meet capacity requests within strict deadlines, results in situations where there is little capacity left for ad hoc trains on heavily utilised lines, which, in turn, puts pressure on applicants to request capacity during the annual timetable planning.

The Recast Directive provides an option (but not an obligation) for IMs to levy appropriate charges for capacity that is allocated but not used. According to an analysis carried out by regulatory bodies[47], the reservation charge schemes put in place by IMs vary widely. However, the RUs' persistent overbooking of train paths to safeguard capacity (see Annex 5) suggests that reservation charges have not provided effective disincentives against this behaviour. The Recast Directive does not envisage penalties for IMs in case of cancellations or modifications of already allocated train paths[48], but requires IMs to set up performance schemes to encourage RUs and IMs to improve the performance of the railway network. The schemes may include penalties for actions which disrupt the operation of the network, compensation for undertakings which suffer from disruption, and bonuses that reward better-than-planned performance. Performance schemes have been established by most EU IMs, but an overview of performance schemes prepared by regulatory bodies in 2017 concluded that they improved performance only in a few countries[49]. A specific challenge is that performance schemes established by individual IMs often lack incentives for traffic running on more than one network[50].

Altogether, reservation charges and performance schemes have not been sufficient to solve on their own the problems of overbooking capacity and late modifications of train paths.

The stakeholder consultation used different definitions for the problem drivers, which resulted in respondents addressing different issues, which were nevertheless relevant for the analysis of the problem drivers. However, both organisations representing RUs and some IMs expressed views in position papers and in meetings with the Commission indicating that performance incentives are necessary for both stakeholder groups, confirming the relevance of the problem driver.

In regard to the specific issues contributing to the lack of incentives for improving capacity and traffic management, stakeholders indicated issues that prevent proper performance monitoring, which in turn makes it difficult to identify the need for incentives for improving performance for capacity and traffic management. In particular, limited data sharing and the lack of commonly agreed concepts, definitions and indicators

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46 See TTR project Business Case study (https://cms.rne.eu/system/files/8.0_ttr_business_case_v3.0_2019-05-15_0.pdf) and section 3.2 of impact assessment support study report (Ecorys et al., 2023).

47 See IRG-Rail (2019). Review of reservation charges across IRG Rail members. Report IRG-Rail (19) 8 (https://www.irg-rail.eu/download/5/650/ReviewofReservationCharges.pdf).

48 Despite the absence of legal provisions on economic incentives for IMs related to capacity commitments, a reciprocal scheme has been put in place by the regulatory body and the IM in France; see IRG-Rail (2019) Review of reservation charges across IRG Rail members (IRG-Rail (19) 8).

49 IRG-Rail concluded that 'Only a few countries report that positive performance results can be attributed to their performance schemes. These are Bulgaria, Croatia, Denmark, Italy and Portugal. Minimal effects or no clear results can be found in Austria, Finland, Belgium, France, Germany and Slovenia. In Greece, Hungary, Lithuania, the Netherlands, Norway, Romania and Sweden there are no results available.'(https://www.irg-rail.eu/download/5/635/IRG-Rail174-IRG-Rail-Overviewonperformanceschemes.docx)

50 For example, delays of trains entering a network from a previous network are often 'neutralised', i.e. considered outside of the scope of the scheme, neglected in the calculation of performance-related payments and, therefore, do not provide economic incentives.

for performance monitoring (e.g., as regards punctuality) are considered to contribute from a large extent a moderate extent to problem driver 2 respectively by 65% and 55% of respondents. Moreover, 17% of respondents consider limited data sharing to contribute to a small extent, but the figure rises to 25% when considering lack of commonly agreed concepts, definitions and indicators for performance monitoring. Limited data availability for performance monitoring and measurement is considered contributing to the driver from a large to a moderate extent by 56% of respondents, while 19% are of the opinion that it contributes to a small extent. The lack of a neutral performance monitoring platform involving all stakeholders is believed to contribute to the lack of proper analysis of performance from a large to a moderate extent by 51% of respondents, while 19% considers its contribution to be small. Finally, the limited scope of performance measurement, either in geographical terms or due to aspects not monitored is believed to have a large to moderate effect on the ability to address performance issues by 53% of respondents and a small effect by 20% of them.

When it comes to the patterns across different stakeholder groups, the responses were rather comparable after disaggregating them by the two main stakeholder groups (i.e., infrastructure managers and railway undertakings). The only pronounced difference was about the limited scope of performance measurement, either in geographical terms or due to aspects that are not monitored. In this case, it is more widely identified as factor influencing poor performance monitoring by the representatives of the railway undertakings (i.e., 82%, of which 68% choosing to a moderate or large extent), rather than the representatives of the infrastructure managers (i.e., 65%, of which 43% choosing to a moderate or large extent). Finally, it is interesting to note that for both factors all representatives of the regulatory bodies agree that they contribute to the problem drivers of ineffective train performance monitoring and lack of effective tools to incentivise performance improvement. For the respondents of this stakeholder group, these problem drivers can be linked to limited data sharing and the limited data availability for performance monitoring and measurement.

2.2.3. Problem driver 3: Inconsistent planning and provision of rail services across borders and modes

Problem driver 3 is linked to problem 1 and problem 2. Planning use of capacity and subsequent management of traffic on the network involves matching the requirements of several categories of operators. A positive outcome is best achieved by effective coordination of the involved parties at all stages of the process. The evaluation, the responses to the public consultation and the targeted stakeholder consultation emphasised weaknesses in coordinating three aspects of the process: i) infrastructure maintenance works; ii) train and terminals activity; iii) cross-border traffic management.

Planning of infrastructure works

The management of rail infrastructure involves maintenance, renewal and upgrade of the existing infrastructure. This means that a trade-off must be found between allocating capacity to passenger and freight transport, and scheduling time windows, the so-called temporary planned capacity restrictions (TCRs), for the execution of infrastructure works. TCRs are especially disruptive in cases where there are few or no alternative routes or when the works are poorly coordinated and result in successive closures along important routes. Directive 2012/34/EU requires IMs to consult applicants and to publish

information on capacity restrictions 24 and 12 months before the publication of the annual timetable. Nevertheless, stakeholders[51] continue to identify poorly managed and coordinated TCRs as a major reason for reduced capacity of the rail network and indicate that such restrictions result in considerable costs and, in extreme cases, rule out rail transport as a viable transport option[52,53].

The impact of works on traffic can be mitigated by effective planning – e.g. by carrying out simultaneously as many maintenance and renewal activities as possible on a given part of the network – and by ensuring that adequate re-routing options remain available during capacity restrictions[54]. A particular challenge is effective coordination between networks.

Information from RUs suggests that the level of international coordination of TCRs – despite the existence of dedicated EU rules[55] – is often insufficient and does not always take place. In some cases, coordination of TCRs involves only a publication and provision of information to the concerned neighbouring IMs and no attempt to synchronise works to minimise the impact of TCRs. Bilateral international coordination has no institutionalised procedures and is sometimes based on good relationships and individual contacts between employees of IMs[56]. The RFC Regulation did not have any major effect on the planning of TCRs either; its evaluation concluded that 'the users (in particular the RUs and the terminal managers and owners) still criticise that infrastructure works are announced too late and 'that works are not really coordinated'[57]. On some networks, TCRs are in the hundreds on a weekly basis and in the tens of thousands for an entire year. In some cases, more than 50% of the issues concern changes or cancellation of previously announced TCRs, indicating a severe lack of stability in planning and execution. Further evidence of the number and effects of TCRs is presented in Annex 5.

Coordination of train and terminal activity

For loading/unloading and for technical/operational purposes, trains need capacity at designated facilities (passenger stations, terminals, shunting yards, etc.). The train paths for accessing these facilities are not always aligned with the capacity schedule of the facility. This is particularly problematic for freight trains and terminals since the latter often have limited capacity for parking trains when they cannot process them upon arrival. Freight is particularly dependent on other operators at the departure and destination, as the cargo needs to be loaded and unloaded onto the train by a third party. The coordination for

[51] The targeted consultation, part of the support study for this impact assessment, asked stakeholders to what extent uncoordinated planning and execution of infrastructure works is contributing to the inefficiency of rail capacity management and allocation. 35 of the 69 respondents stated that it contributes strongly and 21 that it contributes moderately. See the consultation report in the impact assessment support study (Ecorys et al., 2023).

[52] See Annex 5, Evidence of temporary capacity restrictions affecting cross-border rail.

[53] This problem seems to have intensified in recent years. Several IMs have increased the volume of maintenance and renewal works to reduce maintenance and renewal backlogs, profiting from an increase in funding made available by Member States.

[54] The impact of infrastructure works critically depends on the availability of alternative routes providing adequate characteristics (electrification, axle load, loading gauge, etc.) and distance. Even where viable alternatives exist, challenges related to operational and administrative barriers, such as the need for train drivers to have network-specific training, language competences, and route knowledge could still prevent effective re-routing of trains during TCRs.

[55] Annex VII to Directive 2012/34/EU

[56] See impact assessment support study report (Ecorys et al., 2023).

[57] SWD(2021) 134 final of 2 June 2021, Annex VII, sections 13 and 14.

freight trains involves RUs, the IM, the facility operator, operators of relevant services at the facility, the client providing the cargo and the one taking over the cargo at arrival[58].

For the planning phase, the Recast Directive and Regulation (EU) 2017/2177[59] lay down rules to ensure access to rail facilities, but do not address coordination mechanisms. Solutions to the coordination challenge are provided in the RFC Regulation, which introduces an advisory group of terminal operators to the management boards and requires procedures for optimal coordination of the allocation of capacity between IMs that takes account of access to terminals. However, some participants in the advisory groups consulted within the evaluation of the RFC Regulation pointed out that there was one-way communication and terminal operators have limited influence on decisions already taken by IMs in the management boards. The sub-optimal coordination at terminals results in reduced punctuality and poor reliability of freight trains.

Coordination of cross-border traffic

Traffic management is about coordinating train movements on the network between start and end of the journey[60]. This activity is under the control of IMs which must coordinate among themselves in case of cross-border trains.

Many cross-border trains (especially freight) do not stick to the timing provided with the train path. Evidence shows that on average in the EU, more than half of the cross-border freight trains are never on time (not within 30 minutes of their allocated train path)[61]. As a result, IMs need to manage actively the traffic to ensure safe and efficient travel on the network. Delays in one Member State can have a knock-on effect along the route of a cross-border train and different approaches of different IMs to managing delayed trains can affect negatively the punctuality of cross-border trains[62].

At present, traffic management involves the sharing of limited information, but it lacks further direct data exchange and dynamic interaction (including automatised decision support/decision making) between the involved systems (i.e., national traffic management systems, terminal/yard management systems, other resource management systems). Therefore, IMs are not fully aware of the effects that their dispatching decisions will have on the train run itself or on the networks in the subsequent neighbouring countries. This results in accumulating delays for cross-border trains. Moreover, there are no uniform priority rules in traffic management, which means that a cross-border train could be considered a priority in one Member State, but not after crossing the border in the other Member State.

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58 In some cases, the IMs also manage capacity at the facilities (including terminals), but this is not always the case. Coordinated and harmonised paths with terminal slots, shunting operations, and loading/unloading time, also considering the availability of wagons and locomotives, are not widely available as part of the capacity allocation process.

59 Commission Implementing Regulation (EU) 2017/2177 of 22 November 2017 on access to service facilities and rail-related services (OJ L 307, 23.11.2017, p. 1).

60 Traffic management involves several activities such as signalling, use of automatic train protection systems, communication systems, etc. In this context, we focus on the monitoring of trains and the processes for making decisions on allocating rail infrastructure capacity as part of train operations.

61 See Annex 5, section Punctuality of international rail freight services.

62 The average punctuality in 2020 for rail freight in EU27 was 64.1% for domestic and 47.4% for international services; 7.4% of domestic and 8.9% of international services were cancelled. Source: draft 8th RMMS report.

Coordination of traffic management becomes critical in cases of disturbance such as incidents, where alternative routes must be provided. The evaluation of the RFC Regulation showed that despite legal provisions obliging IMs to put coordination procedures in place[63], major incidents often resulted in high numbers of cancelled trains. IMs and RFCs' management boards made efforts to implement harmonised rules (the International Contingency Management Handbook) for rail freight, but the evaluation of the RFC Regulation concluded that these efforts did not result in immediate major improvements[64]. The coordination mechanisms are mostly generic and the more specific ones on contingency management are not implemented systematically. They result in performance deficiencies for cross-border rail that are manifested mostly as lack of reliability (cancelled or late trains, increased costs due to longer routes) and poor punctuality.

The definition of the problem driver in the stakeholder consultation differed from the definition used in the impact assessment (lack of coordination on planning and operations between stakeholders involved in multimodal transport chains), but it still touched upon the main issue of coordination. 62% (51 out of 83 respondents) indicated the problem driver being relevant for problem 1 to a large or to a moderate extent and 22% (18 respondents) – to a small extent.

The problem driver was more widely identified as a driver for problem 2 by the infrastructure managers.

A fair share of 59 respondents to the survey-questionnaire (71%) in the stakeholder consultation believe that the lack of capacity products (for both railways and terminals) fitting customers' needs contributes from a large to a moderate extent to the lack of coordination on planning and operations between stakeholders involved in multimodal transport chains; 19% attribute a small impact to this factor, while the remaining 10% either assess it does not contribute at all (3%), or do not know (7%).

The second-ranked factor contributing to the problem driver is the different planning timeframes of actors to which 63% of stakeholders attribute either a large or moderate contribution, while an additional 12% believes the effect to be small. 25% consider the contribution to be null or do not know.

More than half of respondents (57%) attributes to the lack of digitalisation of the processes a large (25%) or moderate (32%) contribution to the poor coordination between different actors; 25% assesses the contribution to be small, while the remaining 17% either considers the factor not contributing at all, or do not know.

The lack of coordination between customers, railways undertakings and terminal operators in the planning phase (rail and terminal capacity) is considered contributing to a large extent by 24% of respondents, to a moderate extent by 29%, and to a small extent by 22%.

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[63] See Article 16 of Regulation (EU) 913/2010 requiring the management boards to put in place procedures for coordinating traffic management along the freight corridor.

[64] Anecdotal information confirms this conclusion. In the incident in Modane between Italy and France in July 2019, which lasted 20 days, only 51 (9%) of the 539 originally planned freight trains were re-routed. The accident near Auggen in Germany, between Basel and Freiburg (Rhine valley) in April 2020, interrupted traffic on the Rhine-Alpine corridor for 6 days. Further capacity was available on all deviation routes, due to the effect of Covid-19 mobility restrictions which reduced passenger transport on the network. Nevertheless, of the 870 trains originally planned, only about 23% were re-routed.

10% of stakeholders assesses the contribution to be null, while an additional 15% do not know.

The lack of coordination between customers, railways undertakings and terminal operators in the operational phase (yard and terminal operations and railway traffic management) is also seen as contributing to a large extent by 17% of responding stakeholders, to a moderate extent by 37% and to a small extent by 12% of respondents.

Other factors identified in the stakeholder consultation as contributing to problem driver 3 are: (i) the lack of common understanding of operational processes and of the respective roles of all stakeholders involved, which is considered contributing from a large to a moderate extent to the driver by 38% of respondents and to a small extent by another equal share (38%) of them; and (ii) the lack of use of digital tools due to their poor performance and user-friendliness assessed to contribute from a large to a moderate extent to the driver by 48% and to a small extent by 20% of respondents. Finally, 30% of respondents state that the lack of a common terminology used by different stakeholders contributes the problem driver from a large to a moderate extent and an additional 34% is of the opinion it contributes to a small extent.

In terms of patterns across stakeholder groups, it is particularly interesting to note how the lack of capacity products (for both railway infrastructure and terminals) fitting customers' needs is believed to be a factor influencing to some extent the lack of coordination on planning and operations between stakeholders involved in multimodal transport chains. This holds for almost all the representatives of the railway undertakings (i.e., 95%), of which 52% believe that it has a large influence and 38% that has a moderate influence, respectively. Although they agree considering this factor as an important aspect, the view of the representatives of the infrastructure managers is generally more moderate.

2.2.4. Problem driver 4: Insufficient digital tools supporting capacity and traffic management processes

Problem driver 4 is linked to problem 1 and problem 2. The RFC Regulation introduced one-stop shops in the rail freight corridors for the request of international train paths along those corridors. Although it did not mandate use of any specific digital tool, the Path Coordination System (PCS)[65] had been developed for use by the one-stop shops and the applicants. However, given the inherent complexity of timetable planning and the numerous national specificities and processes to be respected, a deep integration between the IMs' planning systems and the PCS has not been achieved. Accordingly, there is limited benefit from the use of PCS as central request tool and RUs often prefer to submit requests through the national systems, as confirmed by stakeholders consulted for the evaluation of the RFC Regulation[66].

Digital tools are important not only for managing rail infrastructure capacity at the planning stage, but also in the operational phase i.e. in traffic management. When looking at operational tools for the dispatching and management/optimisation of the traffic, which

[65] PCS is a web-based international path request coordination system harmonising path requests and offers. The idea is that international path requests need only to be placed once, either into a domestic system or directly into PCS, from which the planning request is then sent to the national planning systems in which the planning is performed.

[66] The evaluation provides more information on the shortcomings of one-stop shops in terms of scope of services provided. Arguably, avoidance of PCS is also due to applicants avoiding the one-stop shops.

are normally deeply integrated within the national command and control systems, it was established that international train-paths are still managed at national level as separate segments. There is no detection and consideration of effects/conflicts in neighbouring countries and no use of real-time information for integrated service optimisation.

Also, the required technology enhancements of the national/regional traffic management systems are included in the Multi-Annual Workplan of Europe's Rail Joint Undertaking and are planned to be developed in the first project phase until 2025. Their effective implementation will however require the necessary set up of joint rules and respective legislation to allow and govern the cross-border management and optimisation activities.

A variety of digital tools are already in use at national level, but they are often neither integrated nor interoperable, nor common to the majority of IMs. Stakeholders consulted in the context of the support study pointed out that the development of digital tools without harmonised processes and authority able to enforce harmonisation and cooperation might lead to stranded investments.

The stakeholder consultation showed that the problem driver was particularly relevant for problem 1 with 63% of respondents suggesting that PD4 was relevant from a large to a moderate extent and 25% indicating only to a small extent. In regard to problem 2, 53% (42 out of 80 respondents) recognised the problem driver as contributing to a large or to a moderate extent to the problem and by 29% (23 respondents) – to a small extent;

RUs assigned stronger importance to the problem drivers, compared to IMs. As indicated above, the questions on the problem drivers could also be interpreted as an assessment of the performance of IMs, which would explain, at least partially, the more reserved attitude in recognising the problem driver.

In terms of detailed information about the type of digital systems that are part of the problem driver, for 63% of the respondents the missing integration between RNE's Path Coordination System and the national planning systems for path request contributes from a large extent to a moderate extent to the ineffectiveness of digital tools for planning and operation of rail services and an additional 18% is of the opining that it contributes to a small extent. The lack of connection of yard and terminal planning systems with railway planning systems has been indicated as a large contributing factor by 39% of respondents, while 15% attributes a moderate contribution and 20% a small contribution to such factor. Overall, 52% of respondents considers inadequate methods and rules for cross-border traffic management to contribute largely or moderately to the problem driver under analysis and an additional 15% of them believes it contributes to a small extent.

Other impacting factors considered as contributing from a large to a small extent to problem driver 3 by responding stakeholders are as follows: lack of connection of national/regional traffic management tools to enable cross-network management (61% of respondents); poor information quality and availability of RNE's Train Information System (65%) and lack of connection of yard and terminal operational management systems with railway traffic management systems (58%).

In this case the responses provided by the two main stakeholder groups are more comparable, with the representatives of the railway undertakings being only slightly less diverging and positive compared to the opinions provided by the representatives of the infrastructure managers. Also, the responses of the representatives of the regulatory bodies show similar patterns, despite having rather different distributions due to the lower

number of respondents. The results are thus comparable to the aggregated figures across all stakeholder groups.

2.2.5. Contextual problem drivers not addressed by this initiative

The four problem drivers described above refer to existing obstacles to effective management of rail network capacity. There are however other factors that contribute to the main problems identified in section 2.1, most notably, the limitations of the physical rail infrastructure in terms of bottlenecks and parameters[67] of the infrastructure (contextual problem driver 1), and the lack of interoperability[68,69] (contextual problem driver 2). Other policy initiatives address the aspects related to physical infrastructure[70] and interoperability[71] and are therefore not further analysed in this context.

The views of all stakeholder groups converged on the relevance of these contextual problem drivers for both problems. The respondents to the survey-questionnaire indicated that the limitations related to the physical infrastructure significantly influence the poor performance of rail freight services. Out of 81 respondents, 76% of them considers this contextual problem driver as contributing to the problem 1 from a large to a moderate extent, 20% to a small extent and the remaining 4% not contributing at all to the problem or they do not have an opinion. The stakeholders also believe that the second relevant driver is the lack of interoperability in terms of operational, technical and safety-related aspects (i.e., contextual problem driver 2), indicated by 72% of respondents as contributing from a large to a moderate extent to the problem; by 14% to a small extent; by 9% not contributing at all to the problem. The remaining 6% do not have an opinion.

The respondents to the survey-questionnaire indicated that the limitations related to physical infrastructure also result in limited capacity of the rail network to absorb additional traffic (problem 2). Out of 78 respondents, 78% of them considers the driver

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67 The TEN-T Regulation gives an indication of the rail infrastructure parameters that would allow rail (in particular freight) to operate to its full capacity. They include uniform track gauge of 1 435 mm, electrification, deployment of ERTMS, at least 22.5 t axle load, 100 km/h line speed and the possibility of running trains with a length of 740 m.

68 Interoperability means the ability of a rail system to allow the safe and uninterrupted movement of trains which accomplish the required levels of performance. It can be categorised as differences in (i) technical systems (notably, command-control and signalling) and (ii) operational, administrative and safety-related requirements (language requirements for train drivers, technical checks of rolling stock at borders, etc.).

69 Detailed evidence on the lack of cross-border interoperability in terms of operational, technical and safety-related aspects is provided by ERA's 2022 'Report on Railway Safety and Interoperability in the EU' (https://op.europa.eu/en/publication-detail/-/publication/e55576d1-e894-11ec-a534-01aa75ed71a1/language-en). Indicators on national rules for train operations and safety management are available from ERA's 2020 'Report on Railway Safety and Interoperability in the EU' (https://www.era.europa.eu/sites/default/files/library/docs/safety_interoperability_progress_reports/report_on_railway_safety_and_interoperability_in_the_eu_2020_en.pdf).

70 See the Commission proposal for revision of the TEN-T Regulation, COM(2021) 812 final of 14 December 2021. The proposal intended to increase the capability of rail to absorb additional traffic by further specifying the requirements and introducing a new one – a standard for the loading gauge (P400). Further changes include operational line speed of 100 km/h for freight trains and of minimum 160 km/h for passenger trains (complementing the high-speed network). The proposal envisages extension of the lines that must conform with these standards and updated schedule for upgrading them.

71 The Commission and the European Union Agency for Railways (ERA) work together with stakeholders and Member States on the harmonisation of technical systems and of the above-mentioned requirements, in particular through the development of technical specifications for interoperability (TSIs) and the deployment of the European Rail Traffic Management System (ERTMS).

contributing to problem 2 from a large to a moderate extent; 13% to a small extent; 5% not at all and 4% do not have an opinion.

Lack of interoperability in terms of operational, technical and safety-related aspects is considered by 58% of respondents to contribute to a large or to a moderate extent and by 25% to a small extent to problem 2.

2.3. How likely is the problem to persist?

Problem 1: Poor performance of cross-border rail services (in particular freight). Without EU level action the poor performance of cross-border rail services is likely to persist over time. The rail sector launched several initiatives aimed at improving rail freight's performance[72] and, in particular, the Timetable Redesign Project (TTR)[73] which is specifically addressed at improving the management of network capacity. However, for these initiatives to become something more than pilot projects or recommended best practices, rules need to be put in place with clearly defined obligations. In the case of TTR, some of the measures cannot be implemented without a change to the EU legal framework, as they are not in line with the current rules.

A specific threat to the performance of rail (freight) transport for the next few years are the temporary capacity restrictions, which were identified as a major problem by stakeholders[74]. While further efforts in implementing the existing rules on the planning and implementation of works (in particular Annex VII of Directive 2012/34/EU) could reduce the negative effect of temporary planned capacity restrictions (TCRs), it is also clear that without the possibility for long-term strategic planning, IMs will struggle to accommodate the needs of the sector.

Problem 2: Insufficient rail infrastructure capacity to absorb growth in transport/traffic. As explained in section 2.1, congestion is a growing problem for the EU's rail network[75]. In the future, infrastructure capacity will need to accommodate an increasing amount of demand: current trends and projections that take into account the EU climate change goals, suggest a considerable growth in the demand for transport services (see section 5.1) with freight and passenger rail volumes expected to grow consistently until 2050.

Although significant capacity improvement is expected in the next decades due to improved infrastructure envisaged by the proposed revision of the TEN-T Regulation, the achievement of such improvements until 2050 (with intermediate deadlines of 2030 and 2040) is also expected to further increase the occurrence of TCRs on the network and to put additional pressure on the system. With the increase in transport demand and with upcoming works, the problem of the lack of infrastructure capacity to absorb the growth of transport traffic will deteriorate, especially in the short and medium term.

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[72] Some of those are the Sector Statement, 30 by 2030 by the Rail Freight Forward coalition, and ELETA.

[73] The project is a joint initiative of infrastructure managers (represented in the project by RNE) and railway undertakings (Forum Train Europe). The project description is available on RNE's website (https://rne.eu/capacity-management/ttr/). See also Annex 7.

[74] See Annex 5, section Evidence of temporary capacity restrictions affecting cross-border rail and support study

[75] The support study gathered information on 170 examples of congested rail sections in Europe.

Stakeholders who provided opinions during the targeted consultation, consider that both problems and the underlying drivers will continue to hamper the growth of cross-border rail freight in the period until 2050.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

Title VI (Articles 90-100) of the Treaty on the Functioning of the EU (TFEU) establishes the EU's right to act in the area of transport. Article 91(1)(a) of the TFEU provides that the Union has competence in the field of transport to lay down measures to adopt common rules applicable to international transport to or from the territory of a Member State or passing across the territory of one or more Member States.

3.2. Subsidiarity: Necessity of EU action

The Union has already adopted legislation on rail infrastructure capacity management and rail traffic management – the Recast Directive (in particular Chapter IV thereof) and the RFC Regulation (in particular Chapter IV thereof). This reflects the policy goal of achieving a Single European Rail Area, in which RUs are able to provide transport services on an increasingly integrated and interoperable network.

Action at EU level is necessary to address the problems and their underlying drivers identified in section 2. This is obviously the case in order to remove obstacles in current EU legislation (problem driver 1), which prevent implementation of sector initiatives such as the TTR project. Poor incentives and performance schemes (problem driver 2) could, in principle, be re-designed at national level but would lack the scope necessary to tackle cross-border issues. Possible sector initiatives risk to make little progress in view of conflicting interests among stakeholders. In the case of lack of coordination (problem driver 3), the problem would be how to achieve an effective coordination at international level without clear legal rights and obligations, which need to be harmonised, at least to a certain extent, across the territory of the EU. Finally, the lack of harmonisation/interoperability of digital tools (problem driver 4), is unlikely to be solved by sectoral or national initiatives, in view of insufficient enforcement possibilities.

3.3. Subsidiarity: Added value of EU action

The adoption of a legal framework at EU level will eliminate the differences in national rules and practices that stand in the way of maximising capacity use of the rail network, reduce the effectiveness of rail traffic management, and ultimately result in the poor performance of cross border rail. Action at EU level would also make it possible to put in place effective and efficient instruments for coordination of strategic infrastructure capacity planning, address potential gaps in the mandate of regulatory bodies with regard to cross-border rail traffic, and introduce harmonised rules incentivising the reduction of cancellations of and amendments to capacity requests.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objective

Railway transport has an important role to play in the transition to a climate neutral economy. This initiative contributes towards Sustainable Development Goal 13 ('Take

urgent action to combat climate change and its impacts'). It also contributes to reducing other negative externalities like road congestion, road accidents and local air pollution. For this to happen, it is important to improve railway transport performance as well as to enable it to cater for growing levels of demand.

The performance of railway transport and the increase of rail traffic depends on multiple factors, many of which are outside the scope of this initiative, such as investments in physical rail infrastructure, technical barriers and competition with other transport modes (which are addressed in other legislative proposals). Consequently, defining the absolute growth of rail traffic (passenger and freight) as the objective of this initiative would risk distorting the analysis, as much of the growth would depend on such external factors. Considering the above, the focus and general objective of this initiative is **to allow rail infrastructure capacity and rail traffic to be managed in a way that optimises the utilisation of the network, thus improving the quality of services and accommodating larger amounts of traffic**.

This means that the initiative contributes directly to the objectives for the development of rail transport defined in the sustainable and smart mobility strategy (SSMS)[76], including a 50% increase in rail freight traffic by 2030 and a 100% increase by 2050 as well as doubling high-speed passenger traffic by 2030 and tripling it by 2050. Sound management of infrastructure capacity can increase the usable capacity for any given level of physical infrastructure and is therefore a key enabler to achieving these objectives. Improvements in infrastructure management can be implemented faster than investments and should deliver significant impacts by 2030 already. However, better management alone will not be sufficient in each and every case. Investments to expand the physical capacity of rail infrastructure are a key element of TEN-T policy. The revision of the TEN-T Regulation on the basis of the Commission's 2021 proposal[77] will provide further impetus in this regard.

4.2. Specific objectives

To address the identified problem drivers, four specific objectives have been set. The specific objectives (SOs) and their correspondence with the problem drivers are presented in Figure 4 and discussed below.

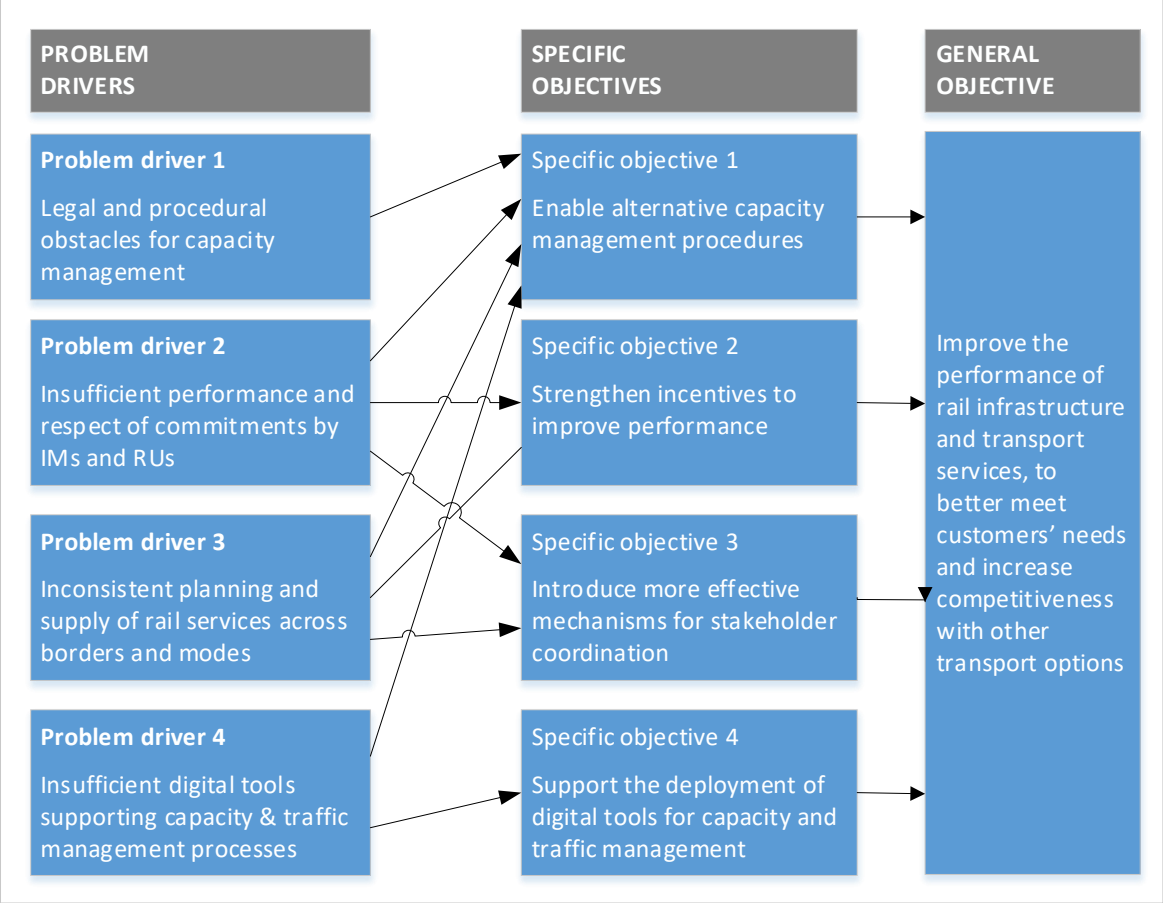
Specific Objective 1 (SO1) – Enable alternative capacity management procedures. The current rules on capacity management, while intended to provide RUs equal and non-discriminatory access to the rail network, are not adapted to the different needs of the various rail market segments and result in systematic disadvantages for freight and cross-border railway transport, including both freight and rail passenger services. The first specific objective of this initiative is to enable a more collaborative approach to the management of network capacity and a more effective planning cycle, providing greater flexibility to IMs and corresponding safeguards for RUs. By amending the rules on capacity allocation in both the Recast Directive and the RFC Regulation, the initiative will address the limitations of the existing rules on capacity management for the whole single European railway area.

[76] COM(2020) 789 final
[77] COM(2021) 812 final and COM(2022) 384 final.

SO1 also ensures that the capacity management procedures will make it easier for both IMs and RUs to stick to their commitments both by improving capacity planning and by providing better access to capacity via more flexible procedures for requesting capacity. The introduction of strategic planning in the capacity management process will allow policy makers and RUs to develop cross-border rail services by ensuring that sufficient capacity is available for such services.

The new capacity management procedures should also provide a faster and more flexible construction and allocation of train paths, which can only be achieve through increased use of interoperable digital tools both by IMs and RUs.

Figure 4: Relation between the specific objectives and the problem drivers



Specific Objective 2 – Strengthen incentives to improve performance of rail infrastructure and rail transport services. The second specific objective is to provide clear incentives and/or requirements for all key stakeholders to improve rail performance. For IMs, this means allocating scarce infrastructure capacity according to social, environmental and economic criteria. It also means keeping allocated capacity stable until the day of the train run and implementing maintenance works in accordance with the agreed plan. For transport operators, it means requesting capacity in line with their actual needs, avoiding capacity hoarding behaviour that goes to the detriment of overall system performance.

The introduction of harmonised rules on incentivising the performance of both IMs and RUs, in particular in the process of planning and allocating capacity, will address the problem of frequent amendments of capacity requests and ensure a more reliable access to capacity, which will allow to develop rail services. Introducing further coherence in the planning and allocation of capacity will facilitate cross-border rail.

Incentives for improved performance would help increase punctuality and facilitate traffic management, ultimately increasing the reliability of rail services (especially freight).

Specific Objective 3 – Introduce more effective mechanisms for stakeholder coordination. The establishment of a true single European rail area requires close cross-border coordination and cooperation on the side of IMs but also between public authorities, rail transport operators and regulators. While the responsibility for the management of capacity and traffic on the network must remain at national level, it is important to significantly improve coordination on all aspects that have a cross-border impact. Accordingly, the third specific objective is to strengthen the relevant governance structures of the single European rail area to support better coordination at all stages of planning and operations, including strategic capacity management, the planning of TCRs, capacity allocation, rescheduling as well as traffic and contingency management.

Both cross-border freight and passenger rail would be able to benefit from clearer rules on capacity and traffic management, from increased convergence of IMs' procedures and practices and from more consistent rules across the internal EU borders. This should help those rail market segments, which include more cross-border traffic, such as freight, but also allow other market segments to grow by providing more cross-border services.

Coordination of train and terminal activities would cover planning and operational aspects and should improve rail freight's overall performance and when it is part of multimodal transport.

Specific Objective 4 – Support the deployment of digital tools for capacity and traffic management. Digitalisation is a key enabler of better capacity utilisation, more flexible responses to customer needs, increased reliability and resilience vis-à-vis disruptions. The current fragmentation and (partial) duplication of tools, systems and standards should be corrected. Existing legally mandated standards should be further developed with a clear focus on user and business needs. The integration of rail with customers and partners in passenger transport and freight logistics should be intensified based on open standards and clearly defined interfaces, supporting the development and deployment of solutions that increase the performance and cybersecurity of IT systems and applications for capacity management and traffic management. The fourth specific objective of this initiative is to clarify and strengthen the legal requirements regarding digitalisation of planning and operations of rail capacity and traffic.

In the targeted stakeholder survey, all four specific objectives received clear support from the 62 participants, with the strongest related to digitalisation (90%) and the lowest related to conditions for access to rail infrastructure (64%).

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. What is the baseline from which options are assessed?

The EU Reference scenario 2020 (REF2020) is the starting point for the impact assessment of this initiative[78]. The REF2020 takes into account the impacts of the COVID-19 pandemic that had a significant impact on the transport sector. More detailed information about the preparation process, assumptions and results are included in the Reference scenario publication[79]. Building on REF2020, the baseline has been designed to include the initiatives of the 'Fit for 55' package proposed by the Commission on 14 July 2021[80] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[81]. The baseline scenario assumes no further EU level intervention beyond the current Rail Freight Corridors Regulation and the Recast Directive that sets up the Union's legal framework for the Single European railway area[82]. A common baseline was developed for this impact assessment, as well as for other initiatives related to freight transport[83]. More details on the baseline are provided in Annex 4.

In terms of transport network, the baseline scenario accounts for the proposed revision of the TEN-T Regulation[84]. It assumes that the high-quality TEN-T rail network would be gradually completed in three steps: 2030 for the core network, 2040 for the extended core network and 2050 for the comprehensive network. It also assumes full electrification of the core TEN-T rail network by 2030 and of the comprehensive TEN-T network by 2050[85].

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78 The EU Reference Scenario 2020 is one of the European Commission's key analysis tools in the areas of energy, transport and climate action. It allows policy-makers to analyse the long-term economic, energy, climate and transport outlook based on the policy framework in place in 2020. National experts from all EU countries contributed to the Reference Scenario 2020 through a consultation process, and stakeholders have also contributed on technology assumptions. The EU Reference Scenario 2020 is the basis on which specific policy scenarios used to assess options informing the policy initiatives in the 'Fit for 55' package have been developed. The EU Reference Scenario has also been the basis for developing the scenarios underpinning the RePowerEU package proposed by the Commission on 18 May 2022. The EU Reference Scenario and the scenarios underpinning the 'Fit for 55' package and the RePowerEU package share the same macro-economic, the same technology assumptions as well as policies implemented or planned at Member State level (including the National Energy and Climate Plans).

79 https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en

80 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

81 https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

82 As explained in section 2.3, the rail sector launched several initiatives aimed at improving rail freight's performance and, in particular, the Timetable Redesign Project (TTR) which is specifically addressed at improving the management of network capacity. However, for these initiatives to become something more than pilot projects or recommended best practices, rules need to be put in place with clearly defined obligations. In the case of TTR, some of the measures cannot be implemented without a change to the EU legal framework, as they are not in line with the current rules. Therefore, the TTR is not part of the baseline.

83 Revision of the Weights and Dimensions Directive, revision of the Combined Transport Directive, proposal for an EU framework for harmonised measurement of transport and logistics emissions.

84 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2021%3A812%3AFIN

85 The TRUST and the ASTRA models have been used also for assessing the impacts of the policy options developed in the context of the impact assessment accompanying the revision of the TEN-T Regulation (SWD(2021) 472 final of 14 December 2021). The baseline scenario thus reflects all the measures included in the preferred policy option of the impact assessment accompanying the revision of the TEN-T Regulation. The detailed inputs used for reflecting these measures in the modelling are available in Annex 4 of the impact assessment accompanying the revision of the TEN-T Regulation.

The baseline also incorporates foresight megatrends[86] and developments captured in the 2022 Strategic Foresight Report[87]. Among others, it captures the trend of increasing demand for transport as population and living standards grow as well as the links between the digital and green transition. In particular, the projected transport activity draws on the long-term population projections from Eurostat and GDP growth from the *Ageing Report 2021*[88] by the Directorate General for Economic and Financial Affairs.

In the Baseline scenario, EU transport activity is projected to grow post-2020, following the recovery from the COVID pandemic. Road transport would maintain its dominant role within the EU by 2050. Rail transport activity is projected to grow significantly faster than for road, driven in particular by the completion of the TEN-T core network by 2030 and of the comprehensive network by 2050, supported by the CEF, Cohesion Fund and ERDF funding, but also by measures of the 'Fit for 55' package that increase to some extent the competitiveness of rail relative to road and air transport. Passenger rail activity is projected to go up by 24% by 2030 relative to 2015 (69% for 2015-2050). High speed rail activity, in particular, would grow by 68% by 2030 relative to 2015 (169% by 2050), missing however to deliver on the milestone of the SSMS of doubling its traffic by 2030 and tripling it by 2050. Freight rail traffic would increase by 42% by 2030 relative to 2015 (96% for 2015-2050)[89] hence falling short of the milestone of the SSMS of increasing the traffic by 50% by 2030 and doubling it by 2050.

As rail infrastructure capacity will need to accommodate an increasing amount of demand, by 2030 nearly 9 000 kilometres of rail (about 6.5% of the network) are projected to be affected by capacity restrictions in the baseline, of which 6 500 kilometres would be congested (4.7% of the network) and 2 500 kilometres highly utilised (1.8% of the network). By 2050, the rail network affected by capacity restrictions is projected to further increase to 20 200 kilometres (about 14.6% of the network), of which 11 500 kilometres would be congested (8.3% of the network) and 8 700 kilometres highly utilised (6.3% of the network). Congestion on the network (expressed in train-kilometres) is projected to go up from 94.3 million train-kilometres in 2020 to 159.3 million train-kilometres in 2030 and 231.2 million train kilometres by 2050[90]. This is despite the significant capacity improvement expected in the next decades due to improved infrastructure envisaged by the proposed revision of the TEN-T Regulation.

Passenger and freight train punctuality is projected to deteriorate by 2030 and to only somewhat improve post-2030, driven by the improved infrastructure envisaged by the proposed revision of the TEN-T Regulation. The share of passenger trains that are

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86 https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#explore

87 COM(2022) 289 final of 29 June 2022.

88 The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)

89 The change in commodities transported by rail has also been taken into account (see Annex 4, section 4.2.2., in the part dedicated to the methodology for estimating cost savings due to punctuality improvements). As regards the decreasing volumes of goods traditionally transported by rail (commodities such as iron ore, coal, steel etc.), it is important to emphasize that in parallel to the decline in the volume of these commodities, intermodal transport of high-value intermediate and final goods has experienced strong growth, resulting in a change in the composition of goods transported by rail.

90 These estimates are based on the TRUST model. As explained in Annex 4, the TRUST model is a European transport network model simulating road, rail, inland waterways and maritime transport activity. TRUST covers the whole EU and its neighbouring countries and it allows for the assignment of passenger and freight origin-destination (OD) matrices at NUTS3 level (about 1 600 zones) on the multimodal transport network.

punctual is projected to go down from 88.3% in 2020 to 87.8% in 2030 and to increase to 90.3% by 2050. Freight rail is expected to face more challenges in terms of punctuality relative to passenger rail. The share of freight trains that are punctual is projected to reduce from 58.4% in 2020 to 57.4% in 2030, increasing to 68.4% by 2050.

Congestion costs[91] would increase by about 14% by 2030 and 32% by 2050, relative to 2015. Congestion on the inter-urban network would be the result of growing freight transport activity along specific corridors, in particular where these corridors cross urban areas with heavy local traffic.

CO_2 emissions from transport[92] are projected to be 24% lower by 2030 compared to 2015, and 87% lower by 2050. The baseline scenario shows that the emission reductions from the transport sector would contribute towards the ambition of at least 55% emission reductions by 2030 and climate neutrality by 2050, while relying to a significant extent on technological solutions (i.e. the uptake of low- and zero-emission vehicles and of renewable and low carbon fuels) and carbon pricing. This would depart from the balanced approach underpinning the impact assessments accompanying the 'Fit for 55' package and the staff working document accompanying the REPowerEU initiatives[93], showing a combined approach of carbon pricing instruments and regulatory-based measures to deliver on the increased climate ambition[94].

NOx emissions are projected to go down by 56% between 2015 and 2030 (85% by 2050), mainly driven by the electrification of the road transport and in particular of the light duty vehicles segment. The decline in particulate matter (PM2.5) would be slightly lower by 2030 at 52% relative to 2015 (90% by 2050).

The baseline scenario reflects the projected higher energy prices driven by the Russian invasion of Ukraine[95]. Beyond this aspect, it was however not possible to quantify the impact of the Russian invasion of Ukraine in the context of the baseline scenario, as there is large uncertainty with respect to its impacts, in particular for the medium to long term. While its impact is felt in terms of trade (e.g. grain, bulk fertilisers and hydrocarbons) and in certain geographical areas, the impact on the baseline of this initiative is expected to be relatively limited, although the problem of the lack of infrastructure capacity to absorb the growth of transport traffic may further deteriorate due to the changes in transport routes.

5.2. Policy measures and policy options

As a first step, a comprehensive list of possible policy measures was established after extensive consultations with stakeholders, expert meetings, independent research, and the

[91] External costs resulting from time lost in road transport due to demand of road space exceeding the supply. They arise mainly during peak periods in urban areas.

[92] Including international aviation but excluding international maritime.

[93] SWD(2022) 230 final of 18 May 2022.

[94] The scenarios underpinning the impact assessments accompanying the 'Fit for 55' initiatives and the staff working document accompanying the REPowerEU initiatives incorporated a broader range of policies (including this initiative) that were represented in a stylised way ahead of the actual proposals, to show the delivery of at least 55% emissions reduction target by 2030 and to account for the interaction with the forthcoming initiatives. The scenario reflecting the 'Fit for 55' initiatives, the REPowerEU initiatives and the forthcoming initiatives shows the need to reduce emissions from transport by 26% by 2030 relative to 2015 and by 94% by 2050. Therefore, this initiative contributes towards the at least 55% emissions reductions target by 2030 and achieving climate neutrality by 2050.

[95] SWD(2022) 230 final of 18 May 2022.

Commission's own analysis. This list was subsequently screened based on the likely effectiveness, efficiency and proportionality of the proposed measures in relation to the given objectives, as well as their legal and technical feasibility, following input from the stakeholders.

5.2.1. Retained policy measures

Table 2 provides an overview of the retained policy measures and their links with problem drivers, specific objectives and policy options. A more detailed description of the individual policy measures included in the policy options is presented in Annex 6.

Table 2: Overview of the policy measures and their link with problem drivers, specific objectives and policy options (an X indicates that a measures is included in the respective policy option)

Problem driver / specific objective	Policy measure	Policy options			
		PO1	PO2	PO3	PO4
PD1 - Legal and procedural obstacles for capacity management SO1 - Enable alternative capacity management procedures through changes to legislation	PM1 - **Mandatory use of RFC one-stop shops:** Make use of the corridor one-stop shops mandatory and clarify the functions of the corridor one-stop shops in capacity management and allocation for cross-border traffic	X			
	PM2-1 - Introduce a harmonised, directly applicable **EU legal framework** for **railway capacity and traffic management** supporting better utilisation of railway network capacity, including via more dynamic and market-oriented traffic and capacity management, and fair competition between rail operators		X	X	X
	PM2-2 - **Introduce an 'EU network statement'** defining the common set of harmonised rules and procedures for rail capacity and traffic management applicable on the entire EU rail network, complementing network statements of individual infrastructure managers; clarifying the status of infrastructure managers' network statements			X	X
	PM3 - **Introduce a strategic capacity management phase**, which (i) establishes a multi-annual planning to optimise the quantity and quality of the capacity offer and (ii) provides a reserve of capacity for flexible allocation to individual applicants		X	X	X
	PM4 - **Introduce new procedures for capacity allocation** in line with market needs, in particular for flexibility and reliability, based on the outcomes of the strategic capacity management phase (PM3)		X	X	X
	PM5 - Introduce **transparent and harmonised methods, based on socio-economic criteria, supporting the management of capacity on infrastructure where demand exceeds supply**; methods should be applied in strategic capacity management (PM3), capacity allocation (PM4) and in contingency management (PM6)		X	X	X
	PM6 - Strengthen existing and introduce new mechanisms and **procedures to ensure traffic continuity** in the event of disruptions or planned non-availability of the network (infrastructure works)		X	X	X
PD2 - Insufficient incentives to improve performance	PM7 - **Strengthen the monitoring of service quality and customer satisfaction on the freight corridors**, notably by introducing a mandatory and harmonised set of performance indicators covering all relevant aspects of rail infrastructure service and rail transport services	X			
SO2 -	PM8 - **Uphold commitments related to capacity:** Introduce effective and reciprocal economic incentives to strengthen respect by		X	X	X

Problem driver / specific objective	Policy measure	Policy options			
		PO1	PO2	PO3	PO4
Strengthen incentives to improve performance	all stakeholders of commitments related to capacity				
	PM9 - **Strengthen capacity-related rights of applicants** (railway undertakings and others) vis-à-vis infrastructure managers, in particular for cross-border capacity and in the event of changes to allocated capacity		X	X	X
	PM10 - **Entrust an independent expert body with reviewing the performance** of rail infrastructure and transport services, providing advice to European Commission, the network of regulatory bodies (PM19) and other rail sector stakeholders.			X	X
	PM11 - **Introduce an EU-level support and monitoring function** addressing (i) compliance with agreed rules and procedures and (ii) the performance of infrastructure and transport services. The function involves the European network of infrastructure managers and the operational entity supporting it (PM20-1/PM20-2), the network of regulatory bodies (PM19)			X	X
	PM12 - Entrusting regulatory bodies with the **review of multi-annual agreements between Member State authorities and infrastructure managers** to assess their consistency with the European performance scheme (PM13) and Member States' indicative rail infrastructure development strategies. Entrusting the network of regulatory bodies to identify and promote best practices for such agreements				X
	PM13 - **Introduce a European performance scheme** to improve operational performance of rail services and providing a framework for national performance schemes				X
PD3 - Insufficient mechanisms for stakeholder coordination SO3 - Introduce more effective mechanisms for stakeholder coordination	PM14 - **Strengthen governance of rail freight corridors** and formalise a cross-corridor governance layer with defined competences	X			
	PM15 - Introduce **binding rules and procedures along corridors** for the coordination of traffic management between infrastructure managers and between infrastructure managers and the operation of terminals	X			
	PM16 - **Introduce a high-level advisory / coordination platform at European level** involving all stakeholders involved in multimodal rail freight transport		X	X	X
	PM17 - **Introduce a European framework for the cross-border coordination of rail traffic management**, including terminals and other rail facilities, based on the principles of collaborative decision-making		X	X	X
	PM18-1 - Conducting continuous **transport market monitoring and analysis via cooperation of infrastructure managers**		X		
	PM18-2 - Conducting continuous **transport market monitoring and analysis at European level**, carried out by ENIM (variant of PM18-1)			X	X
	PM19 - **Strengthening the competences of the European network of regulatory bodies** (Article 57 of Directive 2012/34/EU) and introducing a secretariat supporting its work			X	X
	PM20-1 - **Empower the European Network of Infrastructure Managers (ENIM) as a coordination structure for capacity and**			X	

Problem driver / specific objective	Policy measure	Policy options			
		PO1	PO2	PO3	PO4
	traffic management, by assigning it with the responsibilities (i) to define harmonised EU procedures, rules and tools (PM2-2, PM3, PM4, PM5, PM6, PM24, PM25), (ii) to support and monitor implementation of such procedures, rules and tools (PM11) and (iii) to coordinate capacity management between networks (PM21) as well as by **appointing an entity** (**'the Network Coordinator'**) **to support ENIM in the operational implementation of these functions**				
	PM20-2 - **Empower ENIM and the Network Coordinator as coordination and as planning / operational structure for capacity and traffic management**, including all the responsibilities in PM20-1, and with the addition of decision-making responsibilities in capacity management (PM22) and operational functions in traffic management (PM23)				X
	PM21 - **Introduce an EU-level function supporting cross-border coordination of capacity management**, including **coordination and escalation mechanisms** involving **applicants and regulatory bodies.** Entrusting ENIM (PM20-1) with the task to identify and find solutions to conflicts resulting from the non-alignment or disagreement between infrastructure managers relating to capacity management. If ENIM cannot provide a solution satisfactory for applicants concerned, the matter is forwarded to the network of regulatory bodies for a binding decision			X	
	PM22 - **Entrust the strategic capacity management phase to the European network of infrastructure managers.** Entrusting ENIM (PM20-2), for all rail lines part of the European transport corridors, with decision-making competence relating to the strategic capacity management phase and with the competence to approve the outcomes of the capacity allocation process				X
	PM23 - **Introduce an operational function at EU level supporting the coordination of traffic management, in particular for the management of major disruptions ('crisis cell')**				X
PD4 - Insufficient digital support tools SO4 - Support the deployment of digital tools enabling better capacity and traffic management	PM24 - **Introduce legal requirements on the harmonised exchange of digital information** supporting capacity and traffic management as well as customer information	X	X	X	X
	PM25 - Comprehensive digitalisation and automation of capacity and traffic management providing **a single interface at EU level and seamless end-to-end services for applicants** (railway operators)		X	X	X

5.2.2. Discarded policy measures

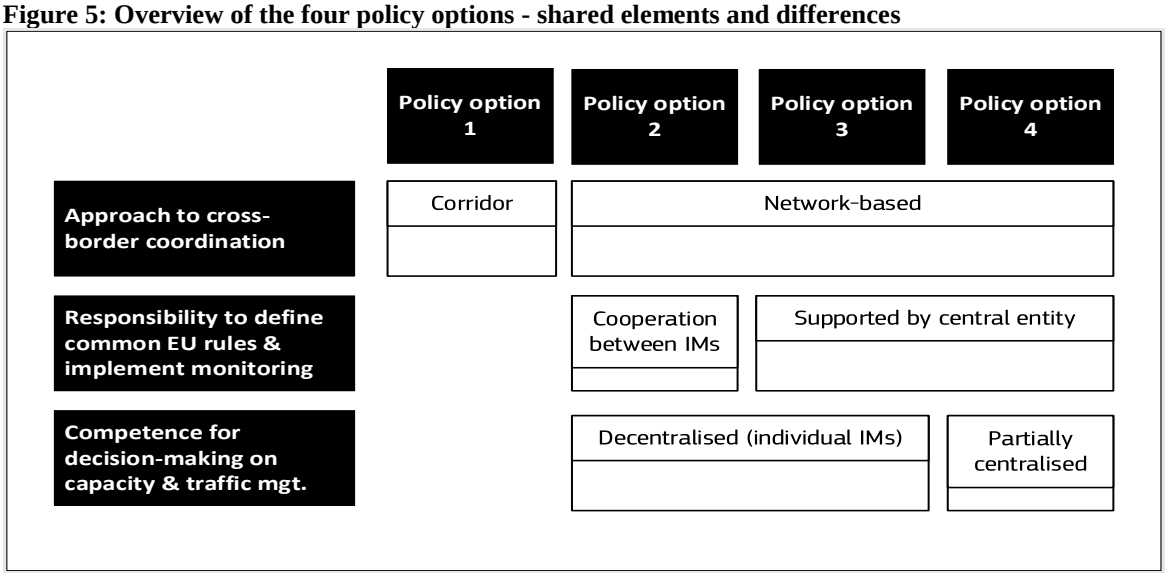
Some policy measures considered in the preparatory phase of the impact assessment were discarded based on a pre-screening, providing a first assessment of potential impacts in

terms of effectiveness, efficiency, coherence, proportionality and subsidiarity and based on stakeholder feedback. These measures include (i) an involvement of customers in the governance of rail freight corridors; (ii) the mandatory establishment of a legal entity for each rail freight corridor; (iii) EU rules for rail-related activities in terminals; (iv) the introduction of an entity in charge of monitoring and supervising rail traffic at EU level in real time and (v) a stronger centralisation of IT tools for capacity and traffic management. More detailed explanations on reasons for discarding them are provided in Annex9.

5.3. Overview of policy options

The retained policy measures have been grouped in 4 policy options: policy option 1 (PO1), policy option 2 (PO2), policy option 3 (PO3) and policy option 4 (PO4). Figure 5 provides a high-level overview of how the four policy options were built. PO1 is an evolutionary development of the current legal framework, which maintains the corridor approach to the cross-border coordination of capacity and traffic management as set out in the RFC Regulation. By contrast, PO2, PO3 and PO4 imply a switch from a corridor-based to a network-based approach to the coordination of rail capacity and traffic management, covering all types of rail transport (passenger/freight, domestic/cross-border), that enable a more seamless approach on the entire rail network, not just on lines designated to corridors[96].

Figure 5: Overview of the four policy options - shared elements and differences



PO2, PO3 and PO4 introduce a comprehensive harmonisation and modernisation of the rules and procedures for capacity and traffic management. They therefore involve a more comprehensive review of the legal framework.

The main difference between PO2, PO3 and PO4 lies in the stringency and ambition of requirements and in the extent of centralisation of the decision-making process. PO2 relies on voluntary cooperation between the stakeholders concerned, in particular rail IMs, with no or very limited centralised coordination structures at EU level. PO3 extends PO2, from which it takes over most of the measures, and entrusts additional responsibilities for harmonisation to coordinating bodies at EU level, making use, to the largest extent

[96] However, a focus on the most strategic lines will be maintained to avoid overregulation on lines with regional importance and/or low traffic density.

possible, of existing entities. The mission of one of the coordinating entities in PO3 is to (i) develop common rules and procedures for capacity and traffic management and (ii) to monitor the implementation of these rules by individual IMs. As a counterbalance to this entity, PO3 introduces a 'network of regulatory bodies' in charge of supervising the activities of the IMs' coordinating entity.

Finally, PO4 extends the remit of the coordinating entity introduced in PO3 by adding operational and decision-making tasks, such as the competence to take final decisions in case of disagreement/non-alignment between IMs and the setup of a European traffic management function supporting the management of major incidents ('crisis cell').

5.4. Description of policy options

5.4.1. Policy option 1 – Strengthening the corridor approach

In continuing the corridor approach, PO1 maintains key elements and tools introduced by the RFC Regulation and addresses their shortcomings by means of targeted interventions.

PO1 addresses **SO1** *(Enable more effective capacity management procedures through changes to legislation)* by making use of the corridor one-stop shops mandatory for the allocation of cross-border infrastructure capacity (train paths), both for passenger and freight services (PM1). This is intended to make the use of the one-stop shops in capacity management and allocation obligatory for all cross-border traffic on RFC lines, compared to the current situation where less than 20% of cross-border freight traffic is allocated via them. PO1 also extends the scope of the functions of the one-stop shops beyond the capacity allocation phase by requiring the involvement of one-stop shops at earlier and later stages, such as the strategic planning phase (e.g. scheduling of capacity restrictions due to infrastructure works) and following capacity allocation (e.g. rescheduling in response to unforeseen changes on the side of infrastructure managers and railway undertakings), in order to eliminate the existing need for railway undertakings to revert to individual infrastructure managers for all activities other than capacity requests/allocation. In addition, as regards the coordination with terminals, PO1 will require corridor management boards to develop procedures on coordinating rail infrastructure and terminal capacity allocation together with the terminal advisory groups. With respect to **SO2** (Strengthen incentive to improve performance), PO1 strengthens the monitoring of the quality of rail transport services along the corridors (PM7). This involves the adoption of a mandatory and harmonised set of performance indicators covering all aspects of rail infrastructure and transport services relevant for cross-border rail transport. The definition of indicators will be based on a consultation via the corridors' advisory groups of RUs, terminals and customers of rail freight services. Publishing the results of performance monitoring can be considered as a 'reputational' incentive to improve performance.

With respect to **SO3** (Introduce more effective mechanisms for stakeholder coordination), PO1 strengthens the corridor governance structure by extending and/or clarifying its competences and by complementing it with a formal cross-corridor governance layer to coordinate across corridors (PM14). In addition, PO1 introduces more specific requirements as regards the coordination of traffic management between IMs, on the one hand, and between IMs and terminals, on the other (PM15). As regards the latter measure, whereas Regulation 913/2010 merely requires infrastructure managers to 'put in place procedures for coordinating traffic management along the freight corridor', which produced only limited results, PO1 introduces binding rules and procedures for coordination along corridors.

In relation to **SO4** (Support the deployment of digital tools enabling better capacity and traffic management), PO1 introduces requirements for digital exchange of information (PM24) – a measure included in all options.

5.4.2. Policy option 2 – Network approach based on common European rules and procedures implemented via cooperation between infrastructure managers

This policy option abandons the rail freight corridors in favour of a network approach. With respect to **SO1**, it introduces a common European legal framework for rail capacity management and allocation that applies to the entire network (PM2-1). It also adds transparent and harmonised methodologies for the partitioning of capacity to different rail infrastructure users (PM5) based on socio-economic criteria and taking into account the need for infrastructure works. These procedures and methods involve a broad range of stakeholders – including public authorities, infrastructure users (RUs and other applicants) as well as representatives of rail transport services users (passenger and freight). The outcome of this phase are binding planning documents that safeguard capacity for defined rail transport market segments over a horizon of 5 to 10 years.

These plans provide the basis for a strategic capacity management process (PM3) which (i) establishes a multi-annual planning procedure to optimise the quantity and quality of the capacity offer and (ii) provides a reserve of capacity for flexible allocation to individual applicants in the capacity allocation phase. In this policy option, the detailed rules and procedures for the strategic management process are elaborated based on cooperation between IMs, following consultation of all relevant stakeholders. The actual implementation of the strategic capacity management process remains in the competence of individual IMs and is under the scrutiny of regulatory bodies. Cross-border coordination is ensured by bilateral or multilateral cooperation between IMs. The results of the process are documented via a sequence of planning documents of increasing level of detail about the utilisation of capacity as the planning cycle progresses. The measure is closely related to the 'advanced planning phase' provided for under the already mentioned TTR project and the output related to capacity (capacity model/partitioning/supply).

Following the outcomes of the strategic capacity management process, PO2 introduces market-oriented procedures for allocating capacity to individual RUs and other applicants (PM4). The procedures and mechanisms are closely related to the allocation concepts proposed under the TTR project, such as capacity allocation on the basis of a rolling planning process or more market-oriented ways to allocate capacity rights covering several timetable periods. A more detailed description of the TTR project, and how it is reflected in the policy measures, is provided below:

The '**Timetable Redesign Project**' or '**TTR project**' is a sector-driven initiative started in 2014 with the view to develop a new capacity management process which better reflects the needs and constraints of rail freight traffic.

The TTR project aims to achieve five general objectives:

1) to optimise the use of the capacity of the existing network,
2) to increase the quality of offered capacity,
3) to harmonise capacity management in Europe, for the benefit of cross-border services, and thereby increasing the stability and reliability of capacity,
4) to automate capacity management processes, and

5) to improve the competitiveness of rail against other modes.

To achieve these objectives, the TTR project introduces five key concepts:

- 'Advance planning': TTR introduces a new and harmonised process for capacity management and allocation which replaces the annual planning exercise with a multi-annual planning prepared in advance.
  The 'advance planning' concept is reflected in PM3 introducing a strategic capacity management phase.
- 'Rolling planning': TTR introduces a new, more flexible process for the allocation of infrastructure capacity during the period of the current working timetable and with the possibility for RUs to be granted the right for infrastructure usage beyond the current timetable period. The new procedures introduced in PM4 cover this new 'rolling planning' concept.
- 'Commercial conditions': TTR introduces financial incentives designed to incite both IMs and RUs to limit changes to allocated capacity with a view to stabilise the planning process. The introduction of such economic incentives is envisaged in PM8.
- 'Digital capacity management': TTR introduces an ecosystem of IT systems supporting capacity management which builds, on the one hand, on a combination of upgrades to the existing IT systems of IMs, and on a 'central IT layer' at EU level on the other hand. Requirements concerning the deployment and use of IT systems supporting capacity management processes are introduced by PM25.
- 'International leading entities': TTR relies on entities to ensure the effective coordination of the actual contents of the planning process and to ensure adherence to commonly agreed standards.

This initiative supports the TTR project by providing, on the one hand, a set of policy measures designed to remove existing legal barriers to its implementation, and a set of policy measures supporting the rollout of TTR through the introduction of specific requirements on the other hand.

Additional details on the TTR project can be found in Annex 7.

In this policy option, capacity allocation remains in the competence of individual IMs. However, for cross-border rail services, IMs must provide seamless capacity via IT applications covering cross-border capacity in a single place and operation (PM17).

This option also strengthens existing and introduces new procedures and mechanisms to ensure traffic continuity in the event of emergency or crises situations (PM6). This includes mandatory measures to prepare for major network disruptions or sanitary or security crises and, potentially, rules for the re-allocation of capacity in such cases, subject to pre-defined criteria and safeguards with respect to the fair and non-discriminatory treatment of applicants.

As regards **SO2**, PO2 clarifies the legal requirements for effective and reciprocal economic incentives to strengthen respect by all stakeholders of commitments related to capacity (PM8). This comprises obligatory cancellation charges for RUs, i.e. require payment for capacity allocated but not used. It also introduces charges for IMs for unilaterally cancelling allocated capacity, or for making substantial changes to allocated train paths. The charges will take into account situations of *force majeure*. In addition, the policy option strengthens the legally defined rights of applicants related to capacity vis-à-vis IMs (PM9), notably in relation to cross-border services and in the event of changes to

allocated capacity. In particular, IMs must ensure the consistency of train paths along the entire cross-border route[97].

In relation to **SO3**, PO2 introduces a requirement for IMs to conduct continuous transport market monitoring and analysis at European level (PM18-1) to support the strategic capacity planning process outlined above. Market monitoring has to be carried out by IMs in cooperation with and must involve a consultation of all relevant stakeholders. PO2 also introduces a European framework for the coordination of rail traffic management across borders and between different stakeholder groups (PM17). These stakeholders will be required to establish the actual rules and procedures, on the basis of collaborative decision-making and in close cooperation with the European Agency for Railways and the Europe's Rail Joint Undertaking. Finally, PO2 requires the presence of a forum for high-level exchange and coordination at European level involving all stakeholders involved in rail transport (PM16). This platform will involve further stakeholders from public authorities, partners and customers of rail transport services and possibly other groups (supplier industry, civil society, and academia), and will be chaired by the Commission. The platform can set up working groups operating based on the mandate from the plenary to address specific issues such as performance review and digital tools. It will replace the advisory groups of the rail freight corridors and ensure systematic involvement of the operators of freight terminals and intermodal transport services in all individual policy measures.

With respect to **SO4** (digitalisation), PO2 requires IMs to provide single IT interfaces at EU level providing seamless end-to-end services for capacity management (PM25). This measure complements the requirement for digital data exchange common to all policy options (PM24); it requires IMs to provide IT services and interfaces covering the entire capacity management process in a single place and operation, going beyond the peer-to-peer approach underlying PM24[98].

5.4.3. Policy option 3 – Network approach supported by a central entity in charge of defining common rules and monitoring their implementation

This policy option also abolishes the rail freight corridors and adopts a network approach. It comprises the same measures as in PO2 in regard to capacity management. However, entities at EU level are introduced to ensure that uniform rules are implemented by all IMs, to strengthen coordination and monitoring for cross-border capacity and traffic management.

With respect to **SO1**, PO3 introduces an 'EU network statement' to accompany the network statements of individual IMs[99]. The EU network statement sets out the concrete common rules and procedures for capacity and traffic management at EU level (PM2-2).

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[97] It is common practice that individual IMs modify timings and/or routings of train paths without coordination with neighbouring IMs, potentially resulting in inconsistent train paths (different routes or inconsistent timing).

[98] The technical specifications on telematics applications for freight (see Commission Regulation (EU) No 1305/2014) provide standards and interfaces for electronic data exchange between IMs and RUs. Data exchange is decentralised at peer-to-peer level, implying that data exchange on cross-border trains may be fragmented in national segments.

[99] Article 27 of the Recast Directive requires IMs to develop and publish a network statement which sets out in detail the general rules, deadlines, procedures and criteria for charging and capacity-allocation schemes, including other information required to enable applications for infrastructure capacity.

Its purpose is to support harmonisation of rules and procedures, by providing a common, mandatory framework for the network statements of individual IMs thereby ensuring consistency and complementing the harmonised legal framework (PM2-1). Preparation of the network statement is assigned to the EU network coordination entity (PM20-1).

In relation to **SO2**, PO3 introduces an independent expert body responsible for reviewing the performance of rail infrastructure and cross-border rail transport services (PM10). The body is comprised of senior experts or managers bringing together technical, market and managerial experience in railways, acting in a personal capacity as independent experts not affiliated with any particular stakeholder (group). Its primary purpose is to provide advice to the network of regulatory bodies and to the rail sector on all matters related to the performance of cross-border rail services. It also introduces EU-level support and monitoring that addresses (i) compliance with agreed rules and procedures and (ii) the performance of infrastructure and transport services (PM11).

With respect to **SO3**, PO3 empowers the European Network of Infrastructure Managers to carry out the key tasks (PM20-1) of (i) developing common rules and procedures for capacity and traffic management, (ii) supporting and monitoring the implementation of these rules by IMs and (iii) resolving inconsistencies between IMs in relation to capacity planning and allocation. The network will be supported by an operational entity (hereafter the "rail network coordinator"), to be designated by the Commission. The scope of such common rules and procedure includes in particular measures PM3, PM4, PM5 and PM6[100]. The governance of the entity assembles all main European IMs and the European Commission. The central coordination entity centralises European-level transport market monitoring and analysis (PM18-2)[101].

As regulatory counterpart to ENIM, policy option 3 strengthens the competences of the European network of regulatory bodies (PM19) set up by the Recast Directive. The network complements national regulatory bodies on matters involving a European or cross-border dimension; it acts as appeal body in the event of complaints or can launch own-initiative investigations. Its tasks include in particular the regulatory supervision of the activities of the EU network coordination entity and of the European network statement. The option assigns ENIM (supported by an operational entity) with the task to carry out continuous transport market monitoring and analysis at European level (PM18-2).

In addition, PO3 provides for an escalation mechanism to resolve disputes at European level or relating to cross-border traffic (PM21). In the first instance, ENIM and the Network Coordinator are given the task of identifying and finding solutions for cases of non-alignment or disagreement between IMs. If this does not result in a satisfactory solution, the matter is forwarded to the network of regulatory bodies (PM19) for a binding decision.

With respect to digital support tools **(SO4)**, policy option 3 includes the same measures as PO2.

[100] PM3, PM4, PM5 and PM6 are also part of policy option 2. However, in policy option 2 IMs develop common rules and procedures based on voluntary cooperation, without a central coordination entity.

[101] In policy option 2, this function is carried out by IMs based on voluntary cooperation (M6-1).

5.4.4. *Policy option 4 – Network approach, assigning competences in operational decision-making to the EU network of infrastructure managers, supported by an operational entity*

This policy option builds on PO2 and PO3; it also abolishes the rail freight corridors. The key feature of PO4 is that it entrusts the EU network of infrastructure managers with several operational and decision-making competences relating to capacity and traffic management for cross-border rail traffic (PM20-2).

In relation to **SO1**, PO4 includes the same policy measures as PO3. With respect to **SO2**, PO4 includes the measures of the PO3 and additionally assigns the network of regulatory bodies with the task to identify best practises with respect to the contractual agreements to be concluded between Member State authorities and IMs in accordance with Article 30 of Directive 2012/34/EU and, in the light of these results, gives national regulatory bodies the responsibility to review the effectiveness of the multi-annual agreements concluded at national level (PM12). In addition, it introduces an EU performance scheme to strengthen the incentives for IMs and RUs to improve the performance of rail infrastructure and transport services (PM13), which will be developed with support from the independent performance review body (PM10).

In relation to **SO3**, PO4 entrusts an entity at European level (PM20-2) with the competence to take final decisions as regards the strategic capacity management phase and the allocation of capacity for cross-border services (PM22). This implies that the planning documents of the capacity planning phase (network utilisation concepts etc.) for lines part of the TEN-T network, in particular lines making up the European Transport Corridors, are approved by ENIM; the latter also has the competence to approve the outcomes of the allocation of capacity (train paths) as far as cross-border traffic is concerned. As regards coordination of traffic management, PO4 introduces an EU 'crisis management cell' providing operational support for the coordination of traffic management during major network disruptions and emergency / exceptional situations (PM23). The crisis cell is established as a part of the EU network coordination entity. Its key function is to coordinate between operational stakeholders in the event of major incidents and crises on the network which have an impact on cross-border rail traffic, as current operational ('real-time') traffic management by infrastructure managers is typically done only at local and national levels with no dedicated entities to support the coordination of cross-border incidents and crises. Other measures addressing SO3 like PM16 (Introduce a high-level advisory/ coordination platform at European level) and PM17 (Introduce a European framework for the cross-border coordination of rail traffic management) are common to PO2, PO3 and PO4, and PM18-2 (Conducting continuous transport market monitoring and analysis at European level) and PM19 (Strengthening the competences of the European network of regulatory bodies) are common to PO3 and PO4.

With respect to **SO4**, PO4 includes the same measures as PO2 and PO3.

5.4.5. *Measure common to all four policy options*

With respect to SO4, all four policy options introduce mandatory requirements and deadlines for the implementation of the technical specifications for interoperability on

telematics applications for freight[102] and for providing the technical description of the rail network via the register of infrastructure[103] (PM24). This measure complements ongoing Commission initiatives to revise the relevant technical railway legislation[104].

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

This section summarises the main expected economic, social and environmental impacts of each policy option[105]. The proposed measures are assumed to be implemented from 2025 onwards, so the assessment has been undertaken for the 2025-2050 period and refers to EU27[106]. Costs and benefits are expressed as present value over the 2025-2050 period, using a 3% discount rate. Further details on the methodological approach and a description of the estimation of impacts in terms of costs and the direct transport and wider economic impacts are provided in Annex 4[107].

It should be emphasised that while some impacts were estimated with advanced methods, such as timetable modelling, others had to be based mainly on plausible assumptions or could not be monetised at all, including some of the presumably most significant impacts[108]. Extensive efforts have been made to compile information and input data from stakeholders, as a basis for the estimation of impacts, in the context of the impact assessment support study. The feedback was mainly limited to anecdotal evidence. Therefore, a conservative approach was taken in which costs estimates are relatively high, while the estimates of benefits are at the low end of the spectrum.

6.1. Economic impacts

This section provides the economic impacts of the policy options on RUs and other applicants for capacity, IMs, public authorities (Member States' public administrations, regulatory bodies responsible for the railway sector and the European Commission), and other stakeholders (terminal operators and customers of rail transport services). It also provides an assessment of impacts on small and medium enterprises (SMEs), on the

[102] Commission Regulation (EU) No 1305/2014 of 11 December 2014 on the technical specification for interoperability relating to the telematics applications for freight subsystem of the rail system in the European Union and repealing the Regulation (EC) No 62/2006 (Text with EEA relevance), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014R1305-20210418

[103] Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU (Text with EEA relevance.), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R0777.

[104] These initiatives also include changes to the technical specifications for interoperability relating to the control-command and signalling subsystems (Commission Regulation (EU) 2016/919) and to the operation and traffic management subsystem (Commission Implementing Regulation (EU) 2019/773).

[105] The analysis in this section is based on Ecorys et al. (2023), Support study to the impact assessment on measures to better manage and coordinate cross-border rail traffic, including through revised rules for capacity allocation and infrastructure charging in rail, and on the analysis of stakeholders' feedback.

[106] Cyprus and Malta do not have a rail system and are not expected to introduce a rail system. Hence, the analysis covers the other 25 Member States.

[107] As explained in Annex 4 (section 1), three models were used for the assessment of impacts of the policy options: (i) the Train Planning System (TPS) to simulate the timetabling process and estimate impacts on capacity; (ii) the TRUST model to derive the transport activity and assign the traffic on the network; (iii) the ASTRA model to derive the macroeconomic impacts, the environmental impacts and the impacts on safety.

[108] An important example is the reduction in negative impact of infrastructure works for repairs, maintenance and renewal on the rail traffic. While anecdotal evidence clearly shows their magnitude to be significant in the current situation and in the baseline, it has not been possible to quantify their possible reduction resulting from the policy measures.

functioning of the internal market and competition, the competitiveness of the rail sector, congestion costs of the road transport sector and on digital by default. The results show a considerable difference in the magnitude of impacts – both on the cost and the benefit side – between the policy option adopting the corridor approach (PO1) and those adopting the network approach (PO2, PO3 and PO4).

6.1.1. Impacts on railway undertakings and other applicants in general

All policy options are expected to lead to adjustment costs for RUs, while PO1 would also result in administrative costs, and PO2, PO3 and PO4 in adjustment costs savings relative to the baseline. Each category of costs/costs savings is briefly discussed below, while a detailed analysis including the estimates and the assumptions used for deriving the costs and costs savings for each policy measure, by Member State where relevant, is provided in Annex 4 (section 3).

Adjustment costs for RUs. In terms of recurrent adjustment costs for 2030 and 2050, PO1 shows no significant costs relative to the baseline (see Table 3). PO1 is however expected to result in one-off adjustment costs of EUR 282.8 million due to investments in digital tools to ensure RUs compliance with the IM systems providing capacity-related services (PM24) - a measure included in all options.

PO2, PO3 and PO4 result in higher recurrent adjustment costs for RUs in 2030 and 2050 compared to PO1 (see Table 3) mostly due to the strategic capacity management and new allocation procedures (PM3, PM4 and PM5)[109], the EU framework for the coordination of traffic management and terminal operations (PM17) and the procedures for tackling disruptions (PM6), that are included in all three options. These measures introduce important elements of the new approach to capacity and traffic management. They require additional efforts from RUs to provide input for long-term planning of capacity needs for different rail segments and for preparing contingency plans. This input is voluntary, but RUs have a vested interest to participate in the process. PO3 and PO4 show somewhat higher annual adjustment costs relative to PO2 (EUR 7.1 million for PO3 and PO4 in 2030 and 2050, compared to EUR 6.7 million in PO2) due to the monitoring function at EU level introduced by PM11. All three options are expected to lead to one-off adjustment costs of EUR 305.2 million, of which EUR 282.8 million linked to investments in digital tools (PM24), EUR 16.9 million to the strategic capacity management and new allocation procedures (PM3, PM4 and PM5), EUR 4.2 million to the procedures for disruption/non-availability (PM6) and EUR 1.3 million to the EU framework for the coordination of traffic management and terminal operations (PM17).

Total adjustments costs expressed as present value over 2025-2050, relative to the baseline, are estimated to be the highest in PO3 and PO4 (EUR 435.1 million), followed by PO2 (EUR 429 million) and PO1 (EUR 282.8 million). The investments in digital tools to ensure RUs compliance with the IM systems (PM24) represent around 65% of the total adjustment costs in PO3 and PO4, 66% in PO2 and 100% in PO1. Other measures with significant contribution to adjustment costs are the strategic capacity management and new allocation procedures (around 17% of the total adjustment costs in PO3 and PO4 and

[109] The costs of PM3, PM4 and PM5 are assessed jointly. The measures are complementary to each other and the associated costs cannot be split between the measures. All three measures are included in PO2, PO3 and PO4.

18% in PO2) and the EU framework for the coordination of traffic management (around 10% of the costs in PO2, PO3 and PO4).

Administrative costs for RUs. PO1 is estimated to result in limited administrative costs for RUs, estimated at EUR 0.1 million in 2030 and 2050 relative to the baseline (see Table 3), driven by the strengthened monitoring of service quality and customer satisfaction on the freight corridors (PM7). Expressed as present value over 2025-2050, the administrative costs for PO1 are estimated at EUR 2.4 million relative to the baseline (in 2021 prices).

Adjustment costs savings for RUs. PO2, PO3 and PO4 would also result in adjustment cost savings for RUs due to the improved capacity management and allocation process, notably from greater stability of allocated paths (PM4). This measure is estimated to reduce costs in PO2 by EUR 20.2 million in 2030 and EUR 27.8 million in 2050 relative to the baseline, in PO3 by EUR 20.3 million in 2030 and EUR 28.1 million in 2050 and in PO4 by EUR 20.4 million in 2030 and EUR 28.9 million in 2050[110]. PO3 and PO4 lead to additional cost savings for RUs (see Table 3) due to the support function for cross-border coordination of capacity management at EU level (PM21) and the strategic capacity management for TEN-T at EU level (PM22), respectively. These measures organise the coordination of capacity planning between IMs or central capacity planning and ensure access to higher quality of capacity for cross-border trains.

Total adjustment cost savings, expressed as present value over 2025-2050 relative to the baseline, are estimated to be the highest in PO4 (EUR 540.6 million), followed by PO3 (EUR 482.8 million) and PO2 (EUR 415.3 million). The reduction in the train path requests (PM4), in conjunction with the improved capacity management and allocation process introduced, represents around 78% of the cost savings in PO4, 87% in PO3 and 100% in PO2.

Table 3: Recurrent costs and costs savings for RUs in the POs relative to the baseline scenario (EU27), in million EUR (2021 prices) in 2030 and 2050

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
Administrative costs	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
PM7 Monitoring performance & satisfaction RFC	0.1	0.1						
Adjustment costs	0.0	0.0	6.7	6.7	7.1	7.1	7.1	7.1
PM3 & PM4 & PM5 Strategic capacity management, new allocation procedures			3.4	3.4	3.4	3.4	3.4	3.4
PM6 Procedures disruption / non-availability			0.8	0.8	0.8	0.8	0.8	0.8
PM11 Monitoring function at EU level					0.3	0.3	0.3	0.3
PM17 EU framework coordination traffic management & terminal operations			2.4	2.4	2.4	2.4	2.4	2.4
PM18-1 Transport market monitoring by IMs			0.1	0.1				
PM18-2 Transport market monitoring by ENIM					0.1	0.1	0.1	0.1

[110] The difference in the costs savings between the options is due to the different rail traffic projected in PO2, PO3 and PO4, which drives the needs for allocated train paths, and thus to higher costs savings due to greater stability of allocated paths in options with higher traffic. PO4 leads to the highest increase in rail traffic among the policy options relative to the baseline and therefore to the highest estimated costs savings due to the greater stability of allocated paths.

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
PM24 IT Legal requirements digital data provision & exchange (TAF TSI, RINF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjustment costs savings	0.0	0.0	20.2	27.8	23.5	32.4	26.1	36.7
PM4 Reduction train path requests			20.2	27.8	20.3	28.1	20.4	28.9
PM21 Support function for cross-border coordination of capacity management at EU level					3.2	4.3		
PM22 Strategic capacity management for TEN-T at EU level							5.7	7.9
Total costs	0.1	0.1	6.7	6.7	7.1	7.1	7.1	7.1
Total costs savings	0.0	0.0	20.2	27.8	23.5	32.4	26.1	36.7

Source: Ecorys et al. (2023), impact assessment support study. Note: excluding one-off adjustment costs.

Other direct benefits for RUs. All policy options are expected to result in an increase of available capacity compared to the baseline. The additional capacity was calculated in several steps (see Annex 4, section 4.1.1) and it took into account the different effect the policy measures would have on single, double and cross-border lines. The modelling focused on the ability of IMs to offer additional train paths by implementing the PMs included in the different POs, in particular on congested lines. The focus was on incorporating a maximum number of train paths. This also resulted in a reduction of the transport time due to more coordinated and informed path planning.

The modelling of the impacts of the policy measures on rail infrastructure capacity for the policy options required the development of different model variants of a timetable. Three factors, explained in Annex 4 (section 4.1.1) were used for deriving the results:

- The time frame, which is split into three time horizons (2030, 2040, 2050).
- The track type – more specifically the distinction between national single track, national double track and international/cross-border sections.
- The congestion status of the lines.

This additional capacity translates into an increase in traffic (expressed in train-km) estimated at 0.2% in PO1, 2.2% in PO2, 4% in PO3 and 7% in PO4 relative to the baseline in 2050[111,112]. This means an increase in traffic in 2050 relative to the baseline of 13.9

[111] For 2030, the increase in traffic is estimated at 0.2% in PO1, 1.7% in PO2, 2.7% in PO3 and 3.6% in PO4 relative to the baseline.

[112] As explained in Annex 4, the TPS application quantifies the impacts of the policy measures included in the policy options in terms of increases in the number of train paths and improvements in punctuality. To derive the increase in rail freight traffic in tonne-kilometres and passenger rail traffic in passenger-kilometres, the results of the TPS application in terms of increase in available train paths on congested sections of the network are used as input in the TRUST model, assuming that: (i) additional available train paths are allocated both to passengers and freight transport; (ii) the demand for additional rail paths fully matches the new supply, meaning that all additional train paths on congested sections of the rail network are fully exploited; (iii) the additional trains running on congested sections will travel on routes extending beyond the congested section (bottleneck effect of congested sections). In addition, improvements in punctuality from the TPS application are used as input in the TRUST model, in terms of reduction of travel time. Based on this, the TRUST model estimates the increase in passenger and freight transport activity in terms of train-kilometres, which is further translated in the model into passenger-kilometres and tonne-kilometres by the use of occupancy rates and load factors, respectively.

million train-km in PO1, 139.6 million train-km in PO2, 249.1 million train-km in PO3 and 432.8 million train-km in PO4[113]. These estimates are based on an IT tool for timetable design, which was used to simulate an actual timetable optimisation using a limited number of representative, real-world case studies; the estimation is explained in more detail in Annex 4 (section 4).

The benefits for RUs from the additional traffic are monetised accordingly[114]. These results provide a very conservative estimate of the benefits. PO4 results in the highest benefits due to the **increase of available capacity**, estimated in monetary terms (see Table 4) at EUR 2 759.1million (expressed as present value over 2025-2050 relative to the baseline), followed by PO3 (EUR 2 575.7 million), PO2 (EUR 1 981 million) and PO1 (EUR 242.1 million).

To provide another perspective on the impact of the policy measures on available capacity, it is also possible to provide a rough estimate of the additional infrastructure that would be required to accommodate a growth in traffic equivalent to the estimations for the policy options in 2050. On the basis of some stylised assumptions about the use of new infrastructure, this would require the construction of 43 km of new lines in PO1, 431 km in PO2, 769 km in PO3 and 1 336 km in PO4. The cost for the construction and maintenance of the additional infrastructure in the period from 2025 to 2050 (expressed as present value) would amount to approximately EUR 0.5 billion in PO1, 4.7 billion in PO2, 8.4 billion in PO3 and 14.6 billion in PO4. The purpose of the estimates is mainly to put into relation the additional rail traffic enabled by the capacity increase estimated for the four policy options. Given the reliance on a number of assumptions, these figures were intentionally not used in the assessment of the policy options with respect to the efficiency criterion, i.e. the estimation of net benefits and benefit/cost ratio.

All policy options are expected to result in **improvements in punctuality** compared to the baseline. These improvements are expected to be higher for freight than for passenger rail. PO4 is estimated to result in the highest benefits (EUR 664.9 million), followed by PO3 (EUR 658 million), PO2 (EUR 501.3 million) and PO1 (EUR 72.7 million). These improvements are monetised, using assumptions on the different value of delays for different EU regions, based on the ASTRA model.

Table 4: Monetised benefits due to increase in capacity and in punctuality in the POs, expressed as present value over 2025-2050 relative to the baseline (EU27), in million EUR (2021 prices)

	Difference to the baseline			
	PO1	PO2	PO3	PO4
Increase in capacity (additional traffic)	242.1	1 981.0	2 575.7	2 759.1
Increase in punctuality	72.7	501.3	658.0	664.9

In other words, the increase in capacity leads to an increase in the rail transport activity but there is no one–to-one relationship between them. The results are also different at rail section level.

[113] For 2030, the increase in traffic is estimated at 8.2 million train-km in PO1, 77.6 million train-km in PO2, 125.1 million train-km in PO3 and 162.5 million train-km in PO4 relative to the baseline.

[114] The monetary value of the benefits from additional capacity is estimated in an indirect way by estimating hypothetical costs savings for the operators of rail services resulting from the improvement in operational conditions accompanying a lower utilisation of capacity (higher stability of timetable, less delays etc.). These cost savings were considered to be a proxy for the value of additional capacity. See Annex 4 for a more detailed description of the estimation approach.

Source: Ecorys et al. (2023), impact assessment support study

All policy options reduce the negative effects of **TCRs** by improving the planning, implementation and cross-border coordination of infrastructure works. They also increase rail's **reliability**. RUs will benefit directly from these improvements. It is expected that the effects will be passed on to their customers (logistics operators, travel agencies, etc.), to consumers and businesses using rail transport. It was however not possible to quantify these effects[115].

Net costs/benefits for RUs. Overall, considering the costs, costs savings and other direct benefits for the RUs, all policy options are estimated to result in net benefits for RUs, expressed as present value over 2025-2050 (relative to the baseline). PO4 would lead to the highest net benefits (EUR 3 529.5 million), followed by PO3 (EUR 3 281.4 million), PO2 (EUR 2 468.4 million) and PO1 (EUR 29.6 million).

6.1.2. Impacts on infrastructure managers

All policy options are expected to lead to adjustment costs for infrastructure managers, while PO1 would also result in administrative costs, and PO3 and PO4 in additional enforcement costs relative to the baseline. At the same time, PO2, PO3 and PO4 would also result in adjustment and administrative costs savings for infrastructure managers[116].

Administrative costs for infrastructure managers. PO1 is expected to result in recurrent administrative costs of EUR 1.3 million relative to the baseline in 2030 and 2050 due to the introduction of a mandatory and harmonised set of performance indicators for rail freight corridors (PM7), which would go beyond the current performance monitoring carried out by the management boards (see Table 5 and Table 6). Expressed as present value over 2025-2050, the administrative costs for PO1 are estimated at EUR 23.9 million relative to the baseline (in 2021 prices).

[115] Analysing the effects of planned works was a major challenge due their large number, the lack of systematic information about restrictions from infrastructure works at EU level, and limited analytical capabilities of infrastructure managers in relation to the impacts of such restrictions on cancelled and rerouted trains. Some of the key practical challenges include: (1) Infrastructure managers communicate legally required information on capacity restrictions in various formats, ranging from generic IT platforms to spreadsheets and emails. Systematic evidence on the volume and impacts of capacity restrictions could not be provided on this basis. (2) Infrastructure managers claim that they cannot assess the impacts of capacity restrictions. Infrastructure managers do not systematically offer alternative train paths to railway undertakings in the event of unforeseen capacity restrictions, i.e. they simply cancel train paths affected without replacement. Railway undertakings therefore request alternative train paths themselves. As a consequence, infrastructure managers cannot link the initial train run to the new one without further, manual analysis. EU legislation on technical aspects of rail defines the concept of a unique identifier for each individual train service (the so-called 'Train ID'), which would allow to establish this link in an automated manner, thereby enabling an analysis of the impacts of capacity restrictions in terms of additional distance, travel time, cancellations etc. However, the concept has not been implemented so far. Due to the limited amount of information available, the impacts of the policy options on capacity restrictions due to planned infrastructure works could only be estimated indirectly, as part of the estimate about additional capacity generated by the initiative. The estimation approach is outlined in section 4.1.1 of Annex 4 (in particular steps 2 and 3, 4 and 5 of the methodological description). The effect of the measures is adjusted for the different policy options by applying a resistance factor to reflect the reduction in the effectiveness of the measures with the reduced centralisation of the coordination. These adjustments include also the reduction in the effectiveness of the policy measures on coordination of works.

[116] A detailed analysis including the estimates and the assumptions used for deriving the costs and costs savings for each policy measure, by Member State where relevant, is provided in Annex 4 (section 3).

Adjustment costs for infrastructure managers. Infrastructure managers are the stakeholder group which is estimated to bear the highest share of total adjustment costs in PO2, PO3 and PO4, while in PO1 RUs would bear the highest share of adjustment costs. PO1 would result in EUR 59.1 million one-off costs, and recurrent costs of EUR 2.3 million in 2030 and EUR 0.2 million in 2050 relative to the baseline. Of these, the highest one-off and recurrent adjustment costs (EUR 58.8 million one-off costs and recurrent costs of EUR 2.2 million in 2030 and EUR 0.1 million in 2050 relative to the baseline) are associated to digital tools to ensure RUs compliance with the IM systems providing capacity-related services (PM24), while the introduction of binding rules and procedures for coordination of traffic management (PM17) would lead to EUR 0.3 million one-off costs and EUR 0.1 million recurrent costs in 2030 and 2050 relative to the baseline (see Table 5 and Table 6).

PO2, PO3 and PO4 are estimated to lead to significantly higher adjustment costs than PO1 due to the change to the network-based approach to the coordination of rail capacity and traffic management. These three policy options include few common measures that lead to adjustment costs for IMs and are related to the introduction of: (i) strategic capacity management and new allocation procedures (PM3, PM4 and PM5), (ii) procedures in case of disruption/non-availability (PM6), (iii) a high-level advisory/coordination platform at European level (PM16), (iv) an EU framework for the coordination of traffic management and terminal operations (PM17), (v) digital tools to ensure RUs compliance with the IM systems (PM24), and (vi) digitalisation and automation of capacity management (PM25). The common measures are estimated to lead to one-off adjustment costs of EUR 677.4 million, and recurrent costs of EUR 48.5 million in 2030 and EUR 27.2 million in 2050 relative to the baseline (see Table 5 and Table 6). Of these common measures, the highest share of costs relates to the measure on the digitalisation and automation of capacity management (PM25). In addition, in PO2 the introduction of transport market monitoring by IMs (PM18-1) would add one-off adjustment costs of EUR 4.2 million and recurrent costs of EUR 1.8 million in 2030 and 2050 relative to the baseline. Thus, PO2 is estimated to result in total one-off adjustment costs of EUR 681.6 million and recurrent costs of EUR 50.2 million in 2030 and EUR 29.2 million in 2050 relative to the baseline.

PO3 and PO4 also include costs related to the ENIM plus the Network Coordinator, which will assist IMs at EU level in the planning and management of capacity. Some of these costs differ between PO3 and PO4, as the Network Coordinator performs different tasks in each option. More specifically, in addition to the common measures included in PO2, PO3 and PO4, both PO3 and PO4 include adjustment costs for the introduction of a performance review body (PM10), for the monitoring function at EU level (PM11) and the transport market monitoring by ENIM (PM18-2). These three measures are estimated to lead together to one-off adjustment costs of EUR 4 million and recurrent costs of EUR 4.1 million in 2030 and 2050 relative to the baseline, of which the highest share of the costs is attributed to the transport market monitoring by ENIM (PM18-2). In addition, PO3 accounts for the preparation of the network statement by the EU Network Coordinator (PM20-1) and the support function for cross-border coordination of capacity management at EU level (PM21), that are estimated to add recurrent costs of EUR 5 million in 2030 and EUR 6.5 million in 2050 relative to the baseline. In total, PO3 is estimated to result in one-off adjustment costs of EUR 681.4 million and recurrent costs of EUR 57.5 million in 2030 and EUR 38.1 million in 2050 relative to the baseline (see Table 5 and Table 6).

PO4 additionally accounts for the introduction of the EU performance scheme (PM13), it entrusts an entity at European level (PM20-2) with the competence to take final decisions

as regards the strategic capacity management phase and the allocation of capacity for cross-border services (PM22) and introduces an EU 'crisis management cell' (PM23). These measures together are estimated to result in one-off adjustment costs of EUR 2.5 million and recurrent costs of EUR 15.7 million in 2030 and EUR 20.3 million in 2050 relative to the baseline, of which the highest share of the costs is attributed to the strategic capacity management phase and the allocation of capacity for cross-border services (PM22). They add to those of the common measures included in PO3 and PO4. Overall, PO4 is estimated to lead to total one-off adjustment costs of EUR 683.9 million and recurrent costs of EUR 68.2 million in 2030 and EUR 51.8 million in 2050 relative to the baseline (see Table 5 and Table 6).

Expressed as present value over 2025-2050 relative to the baseline, PO4 is expected to result in the highest total adjustment costs among the policy options (EUR 1 812.8 million, of which EUR 683.9 million one-off costs), followed by PO3 (EUR 1 596.5 million, of which EUR 681.4 million one-off costs), PO2 (EUR 1 452.8 million, of which EUR 681.6 million one-off costs) and PO1 (EUR 81.6 million, of which EUR 59.1 million one-off costs). The largest share of the costs in PO1 (97% of the total adjustment costs) is associated to digital tools to ensure RUs compliance with the IM systems (PM24). In PO2, PO3 and PO4 the largest share of the costs can be attributed to the digitalisation and automation of capacity management (49% of the total adjustment costs in PO2, 45% in PO3 and 39% in PO4), followed by the strategic capacity management and new allocation procedures which involve considerable organisational changes (21% of the total adjustment costs in PO2, 19% in PO3 and 17% in PO4), the introduction of an EU framework for coordination of traffic management and terminal operations (16% of the total adjustment costs in PO2, 15% in PO3 and 13% in PO4), and the strategic capacity management phase and the allocation of capacity for cross-border services (14% of the total adjustment costs in PO4).

Table 5: Recurrent costs and costs savings for IMs in the POs relative to the baseline scenario (EU27), in million EUR (2021 prices) in 2030 and 2050

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
Administrative costs	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0
PM7 Monitoring performance & satisfaction RFC	1.3	1.3						
Adjustment costs	2.3	0.2	50.2	29.2	57.5	38.1	68.2	51.8
PM3 & PM4 & PM5 Strategic capacity management, new allocation procedures			13.5	13.5	13.5	13.5	13.5	13.5
PM6 Procedures disruption / non-availability			3.4	3.4	3.4	3.4	3.4	3.4
PM10 Performance review body					0.01	0.01	0.01	0.01
PM11 Monitoring function at EU level					2.0	2.0	2.0	2.0
PM13 EU performance scheme							0.2	0.2
PM15 Binding rules & procedures for coordination of traffic management	0.1	0.1						
PM16 High-level advisory/coordination platform at European level			0.1	0.1	0.1	0.1	0.1	0.1
PM17 EU framework coordination traffic management & terminal operations			9.5	9.5	9.5	9.5	9.5	9.5
PM18-1 Transport market monitoring by IMs			1.8	1.8				
PM18-2 Transport market monitoring by ENIM					2.1	2.1	2.1	2.1
PM20-1 Empower the European Network of Infrastructure Managers					0.2	0.2		

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
PM20-2 Designate and/or empower an entity at EU level							0.3	0.3
PM21 Support function for cross-border coordination of capacity management at EU level					4.8	6.3		
PM22 Strategic capacity management for TEN-T at EU level							12.3	16.9
PM23 EU traffic management support function							2.8	2.8
PM24 IT Legal requirements digital data provision & exchange (TAF TSI, RINF)	2.2	0.1	2.2	0.1	2.2	0.1	2.2	0.1
PM25 Digitalisation and automation of capacity management			19.8	0.9	19.8	0.9	19.8	0.9
Enforcement costs	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7
PM11 Monitoring function at EU level					0.7	0.7	0.7	0.7
Administrative costs savings	0.0	0.0	0.4	0.4	0.4	0.4	0.4	0.4
PM2-1 Harmonised legal framework for railway capacity and traffic management			0.4	0.4	0.4	0.4	0.4	0.4
Adjustment costs savings	0.0	0.0	23.8	31.4	23.9	31.8	24.0	32.5
PM2-1 Harmonised legal framework for railway capacity and traffic management			3.6	3.6	3.6	3.6	3.6	3.6
PM4 Reduction train path requests			20.2	27.8	20.3	28.1	20.4	28.9
Total costs	3.6	1.5	50.2	29.2	58.2	38.8	68.9	52.5
Total costs savings	0.0	0.0	24.3	31.9	24.4	32.2	24.4	32.9
Total net costs/costs savings	3.6	1.5	25.9	-2.6	33.9	6.6	44.5	19.6

Source: Ecorys et al. (2023), impact assessment support study. Note: excluding one-off adjustment costs; for the category 'total net costs/costs savings' a positive value stands for net costs and a negative value for net benefits.

Table 6: One-off adjustment costs for IMs in the POs relative to the baseline scenario (EU27), in million EUR (2021 prices) in 2030 and 2050

One-off costs	Difference to the baseline			
	PO1	PO2	PO3	PO4
One-off adjustment costs	59.1	681.6	681.4	683.9
PM3 & PM4 & PM5 Strategic capacity management, new allocation procedures		67.7	67.7	67.7
PM6 Procedures disruption / non-availability		16.9	16.9	16.9
PM13 EU performance scheme				2.5
PM15 Binding rules & procedures for coordination of traffic management	0.3			
PM17 EU framework coordination traffic management & terminal operations		5.0	5.0	5.0
PM18-1 Transport market monitoring by IMs		4.2		
PM18-2 Transport market monitoring by ENIM			4.0	4.0
PM24 IT Legal requirements digital data provision & exchange (TAF TSI, RINF)	58.8	58.8	58.8	58.8
PM25 Digitalisation and automation of capacity management		529.0	529.0	529.0

Source: Ecorys et al. (2023), impact assessment support study

Enforcement costs for infrastructure managers. In PO3 and PO4, the introduction of the monitoring function at EU level (PM11) is estimated to lead to recurrent enforcement costs for infrastructure managers, estimated at EUR 0.7 million in 2030 and 2050 relative

to the baseline. Expressed as present value over 2025-2050, the enforcement costs for PO3 and PO4 are estimated at EUR 12.5 million relative to the baseline (in 2021 prices).

Administrative costs savings for infrastructure managers. The introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors (PM2-1) in PO2, PO3 and PO4 is expected to lead to administrative costs savings of EUR 0.4 million from 2025 onwards relative to the baseline (i.e. EUR 17 836 per year on average per infrastructure manager[117]). These savings come from removing the obligations to collect and publish the information contained in the network statement for national networks regarding the freight corridor, to produce customer satisfaction surveys and to monitor the performance of rail freight services on the freight corridors and publish the survey and monitoring results. The policy measure will also remove the need for management boards to publish annual reports, important and informative documents, which was undertaken on the boards' own initiative. Expressed as present value over 2025-2050, the total administrative costs savings for infrastructure managers are estimated at EUR 8.2 million relative to the baseline (in 2021 prices).

Adjustment costs savings for infrastructure managers. PO2, PO3 and PO4 are also expected to result in adjustment cost savings from the harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors (PM2-1) and from the reduction in the train path requests resulting from the new approach for capacity and traffic management (PM4). The transition from corridor-based to a network-based approach and the abolition of the rail freight corridors results in cost savings related to the governance and operation of the rail freight corridors (including the one-stop shops) and all the activities carried out by the management boards related to capacity and traffic management. Thus, PM2-1 would lead to adjustment costs savings for infrastructure managers of EUR 3.6 million per year relative to the baseline from 2025 onwards. In addition, PM4 is estimated to reduce costs in PO2 by EUR 20.2 million in 2030 and EUR 27.8 million in 2050 relative to the baseline, in PO3 by EUR 20.3 million in 2030 and EUR 28.1 million in 2050 and in PO4 by EUR 20.4 million in 2030 and EUR 28.9 million in 2050[118]. By making the capacity management process more stable, both IMs and RUs (as explained in section 6.1.1) would reduce wasted efforts for repeated changes to the timetable, as RUs would be able to request and get high quality capacity closer to the time of the train run and IMs would be incentivised to limit changes to allocated train paths. Expressed as present value over 2025-2050, the adjustment costs savings for infrastructure managers are estimated to be the highest in PO4 (EUR 490.5 million), followed by PO3 (EUR 485.3 million) and PO2 (EUR 481.9 million). Around 86% of the total adjustment costs savings are associated to the reduction in the train path requests.

Net costs for infrastructure managers. Overall, net recurrent costs for infrastructure

[117] As explained in Annex 4, estimations about costs and cost savings for infrastructure managers and allocation bodies are made on the basis of the (simplifying) assumption that there is one infrastructure manager / allocation body per Member State with a rail system. This results in a total of 25 infrastructure managers / allocation bodies: EU27 without Cyprus and Malta, which do not have a rail system.

[118] The difference in the costs savings between the options is due to the different rail traffic projected in PO2, PO3 and PO4, which drives the needs for allocated train paths, and thus to higher costs savings due to greater stability of allocated paths in options with higher traffic. PO4 leads to the highest increase in rail traffic among the policy options relative to the baseline and therefore to the highest estimated costs savings due to the greater stability of allocated paths.

managers are estimated to be the highest in PO4 (EUR 44.5 million in 2030 and EUR 19.6 million in 2050 relative to the baseline), followed by PO3 (EUR 33.9 million in 2030 and EUR 6.6 million in 2050). PO2 would result in net recurrent costs of EUR 25.9 in 2030 and net recurrent costs savings of EUR 2.6 in 2050 relative to the baseline, and PO1 in net recurrent costs of EUR 3.6 million in 2030 and EUR 1.5 million in 2050. These come in addition to the one-off costs estimated at EUR 683.9 million in PO4, EUR 681.4 million in PO3, EUR 681.6 million in PO2 and EUR 59.1 million for PO1. Expressed as present value over 2025-2050 (relative to the baseline) all policy options are estimated to lead to net costs for infrastructure managers. The highest net costs are estimated for PO4 (EUR 1 326.5 million), followed by PO3 (EUR 1 115.5 million), PO2 (EUR 962.6 million) and PO1 (EUR 105.5 million).

Other direct benefits for infrastructure managers. The additional traffic is expected to benefit mostly RUs. Other direct benefits for IMs were not possible to estimate for two reasons. Firstly, the principles laid down in the Recast Directive[119] envisage that charges for the use of rail infrastructure should cover the cost that is directly incurred as a result of operating a train service. Additional traffic will therefore result in increase in revenue, but they may cover only the marginal costs and would not change considerably the financial situation of IMs. Secondly, as an exception and under certain conditions, mark-ups can be charged to obtain full recovery of the costs incurred by the IMs, but it is difficult to assume how IMs will structure the charges in the future. Hence, assessing the contribution of additional traffic to improving the financial situation of IMs would be speculative[120]. Improvements in punctuality from the policy measures were also estimated only as benefits for RUs, even though they could have limited benefits for IMs through additional traffic and optimised use of resources. As IMs are expected to contribute to the increase of rail traffic and to decarbonisation of transport, the direct benefits are *de facto* implementation of their legal obligation to 'ensure optimal and efficient use' of rail infrastructure[121].

6.1.3. Impacts on public authorities, including regulatory bodies

This section discusses the impacts of the policy options on the national public authorities, the European Commission and EU funding. National public authorities include both Member States' bodies responsible for rail policy and its implementation and regulatory bodies for the railway sector.

Impacts on national public authorities

PO3 and PO4 are expected to lead to adjustment costs for national public authorities, while PO2, PO3 and PO4 would result in enforcement costs. At the same time, PO2, PO3 and PO4 would also result in adjustment and administrative costs savings for national public authorities[122].

Adjustment costs for national public authorities. In PO3 and PO4, the costs related to

[119] See Articles 31 and 32 of Directive 2012/34/EU.

[120] IMs may benefit from additional revenues in case the infrastructure charging systems involves a significant share of mark-ups on the direct cost incurred, in line with Article 32 of Directive 2012/34.

[121] See Article 8(3) of Directive 2012/34/EU.

[122] A detailed analysis including the estimates and the assumptions used for deriving the costs and costs savings for each policy measure is provided in Annex 4 (section 3).

the secretariat of the EU Board of Regulators (PM19)[123], which will prepare the opinions, guidelines, reports, recommendations, common positions and identify the best practices and organise the work of national regulatory bodies in working groups, is estimated at EUR 0.3 million per year from 2025 onwards relative to the baseline. In addition, in PO4 the introduction of the EU performance scheme (PM13) would require an assessment of the compliance of national performance schemes with the European one leading to recurrent costs estimated at EUR 0.1 million from 2025 onwards (see Table 7). Expressed as present value over 2025-2050, PO3 is estimated to result in adjustment costs of EUR 5.9 million and PO4 to costs of EUR 8.2 million, relative to the baseline.

Enforcement costs for national public authorities. PO2, PO3 and PO4 are expected to result in enforcement costs for national public authorities relative to the baseline. The introduction of the strategic capacity management and new allocation procedures (PM3, PM4 and PM5), common to the three policy options, is expected to lead to costs for regulatory bodies for scrutinising the strategic planning (EUR 3.4 million one-off costs in 2025, followed by recurrent costs of EUR 0.7 million relative to the baseline from 2026 onwards). The introduction of procedures in case of disruption/non-availability (PM6), also common to the three options, is expected to add one-off costs of EUR 0.8 million in 2025 and recurrent costs estimated at EUR 0.2 million from 2026 onwards. Overall, PO2 would result in one-off costs of EUR 4.2 million in 2025 and recurrent costs estimated at EUR 0.8 million from 2026 onwards (see Table 7).

PO3 and PO4 result in additional enforcement costs for regulatory bodies relative to PO2, related to the additional functions allocated to European Network of Regulatory Bodies. These tasks are mainly related to the control and monitoring of the European Network of Infrastructure Managers. More specifically, relative to PO2, PO3 provides for an escalation mechanism to resolve disputes at EU level or relating to cross-border traffic (PM21), estimated to lead to recurrent costs of EUR 0.2 million in 2030 and EUR 0.3 million in 2050. Thus, PO3 would result in total one-off costs of EUR 4.2 million in 2025 and recurrent costs of EUR 1.1 million in 2030 and EUR 1.2 million in 2050 relative to the baseline (see Table 7).

Costs between PO3 and PO4 differ due to the different approach to strategic capacity management. PO3 (in particular PM21) envisages a more decentralised approach for strategic capacity planning, which would allow some part of the oversight to be carried out by national bodies in cooperation with each other. PO4 requires more work to be done at EU level, with additional resources needed, and comes at higher cost estimated at one-off costs of EUR 4.2 million in 2025 and recurrent costs of EUR 1.7 million in 2030 and EUR 1.9 million in 2050 relative to the baseline (see Table 7). The two measures that bring additional costs in PO4 relate to the competence to take final decisions as regards the strategic capacity management phase and the allocation of capacity for cross-border services (PM22) and the responsibility to review the effectiveness of the multi-annual agreements concluded at national level (PM12).

Expressed as present value over 2025-2050, the enforcement costs for national public authorities are estimated to be the highest in PO4 (EUR 37.6 million), followed by PO3 (EUR 25.1 million) and PO2 (EUR 20.2 million). Around 75% of the enforcement costs in PO2, 60% in PO3 and 40% in PO4 are associated to the introduction of strategic capacity management and new allocation procedures (PM3, PM4 and PM5). The introduction of

[123] This will act as a virtual body and no costs for offices are foreseen.

procedures in case of disruption/non-availability (PM6) would represent around 25% of the enforcement costs in PO2, 20% in PO3 and 13% in PO4, while the competence to take final decisions as regards the strategic capacity management phase and the allocation of capacity for cross-border services (PM22) is estimated to provide around 34% of the enforcement costs in PO4.

Adjustment costs savings for national public authorities. In PO2, PO3 and PO4 the harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors (PM2-1) is expected to lead to adjustment costs savings estimated at EUR 0.4 million per year from 2025 onwards relative to the baseline (see Table 7). These cost savings would result mostly from terminating the participation in the executive boards, which includes direct labour costs but also overheads (i.e. travel costs for an average of 2 meetings per year per RFC) for the Member States participating in the corridors[124]. Expressed as present value over 2025-2050, the adjustment costs savings for national public authorities are estimated at EUR 6.8 million in PO2, PO3 and PO4.

Administrative costs savings for national public authorities. The introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors (PM2-1) in PO2, PO3 and PO4 is expected to lead to administrative costs savings of EUR 0.1 million from 2025 onwards relative to the baseline (see Table 7). These costs savings would result from the abolishment of the biennial reports of the executive boards of the RFCs[125]. Expressed as present value over 2025-2050, the total administrative costs savings in PO2, PO3 and PO4 are estimated at EUR 2.6 million relative to the baseline (in 2021 prices).

Table 7: Recurrent costs and costs savings for public authorities in the POs relative to the baseline scenario (EU27), in million EUR (2021 prices) in 2030 and 2050

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
Adjustment costs	0.0	0.0	0.0	0.0	0.3	0.3	0.4	0.4
PM13 EU performance scheme							0.1	0.1
PM19 Creating a EU Board of Regulators supported by a secretariat					0.3	0.3	0.3	0.3
Enforcement costs	0.0	0.0	0.8	0.8	1.1	1.2	1.7	1.9
PM3 & PM4 & PM5 Strategic capacity management, new allocation procedures			0.7	0.7	0.7	0.7	0.7	0.7
PM6 Procedures disruption / non-availability			0.2	0.2	0.2	0.2	0.2	0.2
PM12 RB review of MS/IM agreements							0.3	0.3
PM21 Support function for cross-border coordination of capacity management at EU level					0.2	0.3		
PM22 Strategic capacity management for TEN-T at EU level							0.6	0.8
Adjustment costs savings	0.0	0.0	0.4	0.4	0.4	0.4	0.4	0.4

[124] Ireland, Cyprus, Malta and Finland do not participate in the governance of any rail freight corridor. Some Member States participate in several corridors.

[125] The cost estimates are based on the Decision authorising the use of lump sum contributions for technical assistance under the Connecting Europe Facility – Transport sector, of 13 December 2021. The Decision provides the estimated costs for these reports for 2021-2024. The costs of the reports are assumed to remain constant over time in 2021 prices in the baseline scenario.

	Difference to the baseline							
	PO1		PO2		PO3		PO4	
	2030	2050	2030	2050	2030	2050	2030	2050
PM2-1 Harmonised legal framework for railway capacity and traffic management			0.4	0.4	0.4	0.4	0.4	0.4
Administrative costs savings	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
PM2-1 Harmonised legal framework for railway capacity and traffic management			0.1	0.1	0.1	0.1	0.1	0.1
Total costs	0.0	0.0	0.8	0.8	1.4	1.5	2.2	2.4
Total costs savings	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.5
Total net costs	0.0	0.0	0.3	0.3	0.9	1.0	1.7	1.9

Source: Ecorys et al. (2023), impact assessment support study. Note: excluding one-off adjustment costs.

Net costs for national public authorities. Overall, net recurrent costs for national public authorities (see Table 7) are estimated to be the highest in PO4 (EUR 1.7 million in 2030 and EUR 1.9 million in 2050 relative to the baseline), followed by PO3 (EUR 0.9 million in 2030 and EUR 1 million in 2050) and PO2 (EUR 0.3 million in 2030 and in 2050). These come in addition to the one-off costs of EUR 4.2 million in all three options. Expressed as present value over 2025-2050 (relative to the baseline) PO4 results in net costs for national public authorities of EUR 36.4 million, followed by PO3 (EUR 21.7 million) and PO2 (EUR 10.9 million).

Impacts on the European Commission and the use of EU funds

PO3 and PO4 are expected to lead to adjustment costs for the European Commission, while PO2, PO3 and PO4 would also result in adjustment costs savings due to a reduction in the use of EU funds[126].

Adjustment costs for the European Commission. PO3 and PO4 result in adjustment costs for the Commission due to the setting up of a performance review body that will advise the Commission on improving performance monitoring and related methodological issues. The adjustment costs for the expert body are estimated on the basis of the existing Performance Review Body of the single European sky[127]. The Union budget provides for a special allowance of a maximum of EUR 600 in the form of a daily unit cost for each working day for the members of the Performance Review Body. The adjustment costs for the European Commission are estimated at EUR 0.1 million per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs are estimated at EUR 1.8 million relative to the baseline (in 2021 prices).

Adjustment cost savings due to a reduction in the use of EU funds. PO2, PO3 and PO4 are expected to result in adjustment costs savings due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the RFCs (PM2-1). Part of the costs related to the governance and operation of the rail freight corridors, overheads (including for IT) and cost of external services (transport market studies, some external services provided by RNE, etc.) are eligible for EU funding. According to the evaluation of the RFC Regulation, the EU funding is estimated at EUR 6.3 million per year (in 2021 prices) and it is assumed to remain constant over time in real prices in the baseline. PM2-1 would thus result in adjustment costs savings for the

[126] A detailed analysis including the estimates and the assumptions used for deriving the costs and costs savings for each policy measure is provided in Annex 4 (section 3).
[127] Commission Implementing Decision (EU) 2016/2296 (OJ L 344, 17.12.2016, p. 92).

EU estimated at EUR 6.3 million per year. Expressed as present value over 2025-2050, the adjustment costs savings are estimated at EUR 116.7 million (in 2021 prices). However, it can be expected that the EU will continue to provide some form of support for implementing the policy measures resulting from this initiative and the costs savings could be cancelled by future funding. At this stage it is not possible to estimate the amount of a possible future EU budget contribution.

6.1.4. Impacts on other stakeholders

Terminal operators

Estimating the costs/cost savings and other benefits for terminal operators is complicated due to the large divergence in their size, the transport markets served, the organisation of operations and their business models. Therefore, due to these caveats, the estimated costs for terminal operators should be regarded as order of magnitude. PO1 is expected to lead to administrative costs for terminal operators, while PO2, PO3 and PO4 to adjustment costs[128].

Administrative costs for terminal operators. PO1 is estimated to result in limited administrative costs for terminal operators, estimated at EUR 0.1 million in 2030 and 2050 relative to the baseline, driven by the strengthened monitoring of service quality and customer satisfaction on the freight corridors (PM7). Expressed as present value over 2025-2050, the administrative costs for PO1 are estimated at EUR 2.4 million relative to the baseline (in 2021 prices).

Adjustment costs for terminal operators. In PO2, PO3 and PO4 the EU framework for coordination of traffic management and terminal operations (PM17), which involves rules, procedures and tools for coordination of train and terminal operations, is estimated to lead to one-off costs of EUR 0.5 million in 2025, followed by recurrent adjustment costs estimated at EUR 0.9 million from 2026 onwards. Expressed as present value over 2025-2050, total adjustment costs for terminal operators are estimated at EUR 17 million relative to the baseline (in 2021 prices).

Other direct benefits. All policy options are expected to result in an increase of available capacity compared to the baseline. This additional capacity translates into an increase in traffic (expressed in train-km) estimated at 0.2% in PO1, 2.2% in PO2, 4% in PO3 and 7% in PO4 relative to the baseline in 2050[129]. In addition, improvements in punctuality are expected mostly for freight trains. Terminal operators should benefit from the additional traffic and improved punctuality. This should result in additional revenues and operational cost savings. However, as explained above, the complicated structure of the sector and the data gaps do not allow for a sound estimate of these benefits.

Rail customers

Similar to terminal operators, rail customers are expected to benefit from the additional capacity in all policy options. Rail customers vary from citizens and various businesses using passenger rail to specialised transport companies (multimodal operators, logistics services providers, freight forwarders, transport organisers, etc.) and numerous businesses

[128] More details are provided in Annex 4 (section 3).

[129] For 2030, the increase in traffic is estimated at 0.2% in PO1, 1.7% in PO2, 2.7% in PO3 and 3.6% in PO4 relative to the baseline.

using or planning to use freight transport in general. All of them are expected to benefit from the additional rail capacity and operational improvements. Estimating and monetising such impacts is complicated by the large number of rail users, their very different profiles (including the value of rail services for them) and the lack of information on how costs savings could be passed on to rail customers. Therefore, these economic benefits are not estimated in this impact assessment and all the benefits from the increase in traffic and operational cost savings are assigned to RUs.

6.1.5. Impacts on SMEs

SMEs in the rail sector include some RUs, in particular new entrants, as well as terminal operators and customers of rail transport services[130]. Therefore, the initiative is considered relevant for the SMEs and the SME test has been performed.

Step (1) of SME test (identification of affected businesses). The exact number of SMEs among RUs, or their market share, could not be established as information on SMEs is not reported separately in rail market statistics by Eurostat, regulatory bodies or sector associations. Nevertheless, information available about the market share of new entrant RUs and about their number suggests that a significant number of the new entrants in rail freight transport classify as SMEs[131]. In the freight transport, the average annual turnover of non-incumbent RUs is far below the upper threshold for an SME (EUR 50 million turnover) in the majority of Member States. Similarly, in passenger transport, the average annual turnover of non-incumbent RUs is below the threshold of EUR 50 million, with only one exception in Poland. It is therefore safe to assume that a significant number of freight and passenger RUs are indeed SMEs. These aggregate statistical figures have been corroborated by a few samples of RUs, for which staff numbers and turnover could be found.

The market share of the SMEs among RUs is likely to remain low in the baseline but in the policy options (especially in PO2, PO3 and PO4) new entrants could provide a significant boost to competition in market segments where incumbents continue to dominate. SMEs could be successful in market niches such as seasonal touristic trains or in remote regions[132].

Step (2) of SME test (consultation of SME stakeholders). SMEs constitute a significant share of the stakeholders involved in the consultation activities: 25 out of 75 respondents to the survey-questionnaire in the targeted stakeholder consultation were submitted by SMEs. In addition, approximately 15[133] of the 47 stakeholder interviews were conducted with representatives of SMEs. The specific needs and challenges for SMEs were duly taken into account throughout the impact assessment; key issues are mentioned below.

Step (3) of SME test (assessment of the impacts on SMEs). As shown in section 6.1.1, all policy options are estimated to result in net benefits for RUs. PO4 would lead to the

[130] The main infrastructure managers, typically in charge of the entire network of strategic importance within a Member State, are far beyond the thresholds for SME with staff in the thousands or tens of thousands. Smaller infrastructure managers are typically exempted from EU market regulation on the basis of Article 2 of Directive 2012/34/EU ('Exclusions from the scope').

[131] See section 9 of Annex 5 for more detailed information.

[132] However, due to network effects and economies of scale it is likely that successful passenger RUs will grow out of the SMEs category sooner or later.

[133] The exact number will be verified, as far as the availability of exact company data allows.

highest net benefits (EUR 3,529.5 million), expressed as present value over 2025-2050 relative to the baseline, followed by PO3 (EUR 3,281.4 million), PO2 (EUR 2,468.4 million) and PO1 (EUR 29.6 million). It was not possible to separate in the analysis the net benefits for SMEs. It is however expected that a share of the net benefits will accrue to new entrants and SMEs. On the cost side, SMEs will have to make investments in IT interfaces, as other RUs. However, as the relevant measure includes IT interfaces standardized at European level (PM24) and the right to interact with all EU IMs via a single interface, this is expected to be particularly beneficial for SMEs, which in the current situation face significant disadvantages vis-à-vis larger RUs due to the need to deploy national or network-specific interfaces.

Step (4) of SME test (minimizing negative impacts on SMEs). It should be noted that a key issue highlighted by respondents in the stakeholder consultation is the difficulty for small RUs, given limited resources, to actively contribute to consultation processes concerning strategic matters, i.e. of non-operational nature. PO2, PO3 and PO4 include a number of such processes, notably in the context of strategic capacity management (PM3), transport market analysis (PM18-1, PM18-2) and the development of new rules and processes (PM2-1, PM2-2) or IT tools (PM24, PM25). PO2, PO3 and PO4 mitigate this challenge to a certain extent by replacing the corridor approach to cross-border coordination with a network approach, reducing the number of interfaces (groups and meetings) between RUs and IMs at EU level. Another important element is the cooperation between RUs, which can nominate representative bodies defending the common interests vis-à-vis infrastructure managers and/or other (groups) of RUs in capacity management. In PO1 there is no significant change in the consultation processes concerning strategic matters relative to the baseline, so no major impacts on SMEs are expected.

6.1.6. Impacts on the internal market, competition and the single European railway area

All policy options are expected to have a positive impact on the functioning of the internal market. Improving the planning and operations of rail infrastructure allows RUs to deliver better rail transport services for the benefit of freight customers and passengers throughout the Union. Better rail transport services are expected to have knock-on effects throughout the entire economy, leveraging the initial impact on the transport sector. This is also expected to lead to positive impacts on GDP, which is estimated to increase by around 0.1% in 2030 and 0.2% in 2050 in PO3 relative to the baseline (corresponding to EUR 7 billion increase in 2030 and EUR 30 billion increase in 2050) and by around 0.1% in 2030 and 0.3% in 2050 in PO4 (corresponding to EUR 8 billion increase in 2030 and EUR 47 billion increase in 2050). PO1 and PO2 would lead to more limited impacts on GDP[134]. PO2, PO3 and PO4 will result in a higher level of harmonisation and integration of rail

[134] In relation to the impacts on GDP growth, as explained in Annex 4 (section 1), the ASTRA model consists of several modules, including an economic module, a population and social structure module, a foreign trade module, a transport module, a vehicle fleet module and an environment module. The economic module covers various elements related to the macro-economic aspects: supply side, demand side (with a sophisticated investment module), an input-output model (based on 25 economic sectors), employment and government budget. GDP, employment, final energy consumption and investments are among the main outputs provided by the economic module of ASTRA. In the context of this impact assessment, for assessing the impacts of the policy options on GDP, the results of the TRUST model in terms of transport activity have been used as inputs in the ASTRA model. The impacts on GDP growth are a result of the ASTRA model.

infrastructure services, than PO1, which will benefit operators developing cross-border services, thus providing opportunities for more competition and contributing to a single European railway area. In addition, PO3 and PO4 strengthen the role of regulatory bodies at European level, which will enable them to address counter-competitive practices. This will help to create a single European market for rail transport services, in particular for cross-border traffic.

6.1.7. Impacts on the competitiveness of the rail sector

As explained in section 6.1.1, the biggest share of the additional adjustment costs for RUs compared to the baseline are related to digitalisation and the accelerated implementation of the mandatory requirements for the technical specifications for interoperability on telematics applications. On the other hand, all policy options and in particular PO2, PO3 and PO4 will result in benefits for RUs (especially freight) due to the improved quality of capacity, punctuality and reliability, which will allow better utilisation of RUs' resources (see Table 4, in section 6.1.1). Overall, all policy options are estimated to result in net benefits for RUs (EUR 3 529.5 million in PO4, EUR 3 281.4 million in PO3, EUR 2 468.4 million in PO2 and EUR 29.6 million in PO1, expressed as present value over 2025-2050 relative to the baseline). Therefore, it can be concluded that all policy options are expected to improve the competitiveness of RUs, although the positive impact of PO2, PO3 and PO4 would be higher than that of PO1. As regards the price-competitiveness of rail, the potential for RUs to pass on the net cost savings generated by the measures of this initiative to their customers, in particular in the freight segment, may create positive knock-on effects in other, client industries such as the automotive sector or the chemical industry. Naturally, benefits to such other industries would also benefit the sectoral competitiveness of EU companies at international level.

IMs will bear the biggest share of the costs, but as they are natural monopolies, no competitiveness issues arise.

6.1.8. Impacts on congestion costs for road transport

The reduction in the road transport activity in PO2, PO3 and PO4, enabled by better rail transport services for the benefit of freight customers and passengers, leads to a decrease in the external costs of inter-urban road congestion for passenger cars and freight heavy goods vehicles. This reduction is estimated at around EUR 3 531 million in PO4, EUR 2 375 million in PO3 and EUR 1 370 million in PO2 relative to the baseline over the 2025-2050 period, expressed as present value. In PO1 the decrease in congestion costs is more limited (EUR 181 million) due to the lower reduction in road transport activity relative to the other three options[135,136].

6.1.9. Digital by default

All policy options will have a positive impact on the application of the 'digital by default' principle, introduced by the common measure on requirements for digital exchange of information (PM24), included in all options. The impact would be higher in PO2, PO3 and

[135] The impacts on congestion costs for road transport were quantified with ASTRA and TRUST models.
[136] The 2019 Handbook on the external costs of transport has been used to monetise the costs. Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1

PO4 relative to PO1, as they all require IMs to provide single IT interfaces at EU level providing seamless end-to-end services for capacity management (PM25).

6.2. Social impacts

Social impacts are assessed in terms of impacts on employment, public health, road safety and impacts on the protection of fundamental rights.

6.2.1. Impacts on employment

All policy options are expected to have a positive impact on employment in the sector, although the impact of PO2, PO3 and PO4 is expected to be higher relative to PO1, driven by the switch from the corridor-based to the network-based approach to the coordination of rail capacity and traffic management. The increase in capacity and thus in the rail traffic would lead to higher gross value added for the sector, and thus to an increase in employment relative to the baseline. According to the ASTRA model, economy-wide (in net terms), the number of employed persons in PO4 is estimated to increase by 1.46 million cumulatively over the period 2025-2050 (58 520 additional employed persons per year on average), relative to the baseline. In PO3 the number of employed persons would increase by 1.06 million over 2025-2050 (42 320 additional employed persons per year on average) relative to the baseline, followed by PO2 (0.71 million additional employed persons over 2025-2050 or 28 560 per year on average) and PO1 (5 000 additional employed persons over 2025-2050 or 200 per year on average)[137]. The higher impacts in PO4 and PO3, relative to PO2 and PO1, are due to the higher impacts of the measures included in the options on capacity and additional traffic[138].

6.2.2. Impacts on public health

PO2, PO3 and PO4 lead to an increase in rail traffic and a reduction in the road and air transport activity relative to the baseline[139]. Although PO1 results in similar type of impacts, their magnitude is much more limited than in the other three policy options. Enabling higher use of more sustainable transport modes would result in reduced air pollutant emissions and subsequent positive impacts on public health. Savings in external costs of air pollutants are estimated to be the highest in PO4 (EUR 1 026 million), followed by PO3 (EUR 681 million), PO2 (EUR 416 million) and PO1 (EUR 36 million), expressed as present value over 2025-2050 (relative to the baseline)[140]. The reason for

[137] In relation to the impacts on job creation, as explained in Annex 4 (section 1), the ASTRA model consists of several modules, including an economic module, a population and social structure module, a foreign trade module, a transport module, a vehicle fleet module and an environment module. The economic module covers various elements related to the macro-economic aspects: supply side, demand side (with a sophisticated investment module), an input-output model (based on 25 economic sectors), employment and government budget. GDP, employment, final energy consumption and investments are among the main outputs provided by the economic module of ASTRA. In the context of this impact assessment, for assessing the impacts of the policy options on job creation, the results of the TRUST model in terms of transport activity have been used as inputs in the ASTRA model. The impacts on job creation are a result of the ASTRA model. They consider all the economic sectors, going beyond just the transport sector. Thus, this represents the economy-wide net effect on job creation.

[138] Although higher productivity driven by technological progress can reduce the demand for labour, this effect does not offset the positive effect on employment.

[139] See Annex 4 (section 5) for more details on the ASTRA model results.

[140] The 2019 Handbook on the external costs of transport has been used to monetise the costs. Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1

higher savings in external costs of air pollutants in PO4 and PO3, relative to PO2 and PO1, is the higher increase of available rail capacity in these options that results in higher increase in rail traffic relative to the baseline. The reduction of air pollutant emissions would be particularly relevant in urban nodes.

6.2.3. Impacts on road safety

The reduction in the road transport activity in PO2, PO3 and PO4, enabled by better rail transport services for the benefit of freight customers and passengers, would lead to a decrease in the cumulative number of fatalities and injuries from road transport over 2025-2050 of 0.1% in PO2, 0.2% in PO3 and 0.3% in PO4 relative to the baseline. The effect is the highest in PO4 due to the higher reduction in the road transport activity in this policy option. PO1 results in very limited decrease in the number of fatalities and injuries, below 0.1% relative to the baseline. The reduction in the external costs of accidents is estimated at around EUR 4 194 million in PO4, EUR 2 802 million in PO3, EUR 1 608 in PO2 and only EUR 181 million in PO1 relative to the baseline over the 2025-2050 period, expressed as present value (in 2021 prices)[141]. The 2019 Handbook on the external costs of transport[142] has been used to monetise the costs. According to the Handbook, the external cost of a fatality in 2021 prices is estimated at around EUR 3.6 million and that of a serious injury at around EUR 0.5 million.

6.2.4. Impacts on fundamental rights

The policy options were assessed to determine if they have an impact on the fundamental rights and/or equal treatment of EU citizens. The starting point of the assessment of the fundamental rights is the Charter of Fundamental Rights of the European Union[143]. All options were assessed having regard to the relevant EU instrument and it was concluded that they maintain full respect for human and fundamental rights and none will have any negative impact thereon.

6.3. Environmental impacts

The analysis of environmental impacts covers CO_2 emissions and air pollutant emissions. The environmental impacts were quantified with the ASTRA model.

6.3.1. Impact on CO_2 emissions

The reduction in the CO_2 and air pollutant emissions is mainly driven by the higher use of more sustainable transport modes and the reduction in the road and air transport activity. The highest CO_2 emissions reductions from the transport sector[144] relative to the baseline are projected for PO4 (0.2% decrease in 2030 and 0.9% in 2050 or 1 491 thousand tonnes of CO_2 saved in 2030 and 902 thousand tonnes saved in 2050), followed by PO3 (0.2% decrease in 2030 and 0.4% in 2050 or 1 195 thousand tonnes of CO_2 saved in 2030 and 450 thousand tonnes saved in 2050) and PO2 (0.1% decrease in 2030 and 0.2% in 2050 or 778 thousand tonnes of CO_2 saved in 2030 and 244 thousand tonnes saved in 2050). PO1 shows very limited emissions reductions relative to the baseline (below 0.1% for 2030 and 2050 or 87 thousand tonnes of CO_2 saved in 2030 and 27 thousand tonnes saved in 2050)

[141] The impacts on the number of fatalities and injuries were derived with the ASTRA model.
[142] Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1
[143] OJ C 326 of 26.10.2012 p.2
[144] Excluding powered 2-wheelers and international maritime.

due to the lower increase in the capacity of the rail network in this option. In cumulative terms, over 2025-2050, PO4 is estimated to result in 39 million tonnes of CO_2 emissions saved, PO3 in 26 million tonnes of CO_2 emissions saved, while PO2 and PO1 in 15 and 1 million tonnes of CO_2 emissions saved, respectively. The reduction in the external costs related to CO_2 emissions is estimated at EUR 4 979.1 million in PO4, followed by PO3 (EUR 3 309.3 million), PO2 (EUR 1 919.6 million) and PO1 (EUR 140.7 million)[145].

It should be noted that the reason for the limited CO_2 emissions reductions from transport is the fact that the baseline scenario already reflects the 'Fit for 55' initiatives and the REPowerEU initiatives, as well as the proposed revision of the TEN-T Regulation. On the other hand, as explained in section 5.1, the scenarios underpinning the impact assessments accompanying the 'Fit for 55' initiatives[146] and the staff working document accompanying the REPowerEU initiatives[147] took into account a broader range of policies (including this initiative) that were represented in a stylised way ahead of the actual proposals, to show the delivery of at least 55% emissions reduction target by 2030 and to account for the interaction with the other forthcoming initiatives. Therefore, this initiative contributes towards the at least 55% emissions reductions target by 2030 and achieving climate neutrality by 2050.

6.3.2. Impact on air pollutant emissions

Similarly to CO_2 emissions, the reduction in air pollution emissions is mainly driven by the higher use of more sustainable transport modes and the reduction in the road and air transport activity. **CO emissions** from the transport sector[148] are projected to reduce by 0.1% in PO2, PO3 and PO4 in 2030 relative to the baseline and only marginally (by less than 0.1%) in PO1. For 2050, CO emissions would reduce by 0.7% in PO4, 0.3% in PO3 and 0.1% in PO2, while the CO emissions reduction due to PO1 is expected to be marginal. In cumulative terms, over 2025-2050, PO4 is estimated to result in 65 thousand tonnes of CO emissions saved, PO3 in 34 thousand tonnes of CO saved, while PO2 and PO1 in 19 and 1 thousand tonnes of CO emissions saved, respectively. For **NOx emissions**, PO4 is projected to lead to reductions of 0.2% in 2030 (0.8% in 2050) in NOx emissions from the transport sector relative to the baseline, while PO3 would result in emissions reductions of 0.1% in 2030 (0.4% in 2050). PO2 and PO1 show a more limited effect on NOx emissions from the transport sector (less than 0.1% decrease in 2030 for both PO2 and PO1 and 0.2% decrease in 2050 for PO2, with PO1 showing only marginal decrease for 2050). In cumulative terms, over 2025-2050, PO4 is estimated to result in 129 thousand tonnes of NOx emissions saved, PO3 in 84 thousand tonnes of NOx saved, while PO2 and PO1 in 48 and 2 thousand tonnes of NOx emissions saved, respectively.

With regard to particulate **matter (PM) emissions**, all policy options would lead to a very marginal increase in emissions relative to the baseline. This however is not linked to the energy/fuel use but can be explained by increased PM emission from rail transport due to higher wear and tear[149], as a consequence of increased rail activity. This increase in

[145] The 2019 Handbook on the external costs of transport (Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1) has been used to monetise the costs.
[146] Delivering the European Green Deal (europa.eu)
[147] SWD(2022) 230 final of 18 May 2022.
[148] Excluding powered 2-wheelers and international maritime.
[149] Emission from wear and tear are currently not part of EMEP/EEA Guidebook, which does not consider non-exhaust emissions of rail transport as a separate category, so reporting with respect to the emission inventory is not clear. However, it is included here for sake of completeness.

emissions slightly overcompensates the reduction in the PM emissions from road transport. In cumulative terms, over 2025-2050, PO4 is estimated to result in 239 additional tonnes of PM emissions relative to the baseline, PO3 in 199 additional tonnes of PM, while PO2 and PO1 in 36 and 18 additional tonnes of PM emissions, respectively. For **VOC emissions**, PO4 and PO3 are projected to lead to reductions of 0.1% in 2030 (0.5% decrease in PO4 and 0.2% in PO3 for 2050) in VOC emissions from the transport sector relative to the baseline, while PO2 and PO1 would result in emissions reductions of less than 0.1% in 2030 (0.1% decrease in PO2 and less than 0.1% decrease in PO1 in 2050). In cumulative terms, over 2025-2050, PO4 is estimated to result in 10 thousand tonnes of VOC emissions saved, PO3 in 6 thousand tonnes of VOC saved, while PO2 and PO1 in 3 and 0.1 thousand tonnes of VOC emissions saved, respectively. Overall, the reduction in the external costs related to air pollutant emissions is estimated at EUR 1 026.5 million in PO4, followed by PO3 (EUR 681 million), PO2 (EUR 415.5 million) and PO1 (EUR 36.2 million), expressed as present value over 2025-2050 relative to the baseline[150].

All policy options are consistent with the environmental objectives of the **European Green Deal** and the **European Climate Law**[151], although PO1 only marginally contributes to the CO_2 emissions and air pollution emissions reductions. All policy options contribute towards Sustainable Development Goal 13 ('Take urgent action to combat climate change and its impacts'), although PO1 only marginally. **No significant harm** is expected on the environment in any of the policy options.

7. HOW DO THE OPTIONS COMPARE?

7.1. Effectiveness

The assessment of effectiveness looks at the extent to which the general and specific objectives (SO) of the intervention are met. Table 8 provides the link between policy objectives and assessment criteria.

Table 8: Link between objectives and assessment criteria

General objective	Specific objective	Assessment criteria
Allow rail infrastructure capacity and rail traffic to be managed in a way that optimises the utilisation of the network, thus improving the quality of services and accommodating larger amounts of traffic	**SO1** – Enable alternative capacity management procedures in the legal framework	Expected increase in available and usable rail infrastructure capacity, meeting the needs of different rail market segments, enabling an increase in rail traffic. Expected improvement in performance of rail transport services, notably punctuality, resulting in an increase of rail traffic.
	SO2 - Strengthen incentives to improve performance of rail infrastructure and rail transport services	Cost savings for IMs and applicants from better quality and management of capacity, notably resulting from a reduction in cancelled or modified train path requests. Expected improvement of planning and implementation of infrastructure works resulting in reducing their negative impact.
	SO3 - Introduce more effective mechanisms for coordination between stakeholders, in particular across borders	Expected improvement of coordination procedures between all stakeholders involved in a freight train run. Expected increase in reliability of rail transport, in cases of *force majeure* and during periods of infrastructure works.

[150] The 2019 Handbook on the external costs of transport (Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1) has been used to monetise the costs.

[151] Regulation(EU) 2021/1119

General objective	Specific objective	Assessment criteria
	SO4 - Support the deployment of digital tools for capacity and traffic management	Extent to which IT tools for capacity requests, capacity planning and allocation and traffic management respond to the needs of all rail market segments.

Concerning **SO1**, all options are expected to result in additional rail infrastructure capacity, although PO2, PO3 and PO4 clearly have a much bigger impact than PO1. The same applies to meeting the needs of all rail market segments in terms of access to capacity. PO1 relies on the existing tools to support cross-border traffic and its impacts are limited as it does not address the core capacity issue for rail freight – i.e. not fitting into the annual timetable process. PO2, PO3 and PO4 introduce a new approach to capacity management, which is expected to result in significant benefits. This is due mostly to a more strategic management of capacity, allowing to optimise the provision of capacity in line with market needs over a longer time horizon and safeguarding capacity to be allocated later in the calendar year. The options differ in terms of total impact and how much time is needed to realise their full potential. According to the quantitative analysis, PO4 and PO3 show the highest impact on capacity resulting in benefits for railways undertakings (estimated at EUR 2 759.1 million in PO4, expressed as present value over 2025-2050 relative to the baseline, and EUR 2 575.7 million in PO3), followed by PO2 (EUR 1 981 million), while the benefits of PO1 are more limited (EUR 242.1 million). PO2, PO3 and PO4 also result in significantly higher improvements in the performance of rail transport services, notably punctuality, relative to PO1. The benefits for railways undertakings due to improved punctuality are estimated at EUR 664.9 million in PO4, EUR 658 million in PO3 and EUR 501.3 million in PO2, while the impacts of PO1 are more limited (EUR 72.7 million). Thus, PO4 and PO3 are equally effective in addressing SO1, followed by PO2. It should be noted that this result is highly dependent on the hypothesis that, in PO4, the Network Coordinator achieves full optimisation of capacity on the TEN-T network lines for which it assumes the responsibility of strategic capacity planning. However, this working hypothesis does not account for the possible inefficiencies that, in PO4, could derive from mismatches between the capacity planning for the TEN-T lines carried out by the future Network Coordinator and the lines managed by IMs on the national network. Indeed, the number of intersections between TEN-T and non-TEN-T lines is considerable and potential mismatches would need to be addressed in what could be a time-consuming coordination process. This potential source of inefficiency is hard to quantify, but it has been evoked also by stakeholders and appears to constitute a non-negligible risk. In view of these considerations, the effectiveness of PO4 is subject to much greater uncertainty than that of PO1, PO2 and PO3.

Concerning **SO2**, PO1 does not address the challenges in the baseline resulting from the instability in the capacity management process, which leads to a waste of efforts and, in the worst case, of usable network capacity. It relies on strengthening the existing corridor performance monitoring, while PO2, PO3 and PO4 introduce a harmonised incentive scheme that encourages a higher respect of commitments related to capacity, both on IM and RU side, improving the stability of capacity planning and significantly reducing in this way their workload related to capacity management. The costs savings for infrastructure managers from the greater stability of allocated paths are estimated to be similar in PO2, PO3 and PO4: EUR 415.3 million in PO2, expressed as present value over 2025-2050, EUR 418.6 million in PO3 and EUR 423.9 million in PO4. Each modification of a train path concerns both infrastructure managers and railway undertakings (i.e. irrespective which side requests a change initially, the other side will have to adjust its

planning accordingly) and the costs savings for railways undertakings are thus assumed to be the same as those for infrastructure managers. PO2, PO3 and PO4 contain additional measures that ensure equal treatment of cross-border applicants with national traffic. Thus, PO2, PO3 and PO4 are assessed to be equally effective and much more effective than PO1.

Concerning **SO3**, PO1 is expected to have negligible impacts on coordination procedures between all stakeholders involved in train runs (including in other modes for freight traffic) due to its reliance on structures and tools pre-existing in the baseline and to the persistence of the fragmentation resulting from a corridor approach. PO2, PO3 and PO4 are expected to have a positive effect with respect to this criterion, as they harmonise the procedures for capacity and traffic management (i.e. planning and operations). This creates a more solid basis for effective coordination procedures. Important differences in the effectiveness for cross-border traffic between PO2, PO3 and PO4 come from the different mechanisms ensuring cross-border coordination. The reliance on voluntary cooperation between infrastructure managers in PO2 is expected to limit both the degree of harmonisation and the exploitation of its benefits compared to PO3 and PO4 where the 'Network Coordinator' provides operational support. In PO4, a single interlocutor (the Network Coordinator) responsible for the planning of capacity on the TEN-T lines would bring about two effects: simplify coordination along the TEN-T lines but require an additional coordination process for the part of the rail journeys taking place outside the TEN-T lines; it is difficult to anticipate which of the two effects will prevail in comparing with PO3.

As regards the increase in reliability of rail transport, PO1 is expected to deliver limited positive impacts, based on a set of procedures to coordinate traffic management between IMs in a harmonised manner. PO2 delivers more significant improvements resulting from strengthened requirements regarding contingency planning and a more comprehensive approach to coordinate operations based on collaborative decision-making. PO3 and PO4 have even stronger positive impacts resulting from dedicated support by the network coordinator in (i) contingency planning to prepare for disruptions (PO3 and PO4) and in (ii) operational traffic management during disruptions (PO4 only). Overall, PO4 is most effective in addressing SO3, followed by PO3 and PO2. PO1 is expected to result in a more limited impacts.

Concerning **SO4**, PO2, PO3 and PO4 include a comprehensive measure to digitalise and automate capacity management, providing a virtual 'one-stop shop' functionality for RUs in the form of a single digital interface at EU level for capacity management. PO1 does not provide such functionalities and can only make a limited contribution through requirements for digital exchange of information. Thus, PO2, PO3 and PO4 are equally effective in addressing SO4 and more effective than PO1. A more detailed assessment of the effectiveness of the policy options is provided in Annex 8.

As explained above, the effectiveness of the POs with respect to SO1 and SO2 in monetary terms can be compared on the basis of the most important direct effects for the main stakeholder groups (IMs and RUs). These include the impacts from increases in available capacity (and traffic) and in train punctuality for RUs (SO1) and the cost reductions from the reduced number of amendments and cancellations of capacity requests (SO2) for RUs and IMs. The results indicate that PO3 and PO4 have the strongest direct impact especially for RUs.

Table 9: Summary of the effectiveness of the policy options expressed as direct benefits for IMs and RUs – present value over 2025-2050 relative to the baseline (EUR million in 2021 prices)

	Policy options			
Specific objectives	**PO1**	**PO2**	**PO3**	**PO4**
SO1	314.8	2 482.3	3 233.7	3 424
SO2	-	415.3	418.6	423.9

Table 10 provides a summary of the comparison of the options against the baseline scenario in terms of effectiveness. The following ranking symbols have been used: from '+' (more effective than the baseline) to '++++' (much more effective than the baseline); 0 indicated no or negligible impacts.

Table 10: Summary of the effectiveness of the policy options – qualitative comparison

	Policy options			
Specific objectives	**PO1**	**PO2**	**PO3**	**PO4**
SO1	+	+++	++++	++++
SO2	0	++++	++++	++++
SO3	+	++	+++	++++
SO4	+	++++	++++	++++

As indicated above the measures in PO1 are expected to have limited or no effect in most of the cases. This is mostly due to them relying on the instruments available at present to the rail freight corridors, which, even with improvements, are likely to face considerable limitations. PO2 is expected to be more effective, as it shares a number of policy measures with PO3 and PO4 (e.g. for SO2). However, the lack of a clear and established coordination mechanism between IMs for capacity management, raises uncertainty about the impact in regard to SO1 and SO3.

Finally, PO3 and PO4 contain policy measures that provide the necessary mechanisms to ensure that the new approach for capacity management is implemented and coordinated. PO4 has a relatively higher impact based on the assumption that more coordination at EU level will provide more improvements in capacity management and allocation. However, as outlined in section 8.4, a number of factors raise uncertainty about the effectiveness of PO4, whereas these risks are expected to be lower for PO3.

7.2. Efficiency

Efficiency concerns the ‘extent to which objectives can be achieved for a given cost (cost effectiveness)’. In all policy options, the benefits outweigh the increase in costs, relative to the baseline. The estimates of costs and benefits are summarised in Table 11.

Table 11: Summary of costs and benefits of policy options – net present value for 2025-2050 compared to the baseline (in million EUR), in 2021 prices

	Difference to the baseline			
	PO1	**PO2**	**PO3**	**PO4**
Railway undertakings				
Administrative costs	2.4	0.0	0.0	0.0
Adjustment costs	282.8	429.0	435.1	435.1
Adjustment costs savings	0.0	415.3	482.8	540.6
Other direct benefits	314.8	2 482.2	3 233.7	3 424.0
Increase in capacity	242.1	1 981.0	2 575.7	2 759.1
Increase in punctuality	72.7	501.3	658.0	664.9
Infrastructure managers				

	Difference to the baseline			
	PO1	PO2	PO3	PO4
Administrative costs	23.9	0.0	0.0	0.0
Adjustment costs	81.6	1 452.8	1 596.5	1 812.8
Enforcement costs	0.0	0.0	12.5	12.5
Administrative costs savings	0.0	8.2	8.2	8.2
Adjustment costs savings	0.0	481.9	485.3	490.5
Public authorities				
Adjustment costs	0.0	0.0	5.9	8.2
Enforcement costs	0.0	20.2	25.1	37.6
Adjustment costs savings	0.0	6.8	6.8	6.8
Administrative costs savings	0.0	2.6	2.6	2.6
European Commission and EU funding				
Adjustment costs	0.0	0.0	1.8	1.8
Adjustment cost savings	0.0	116.7	116.7	116.7
Operators of terminals and multimodal transport services				
Administrative costs	2.4	0.0	0.0	0.0
Adjustment costs	0.0	17.0	17.0	17.0
Reduction in external costs				
CO_2 emissions	140.7	1 919.6	3 309.3	4 979.1
Air pollution	36.2	415.5	681.0	1 026.5
Fatalities and injuries	159.4	1 607.8	2 801.6	4 193.7
Congestion	181.4	1 369.5	2 374.8	3 530.8
Total costs	393.1	1 919.1	2 094.0	2 324.9
Total benefits	832.5	8 826.1	13 502.7	18 319.5
Net benefits	439.3	6 907.0	11 408.8	15 994.6
Benefits to costs ratio	2.1	4.6	6.4	7.9

Source: Ecorys et al. (2023), impact assessment support study

The major cost element of the policy options, except for PO1, consists of adjustment costs for the digitalisation and automation of capacity management. Other significant groups of costs, included in PO2, PO3 and PO4, are adjustment costs related to strategic capacity management and new allocation procedures, the introduction of an EU framework for coordination of traffic management and terminal operations, and the requirement for digital exchange of information that is included in all options. In terms of stakeholders' groups, the highest share of the costs consists of adjustment costs for infrastructure managers and railways undertakings (i.e. the stakeholders involved in delivering rail infrastructure and transport services).

PO1, comprising a limited set of measures aiming to improve existing structures and mechanisms, shows the lowest **total costs**, estimated at EUR 393.1 million relative to the baseline, expressed as present value over 2025-2050. PO2, PO3 and PO3 show significantly higher costs of EUR 1 919.1 million, EUR 2 094.0 million and EUR 2 324.9 million, respectively. The main difference in terms of costs between PO1, on the one hand, and PO2, PO3 and PO4, on the other, comes from the additional investments in the digitalisation and automation of capacity management, the introduction of a strategic capacity management phase, additional procedures to ensure traffic continuity in the event of infrastructure non-availability and of a framework to coordinate traffic management and terminal operations. The additional costs in PO3 compared to PO2 (EUR 174.9 million) result mainly from staffing ENIM (including the Network Coordinator), responsible for coordinating between IMs and monitoring performance of rail infrastructure and transport services at European level. PO4 shows the highest costs of

all policy options as a result of the additional functions assigned to the IM coordination entity in this policy option: taking over strategic capacity management from IMs on the most strategically important lines of the TEN-T network and an operational support function in traffic management.

In terms of benefits, the policy options result in improvements in the capacity and punctuality for RUs and IMs, costs savings for the public authorities and IMs due to the abolition of the rail freight corridors (PO2, PO3 and PO4), costs savings due to the greater stability of allocated paths for RUs and IMs (PO2, PO3 and PO4), as well as in reductions in the external costs of transport. The benefits related to improvements in the performance of rail transport in terms of capacity and punctuality accrue to RUs in the first instance but might be passed on the customers of rail transport services.

As regards **total benefits**, PO1 stands out with a clearly lower level of total benefits estimated at EUR 832.5 million relative to the baseline, expressed as present value over 2025-2050. PO4 shows the highest total benefits of EUR 18 319.5 million, while the total benefits of PO2 and PO3 amount to EUR 8 826.1 million and EUR 13 502.7 million, respectively. The difference between PO1, on the one hand, and PO2, PO3 and PO4, on the other, is mainly driven by benefits generated by the introduction of new procedures, rules, as well as IT tools and applications, where PO1 relies mainly on existing instruments of limited effectiveness. Compared to PO2, the total benefits increase in PO3 and PO4 with the introduction of additional support and management functions at EU level, resulting in a more effective and seamless implementation of the common European framework.

Overall, all policy options result in **net benefits** relative to the baseline. PO4 shows the highest net benefits, estimated at EUR 15 994.6 million expressed as present value over 2025-2050, followed by PO3 (EUR 11 408.8 million) and PO2 (EUR 6 907.0 million). PO1 results in significantly lower net benefits of EUR 439.3 million. PO4 also shows the highest benefit to cost ratio (7.9), followed by PO3 (6.4), PO2 (4.6) and PO1 (2.1).

However, the efficiency of PO4 is subject to considerable uncertainties. PO4 results in a new split of responsibilities: (i) a geographical split between lines where capacity is managed at EU level (TEN-T) and at national level (rest of the network); and (ii) a functional split between the management of capacity (ENIM) and the development, renewal and maintenance of infrastructure (individual IMs).

As regards the geographical split, PO4 gives better results on cross-border lines by employing a single entity in charge for capacity management on all TEN-T lines. However, PO4 requires additional coordination between the lines managed at EU and national level, particularly in urban and industrial nodes. The TEN-T network comprises around 80 border crossings but more than 400 urban nodes. It was considered proportionate to limit the modelling work described in section 4.1 of Annex 4 to simulating capacity increases at the level of single lines. This fully captures the benefits of better cross-border coordination in PO4 but it does not cover wider network-level effects in nodes. Modelling a timetable for the whole EU network would have required an amount of resources disproportionate to the purpose of the analysis. Overall, the limitations of the analysis mean that the benefits of PO4 cannot be assessed with the same degree of certainty as those of the other POs.

The functional split in competences for maintenance and renewal of the infrastructure (which would remain in the competence of individual IMs) and for capacity management (which would be transferred to the EU level – ENIM) may be problematic because it

concerns one of the key challenges facing rail capacity today: the planning and execution of infrastructure works for maintenance and renewal. This adds to the uncertainties over the benefits of PO4.

On the costs side, the effort for coordinating the strategic planning between the Network Coordinator, which is in charge of strategic capacity management on the lines of the TEN-T network with the highest strategic importance, and national IMs who are responsible for the rest of the national network, could result in higher efforts and costs than expected. Separating the strategic capacity management (Network Coordinator) from the allocation phase, the planning and implementation of infrastructure works and network development (responsibility of the IMs) increases the uncertainty that the capacity benefits will be realised in full.

7.3. Coherence

Internal coherence assesses how various elements of the revised legislation or new legal act function together to achieve the objectives. This does not only concern the existing RFC Regulation or a possible new legal act itself, but also any accompanying secondary legislation (delegated and/or implementing acts). Although all four policy options address the identified problems, PO1 relies on a corridor-based approach, using the governance and the tools of the existing rail freight corridors (specified in the RFC Regulation), while PO2, PO3 and PO4 introduce a network-based approach with a different level of intervention. The new approach means that the two sets of legal rules on capacity allocation – one in the RFC Regulation and the other in Chapter IV, Section 3 of the Recast Directive – will be replaced with a new Regulation. PO1 shares only one single measure with the other three options. All options contain measures that are fully coherent, with measures for the IMs acting as natural monopolies being complemented with measures on regulatory supervision.

External coherence concentrates on the compliance of the initiative with national policies, other EU instruments and relevant EU policies, as well as international obligations. All identified policy options show strong links to several EU instruments. There is an obvious link with the Recast Directive, which contains a number of relevant legal definitions and provides the broad framework for the Union rail sector, as well as a number of detailed rules on the functioning of IMs, regulatory bodies, rights of applicants for capacity, licensing of RUs, charging for the use of rail infrastructure, etc. The initiative is linked to the EU policy on infrastructure development (TEN-T Regulation) and with the legislation on interoperability. Both issues are identified as important contextual drivers. All options are consistent with the existing legislation, including the legislative proposal for the amendment of the TEN-T Regulation adopted in 2021 and strengthen the link to interoperability legislation and in particular with the technical specification for interoperability relating to telematics applications for freight services.

7.4. Subsidiarity and proportionality

The intervention addresses the deficiencies in EU rules on capacity management, identified in the evaluation of the RFC Regulation. These can only be addressed at EU level. The policy options tackle issues of cross-border coordination for capacity and traffic management, infrastructure works, performance schemes that affect cross-border traffic and therefore cannot be addressed at national or bilateral level. This being said, PO4 introduces a significant element of centralisation in the capacity management process, with the Network Coordinator taking over the responsibility for the strategic capacity

management phase. Stakeholders have raised concerns in this respect, in particular IMs and regulatory bodies.

In terms of proportionality, PO1 largely retains the current balance for decision-making between IMs (national level) and corridors (EU level). It strengthens the cross-corridor cooperation. PO2 envisages a transition to a network approach based largely on voluntary cooperation between IMs which raises uncertainty about the effectiveness of coordination of capacity planning. Both PO1 and PO2 do not address the limitations of national regulatory bodies in relation to cross-border traffic. PO3 and PO4 envisage some of the decisions related to capacity planning to be taken at EU level.

PO3 is proportional to the goals of the initiative of introducing new rules for capacity management for the whole rail traffic, including cross-border trains. The latter requires a reinforced mechanism of coordination compared to the current rail freight corridors' governance.

PO4 assigns the strategic capacity planning of rail infrastructure capacity for lines part of the TEN-T network to the Network Coordinator. This allows for better planning of cross-border train paths, but requires new coordination processes to address potential mismatches between the capacity planning for the TEN-T and the non-TEN-T lines. Depriving IMs of the responsibility for capacity planning on the TEN-T lines might be considered disproportionate at a stage in which passenger rail is still predominantly national[152] and represents roughly 80% of the rail traffic.

8. PREFERRED OPTION

8.1. Identification of the preferred policy option

Even though all policy options are in line with the general objective and include measures that address all specific objectives and problem drivers, there is a clear difference in **effectiveness** between PO1 and the other three options. The former is far less effective, as it relies on policy instruments (like the rail freight corridors' one-stop shops) that have not been able to make a significant impact on capacity management, traffic management or on the performance of rail freight services. The measures included will not address the issue that trains travelling on RFC and non-RFC lines follow two different sets of processes, rules and tools – the ones of the RFC Regulation and the Recast Directive, respectively. This also results in less efficient use of resources by RUs and IMs.

When addressing SO1 (Enable alternative capacity management procedures), all policy options are expected to result in additional rail infrastructure capacity on capacity-constrained lines and nodes, and positive impacts on punctuality. PO4 and PO3 are however expected to be equally effective and more effective than PO2 and PO1 in addressing SO1 due to the higher increase in capacity and improvements in punctuality mostly driven by better capacity planning of cross-border traffic (PM20-1 and PM20-2).

Concerning SO2 (Strengthen incentives to improve performance of rail infrastructure and rail transport services), PO2, PO3 and PO4 are expected to result in similar costs savings for IMs and RUs from the greater stability of allocated train paths. The slightly higher impact on costs savings in PO4 relative to PO3 can be explained by the fact that the higher

[152] International rail passenger traffic is only around 6-7% of total passenger traffic.

rail traffic in PO4 is accompanied by a higher reduction in the modifications to the planned train paths. Even more importantly, PO2, 3 and 4 improve the quality of capacity by improving TCRs planning and implementation (PM8 and 9). The impacts of PO1 are negligible.

When addressing SO3 (Introduce more effective mechanisms for coordination between stakeholders, in particular across borders) PO1 delivers limited positive impacts while PO2, PO3 and PO4 result in significant benefits due to harmonisation of processes and rules (PO2, PO3, PO4) and due to the introduction of a network coordinator supporting IMs in the cross-border planning and operational tasks (PO3). PO4 goes further than PO3 in attributing responsibilities to the coordination entity (Network Coordinator), which makes this PO difficult to assess with certainty: improvements in the coordination process along the TEN-T lines could be accompanied by difficulties in coordination with the rest of the rail network (infrastructure managers).

Concerning SO4 (Support the deployment of digital tools to enable better capacity and traffic management), PO1 has limited effects by ensuring interoperability of the IT systems for capacity management. POs 2, 3 and 4 all envisage a comprehensive digitalisation of capacity management services, which will allow to make full use of the new rules on capacity and traffic management and thus have a profound effect on improving access to and quality of capacity.

Concerning the **efficiency,** PO2, PO3 and PO4 result in significant net benefits relative to the baseline, with the net benefits being the highest in PO4, followed by PO3 and PO2. The benefit to cost ratio is estimated at 7.9 for PO4, 6.4 for PO3, 4.6 for PO2 and 2.1 for PO1.

PO4 shows the highest benefit to cost ratio. It results in the highest costs, born mostly by IMs, but these costs are overcompensated by the significant benefits due to increased capacity and improved punctuality, which accrue mostly to RUs as direct beneficiaries. The highest costs come from investments for IT development and deployment, required for the implementation of the new allocation processes, but additional resources are also required for staffing ENIM (and the Network Coordinator), responsible for strategic capacity planning on the TEN-T network lines. In fact, whereas the higher costs of PO4 with respect to the other options can be projected with some confidence, the actual realisation of the higher benefits, especially with respect to PO3, is subject to considerable uncertainties as explained in section 7.2. It is difficult to quantify the impact of these uncertainties, but they are likely to significantly reduce, and possibly eliminate, PO4's advantage in terms of benefit to cost ratio with respect to PO3.

PO3 ranks second in terms of benefit to cost ratio and PO2 ranks the third. The difference between the two are the higher costs for PO3 for the work of the two central entities[153] (ENIM and the ENRRB). They are overcompensated by the higher increase in available capacity and improvements in punctuality. IT-related investments are expected to be the same as in PO4 and are by far the biggest contributor to costs for both policy options.

PO1 shows the lowest benefit to cost ratio. Even though it results in the lowest costs, it increases slightly the administrative burden, does not produce significant cost savings and

[153] The European Network of Infrastructure Managers and the European Network of Regulatory Bodies.

results in very limited benefits due to increase in capacity and punctuality compared to the baseline.

Concerning **internal coherence** and **external coherence**, all POs are coherent. Concerning external coherence, PO1 keeps the existing RFC governance, which is given the task to contribute to EU transport infrastructure policy by providing feedback to the European Coordinators[154] in the proposal for a regulation[155] replacing the TEN-T Regulation[156]. In PO2, PO3 and PO4, this feedback mechanism will be taken over by the Network Coordinator, which coordinates input by individual IMs from a cross-border perspective. PO2, PO3 and PO4 will replace the advisory groups in the RFC governance with a new platform for consulting rail stakeholders, which will be broader in terms of the stakeholder groups involved, in particular by adding customers of rail transport services, and more efficient as regards issues to be addressed at EU level, by avoiding multiplication of exchanges in 11 corridors, and more flexible with respect to issues that require more local approaches, allowing address issues at the most appropriate level possible. All policy options envisage supporting the implementation of standardised digital information exchange between operation stakeholders in line with the technical specification for interoperability relating to telematics applications for freight services by requiring compliance of IM and RU systems for specified implementation deadlines.

All policy options are in line with the principle of **subsidiarity**, addressing issues that cannot be solved by an intervention at national level. This being said, PO4 introduces a significant element of centralisation in the capacity management process, with the Network Coordinator taking over the responsibility for the strategic capacity management phase. Stakeholders have raised concerns in this respect, in particular IMs and regulatory bodies.

In addition, all policy options meet the requirements of the **proportionality** principle but, as in the case of subsidiarity, stakeholder feedback on PO4 has been mixed. PO4 assigns the strategic capacity management of lines that are part of the TEN-T network to the Network Coordinator, thus depriving IMs of an important function. This move is rather controversial and might be considered not entirely justified in view of the uncertainty of the additional benefits that it would generate with respect to the, less radical, PO3. It is important to highlight that the behavioural response of parties involved in the implementation of the measures will have an influence on the success of the initiative, and that evidence from the evaluation of the RFC Regulation has shown that the formalistic implementation of rules can undermine the effectiveness of measures. In this regard, PO3 has the advantage over PO4 of eliciting a more positive response of stakeholders.

Overall, considering the assessment of effectiveness, efficiency, coherence, subsidiarity and proportionality of the four options, **the analysis points at PO3 as the preferred policy option**, since it brings the best balance between the objectives which must be

[154] The European Coordinators facilitate the coordinated implementation of the European Transport Corridors and the horizontal priorities for the implementation of the trans-European transport network. They are designated by the Commission with one European Coordinator for each Corridor and for each horizontal priority.

[155] COM(2021) 812 final of 14 December 2021.

[156] Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013, p. 1).

achieved, the degree of proportionality of the intervention, the costs and benefits incurred and the confidence that can be placed on the assessment of impacts.

Stakeholders' views in the stakeholder consultation were divergent and there was no clear-cut majority for one policy option, although support for a new approach to capacity management, inspired by TTR prevailed. A higher number of railway undertakings were supportive of PO3 and the option was supported by some IMs. The latter mostly expressed support for PO 2. Some RUs and IMs alluded to a combination of PO2 and PO3 or a step-wise implementation of PO3.

With regard to PO4, the most contentious issue is the introduction of tasks for entities at EU level. While the feedback from the public consultation on the policy options was positive overall, including on this particular element, the targeted stakeholder consultation showed that several stakeholder groups had doubts. IMs expressed strong opposition towards the introduction of a central entity , which would take over management competences from individual IMs under PO4, and voiced a preference for either PO2 or PO3. RUs, on the other hand, appeared more supportive of the centralised mechanisms of PO4. The members of the rail freight corridors governance (both IMs and public authorities responsible for rail policy) considered a mix of PO2 and PO3 as the best approach and considered PO4 to be unrealistic. RUs were more supportive of the concept of central entities. Regulators supported options PO2 and PO3 and considered PO4 as too costly and time consuming for implementation[157].

On the basis of what precedes and the analysis above, PO3 is selected as the preferred policy option.

8.2. REFIT (simplification and improved efficiency)

This initiative is a follow-up to the evaluation of the RFC Regulation[158], completed in 2021[159], and it is part of the Greening freight package, included in the Commission work programme 2023[160]. This initiative has an important REFIT dimension in terms of streamlining and updating the rules on rail infrastructure capacity to suit better the needs of different rail market segments, in particular cross-border freight. The initiative will repeal Regulation (EU) 913/2010, which lays down rules applicable only to the rail freight corridor lines, and thereby replace the current two sets of rules for capacity and traffic management[161] with a single one for the whole EU network.

The preferred policy option is expected to lead to administrative costs savings for national public authorities due to the implementation of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, estimated at EUR 2.6 million relative to the baseline, expressed as present value over 2025-2050. The initiative will result in simplifications for applicants for capacity involved in cross-border rail services by making the process of capacity allocation more efficient. It will also result

[157] See Annex 2 for further details.

[158] The evaluation was included in Annex II REFIT initiatives of the Commission work programme 2020, COM(2020) 37 final of 29 January 2020.

[159] SWD(2021) 134 final of 2 June 2021.

[160] See point 8, Annex I, COM(2022) 548 final of 18 October 2022.

[161] The Recast Directive is *lex generalis* on capacity and traffic management, whereas the RFC Regulation is applicable only to the RFC lines.

in a reduction of administrative costs for IMs, estimated at EUR 8.2 million relative to the baseline, expressed as present value over 2025-2050.

8.3. Application of the 'one in, one out' approach

PO3 will result in limited administrative cost savings for IMs, of EUR 0.4 million from 2025 onwards relative to the baseline (i.e. EUR 17 836 per year on average per infrastructure manager[162]), due to the envisaged abolition of the rail freight corridors. Expressed as present value over 2025-2050, they are estimated at EUR 8.2 million relative to the baseline (in 2021 prices). As explained in section 6.1.2, the savings come from removing the obligations for management boards to collect and publish information, in particular to produce customer satisfaction surveys and to monitor the performance of rail freight services. The policy measure will also remove the need for management boards to publish annual reports, which they do on their own initiative.

The preferred policy option is expected to result in adjustments costs estimated at EUR 435.1 million for RUs, EUR 1 596.5 million for IMs, and EUR 17 million for terminal operators, expressed as present value over 2025-2050 relative to the baseline. At the same time, it would also result in adjustment costs savings of EUR 482.8 million for RUs and EUR 485.3 million for IMs over the same period.

8.4. Sensitivity analysis of the policy options

Policy options 2, 3 and 4 introduce a new approach to capacity management. This creates challenges for all involved stakeholders and in particular infrastructure managers and railway undertakings. Overall, the introduction of the new approach and the different policy measures in the POs increase to a different degree the level of uncertainty of the estimations of the impacts. This warrants performing sensitivity analysis on the modelling results of the additional capacity created in the different POs, to complement the cost-benefit analysis in identifying the preferred policy option. The differences in the results on available capacity have a knock-on effect on a number of outputs that were modelled for this impact assessment, such as the estimates of the monetary value of the direct benefits from the additional freight and passenger capacity.

Two main factors create uncertainty: the higher level of complexity and ambition of a policy option and the effectiveness of the coordination between infrastructure managers and ENIM regarding traffic that goes both on TEN-T lines and the rest of the network.

For the first factor, the key assumption is that a higher level of complexity and ambition of a policy option results in a higher level of uncertainty about its outcomes, as the necessary adjustments increase compared to the baseline. Therefore, increasing uncertainty factors were assigned to the POs (the lowest for PO1 and the highest for PO4). One adjustment was made for PO2, where the lack of a solid coordination mechanism for cross-border traffic was assessed to result in the same uncertainty factor as the more complex PO3. While PO2 contains no policy measure on coordination, PO3 has a relatively straightforward mechanism introduced by PM20-1. For PO4, the uncertainty is the highest in particular due to the complexity of PM20-2, PM22 and PM23. The simulation of the

[162] As explained in Annex 4, estimations about costs and cost savings for infrastructure managers and allocation bodies are made on the basis of the (simplifying) assumption that there is one infrastructure manager / allocation body per Member State with a rail system. This results in a total of 25 infrastructure managers / allocation bodies: EU27 without Cyprus and Malta, which do not have a rail system.

timetable process in TPS focuses on individual lines, including cross-border lines. Policy option 4 fares very well in this respect, because capacity on cross-border lines is managed by the central entity. Therefore, the analysis in PO4 produces results on the premise that there are no remaining inconsistencies in the planning of capacity for cross-border traffic. However, the modelled results of PO4 assume the smooth implementation of higher and more complex requirements and dependencies towards the coordination of traffic between the lines managed by the central entity (TEN-T lines) and those managed by individual infrastructure managers (the rest of the network) than for the other policy options. Therefore, there is more uncertainty regarding potential inconsistencies in the capacity planning and allocation.

This uncertainty factor is also applied to calculate upper bounds. The modelling of the train paths, includes a buffer zone. This buffer was part of the simulated scheduling process to consider short operational delays. For PO4, these buffers had the highest relative negative impact due to the proportionally high number of lines on the network. Therefore, the reversed uncertainty factors are the basis for the upper bounds of the sensitivity analysis on the results of the additional capacity.

The second factor driving the sensitivity analysis is the uncertainty about the effectiveness of the coordination between infrastructure managers and ENIM regarding traffic using both TEN-T lines (where ENIM is competent for planning) and the rest of the network (in competence of infrastructure managers). This is introduced by PM20-2. The TEN-T lines are still heavily used for domestic traffic, which often does not start on these lines and hence would need to be coordinated between infrastructure managers and ENIM. This coordination might not always be smooth. The central value (CV) used for the estimation of the impacts of the options in section 6 assumed a full continuation of the domestic services. Therefore, for a lower bound (LB) calculation, a 50% reduction of the modelled impact of additionally available train paths is assumed for PO4, while for the upper bound (UB) a doubling of the additionally available train paths has been assumed. For the other policy options this uncertainty is scaled down by halving the previous value (i.e., from policy option 4, to policy option 3, to policy option 2 and to policy option 1).

The results of the sensitivity analysis are provided in Table 12.

Table 12: Results of the sensitivity analysis on the additional rail infrastructure capacity created in POs 1 to 4 (LB – lower bounds; CV – central value; UB – upper bounds) relative to the baseline

Policy option	2030			2040			2050		
	LB	CV	UB	LB	CV	UB	LB	CV	UB
PO1	0.17%	0.19%	0.19%	0.19%	0.20%	0.21%	0.21%	0.23%	0.23%
PO2	1.32%	1.55%	1.63%	1.55%	1.82%	1.91%	1.71%	2.01%	2.11%
PO3	1.92%	2.55%	2.68%	2.55%	3.40%	3.57%	2.76%	3.67%	3.85%
PO4	1.74%	3.33%	3.66%	2.79%	5.33%	5.86%	3.35%	6.39%	7.03%

Ecorys et al. (2023), impact assessment support study

The results show that the preferred policy option, PO3 has relatively stable results with an increase in the available rail infrastructure capacity between 2.7 and 3.9% in 2050 relative to the baseline. Policy option 4, which had the best cost-benefit ratio in the modelled results, shows considerable uncertainty especially in regard to the lower bound.

The effect of available capacity has a stronger impact on direct benefits and external costs, as these are the categories that have the most direct link to rail traffic. The results of

sensitivity analysis in terms of total costs, total benefits, net benefits and benefits to costs ratio for PO3 and PO4 are presented in Table 13. As shown in section 7.2, these are the policy options with the highest benefits to costs ratio and therefore have been retained for further analysis.

Table 13: **Summary of costs and benefits of policy options – net present value for 2025-2050 compared to the baseline (in million EUR), in 2021 prices for POs 3 and 4 (sensitivity analysis). LB – lower bounds, CV – central value and UB – upper bounds**

	PO3: difference to the baseline			PO4: difference to the baseline		
	LB	CV	UB	LB	CV	UB
Total costs	2 094.0	2 094.0	2 094.0	2 324.9	2 324.9	2 324.9
Total benefits	9 553.3	13 502.70	14 084.7	9 714.7	18 319.5	19 963.5
Net benefits	7 459.4	11 408.8	11 990.8	7 389.7	15 994.6	17 638.6
Benefits to costs ratio	4.6	6.4	6.7	4.2	7.9	8.6

Source: Ecorys et al. (2023), impact assessment support study

The results of the sensitivity analysis show that if risks are considered the estimates of the additional capacity and the total costs and benefits for POs 3 and 4 change considerably. In particular, the lower bound of PO4 in terms of benefits to costs ratio is below that of all the variants of PO3. The sensitivity analysis confirms the benefits of selecting PO3 as the preferred policy option, which shows lower uncertainty with respect to the benefits to costs ratio.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The initiative will be implemented in conjunction with other legislative initiatives put forward by the Commission, which address challenges related to rail infrastructure development, interoperability in rail and multimodal transport.

As regards rail infrastructure development, the baseline scenario includes the completion of the core TEN-T network by 2030 and of the comprehensive TEN-T by 2050. It also assumes the full electrification of the core TEN-T rail network by 2030 and of the comprehensive TEN-T rail network by 2050, which is in line with the existing TEN-T Regulation. In addition to these developments, the Commission proposal on the revision of the TEN-T Regulation is also included in the baseline. It envisages accelerated and better aligned TEN-T implementation (e.g. for ERTMS deployment), the addition of infrastructure requirements for rail relevant for intermodal transport (P400 loading gauge), extending the scope of rail freight infrastructure standards to the comprehensive network (22.5 t axle load, 100 km/h line speed for freight and the possibility of running trains with a length of 740 m), digitalisation of passenger and freight terminals and upgrading their infrastructure (740 m long tracks under the crane, electrification, etc.) and the introduction of a minimum passenger line speed of 160 km/h for the passenger core network.

The initiative will complement all these infrastructure-related measures by providing a legal framework that would allow IMs to maximise the use of the network and prioritise better rail traffic on congested or capacity constrained infrastructure, which in turn will maximise the value of infrastructure investments. Better rail infrastructure capacity planning and allocation will allow to make full use of improvements in possible speed, train length and in ERTMS deployment. The measures of the initiatives on coordination of rail and terminal operators and the digitalisation of rail-related services will allow to take full advantage of terminal infrastructure improvements and the digitalisation of terminals.

The measures in this initiative ensure synergies with other initiatives in the Fit for 55 package of initiatives[163], such as the revision of the Energy Taxation Directive[164], the RePowerEU plan and with future Commission proposals for revision of the Combined Transport Directive[165] and CountEmissions EU[166]. The initiative should help increase rail traffic, which should improve EU's transport energy efficiency and reduce the dependence of EU transport on imported fossil fuels, which is in line with the measures put forward in the Energy Taxation Directive proposal and with the RePowerEU plan. The taxation proposal envisages linking energy taxation rates to the energy content of energy products and electricity, while RePowerEU advocates for increased electrification including in transport. The proposal for revision of the Combined Transport Directive will provide a boost for multimodal transport and the measures to improve the performance of rail terminals will further support an increased role for rail in the multimodal chain. The initiative should facilitate the development of rail transport services and thus provide more options for those who want to reduce their transport carbon footprint, information on which should become increasingly available, as it will be based on transparent harmonised rules on calculating and reporting transport-related greenhouse gas emissions.

The initiative will be successful if it will bring about an improvement in the management of capacity and traffic that results in visible progress of rail performance. This, in turn, will trigger greater demand for rail transport, which could be accommodated thanks to greater availability of capacity.

Ultimately, a successful scenario is one in which there is growing modal share of rail and an increasing number of cross-border rail services, which would translate into a better environmental performance of the EU transport system.

The Commission services will monitor the implementation and effectiveness of this initiative through a number of actions and a set of core indicators that will measure progress towards achieving the operational objectives. These indicators, as well as the operational objectives will be developed based on the advice of a performance review body, which will include independent experts with experience in rail, coming from different stakeholder groups. Data will be provided by ENIM and in particular by the supporting operational entity - the Network Coordinator, which also play an important role in defining the operational objectives. The quality of data is expected to increase following the application of uniform definitions and methods for collecting and presenting the data, which the rail network coordinator should develop in cooperation with the Commission. Data and analysis on competition developments and implementation is expected to be provided by the ENRRB. Improvements in quality of the information are expected due to the collaboration of regulatory bodies.

Taking into account the interaction with the initiatives outlined above, when developing the performance indicators, the following will be taken into consideration:

- Monitoring capacity use (traffic) with less trains, including optimising stopping patterns and runtimes, minimising block occupation time, profile of freight trains

[163] COM(2021) 550 final of 14 July 2021.
[164] COM(2021) 563 final of 14 July 2021.
[165] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13010-Sustainable-transport-revision-of-Combined-Transport-Directive_en
[166] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13217-Count-your-transport-emissions-%E2%80%98CountEmissions-EU%E2%80%99_en

in particular 740 m trains, developments of containerised transport on rail, changes in planned and actual train speed.
- Monitoring energy efficiency of rail transport and of EU transport in general.
- Monitoring rail market developments, in particular the development of new cross-border and long-distance rail transport services.

The performance indicators will be linked to rail capacity and traffic management or to coordination of rail and rail-related services in rail facilities to ensure that they can identify the effect of the policy measures included in the proposal. Nevertheless, the synergies between the policy initiatives mentioned above will also result in measuring the combined effects of some measures (e.g. the increase in traffic of 740 m trains will depend both on the investments in and the development of rail infrastructure and infrastructure management to allow for the construction of train paths for such trains).The table below provides an overview of performance areas, corresponding operational objectives and possible indicators.

Table 14: Performance areas, corresponding operational objectives and possible indicators

Performance area	Operational objectives	Possible indicators
Physical infrastructure and its capabilities (note: achievement of these objectives is beyond the scope of this initiative but indicators are contextual variables for monitoring other performance areas)	• Increase the volume of physical infrastructure • Increase the capabilities of physical infrastructure • Improve the state-of-repair of physical infrastructure	• Length of lines by track numbers (single, double, quadruple etc.) • Length of lines equipped with ERTMS • Theoretical capacity of lines / tracks (headway between two trains) • Volume of temporary and permanent speed restrictions
Infrastructure capacity management (quality and outcome of capacity planning processes)	• Increase the volume of capacity offered • Increase quality and match with market needs of capacity offered (timings, connections in nodes, etc.) • Increase the stability of capacity offered • Increase respect of processes (e.g. timeline) • Increase in consistency of cross-border capacity • Reduce impact of capacity restrictions due to works on traffic	• Train path-km offered • Number of connections in nodes per train path • Share of train paths allowing 740 m length trains • Share of train paths suffering from inconsistencies between networks • Average time to respond to ad-hoc path requests • Planned dwelling times of trains at border crossings • Average lead time for publication of capacity restrictions due to works
Traffic management and contingency / crisis management (quality and outcome of operational processes)	• Reduce volume of delays • Increase traffic continuity in the event of network disruptions or crises • Provide relevant and up-to-date information to customers	• Sum of or average delay-hours • Share of trains that can be re-routed in the event of disruptions • Accuracy of estimated-time-of-arrival information • Actual dwelling times of trains at border crossings
Digital tools and services	• Provide information about physical infrastructure and its capabilities in digital	• Completeness of information in digital EU rail infrastructure register • Share of cross-border train paths allocated

Performance area	Operational objectives	Possible indicators
	form • Digitalise capacity planning and allocation processes • Provide rail customers with relevant and up-to-date information	via a single IT interface • Share of train paths generated automatically and instantaneously • Share of shipments with estimated time-of-arrival information
Services provided to passengers and freight customers	• Increase the volume of rail passenger and freight transport • Increase speed, frequency, connectivity, punctuality and reliability of passenger and freight transport services • Decrease time to launch new rail transport services • Improve scope and quality of information provided to customers	• Passenger-kilometres and tonne-kilometres (freight) • Train-kilometres • Modal share of rail (passenger / freight) • Frequency of passenger services (direct & connections) • Delays • Share of cancelled services

The initiative will provide a legal framework for the development of more detailed rules, procedures and templates, which will be laid down in non-legislative acts. Therefore, the implementation period should reflect the entry into effect of these acts. Five years after the end of the implementation date of all the relevant legislation (including the adoption and entry into effect of the necessary implementing and delegated acts), the Commission services should carry out an evaluation to verify to what extent the objectives of the initiative have been reached.

ANNEX 1: PROCEDURAL INFORMATION

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

The lead DG is the Directorate-General for Mobility and Transport DG MOVE, Unit C3: Single European Rail Area

DECIDE reference number: PLAN/2021/10644.

Item 8.a) in Annex I to Commission Work Programme 2023, headline 'A European Green Deal', part of the Greening freight package[167].

2. ORGANISATION AND TIMING

The Call for evidence[168] was published on 8 March 2022.

This impact assessment was coordinated by an Inter-Service Steering Group (ISSG), involving the following Commission Services: Secretariat-General, Legal Service, Directorate-General for Competition (COMP), Directorate-General for Employment, Social Affairs and Inclusion (EMPL), Directorate-General for the Internal Market, Industry, Entrepreneurship and SMEs (GROW), Directorate-General for Environment (ENV), Directorate-General for Research and Innovation (RTD), the Joint Research Centre (JRC), Eurostat (ESTAT), Directorate-General for Neighbourhood and Enlargement Negotiations, as well as the European Union Agency for Railways (ERA), the European Climate, Infrastructure and Environment Executive Agency (CINEA) and Europe's Rail Joint Undertaking (EU-Rail).

The Inter-Service Steering Group met 5 times: on 12 January, 18 February, 23 May, 10 November 2022 and 26 January 2023. It was consulted throughout the different steps of the impact assessment process: notably on the draft staff working document.

3. CONSULTATION OF THE RSB

The draft report was submitted to the RSB on 1 February 2023 and was discussed by the Board on 1 March 2023. RSB issued a positive opinion on 3 March 2023. Recommendations from the Board have been addressed in the revised version of the Impact Assessment report as detailed in the table below.

Table 15: Modifications of the IA report in response to RSB recommendations

Detailed RSB comments	**Modifications to the IA report**
(1) The report should better explain the parameters used as model inputs to estimate the key specific impacts of the policy options. In particular, it should better explain how capacity restrictions (both in terms of general limitations in available capacity and more specific temporary restrictions due to maintenance and renewal infrastructure work) were taken into account in the modelling. It should	Additional explanations on capacity and corresponding assumptions have been added in sections 5.1, 6.1.1 and Annex 4 (sections 2.1.4 and 4.1.1). The explanations on the articulation between TRUST and ASTRA models to estimate the net job creation and the GDP growth have been added in footnotes in sections 6.1.7 and 6.2.1., and clarifications regarding the way these

[167] COM (2022) 548 final of 18 October 2022.

[168] International freight and passenger transport – increasing the share of rail traffic (https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13134-International-freight-and-passenger-transport-increasing-the-share-of-rail-traffic_en).

Detailed RSB comments	Modifications to the IA report
be clearer on all parameters and assumptions used to estimate the increase in available rail network capacity and rail freight transport activity. It should also better explain the articulation between the TRUST and ASTRA models to estimate the net job creation and the GDP growth. The report should undertake a sensitivity analysis to better account for the uncertainty of the outputs, such as the estimated potential 4% increase in rail capacity thanks to the preferred policy option of the initiative.	models were used to assess impacts on transport activity were inserted in section 4.1.1. of Annex 4. Sensitivity analysis has been performed and the results in terms of rail capacity, net benefits and benefits to costs ratio are provided in section 8.4 and Annex 4 (section 4.6).
(2) The report should provide further argumentation on the choice of the preferred option given that it does not have the best Benefit Cost Ratio. It should further explain the source of uncertainties and limitations of the cost benefit analysis to strengthen the justification of the preferred option. To complement the cost benefit analysis, the report should more explicitly compare the options in terms of effectiveness, in particular delivery on the specific objectives of the initiative. It should bring out more clearly how the options differ in terms of key benefits, including any available quantitative estimates.	The efficiency section (section 7.2) has been reinforced, to better explain the source of uncertainties and limitations of the cost benefit analysis. This has been complemented by the sensitivity analysis presented in section 8.4. In addition, the section on effectiveness (section 7.1) has been revised and tables have been added to more clearly present the assessment. Furthermore, insights collected from stakeholder consultation activities were included in the text of Section 8.1 to strengthen the justification for the choice of preferred option.
(3) The report should more clearly outline the failures of the current Rail Freight Corridors system, and better explain how the 2021 evaluation findings fed into the report. The intervention logic should make a more direct link between the identified problems and corresponding objectives, clarifying how they address problems other than capacity restraints for freight transport. The report should further explain to what extent capacity increase is a key enabler to reach the rail transport objectives 2030 and 2050 set out in the Commission's Sustainable and Smart Mobility Strategy.	Section 1.5 on ex-post evaluation has been reinforced, and it now also includes a table linking the conclusions of the evaluation to the impact assessment. The intervention logic has been revisited. The problem tree in section 2 has been revised to clearly indicate the links between problem drivers, problems and consequences. In addition, the wording of the problem drivers 2, 3 and 4 has been fine tuned. The one-to-one correspondence between specific objectives and problem drivers in Figure 4, that over-simplified the relationships between the specific objectives and problem drivers, has been revisited. The wording of specific objective 1 has been also be fine-tuned. In relation to the overall intervention logic, Table 1 of the impact assessment report links the various elements: problem drivers, specific objectives, policy measures and policy options. Section 4.1 explains how the capacity increase is a key enabler to reach the rail transport objectives 2030 and 2050 set out in the Commission's Sustainable and Smart Mobility Strategy.
(4) The report should be clear on what success would look like in terms of increase of freight and passenger transport, linking the achievements of this initiative with parallel, complementary, initiatives addressing other barriers to the growth of rail transport. It should explain how the achievement of success of this initiative would be monitored while adequately reflecting the progress of other relevant initiatives. It should establish a set of operational objectives linked to monitoring indicators.	Section 9 has been reinforced and now discusses how success would look like in terms of increase of freight and passenger transport, linking the achievements of this initiative with parallel, complementary, initiatives addressing other barriers to the growth of rail transport. A table has been added in section 9 linking operational objectives to monitoring indicators.
(5) The views of different stakeholder groups should be more visible throughout the report.	The views of the different stakeholders groups have been made more visible throughout the report (e.g. sections 2.2.1 to 2.2.5).

Detailed RSB comments	**Modifications to the IA report**
(6) The introduciton section of the report should better clarify that the initiative covers all type of rail traffic (passenger and freight) and not only the freight segment.	The words 'passenger and freight' were added more systematically throughout Section 1.
(7) The 'economic context' section of the report should provide additional background to better describe the current rail market situation.	Section 1.4 of the report was significantly reinforced and now includes new paragraphs and a new figure providing additional facts and figures concerning rail freight and infrastructure management0
(8) The purpose and way of working of corridor one-stop shops under the RFC Regulation should be better explained.	Additional clarifications were inserted in Section 1.3 of the report.
(9) The report should also better explain how the one-stop shops would work under PO1 of the initiative.	Additional clarifications were inserted in Section 5.4.1 and in Annex 6 of the report.
(10) And explanation should be provided as to why 'individual freight trains' are considered a 'niche' segment and why it is expected that this will remain true in the future.	Explanations were added in a footnote in Section 2.2.1.
(11) The section on priority criteria in the context of capacity allocation and PSOs should explain the meaning of the acronym 'PSO'.	The text of Section 2.2.2 was updated to include an explanation of the acronym 'PSO'.
(12) If data is available, the report should provide additional background regarding how the challenges concerning the cross-border coordination if rail traffic differ between Member States.	For lack of comprehensive data, additional text regarding the challenges related to the cross-border coordination of traffic faced identified in the evaluation of the RFC Regulation was added in Section 2 of Annex 5.
(13) The report should explain why the growth of rail transport is not the general objective of the initiative. It should also explain how the initiative contributes to the milestones of the Sustainable and Smart Mobility Strategy (SSMS), and the interplay between this initiative and other initiatives.	Section 4.1 of the report was revised to further justify the rationale for defining the objective of the initiative and to clarify the links between the initiative and the SSMS and other initiatives.
(14) The report should better explain the assumptions related to rail infrastructure underpinning the baseline scenario.	Annex 4 of the report was updated to better explain how the preferred option of the revision of the TEN-T Regulation was factored in modelling for the baseline scenario.
(15) The report should better explain how the 'crisis cell' envisaged in PM23 would work.	Clarifications on the 'crisis cell' in PM23 were introduced in Section 5.4.4.
(16) The report should clarify how the TTR project fits into the policy measures envisaged in the initiative.	A box describing the TTR project in more detail and its relationship with the policy measures of the initiative was added in Section 5.4.2 of the report.
(17) The report should explain the similarities and differences between the proposed EU performance reviewing body under PM10 and the existing one in the area of aviation.	Additional explanations were added in the description of PM10 in Annex 6 of the report.
(18) The section regarding the impact of the initiative on SMEs should provide more information regarding how the SME test was conducted.	Paragraphs explaining the methodology and outcome of the SME test in Annex 11 were moved into Section 6.1.5. of the report.
(19) The section of the report concerning impacts on competitiveness should be revised to explain the potential	Section 6.1.7 of the report was updated accordingly.

Detailed RSB comments	Modifications to the IA report
for improving the price competitiveness of rail.	

4. EVIDENCE, SOURCES AND QUALITY

The impact assessment is based on several sources, using both quantitative and qualitative data, collected from Member States and industry. This includes:

- The ex-post evaluation of the Rail Freight Corridors Regulation
- Stakeholder consultation activities (see Annex 2)
- External support study carried out by an independent consortium (Ecorys, TRT, Hacon, M-Five)
- Commission's experience in monitoritung and implementing the RFC Regulation and the Recast Directive
- The Commission monitoring reports on the development of the rail market
- Samples of quantitative datasets from industry associations RailNetEurope and Forum Train Europe.

ANNEX 2: STAKEHOLDER CONSULTATION (SYNOPSIS REPORT)

This annex provides a summary of the result of the consultation activities, carried out as part of this impact assessment in view of the possible review of the EU legal framework for railway infrastructure capacity allocation and rail traffic management. It provides a basic analysis of the responses of stakeholder groups involved in the consultation process and a summary of the main issues which they raised. A more detailed description is provided in the consultation report, forming part of the impact assessment support study undertaken by an external consortium.

The objective of the consultation activities were to collect information and opinions of stakeholders on the key problems and problem drivers, definition of relevant policy objectives linked to those problem areas and the identification, definition and screening of policy measures that could eventually be incorporated into policy options for this impact assessment.

1. CONSULTATION STRATEGY AND OVERVIEW OF CONSULTATION ACTIVITIES

The consultation strategy was developed from the start of the process by the Commission services and addressed the following stakeholder groups:

- Representatives of individual infrastructure managers, allocation bodies and stakeholder organisation representing them;
- Railway undertakings (freight and passenger) and their stakeholder organisations, in particular those undertakings using the services of the Rail Freight Corridors;
- Members of executive and management board of the Rail Freight Corridors, including members of the permanent management offices;
- Terminal operators and owners, including those participating in the advisory groups of the Rail Freight Corridors;
- Representatives of the Member States' ministries responsible for rail, in particular those involved in the work of the Rail Freight Corridors and local authorities;
- Economic operators that are customers of rail services, in particular freight forwarders, shippers, intermodal operators and their organisations;
- Representatives of rail regulators, including IRG-Rail;
- Representatives of national and national safety authorities;
- Other relevant stakeholders, such as NGOs and civil society;
- Academia and research institutes;
- Citizens.

The consultation covered all stakeholder groups identified in the initial consultation strategy. The consultation activities took place in 2022 and included:

- A consultation on the call for evidence[169],
- An open public consultation[170],
- Two focus group meetings, organised by the external contractors,
- Surveys and interviews managed by external contractors,
- Two stakeholder events, organised by the Commission via PRIME[171] (targeting infrastructure managers) and RU-Dialogue[172] (targeting railway undertakings).

[169] International freight and passenger transport – increasing the share of rail traffic (europa.eu)
[170] International freight and passenger transport – increasing the share of rail traffic (europa.eu)
[171] Platform of Rail Infrastructure Managers in Europe (PRIME) for cooperation between infrastructure managers and the Commission services.
[172] A forum for rail undertakings, involving the Commission services and the European Union Agency for Railways.

The consultation included the collection and analysis of position papers (18 submitted alongside responses to the OPC and 15 additional position papers provided for the support study during the stakeholder consultations).

Both quantitative and qualitative tools were used in analysing data obtained from stakeholders.

Limitations of the stakeholder consultation

It was particularly difficult to gather input from IMs on estimates on **congested lines.** Stakeholders were also asked to comment on how they might be impacted by the various proposed measures (and especially on **cost assumptions** regarding the implementation of TTR), but they were not able to provide detailed estimates on the monetised costs and benefits.

The policy measures were further refined after they were presented to some stakeholder groups. Therefore, not all stakeholder groups were consulted on the wording used in the impact assessment. Nevertheless, the nature of the measures and their essential elements did not change.

2. FEEDBACK ON THE CALL FOR EVIDENCE

The call for evidence was open for feedback between 8 March and 5 April 2022 on Have your say webpage. As part of the initial feedback mechanism, there were 67 valid responses (including 15 position papers and documents) were received: 31 from citizens, 9 public authorities, 9 companies/business organisations, 9 business associations, 3 NGOs, 3 trade unions, 1 consumer organisation and 2 other respondents.

The responses focused on the measures needed to boost rail (with different respondents focusing on passenger, freight or both). Most respondents expressed support for the initiative (public authorities, citizens, NGOs, business associations, companies) and some citizens expressed general support for rail. Suggestions for additional measures included implementing a level playing field among the different transport modes (business associations, trade unions, citizens), increasing investments in rail infrastructure (business associations), developing further the Timetable Redesign Project (business associations), working on through ticketing, deprioritising PSOs[173], improving data exchange in rail (public authority) and capacity management organised by supranational regions (citizen). Some respondents (NGO) addressed the draft policy options, expressing support for the more ambitious ones (options 2 and 3, which propose a network approach to capacity management). A trade union, some business associations and some citizens were against the EU focussing on long-distance (freight) trains and instead insisted on focusing on commuter and intercity trains, expanding rail infrastructure and making rail more affordable. Regional issues (rail market problems in Spain e.g.) were also raised by some (NGOs and business associations).

Some respondents (companies from the rail sector, public authorities) expressed preference for the policy option which would improve the RFCs. Some business associations, trade unions, public authorities expressed reservations about an entity at EU level responsible for capacity management, but others (citizens, companies) explicitly supported it. One respondent (a company) saw the options as evolutionary stages. A respondent (trade union) suggested that trade unions should be represented in the advisory groups of the RFC governance.

[173] Public service obligations are state-supported public passenger transport services in the general interest that transport companies would not provide on their own initiative. They are regulated in the Recast Directive and in PSO Regulation (Regulation (EC) No 1370/2007).

Some suggestions for additional measures (level playing field and changing rules for road transport, rail infrastructure investments, direct support to railway undertakings, etc.) could not be taken into consideration, as they are being addressed by other Commission initiatives.

3. RESULTS OF THE OPEN PUBLIC CONSULTATION

The public consultation opened on 30 March 2022 and closed on 22 June 2022. The total number of responses to the questionnaire was 123. This includes 18 written contributions. The Commission services received 1 late reply by email and corrections to 1 reply after the deadline. More details about the results of the open public consultations are available in the factual summary report published on the Commission's Have your say website and in the consultation report forming part of the impact assessment support study. The highest rate of responses came from business (companies 34, associations 13), citizens (31 EU and 1 non-EU) and public authorities (27). Respondents included also 7 NGOs, 2 consumer organisations, 2 trade unions and 1 environmental organisation. Many of the respondents are related professionally to rail, including some of those who replied as citizens.

Table 16: Classification of respondents per stakeholder group according to their relationship with rail

Stakeholder category	Number of responses	% of responses
Citizens	22	17.9%
Railway undertaking providing freight services	9	7.3%
Railway undertaking providing passenger services	6	4.9%
Rail infrastructure managers and allocation bodies	11	8.9%
Rail regulatory body	11	8.9%
Transport operators of other modes (e.g., road hauliers)	2	1.6%
Terminal owners and operators	3	2.4%
Multimodal operators (MTOs)	1	0.8%
Logistics services providers, freight forwarders and transport organisers	2	1.6%
Industry and commerce	1	0.8%
Umbrella organisations and associations representing the rail stakeholders	16	13.0%
Non-governmental organisations (not specialising in rail transport) and civil society	5	4.1%
Ministries, regulatory bodies, national safety authorities and other public authorities	19	15.4%
Research and academia	0	0.0%
Other	15	12.2%
Total	**123**	**100.0%**

Respondents came from 20 Member States. Further 10 responses were received from Norway, Switzerland, Turkey and the United Kingdom and 2 responses did not provide information on the country of origin. Germany, Belgium, France and Sweden provided the highest numbers of responses (a total of 57 responses between them, or 47% of all the responses).

Responses from legal entities included 42 responses from large organisations (i.e., with 250 or more employees), 18 from micro organisations (i.e., between 1 and 9 employees), 17 from medium-size organisations (i.e., between 50 and 249 employees) and 13 from small organisations (i.e., between 10 and 49 employees). Some 33 respondents did not provide information on the size of their organisation.

The number of replies 'I do not know' or 'I have no opinion' varied, sometimes surpassing one third of the replies, indicating that some of the questions required considerable knowledge about rail infrastructure and traffic management and about particular rail market segments (e.g. freight).

3.1. Questions on challenges and problems

The majority of respondents agreed that the challenges to cross-border rail listed in the questions were important. 58 out of the 82 respondents agreed with the fact that higher prices of rail freight services compared to other modes of transport is a challenge, mostly economic operators stating that other issues are more important than pricing. 80 out of the 97 respondents agreed with the issue of poor performance of rail freight compared to other modes of transport. The few respondents who disagreed were citizens or business organisations (companies). 68 out of the 85 respondents agreed with the fact that insufficient availability of scheduled rail freight services is also one of the main challenges facing the sector. Lack of capacity was identified (77 out of the 93 responses) as a problem both for cross-border passenger and freight railway transport.

The only question where respondents were almost evenly split was whether amendments of train paths after allocation was a problem for passenger rail, with 41 agreeing and 30 disagreeing that this is a problem.

When assessing whether deficiencies in the performance of railway undertakings in freight causes poor performance for rail, the different stakeholder groups did not demonstrate major differences in opinion, although some railway undertakings and their associations disagreed that this is a problem. 80 out of 97 replies confirmed that this was a problem.

The situation was similar in regard to assessing the quality of services provided by infrastructure managers, where again the majority (68 out of 85 respondents) agreed that this is a problem and those respondents who disagreed were mostly representatives of infrastructure managers.

3.2. Questions on measures and solutions

The majority of respondents assessed positively the proposed measures to support actions within the existing framework of the rail freight corridors.

On the use of plans for the utilisation of capacity on the rail network, the majority of respondents agreed with such a measure and the most popular approach was coordinating such plans between IMs within the existing structures of the rail freight corridors (54 out of 100 respondents). 23 thought that alignment should be supported by a single EU entity responsible for the entire network of strategic lines in Europe. 22 respondents thought that alignment should be supported by a bilateral processes, involving only the infrastructure managers concerned. In general, the responses were similarly distributed within each stakeholder category with a statistically meaningful number of respondents.

On the introduction of clear rules to define how capacity should be split between different types of traffic (national, regional, cross-border, passenger, freight, etc.), the majority (63 out of 109) was in favour of introducing binding rules at EU level. 33 respondents stated that there should be rules at EU level that, but that these rules should only provide guidance. Finally, 13 respondents thought there should be no rules at all.

On the introduction of an entity at EU level responsible for rail infrastructure capacity management, the majority of respondents saw a need for such an entity and supported all of the functions listed in

the questionnaire: development of a harmonised network of rules (57 out of 76), supervising IMs (72 out of 93), traffic management on important lines (only 52 out of 91), providing one-stop shop services for applicants requesting capacity (51 out 85).

52 out of 101 respondents agreed with the introduction of an EU layer for regulatory supervision of rail and 42 out 101 supported only coordination between existing regulators on the basis of clear rules.

Respondents agreed with all venues outlined in the questionnaire on improving the performance of rail in multimodal transport including different coordination measures (89 out of 91; 83 out 84; 77 out of 81 respondents) and even more ambitious bonus-malus schemes for incentivising performance (57 out of 69).

Respondents overwhelmingly supported (84 out of 86) stricter approach to progressing with the digitalisation of rail-related services, such as having clear deadlines.

On traffic management, respondents supported in large numbers all possible venues: harmonisation at technical level (87 out of 102), harmonisation of processes (68 out of 103) and of priority rules for rail traffic (59 out of 98). All stakeholder groups provided similar pattern of replies.

On monitoring of performance, respondents supported both strengthening the cooperation between IMs, RUs and other stakeholders (67 out of 82) and the introduction of an independent entity for the supervision of performance monitoring (58 out of 86).

4. TARGETED STAKEHOLDER CONSULTATION

4.1. Organisation and participants

Most targeted stakeholder consultation activities were undertaken during 2022 as part of the impact assessment support study, namely two rounds of survey-questionnaires, two rounds of targeted interviews and two focus group meetings (on 31 March and 6 July, attended by 42 and 47 stakeholders and experts respectively). The first round of surveys was dedicated to the problem definition and the second one to the policy measures. The interview programme focused largely on the policy options. The Commission also organised the above-mentioned workshops in PRIME and RU-Dialogue on 14 and 15 December 2022.

Table 17: Overview of targeted stakeholder consultation activities undertaken by the external consortium

Consultation activity	Number of stakeholders invited	Number of responses
Survey-questionnaire round 1	322[174]	After analysing and filtering the data, 94 questionnaires received, of which 68 fully completed
Targeted interviews phase 1	25	19
First focus group meeting	60	42[175]
Survey-questionnaire round 2	322[176]	After analysing and filtering the data, 85 questionnaires received, of which 75 fully completed
Targeted interviews phase 2	28	28[177]
Second focus group meeting	132	47[178]

Source: Ecorys et al. (2023), impact assessment support study

For the survey-questionnaire of round 1 respondents came from 20 Member States (SE, FI, LV, LT, PL, HU, CZ, SK, HR, SI, IT, AT, DE, DK, NL, BE, FR, ES, PT, LU) and Norway and Switzerland. In Round 2, respondents came from 21 Member States (SE, LV, LT, PL, HU, CZ, SK, RO, BG, EL, HR, IT, AT, DE, DK, NL, BE, FR, ES, PT, LU) and Norway and Switzerland.

Interviewees were selected from individual organisations, taking into account their involvement and technical expertise in the rail sector, notably when it comes to infrastructure capacity allocation and traffic management. The list of interviewees was representative of all stakeholder groups and included infrastructure managers and allocation bodies, railway undertakings, terminal operators, rail regulators, representatives of the national ministries responsible for railways, members of the governance structure and representatives of the rail freight corridors, rail customers, academia / rail experts. The consultation report of the support study provides further details on the interviewees.

Representatives of all key stakeholder groups were also selected for the focus group meetings.

4.2. Outcome of the targeted stakeholder consultation

The problem definition, objectives and measures have evolved throughout the impact assessment and hence their wording used during the various phases of the stakeholder consultation was not identical with the final one presented in this report, while not varying significantly in substance.

4.2.1. Analysis of the problems and their drivers

The majority of stakeholders recognised all 5 problem drivers as relevant to problem 1– poor performance of cross-border rail transport services, although the assigned importance differed considerably among the drivers.

- ineffective rail capacity management (i.e., Problem Driver 1) is considered by 54% of respondents contributing from a large to a moderate extent and by 27% to a small extent;

[174] Number of individual contacts invited. Multiple individual contacts have been reached out for one entity.
[175] Number of invitees that joined the first focus group meeting.
[176] Number of individual contacts invited. Multiple individual contacts have been reached out for one entity.
[177] Number of interviewees that agreed to be consulted with a targeted interview and resulting from those who have declined the invitation and those who have spontaneously approached to study team (e.g., as follow up activity of the second focus group meeting).
[178] Number of invitees that joined the second focus group meeting.

- ineffective rail traffic management (i.e., Problem Driver 2) by 55% from a large to a moderate extent and by 26% to a small extent;
- ineffective digital tools for planning and operation of rail services (i.e., Problem Driver 3) by 63% from a large to a moderate extent and by 25% to a small extent;
- ineffective train performance monitoring and lack of effective tools to incentivise performance improvement (i.e., Problem Driver 4) by 47% from a large to a moderate extent and by 34% to a small extent.
- lack of coordination on planning and operations between stakeholders involved in multimodal transport chains (i.e., Problem Driver 5) by 62% (51 out of 83 respondents) from a large to a moderate extent and by 22% (18 respondents) to a small extent.

As regards the patterns across the different stakeholder groups, most railway undertakings and rail regulatory bodies generally agreed to a larger extent with the problem definition than the overall sample of respondents. A majority of them agreed to a large or moderate extent that the problem drivers were negatively affecting the performance of cross-border rail transport services. Infrastructure managers showed a more moderate and fragmented perception regarding the influence of the problem drivers to problem 1 and they were more evenly split across the spectrum of responses.

The majority of the representatives of the railway undertakings indicated problem drivers 1 and 2, contextual driver 2 (lack of interoperability) and problem driver 3 as most important. The majority of the representatives of the infrastructure managers indicated problem driver 3, contextual driver 2 and problem driver 5.

The situation was similar for the 3 problem drivers underlying problem 2 – limited capacity of the rail network to absorb additional traffic:

- ineffective rail capacity management and allocation (i.e., Problem Driver 1) by 62% (50 out of 81 respondents) from a large to a moderate extent and by 20% (16 respondents) to a small extent;
- ineffective digital tools for planning and operation of rail services (i.e., Problem Driver 3) by 53% (42 out of 80 respondents) from a large to a moderate extent and by 29% (23 respondents) to a small extent;
- ineffective rail traffic management (Problem Driver 2) by 51% (40 out of 79 respondents) from a large to a moderate extent and by 27% (21 respondents) to a small extent.

For problem 2 similar response patterns to the ones previously described for problem 1 emerged when analysing the responses of the two main stakeholder groups (IMs and RUs). In particular, one can notice that most of the representatives of RUs generally agreed with the problem drivers, with almost all respondents having agreed to some extent that all problem drivers were actually affecting the limited capacity of the railway network to absorb additional rail traffic. IMs showed a more moderate and fragmented perception regarding the influence of the problem drivers on problem 2, as the respondents of this category were more evenly split across the spectrum of responses.

With regards to the different views on the influence of single problem drivers, respondents from both groups converged on contextual driver 1. The majority of RUs identified problem drivers 1 and 2, contextual driver 2 (lack of interoperability) and problem driver 3 as most important, and IMs identifying problem drivers 5, 3 and contextual driver 2. Lack of coordination on planning and operations between stakeholders involved in multimodal transport chains (i.e., problem driver 5) was more widely identified by the infrastructure managers as a driver for problem 2, compared to problem driver 3 and contextual driver 2. For this stakeholder category, the latter problem drivers were more linked in problem 1.

Rail regulatory bodies showed comparable patterns to the ones identified for the infrastructure managers on the problem drivers for problem 2.

Both contextual drivers (limitations of the physical rail infrastructure and lack of interoperability) were identified as very important for the two problems targeted by this initiative by all respondents.

The interviews in round 1 showed interviewees agreeing with the links between problems and drivers. Both the replies to the questionnaires and the interviews provided important insights of the factors contributing to the problem drivers and the mechanisms by which they result in the 2 problems, which were used in refining the problem definition. Further details are available in the consultation report accompanying the support study.

4.2.2. How will the problems evolve

The replies to the targeted consultation showed the expectations of stakeholders for up to 2050 of the large majority (total of 69 respondents) that congestion and overlap with passenger traffic due to inefficient use of available infrastructure to increase highly (22%) or moderately (35%) with only 17% of the respondents that believes that the situation will not change. Few stakeholders envisage a moderate (10%) or high (7%) decrease of congestion and 9% do not have an opinion.

Without special capacity safeguards for rail freight transport, there is a risk that high-quality capacity will not be available, leading to an increased loss of competitiveness of the sector.

The poor performance of rail freight services (Problem 1) in terms of punctuality, speed and reliability, is generally expected to remain unchanged or deteriorate. In the absence of any EU intervention, the vast majority of stakeholders expects a stability or even a worsening (increasing) of the factors contributing to ineffective rail capacity (Problem Driver 1) and traffic management (Problem Driver 2).

For Problem 1, contextual driver 1 is most concerning to respondents. Ineffective rail capacity management and allocation ranks second, with 37% of respondents (out of a total of 67) attributing a large, 18% a moderate, and 28% a small contribution respectively; 13% of the respondents attributes no impact to this problem driver.

For Problem 2 (limited capacity of the rail network to absorb additional traffic), the picture was similar with 47% of respondents (a total of 68) attributing a large, 16% a moderate, and 19% a small contribution respectively and only 4% see no impact from problem driver 1. Problem driver 2 is also a major concern, with 49% of 67 respondents saying that the ineffective rail traffic management will contribute from a large (27%) to a moderate (22%) extent to the limited capacity of the rail network to absorb additional traffic and 27% believes that it will contribute to a small extent.

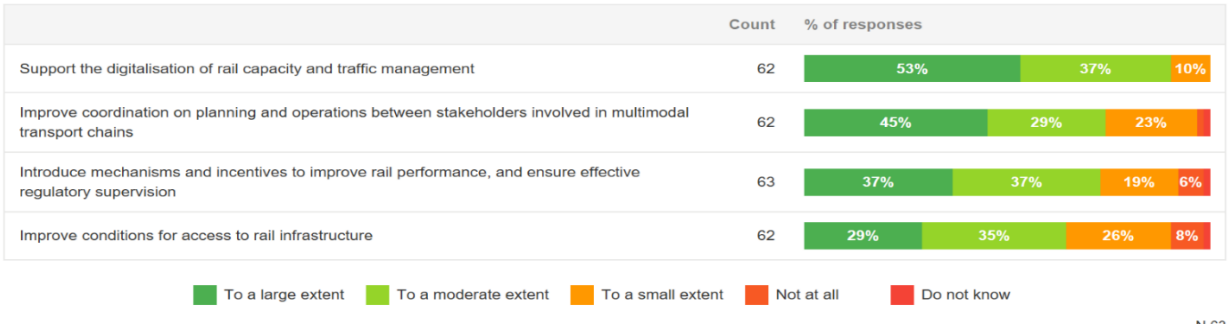
Both the replies to the questionnaires and the interviews provided important insights on the expectations on the evolvement of the problem drivers and the 2 problems without an EU intervention. Further details, in particular on the effect of the sector initiatives, are available in the consultation report accompanying the support study.

4.2.3. Policy objectives

The initial formulation of the specific objectives (5 instead of the 4 used in the impact assessment) produced the results outlined below expressed in reply to the stakeholder survey, indicating an overall support. The most relevant specific objectives according to stakeholders were (i) support of

digitalisation of rail capacity and traffic management and (ii) improve coordination on planning and operation between stakeholders involved in multimodal transport chains.

Figure 6: Stakeholders' views on the specific objectives



4.2.4. Policy measures

Stakeholders were presented with a list of 26 potential policy measures, covering the initial 5 specific objectives. These measures were kept without major changes (except for PM26, which was discarded). The measures took into account (i) the existing initiatives of the rail sector (i.e., TTR, European Virtual Traffic Management Network, Q-ELETA[179], Collaborative Decision Making approach and Enhanced Data Interoperability for Combined Transport) and (ii) both legislative and non-legislative measures that could amend Regulation (EU) 913/2010 and Directive 2012/34/EU.

In the interviews and in the focus group meetings, stakeholders provided further details and confirmed an overall positive assessment of the measures. Infrastructure managers asked for more flexibility in light of national specificities (e.g., for TCR planning). Railway undertakings noted that some flexibility for amending the allocated capacity would be needed by some market segments. Terminal operators and owners identified information exchange as the most relevant measure. Regulatory bodies believed more clarity on future role of the European network of regulatory bodies is needed. Academia representatives believed that PaPs are useful and could be combined with clock-face timetable of passenger trains and that binding rules work better than voluntary compliance for cooperation between infrastructure managers.

The overall level of support for the policy measures is presented in the figures below.

[179] Q-ELETA is a project run by UIRR on electronic exchange of estimated time of arrival information.

Regarding Problem driver 1: Ineffective rail capacity management and allocation, the figure below presents the views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the driver (note that the wording of the policy measures is not always identical with that presented in Section 5.2 and Annex 6, since the list of measures was subject to subsequent streamlining and clarification).

Figure 7: Views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the problem driver 1 (Ineffective rail capacity management and allocation)

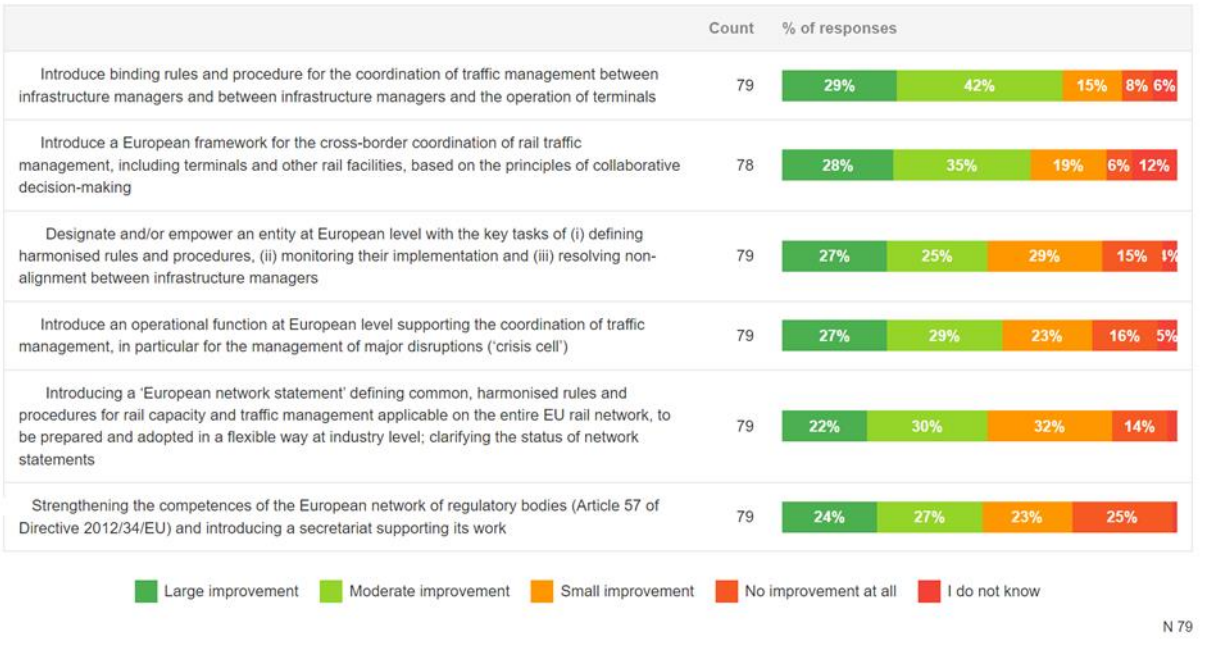
Source: Ecorys et al. (2023), impact assessment support study

According to the consulted stakeholders, the most impactful policy measure is the introduction of harmonised, directly applicable EU framework for rail capacity and traffic management (policy measure 2-1). The policy measure designed to introduce new procedures for capacity allocation in line with market needs, in particular for flexibility and reliability and the introduction of a strategic planning phase and harmonised methodology based on socio-economic criteria supporting the capacity management on infrastructure where demand exceeds supply were also perceived as

impactful. Measures envisaging further action at EU level, in particular via central entities or further harmonisation of rules, were also identified as impactful, although to a lesser extent. Overall, the measures included in PO1 were considered as less effective, but they were still identified as providing for moderate improvement.

Regarding Problem driver 2: Ineffective rail traffic management, the figure below presents the views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the driver (note that the wording of the policy measures is not always identical with that presented in Section 5.2 and Annex 6, since the list of measures was subject to subsequent streamlining and clarification).

Figure 8: Views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the problem driver 2 (Ineffective rail traffic management)

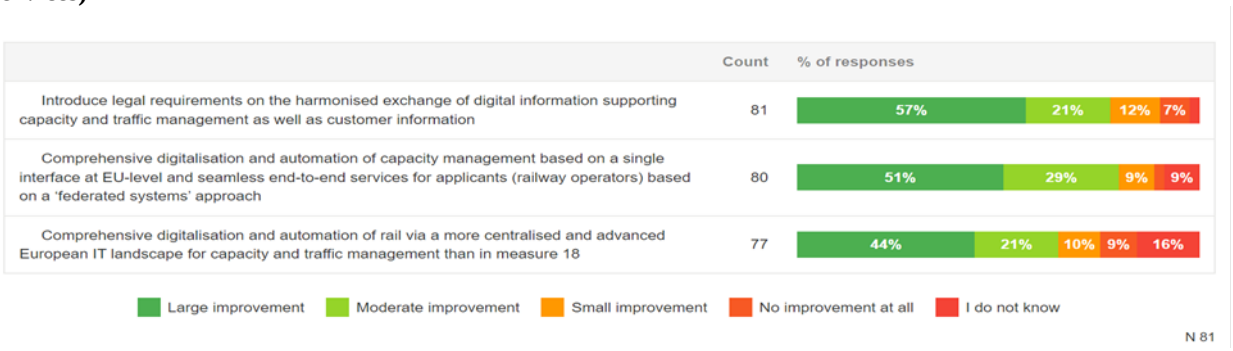


Source: Ecorys et al. (2023), impact assessment support study

Policy measure 2-1, introducing binding rules and procedures for the coordination of traffic management (including coordination between IMs and terminals) was identified again as the measure that could produce the strongest improvement. PM17, collaborative decision-making (which is a voluntary measure) was also identified as impactful. Stakeholders perceived the other measures corresponding to PMs 2-2, 11, 20-1 and 23 (numbering as per section 5) addressing problem driver 2 slightly less positively, but overall all measures were seen as effective.

Regarding Problem driver 3: Ineffective digital tools for planning and operations of rail services, the figure below presents the views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the driver (note that the wording of the policy measures is not always identical with that presented in Section 5.2 and Annex 6, since the list of measures was subject to subsequent streamlining and clarification).

Figure 9: Views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the problem driver 3 (Ineffective digital tools for planning and operations of rail services)



Source: Ecorys et al. (2023), impact assessment support study

These policy measures were identified as among the most effective. Policy measure 24, introducing harmonised exchange of digital information through implementation of TAF TSI received the most support with 46 out of 81 respondents believed that it would result in large improvement and 17 out of 81 saw a moderate improvement. PM25 (and discarded measure 26) also received strong support with 41 out of 80 respondents believed that it would result in large improvement and 23 respondents citing moderate improvement. Regarding Problem driver 4: Ineffective train performance monitoring, in particular for cross-border trains, and lack of effective tools to incentivise performance improvement, the figure below presents the views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the driver (note that the wording of the policy measures is not always identical with that presented in Section 5.2 and Annex 6, since the list of measures was subject to subsequent streamlining and clarification).

Figure 10: Views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the problem driver 4 (Ineffective train performance monitoring, in particular for cross-border trains, and lack of effective tools to incentivise performance improvement)

Source: Ecorys et al. (2023), impact assessment support study

Financial incentives (PM8) were identified as the most effective measure from this group. 30 out of 80 respondents identified the measure as a large improvement and 24 as a moderate improvement. The results show dwindling support for more stringent measures aimed at IMs, such as PM12, which envisages a review by the regulatory bodies of contractual agreements between IMs and Member States' authorities, to ensure that they are kept in line with the national strategies to develop rail.

Stakeholders indicated that coordinating entities at EU level could result mostly in moderate improvements, but the replies did not indicate that they were considered as the most effective instrument. It is possible that stakeholders' doubts could be due to them not finding a strong link between the measures and the specific objective as initially worded.

Regarding Problem driver 5: Lack of coordination on planning and operations between stakeholders involved in multimodal transport chains, the figure below presents the views of

stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the driver (note that the wording of the policy measures is not always identical with that presented in Section 5.2 and Annex 6, since the list of measures was subject to subsequent streamlining and clarification).

Figure 11: Views of stakeholders participating to the targeted questionnaire as to the extent to which each policy measure is likely to address the problem driver 5 (Lack of coordination on planning and operations between stakeholders involved in multimodal transport chains)

Source: Ecorys et al. (2023), impact assessment support study

One of the key measures for POs 2, 3 and 4 – PM3 (introduce a strategic capacity management phase) was identified as largely effective by 36 out of 74 respondents. Stakeholders saw binding rules and procedures for traffic management (including with terminals) as the most effective measure from the package, with 22 out of 73 respondents seeing the measure as effective and 23 having more limited expectations. Several other measures were identified as largely effective, including PM23, which is of operational nature, envisaging a 'crisis cell' at EU level to address major disruptions on the rail network.

The measures on performance monitoring and those supporting long-term planning (the ones related to transport market studies) were identified as least impactful.

4.2.5. Policy options

The targeted stakeholder consultation on the policy options consisted of two rounds of interviews with key stakeholders to collect their views. The consultants used a preliminary list of 3 policy options for the first round:

- Policy option 1: Refinement of the existing legal framework for rail freight and passenger traffic;
- Policy option 2: Comprehensive modernisation and harmonisation of rules, procedures and tools for freight and passenger traffic and
- Policy option 3: Stronger centralisation of decision-making and operational functions at European level.

The outcome of the first round of interviews indicated a preference of the infrastructure managers and the members of the executive and management boards of the corridor for policy option 2. The views of rail services customers and rail regulators were more nuanced, highlighting a need for a gradual approach.

A list of more refined 4 policy options, which corresponds to what is presented in this report, was used for the second round of interviews:

1. Policy option 1: Strengthening the corridor approach;
2. Policy option 2: Introducing a network approach based on common rules and cooperation between infrastructure managers;
3. Policy option 3: Introducing a network approach based on common rules defined and monitored by central entities; and
4. Policy option 4: Introducing network approach based on common rules defined and monitored by central entities at European level and with certain operational responsibilities

In the second round of interviews, the infrastructure managers mostly supported option 2. Two believed that options 1 or 2 are acceptable. One supported option 3 and one indicated support for TTR without identifying a preferred policy option. Two interviewees considered option 4 as very promising from theoretical point of view, but unrealistic concept.

The interviewed railway undertakings expressed divergent views. Two incumbent RUs were clearly not supportive of measures involving an EU entity (one of them chose explicitly option 2). Three interviewees (including one incumbent and one new entrant) supported the introduction of a central entity, even suggesting a combination of POs 3 and 4.

5 members of the governance of 4 rail freight corridors (both management and executive boards) considered a mix of options 2 and 3 as the best approach and found option 4 detached from reality. Some also see option 1 as promising.

One rail regulator representative identified option 2 as preferable. The representatives of the other two regulatory bodies supported option 2 (one indicating option 1 and the other option 3 as alternative).

A terminal manager did not support the introduction of a centralised entity (i.e., policy options 3 and 4) and suggested focusing more on finding solutions on the corridor level (option 1).

Economic operators that are customers of rail services prefer policy option 3 but could see option 2 as being considered a more realistic scenario.

NGOs supported options 3 and 4.

5. WORKSHOPS ON THE INITIATIVE ORGANISED VIA PRIME AND RU-DIALOGUE

The workshop with IMs and allocation bodies took place on 14 December 2022. IMs and allocation bodies from 15 Member States (Belgium, Czechia, Germany, Spain, France, Italy, Lithuania, Hungary, Netherlands, Austria, Poland, Portugal, Slovenia, Slovakia and Sweden) and 2 third countries (Switzerland and Norway) attended. They were joined by representatives of ERA, national safety authorities, stakeholder organisations (CER[180], EIM[181], RNE) and economic operators.

The workshop with RUs took place on 15 December 2022. RUs operating internationally and set up in 12 different Member States (Belgium, Czechia, Germany, Greece, France, Italy, Luxembourg, Hungary, Netherlands, Austria, Poland and Sweden) attended. They were joined by stakeholder organisations (CER, ERFA[182], Forum Train Europe, UIC[183], UIP[184], UIRR, UTP[185]).

The Commission service presented the measures included in this impact assessment.

Those IM representatives who took the floor in the PRIME meeting expressed support for the initiative, as it followed a market approach to capacity management. Some indicated that for the new approach to work clear rules for the relations between IMs and between IMs and applicants should be set. Some expressed concerns about discarding the corridor concept completely, as it allowed for focused cooperation on specific problems (which would be difficult in a network approach) and provided for the involvement of the policy makers (national public authorities and ministries of transport).

Those who made comments in the RU-Dialogue meeting supported the initiative as inspired by TTR and stressed the importance of IM-RU coordination in the strategic planning of capacity. Participants highlighted the need for improvements in the planning and implementation of TCRs (identifying financing agreements between public authorities and IMs as crucial). The measure introducing a European network statement gave rise to contradicting opinions including some concerns about the concept. A few participants expressed reservations towards the introduction of entities at EU level to support the implementation of the measures.

[180] Community of European Railway and Infrastructure Companies.
[181] European Rail Infrastructure Managers.
[182] European Rail Freight Association.
[183] International Union of Railways.
[184] International Union of Wagon Keepers.
[185] Union des transports publics et ferroviaires.

ANNEX 3: WHO IS AFFECTED AND HOW?

5. PRACTICAL IMPLICATIONS OF THE INITIATIVE

Summary of **the implementation** of **the preferred policy option**

The focus of the initiative is to help optimise the use of the rail network, by the introduction of a new set of rules on capacity management implying a shift from a corridor-based to a network-based approach covering all types of rail transport (passenger/freight, domestic/cross-border). The preferred policy option (PO3) addresses other important issues, such as optimising traffic management, reducing the negative effect of infrastructure works on rail traffic, digitalisation and interoperability of IMs' capacity management systems, improving the coordination of rail with other operators in multimodal terminals.

The impacts of the measures included in the preferred policy option are expected to fall on different stakeholder groups: RUs, IMs, rail regulatory bodies, terminal operators and rail customers in the broad sense.

Implications for RUs

The new rules on capacity allocation will allow more rail infrastructure capacity to be available for requests after the publication of the annual timetable. They will allow for capacity requests that extend beyond the period of the annual timetable. This means that RUs will be able to request capacity closer to the time of the train run, which is particularly important for many freight RUs. The measures addressing the coordination and timely implementation of infrastructure works, combined with better coordinated and harmonised rules on traffic and contingency management, should improve the quality of rail services, including punctuality and reliability and thus make rail a more attractive mode of transport. RUs will also benefit from better services provided by IMs following further digitalisation of the capacity management and allocation process. Freight RUs should benefit from the measures targeting the coordination with terminals and thus strengthen their position in multimodal transport. The costs related to the implementation of the preferred policy option stem from a stricter implementation of interoperability requirements for the digital tools used for requesting capacity.

Implications for IMs

IMs will bear the biggest share of the costs in the preferred policy option, with digitalisation of capacity management being the most costly element (adjustment costs). IMs should benefit from the improved process of capacity management, which should result in reduction of costs related to managing amendments to applications for capacity and cancellations. Additional cost savings are expected from abandoning the RFC concept and terminating IMs' participation in the management boards. Furthermore, IMs will get coordinated at EU level through ENIM and with the support of a Network Coordinator, which could result in operational benefits (e.g. the Network Coordinator will be responsible for a transport market study for the whole EU). The biggest positive result for IMs would be the more efficient use of rail infrastructure. As explained in section 6.1.2, IMs cannot profit from the increase in traffic, but they can still benefit from optimised use of resources.

Implications for rail regulatory bodies

Rail regulatory bodies are expected to incur increased enforcement costs, due to the additional tasks related to monitoring the strategic planning of rail infrastructure capacity. The additional tasks will be assigned mostly to the ENRRB. The preferred policy option will result in some cost savings stemming from abandoning the RFCs. The main regulatory benefit will result from empowering the regulatory bodies through the ENRRB to address issues with capacity allocation and traffic management in cases of cross-border traffic.

Implications for terminal operators and other stakeholders

The preferred policy option is expected to result in improved train punctuality and reliability. Terminal operators will benefit from more punctual trains, as they will be able to improve the planning and use of resources. The preferred policy option could result in increase of adjustment costs following the facilitation of voluntary decentralised collaboration between rail stakeholders. Due to the voluntary nature of the collaborative decision-making, it can be assumed that these costs will materialise only for those economic operators that implement it. It is expected that the measure will produce cost savings or increase in revenues, which will be higher than the costs. However, these benefits could not be monetised.

Rail customers includes a wide range of economic operators and citizens. For logistics operators, forwarders and others involved in organising transport, there will be additional opportunities for using a sustainable mode of transport thanks to the increased capacity and improved performance of rail freight. End customers of rail freight services should benefit from the improvements in punctuality and reliability, which could reduce losses due to disrupted production processes and allow for better planning of resources (e.g., warehouse capacity).

Users of rail passenger services will also benefit from an increased supply of cross-border services due to improvements in capacity management. Punctuality and reliability for passenger trains are expected to improve less than for freight, but a positive effect is nevertheless projected.

6. SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred Option (Policy option 3)		
Description	**Amount**	**Comments**
Direct benefits		
Benefits for railways undertakings from an increase of available capacity, expressed as present value over 2025-2050 relative to the baseline	EUR 2 575.7 million	Benefits to RUs due to the increase in the available capacity estimated at EUR 2 575.7 million, expressed as present value over 2025-2050 relative to the baseline. This is due mostly to a more strategic management of capacity, allowing to optimise the provision of capacity in line with market needs over a longer time horizon and safeguarding capacity to be allocated later in the calendar year.
Benefits for railways undertakings from improvements in punctuality, expressed as present value over 2025-2050 relative to the baseline	EUR 658 million	Benefits to RUs due to improvements in the performance of rail transport services, notably punctuality, estimated at EUR 658 million, expressed as present value over 2025-2050 relative to the baseline.
Adjustment costs savings	EUR 482.8 million	Adjustment costs savings for railway

I. Overview of Benefits (total for all provisions) – Preferred Option (Policy option 3)		
Description	**Amount**	**Comments**
for railway undertakings, expressed as present value over 2025-2050 relative to the baseline		undertakings due to the improved capacity management and allocation process, notably from greater stability of allocated paths and the support function for cross-border coordination of capacity management at EU level. Expressed as present value over 2025-2050 relative to the baseline, the adjustment costs savings for railway undertakings are estimated at EUR 482.8 million.
Administrative costs savings for infrastructure managers, expressed as present value over 2025-2050 relative to the baseline	EUR 8.2 million	Administrative costs savings for infrastructure managers, due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, estimated at EUR 0.4 million annually relative to the baseline (i.e. EUR 17 836 per year on average per infrastructure manager). Expressed as present value over 2025-2050 relative to the baseline the administrative costs savings are estimated at EUR 8.2 million.
Adjustment costs savings for infrastructure managers, expressed as present value over 2025-2050 relative to the baseline	EUR 485.3 million	Adjustment costs savings for infrastructure managers due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, and from the reduction in the train path requests resulting from the new approach for capacity and traffic management. The costs savings are estimated at EUR 485.3 million expressed as present value over 2025-2050 relative to the baseline.
Administrative costs savings for national public authorities, expressed as present value over 2025-2050 relative to the baseline	EUR 2.6 million	Administrative costs savings for national public authorities due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, leading to the abolishment of the biennial reports of the executive boards of the rail freight corridors. Expressed as present value over 2025-2050, the total administrative costs savings are estimated at EUR 2.6 million relative to the baseline.
Adjustment costs savings for national public authorities, expressed as present value over 2025-2050 relative to the baseline	EUR 6.8 million	Adjustment costs savings for national public authorities due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, leading to the termination of the participation in the executive boards, which includes direct labour costs but also overheads (i.e. travel costs) for the Member States participating in the corridors. Expressed as present value over 2025-2050, the adjustment costs savings for national

I. Overview of Benefits (total for all provisions) – Preferred Option (Policy option 3)		
Description	**Amount**	**Comments**
		public authorities are estimated at EUR 6.8 million.
Adjustment cost savings in terms of use of EU funds, expressed as present value over 2025-2050 relative to the baseline	EUR 116.7 million	Adjustment cost savings due to a reduction in the use of EU funds, driven by the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors. Part of the costs related to the governance and operation of the rail freight corridors, overheads (including for IT) and cost of external services (transport market studies, some external services provided by RNE, etc.) are eligible for EU funding. Expressed as present value over 2025-2050, the adjustment costs savings are estimated at EUR 116.7 million.
Improvement in the functioning of the internal market		Positive impact on the functioning of the internal market. Improving the planning and operations of rail infrastructure allows railway undertakings to deliver better rail transport services for the benefit of freight customers and passengers throughout the Union.
Indirect benefits		
Reduction in external costs of CO2 emissions, expressed as present value over 2025-2050, relative to the baseline	EUR 3 309.3 million	Indirect benefit to society at large, due to the tonnes of CO2 emissions saved, enabled by better rail transport services for the benefit of freight customers and passengers and a decrease in the road and air transport activity relative to the baseline. The reduction in the external costs of CO2 emissions is estimated at EUR 3 309.3 million, expressed as present value over the 2025-2050 horizon relative to the baseline.
Reduction in external costs of air pollutant emissions, expressed as present value over 2025-2050, relative to the baseline	EUR 681 million	Indirect benefit to society at large, due to the tonnes of air pollutant emissions saved, enabled by better rail transport services for the benefit of freight customers and passengers and a decrease in the road and air transport activity relative to the baseline. The reduction in the external costs of air pollutant emissions is estimated at EUR 681 million, expressed as present value over the 2025-2050 horizon relative to the baseline.
Reduction in external costs of road accidents (fatalities and serious injuries), expressed as present value over 2025-2050, relative to the baseline	EUR 2 801.6 million	Indirect benefit to society at large, due to the lives saved and injuries avoided, enabled by better rail transport services for the benefit of freight customers and passengers and a decrease in road transport activity relative to the baseline. The reduction in the external costs of road accidents is estimated at EUR 2 801.6 million, expressed as present value over the 2025-2050 horizon relative to the baseline.

I. Overview of Benefits (total for all provisions) – Preferred Option (Policy option 3)		
Description	**Amount**	**Comments**
Reduction in external costs of congestion, expressed as present value over 2025-2050, relative to the baseline	EUR 2 374.8 million	Indirect benefit to society at large, enabled by better rail transport services for the benefit of freight customers and passengers and a decrease in road transport activity relative to the baseline. The reduction in the external costs of congestion is estimated at EUR 2 374.8 million, expressed as present value over the 2025-2050 horizon relative to the baseline.
Positive impact on GDP relative to the baseline	GDP increase of 0.1% in 2030 and 0.2% in 2050 relative to the baseline. This translates into EUR 7 billion increase in GDP relative to the Baseline in 2030 and EUR 30 billion increase in 2050.	Indirect benefit to society at large. Better rail transport services are expected to have knock-on effects throughout the entire economy, leveraging the initial impact on the transport sector. This is also expected to lead to positive impacts on GDP, which is estimated to increase by around 0.1% in 2030 and 0.2% in 2050 relative to the baseline (corresponding to EUR 7 billion increase in 2030 and EUR 30 billion increase in 2050).
Positive impacts on employment relative to the baseline (additional persons employed over 2025-2050)	1.06 million additional persons employed over 2025-2050 (42 320 additional persons employed per year on average)	Indirect benefit to society at large. The increase in capacity and thus in the rail traffic would lead to higher gross value added for the sector relative to the baseline, and to an increase in employment. Economy-wide, the number of additional persons employed would increase by 1.06 million over 2025-2050 (42 320 additional persons employed per year on average) relative to the baseline.
Administrative cost savings related to the 'one in, one out' approach		
Administrative costs savings for infrastructure managers (annual average)	EUR 0.4 million per year on average	Administrative costs savings for infrastructure managers, due to the introduction of a harmonised legal framework for railway capacity and traffic management and the abolition of the rail freight corridors, estimated at EUR 0.4 million annually relative to the baseline (i.e. EUR 17 836 per year on average per infrastructure manager). Expressed as present value over 2025-2050 relative to the baseline the administrative costs savings are estimated at EUR 8.2 million.

II. Overview of costs – Preferred option *(Policy option 3)*							
		Citizens/Consumers		**Businesses**		**Administrations**	
		One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs, expressed as present value over 2025-2050, relative to the baseline		-	-	For railways undertakings: EUR 305.2 million For infrastructure managers: EUR 681.4 million For operators of terminals and multimodal transport services: EUR 0.5 million	For railways undertakings: EUR 129.9 million For infrastructure managers: EUR 915.2 million For operators of terminals and multimodal transport services: EUR 16.5 million		For public authorities: EUR 5.9 million For the European Commission: EUR 1.8 million
Direct administrative costs		-	-	-	-	-	-
Direct regulatory fees and charges		-	-	-	-	-	-
Direct enforcement costs, expressed as present value over 2025-2050, relative to the baseline		-	-	-	For infrastructure managers: EUR 12.5 million	For public authorities: EUR 4.2 million	For public authorities: EUR 20.9 million
Indirect costs		-	-	-	-	-	-
Costs related to the 'one in, one out' approach							
Total	Direct adjustment costs, expressed as present value over 2025-2050, relative to the baseline			For railways undertakings: EUR 305.2 million For infrastructure managers: EUR 681.4 million For operators of terminals and multimodal transport services: EUR 0.5 million	For railways undertakings: EUR 129.9 million For infrastructure managers: EUR 915.2 million For operators of terminals and multimodal transport services: EUR 16.5 million		
	Indirect adjustment costs	-	-	-	-		
	Administrative costs (for offsetting)	-	-	-	-		

7. RELEVANT SUSTAINABLE DEVELOPMENT GOALS

III. Overview of relevant Sustainable Development Goals – Preferred Option *(Policy Option 3)*		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG No 13 - Take urgent action to combat climate change and its impacts	0.2% decrease in CO_2 emissions 2030 and 0.4% in 2050, relative to the baseline, or 1 195 thousand tonnes of CO_2 saved in 2030 and 450 thousand tonnes of CO_2 saved in 2050	The reduction in the CO_2 emissions is mainly driven by the higher use of more sustainable transport modes and the reduction in the road and air transport activity. In cumulative terms, over 2025-2050, the preferred policy option is expected to result in 26 million tonnes of CO2 emissions saved.

ANNEX 4: ANALYTICAL METHODS

1. Description of the analytical methods used

The analytical framework used for the purpose of this impact assessment builds on the PRIMES-TREMOVE, ASTRA and TRUST models, complemented by the Train Planning System (TPS) and the assessment of the administrative costs, etc.[186]

The baseline scenario has been developed using the PRIMES-TREMOVE model by E3Modelling. PRIMES-TREMOVE has a successful record of use in the Commission's energy, transport and climate policy assessments. In particular, it has been used for the impact assessments underpinning the 'Fit for 55' package, the impact assessments accompanying the 2030 climate target plan[187] and the staff working document accompanying SSMS[188], the Commission's proposal for a long term strategy[189] as well as for the 2020 and 2030 EU's climate and energy policy framework.

ASTRA and TRUST, together with the TPS, are the main models used to assess the policy options presented in this impact assessment. The ASTRA and TRUST models have also been used in the impact assessment of the revision of the TEN-T Regulation[190], whose preferred policy option in terms of TEN-T transport network is reflected in the baseline scenario of the present impact assessment. For the baseline scenario, these three models have been calibrated on the results of the PRIMES-TREMOVE model.

The proposed measures are assumed to be implemented from 2025 onwards, so that the assessment has been undertaken for the 2025-2050 period and refers to EU27. Costs and benefits are expressed as present value over the 2025-2050 period, using a 3% discount rate.

PRIMES-TREMOVE model

The PRIMES-TREMOVE transport model projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs.

The PRIMES-TREMOVE transport model can therefore provide the quantitative analysis for the transport sector in the EU, candidate and neighbouring countries covering activity, equipment, energy and emissions. The model accounts for each country separately which means that the detailed long-term outlooks are available both for each country and in aggregate forms (e.g. EU level).

[186] Ecorys et al. (2023), impact assessment support study.
[187] SWD(2020) 176 final of 17 September 2020.
[188] SWD(2020) 331 final of 9 December 2020.
[189] COM(2018) 773 final of 28 November 2018.
[190] For more details, see Annex 4 of the impact assessment of the revision of the TEN-T Regulation (SWD(2021) 472 final).

In the transport field, PRIMES-TREMOVE is suitable for modelling *soft measures* (e.g. eco-driving, labelling); *economic measures* (e.g. subsidies and taxes on fuels, vehicles, emissions; ETS for transport when linked with PRIMES; pricing of congestion and other externalities such as air pollution, accidents and noise; measures supporting R&D); *regulatory measures* (e.g. CO_2 emission performance standards for new light duty vehicles and heavy duty vehicles; EURO standards on road transport vehicles; technology standards for non-road transport technologies, deployment of Intelligent Transport Systems) and *infrastructure policies for alternative fuels* (e.g. deployment of refuelling/recharging infrastructure for electricity, hydrogen, LNG, CNG). Used as a module that contributes to the PRIMES energy system model, PRIMES-TREMOVE can show how policies and trends in the field of transport contribute to economy-wide trends in energy use and emissions. Using data disaggregated per Member State, the model can show differentiated trends across Member States.

The PRIMES-TREMOVE has been developed and is maintained by E3Modelling, based on, but extending features of, the open source TREMOVE model developed by the TREMOVE[191] modelling community. Part of the model (e.g. the utility nested tree) was built following the TREMOVE model.[192] Other parts, like the component on fuel consumption and emissions, follow the COPERT model.

Data inputs

The main data sources for inputs to the PRIMES-TREMOVE model, such as for activity and energy consumption, come from EUROSTAT databases and from the Statistical Pocketbook 'EU transport in figures'[193]. Excise taxes are derived from DG TAXUD excise duty tables. Other data comes from different sources such as research projects (e.g. TRACCS project) and reports.

ASTRA model

ASTRA is a strategic model based on the Systems Dynamics Modelling approach simulating the transport system development in combination with the economy and the environment until the year 2050.

ASTRA consists of different modules, each related to one specific aspect such as the economy, transport demand or the vehicle fleet. The main modules cover the following aspects:

- Population and social structure (age cohorts and income groups)
- Economy (e.g. GDP, input-output tables, employment, consumption and investment both at aggregate and at sectoral level)
- Foreign trade (inside EU and to partners from outside EU)
- Transport (including demand estimation, modal split, transport cost and infrastructure networks)

[191] Source: https://www.tmleuven.be/en/navigation/TREMOVE

[192] Several model enhancements were made compared to the standard TREMOVE model, as for example: for the number of vintages (allowing representation of the choice of second-hand cars); for the technology categories which include vehicle types using electricity from the grid and fuel cells. The model also incorporates additional fuel types, such as biofuels (when they differ from standard fossil fuel technologies), LPG, LNG, hydrogen and e-fuels. In addition, representation of infrastructure for refuelling and recharging are among the model refinements, influencing fuel choices. A major model enhancement concerns the inclusion of heterogeneity in the distance of stylised trips; the model considers that the trip distances follow a distribution function with different distances and frequencies. The inclusion of heterogeneity was found to be of significant influence in the choice of vehicle-fuels especially for vehicles-fuels with range limitations.

[193] Source: https://ec.europa.eu/transport/facts-fundings/statistics_en

- Vehicle fleet (passenger and freight road vehicles by segment and drivetrain)
- Environment (including air pollutant emissions, CO_2 emissions, energy consumption).

The economy module simulates the main economic variables. Some of these variables (e.g. GDP) are transferred to the transport generation module, which uses the input to generate a distributed transport demand. In the transport module, demand is split by mode of transport. The traffic performance by mode is associated with the composition of the fleet (computed in the vehicle fleet module) and the emissions factors (defined in the environmental module), in order to estimate total emissions.

Several feedback effects take place in the ASTRA model. For instance, the economy module provides the level of income to the fleet module, in order to estimate vehicle purchase. The economy module then receives information on the total number of purchased vehicles from the fleet module to account for this item of transport consumption and investment. Furthermore, changes in the economic system immediately feed into changes of the transport behaviour and alter origins, destinations and volumes of European transport flows.

The indicators that ASTRA can produce cover a wide range of impacts; in particular transport system operation, economic, environmental and social indicators. The environment module uses input from the transport module (in terms of vehicle-kilometres-travelled per mode and geographical context) and from the vehicle fleet module (in terms of the technical composition of vehicle fleets), in order to compute fuel consumption, greenhouse gas emissions and air pollutant emissions from transport. ASTRA also estimates the upstream emissions (well-to-tank) due to fuel production and vehicles production. Therefore, well-to-wheel emissions can be provided as well.

Strategic assessment capabilities in ASTRA cover a wide range of transport measures and investments with flexible timing and levels of implementation.

Geographically, ASTRA covers all EU Member States plus United Kingdom, Norway and Switzerland. The model is built in Vensim software and is developed and maintained by TRT, M-Five and ISI Fraunhofer.

Data inputs

ASTRA is calibrated on the EUROSTAT database and data from the Statistical Pocketbook 'EU transport in figures'[194].

TRUST model

TRUST is a European scale transport network model developed and maintained by TRT and simulating road, rail, inland waterways and maritime transport activity. TRUST covers the whole Europe and its neighbouring countries and it allows for the assignment of passenger and freight origin-destination (OD) matrices at NUTS3 level of detail (about 1 600 zones) on the multimodal transport network[195].

Road rail, inland waterways and maritime transport modes are covered in separate modules, each with its own matrices that are then assigned simultaneously on the multimodal transport network.

TRUST is built in PTV-VISUM software environment. The assignment algorithm used is Equilibrium Assignment which distributes demand for each origin/destination pair among available alternative routes, according to Wardrop first principle. This principle assumes that each traveller is identical, non-cooperative and rational in selecting the shortest route, and knows the exact travel time he/she will encounter. If all travellers select routes according to this principle the road network

[194] Source: https://ec.europa.eu/transport/facts-fundings/statistics_en

[195] Further information on TRUST is available on http://www.trt.it/en/tools/trust/

will be at equilibrium, such that no one can reduce their travel times by unilaterally choosing another route of the same OD pair. This principle has been extended to consider generalised travel cost instead of travel time, where generalised travel cost can include the monetary cost of in-vehicle travel time, tolls, parking charges and fuel consumption costs. The impedance function is defined in terms of generalised time from an origin O to a destination D. Travel costs are defined separately by link types using combinations of fixed, time-dependent and distance-dependent parameters. Travel time is estimated endogenously by the model as result of the assignment. Speed-flow functions are used to model the impact of traffic on free-flow speeds, given links capacity. The model iterates until a pre-defined convergence criterion for equilibrium is reached.

TRUST can be used in the context of impact assessments and for supporting policy formulation and evaluation. It is particularly suitable for modelling road charging schemes for cars and heavy goods vehicles as well as policies in the field of infrastructure.

Data inputs

The main data sources for inputs to the TRUST model are the EUROSTAT database and the Statistical Pocketbook 'EU transport in figures'[196], TENtec Information system[197] and ETISplus database.

Train Planning System (TPS)

The modelling of the effects of the policy measures on rail infrastructure capacity was done using the **Train Planning System**[198]. TPS is a multi-user system software application, facilitating the process of rail network capacity management and used for capacity management by several infrastructure managers in the EU. It allows for real-life planning of infrastructure capacity in different time frames (strategic, timetable, ad hoc, etc.), detection of train path conflicts, implementing restrictions into capacity planning (e.g. TCRs), automatically identifying and resolving conflicts in capacity planning, exact runtime calculation and ultimately optimising capacity management and allocation. These elements of TPS allow for the introduction of specific rules and limitations to capacity planning and allocation, based on the different policy measures, and simulating their effect with the construction of fully realistic train paths and timetables.

The most relevant features of TPS for the modelling are:

- Capacity planning for all time horizons (strategic, framework, long and short term, ad-hoc, etc.) up to offline production planning (integration with traffic management systems)
- Microscopic infrastructure with detailed interlocking system/information
- Train path editor
- Highly accurate dynamic runtime calculation
- Automatic conflict detection
- Automatic route finder
- Decision support / Slot finder / Automatic decision support for conflict resolution
- Managing different planning rules
- Timetable production with different operating days / train versions / timetable variants
- Import/export of trains including merging/validation/correction of train path/data
- Synchronisation of operational data (Temporary Capacity Restrictions)
- Infrastructure data setup and maintenance

[196] Source: https://ec.europa.eu/transport/facts-fundings/statistics_en
[197] https://ec.europa.eu/transport/themes/infrastructure-ten-t-connecting-europe/tentec-information-system_en
[198] Train Planning System is a private multi-user system software application of Hacon Ingenieurgesellschaft mbH.

- Handling restrictions (e.g., temporary capacity restrictions, speed restrictions, etc.)
- UIC compression method 406 for assessment of capacity utilisation
- Synchronous railway traffic simulation
- Integration platform (external business processes, systems, and portals)
- Monitoring and analysis.

Data inputs

Timetable data for sections of the RFC Baltic-Adriatic was used as sample input data for the modelling exercise. In addition, information published by RFCs and included in the evaluation of the RFC Regulation, network statements as well as figures from RMMS and Eurostat were considered, amongst others to ensure the representativeness of the timetable data.

- For the simulation of the impact of the policy measures:

Timetable and train run data for the whole area of RFC Baltic-Adriatic was provided by RNE to the consortium for the impact assessment support study. An infrastructure model from the Austrian Südbahn from Wien to Bruck a. d. Mur was used as a representative double track line, whereas the basic infrastructure model between the Graz and Wien regions including the line toward the AT/SI border via Spielfeld Straß was used as basis for a hypothetical representative cross-border case study. The line between Divaca and Koper in Slovakia was used as basis to create a representative single track use case.

For the average maximum speed of European railroad lines the data is from a 2015 TENtec study and the Open Railway Map as well as from model train configuration data that was checked for consistency with the RFC timetable data.

- For estimating the share of congested lines:

The impact assessment used data from RMMS, network statements, timetable data and input by stakeholders collected via the impact assessment support study.

- For the evaluation of the impacts on punctuality and reliability

RMMS is the source for data on train punctuality. For the calculations leading to the quantifications, RMMS was also used as well as Eurostat and IRG Rail.

- For the evaluation of the impact on TCRs

Data from RFCs on the TCR implementation schedule was used as well as data from Eurostat to evaluate the number of trains on selected sections.

As explained above, ASTRA, TRUST and Train Planning System (TPS) have been used for the assessment of impacts of the policy options. More specifically:

- The Train Planning System (TPS) to simulate the timetabling process and estimate impacts on capacity;
- The TRUST model to derive the transport activity and assign the traffic on the network;
- The ASTRA model to derive the macroeconomic impacts, the environmental impacts and the impacts on safety.

2. Baseline scenario

In order to reflect the fundamental socio-economic, technological and policy developments, the Commission prepares periodically an EU Reference Scenario on energy, transport and GHG emissions. The socio-economic and technological developments used for developing the baseline scenario for this impact assessment build on the latest EU Reference scenario 2020 (REF2020)[199]. The same assumptions have been used in the policy scenarios underpinning the impact assessments accompanying the "Fit for 55" package[200].

2.1. Main assumptions of the Baseline scenario

The main assumptions related to economic development, international energy prices and technologies are described below.

2.1.1. Economic assumptions

The modelling work is based on socio-economic assumptions describing the expected evolution of the European society. Long-term projections on population dynamics and economic activity form part of the input to the model and are used to estimate transport activity, particularly relevant for this impact assessment.

Population projections from Eurostat[201] are used to estimate the evolution of the European population, which is expected to change little in total number in the coming decades. The GDP growth projections are from the Ageing Report 2021[202] by the Directorate General for Economic and Financial Affairs, which are based on the same population growth assumptions.

Table 18: Projected population and GDP growth per Member State

	Population			GDP growth	
	2020	2025	2030	2020-'25	2026-'30
EU27	447.7	449.3	449.1	0.9%	1.1%
Austria	8.90	9.03	9.15	0.9%	1.2%
Belgium	11.51	11.66	11.76	0.8%	0.8%
Bulgaria	6.95	6.69	6.45	0.7%	1.3%
Croatia	4.06	3.94	3.83	0.2%	0.6%
Cyprus	0.89	0.93	0.96	0.7%	1.7%
Czechia	10.69	10.79	10.76	1.6%	2.0%
Denmark	5.81	5.88	5.96	2.0%	1.7%
Estonia	1.33	1.32	1.31	2.2%	2.6%
Finland	5.53	5.54	5.52	0.6%	1.2%
France	67.20	68.04	68.75	0.7%	1.0%
Germany	83.14	83.48	83.45	0.8%	0.7%
Greece	10.70	10.51	10.30	0.7%	0.6%
Hungary	9.77	9.70	9.62	1.8%	2.6%
Ireland	4.97	5.27	5.50	2.0%	1.7%

[199] EU Reference Scenario 2020 (europa.eu)
[200] Policy scenarios for delivering the European Green Deal (europa.eu)
[201] EUROPOP2019 population projections: Eurostat - Data Explorer (europa.eu)
[202] The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)

	Population			GDP growth	
	2020	2025	2030	2020-‘25	2026-‘30
Italy	60.29	60.09	59.94	0.3%	0.3%
Latvia	1.91	1.82	1.71	1.4%	1.9%
Lithuania	2.79	2.71	2.58	1.7%	1.5%
Luxembourg	0.63	0.66	0.69	1.7%	2.0%
Malta	0.51	0.56	0.59	2.7%	4.1%
Netherlands	17.40	17.75	17.97	0.7%	0.7%
Poland	37.94	37.57	37.02	2.1%	2.4%
Portugal	10.29	10.22	10.09	0.8%	0.8%
Romania	19.28	18.51	17.81	2.7%	3.0%
Slovakia	5.46	5.47	5.44	1.1%	1.7%
Slovenia	2.10	2.11	2.11	2.1%	2.4%
Spain	47.32	48.31	48.75	0.9%	1.6%
Sweden	10.32	10.75	11.10	1.4%	2.2%

Beyond the update of the population and growth assumptions, an update of the projections on the sectoral composition of GDP was also carried out using the GEM-E3 computable general equilibrium model. These projections take into account the potential medium- to long-term impacts of the COVID-19 crisis on the structure of the economy, even though there are inherent uncertainties related to its eventual impacts. Overall, conservative assumptions were made regarding the medium-term impacts of the pandemic on the re-localisation of global value chains, teleworking and teleconferencing and global tourism.

2.1.2. International energy prices assumptions

Alongside socio-economic projections, transport modelling requires projections of international fuel prices. The table below shows the oil prices assumptions of the baseline and policy options of this impact assessment, that draw on the modelling underpinning the REPowerEU package[203].

Table 19: Oil prices assumptions

Oil	2015	2020	2030	2040	2050
in $'15 per boe	52.3	39.8	92.1	97.4	117.9
in €'15 per boe	47.2	35.8	83.0	87.8	106.3

2.1.3. Technology assumptions

Modelling scenarios is highly dependent on the assumptions on the development of technologies, both in terms of performance and costs. For the purpose of the impact assessments related to the Climate Target Plan and the Fit for 55 policy package, these assumptions have been updated based on a rigorous literature review carried out by external consultants in collaboration with the JRC. Continuing the approach adopted in the long-term strategy in 2018, the Commission consulted on the technology assumption with stakeholders in 2019. In particular, the technology database of the PRIMES and PRIMES-TREMOVE models (together with GAINS, GLOBIOM, and CAPRI) benefited from a dedicated consultation workshop held on 11 November 2019. EU Member States representatives also had the opportunity to comment on the costs elements during a workshop held on 25 November 2019. The updated technology assumptions are published together with the EU

[203] SWD(2022) 230 final of 18 May 2022.

Reference Scenario 2020[204]. The same assumptions have been used in the context of this impact assessment.

2.1.4. Assumptions regarding the railway network affected by capacity limitations

The completeness of the data on currently congested and highly utilised rail sections is uncertain and the impact assessment support study did not succeed in improving the quality of data. Only limited and incomplete data had been collected.

For the modelling purposes, the official data on congestion of the rail network in EU27 as reported in RMMS (see Annex 5) has been used as starting point.

Table 20: Total length of track declared congested (total and freight corridors) (km, 2012-2018)

Year	Total length of track declared congested [km]
2012	700
2013	1 745
2014	1 414
2015	1 042
2016	1 601
2017	1 811
2018	2 261

Source: *Source: Ecorys et al. (2023), impact assessment support study, based on data from 7th RMMS Report (2020)*

Although this data might be underreported and may not reflect the actual network usage, it is the only quantitative information available that could be used as a starting point for the the purpose of this impact assessment.

Based on the assumption that data underreports the congestion on EU's rail network, it was estimated that the length of the EU rail network affected by capacity restrictions (i.e., not only congested but generally affected by high utilization levels) in 2018 was slightly more than double of the one declared (i.e., about 5 000 km).

Starting from this assumption for 2018, and assuming increasing rail capacity limitations driven by the expected growth of rail traffic until 2050, projections were made on the expected length of the EU rail network affected by capacity limitations (see section 2.2 of Annex 4).

2.1.5. Policies in the baseline scenario

Building on REF2020, the baseline has been designed to include the initiatives of the 'Fit for 55' package proposed by the Commission on 14 July 2021[205] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[206]. The baseline scenario assumes no further EU level intervention beyond the current Rail Freight Corridors Regulation and the Recast Directive that sets up the Union's legal framework for the Single European railway area.

[204] https://energy.ec.europa.eu/document/download/5959845e-435c-4780-9281-b64a709b273b_en?filename=ref2020_technology_assumptions.zip
[205] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
[206] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

In terms of transport network, the baseline scenario accounts for the proposed revision of the TEN-T Regulation[207]. It assumes that the high-quality TEN-T rail network would be gradually completed in three steps: 2030 for the core network, 2040 for the extended core network and 2050 for the comprehensive network. It also assumes full electrification of the core TEN-T rail network by 2030 and of the comprehensive TEN-T network by 2050.

The baseline also incorporates foresight megatrends[208] and developments captured in the 2022 Strategic Foresight Report[209]. Among others, it captures the trend of increasing demand for transport as population and living standards grow as well as the links between the digital and green transition. In particular, the projected transport activity draws on the long-term population projections from Eurostat and GDP growth from the *Ageing Report 2021*[210] by the Directorate General for Economic and Financial Affairs.

2.2. Baseline scenario results

In the Baseline scenario, EU transport activity is projected to grow post-2020, following the recovery from the COVID pandemic. Road transport would maintain its dominant role within the EU by 2050. Rail transport activity is projected to grow significantly faster than for road, driven in particular by the completion of the TEN-T core network by 2030 and of the comprehensive network by 2050, supported by the CEF, Cohesion Fund and ERDF funding, but also by measures of the 'Fit for 55' package that increase to some extent the competitiveness of rail relative to road and air transport. Passenger rail activity is projected to go up by 24% by 2030 relative to 2015 (69% for 2015-2050). High speed rail activity, in particular, would grow by 68% by 2030 relative to 2015 (169% by 2050), missing however to deliver on the milestone of the SSMS of doubling its traffic by 2030 and tripling it by 2050. Freight rail traffic would increase by 42% by 2030 relative to 2015 (96% for 2015-2050) hence falling short of the milestone of the SSMS of increasing the traffic by 50% by 2030 and doubling it by 2050.

Congestion costs would increase by about 14% by 2030 and 32% by 2050, relative to 2015. Congestion on the inter-urban network would be the result of growing freight transport activity along specific corridors, in particular where these corridors cross urban areas with heavy local traffic.

CO_2 emissions from transport[211] are projected to be 24% lower by 2030 compared to 2015, and 87% lower by 2050. The baseline scenario shows that the emission reductions from the transport sector would contribute towards the ambition of at least 55% emission reductions by 2030 and climate neutrality by 2050, while relying to a significant extent on technological solutions (i.e. the uptake of low- and zero-emission vehicles and of renewable and low carbon fuels) and carbon pricing. This would depart from the balanced approach underpinning the impact assessments accompanying the 'Fit for 55' package and the staff working document accompanying the REPowerEU initiatives[212], showing a combined approach of carbon pricing instruments and regulatory-based measures to deliver on the increased climate ambition. It should be noted that the scenarios underpinning the impact assessments accompanying the 'Fit for 55' initiatives and the

[207] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2021%3A812%3AFIN
[208] https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#explore
[209] COM(2022) 289 final of 29 June 2022.
[210] The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)
[211] Including international aviation but excluding international maritime.
[212] SWD(2022) 230 final of 18 May 2022.

staff working document accompanying the REPowerEU initiatives took into account a broader range of policies (including this initiative) that were represented in a stylised way ahead of the actual proposals, to show the delivery of at least 55% emissions reduction target by 2030 and to account for the interaction with the forthcoming initiatives. The scenario reflecting the 'Fit for 55' initiatives, the REPowerEU initiatives and the forthcoming initiatives shows the need to reduce emissions from transport by 26% by 2030 relative to 2015 and by 94% by 2050. Therefore, this initiative contributes towards the at least 55% emissions reductions target by 2030 and achieving climate neutrality by 2050.

NOx emissions are projected to go down by 56% between 2015 and 2030 (85% by 2050), mainly driven by the electrification of the road transport and in particular of the light duty vehicles segment. The decline in particulate matter (PM2.5) would be slightly lower by 2030 at 52% relative to 2015 (90% by 2050).

Projected passenger train punctuality

Passenger train punctuality is measured in accordance with Commission Implementing Regulation (EU) 2015/1100[213] and reported in RMMS. For passenger trains, the figures show the share of trains that depart and arrive within 5 minutes of the allocated time. In the baseline scenario punctuality is expected to deteriorate by 2030 compared to 2020 and to only somewhat improve post-2030, driven by the improved infrastructure envisaged by the proposed revision of the TEN-T Regulation. The share of passenger trains that are punctual is projected to go down from 88.3% in 2020 to 87.8% in 2030 and to increase to 90.3% by 2050 (see Table 21).

Table 21: Projected passenger train punctuality in the baseline scenario

Region	2020		2030		2040		2050	
	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)
Northern Europe	9.8%	91.8%	9.8%	91.3%	9.8%	92.3%	9.8%	93.8%
Central and Eastern Europe	17.4%	84.1%	17.4%	83.6%	17.4%	84.6%	17.4%	86.1%
Southern Europe	14.7%	87.1%	14.7%	86.6%	14.7%	87.6%	14.7%	89.1%
Western Europe	58.0%	89.3%	58.0%	88.8%	58.0%	89.8%	58.0%	91.3%
EU total	100.0%	88.3%	100.0%	87.8%	100.0%	88.8%	100.0%	90.3%
Punctuality development				**-0.5%**		**+0.5%**		**+2.0%**

Source: Ecorys et al. (2023), impact assessment support study

Projected freight train punctuality

[213] Commission Implementing Regulation (EU) 2015/1100 of 7 July 2015 on the reporting obligations of the Member States in the framework of rail market monitoring (OJ L 181, 9.7.2015, p. 1).

Freight train punctuality is measured in accordance with Commission Implementing Regulation (EU) 2015/1100 and reported in RMMS. For freight trains the figures show the share of trains that start and arrive within 15 minutes of the allocated time. Despite the broader limit of 15 minutes, freight shows bigger problems with punctuality compared to passenger rail. In the baseline scenario punctuality is expected to deteriorate by 2030 compared to 2020 and to only somewhat improve post-2030, driven by the improved infrastructure envisaged by the proposed revision of the TEN-T Regulation. Freight rail is expected to face more challenges in terms of punctuality relative to passenger rail. The share of freight trains that are punctual is projected to reduce from 58.4% in 2020 to 57.4% in 2030, increasing to 68.4% by 2050.

Table 22: Projected freight train punctuality in the baseline scenario

Region	2020		2030		2040		2050	
	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)	Share of traffic (%)	Share of punctual trains (%)
Northern Europe	10.1%	77.5%	10.1%	76.5%	10.1%	82.5%	10.1%	87.5%
Central and Eastern Europe	26.0%	38.6%	26.0%	37.6%	26.0%	43.6%	26.0%	48.6%
Southern Europe	10.5%	58.6%	10.5%	57.6%	10.5%	63.6%	10.5%	68.6%
Western Europe	53.3%	64.5%	53.3%	63.5%	53.3%	69.5%	53.3%	74.5%
EU total	100.0%	58.4%	100.0%	57.4%	100.0%	63.4%	100.0%	68.4%
Punctuality development				**-1%**		**+5%**		**+10%**

Source: Ecorys et al. (2023), impact assessment support study

Evolution of congested lines

Congested lines are defined in the Recast Directive and reported by IMs. To project the share of congestion, a number of variables need to be taken into account: traffic developments, infrastructure works, new infrastructure, etc. No projections on congestion of the network were provided by IMs during the stakeholders' consultation. Information from other stakeholders (RUs in particular) collected in the context of the impact assessment support study, suggests that the figures reported by IMs are lower than the actual length of congested lines.

The baseline projections draw on the officially reported congested lines and a number of assumptions. More specifically, drawing on stakeholders' consultation in the context of the impact assessment support study, it has been assumed that the actual status of congestion is more than 2 times higher than the officially declared sections of the network and that the effects extend beyond the congested sections. The length of the congested lines and of the highly utilised lines was estimated in km.

According to the TRUST model, as rail infrastructure capacity will need to accommodate an increasing amount of demand, by 2030 nearly 9 000 kilometres of rail (about 6.5% of the network)

are projected to be affected by capacity restrictions in the baseline, of which 6 500 kilometres would be congested (4.7% of the network) and 2 500 kilometres highly utilised (1.8% of the network). In 2040 about 12 800 kilometres of rail (about 9.2% of the network) are projected to be affected by capacity restrictions in the baseline, of which 9 000 kilometres would be congested (6.5% of the network) and 3 800 kilometres highly utilised (2.7% of the network). By 2050, the rail network affected by capacity restrictions is projected to further increase to 20 200 kilometres (about 14.6% of the network), of which 11 500 kilometres would be congested (8.3% of the network) and 8 700 kilometres highly utilised (6.3% of the network).

As shown in the table below, congestion on the network (expressed in train-kilometres) is projected to go up from 94.3 million train-kilometres in 2020 to 159.3 million train-kilometres in 2030 and 231.2 million train kilometres by 2050. This is despite the significant capacity improvement expected in the next decades due to improved infrastructure envisaged by the proposed revision of the TEN-T Regulation.

The projections consider that sections that are currently highly utilised might be congested in the future and that sections that currently are not affected by capacity limitations will start experiencing high utilization and saturation in the future. Over time, congestion is assumed to affect an increased number of sections along the main traffic corridors and to be more concentrated in central European countries (i.e., mainly in Germany, France, the Netherlands, Belgium, Austria, Italy and Denmark) and less pronounced in the other Member States.

Table 23: Evolution of congestion in the baseline scenario (in million train-kilometres)

Member State	2020	2030	2040	2050
AT	3.01	5.54	6.69	7.56
BE	3.46	5.53	7.59	9.39
DK	0.85	1.52	2.08	2.71
ES	0.23	0.38	0.47	0.54
FI	0.03	0.07	0.09	0.11
FR	4.51	7.47	9.31	10.20
DE	69.95	115.87	144.03	168.00
EL	0.00	0.00	0.00	0.00
IE	0.01	0.01	0.02	0.02
IT	3.60	7.28	7.61	8.61
NL	1.76	2.78	2.82	3.74
PT	0.28	0.48	0.55	0.63
SE	2.23	3.60	4.42	5.40
BG	0.04	0.07	0.07	0.09
CY	0.00	0.00	0.00	0.00
CZ	2.37	4.01	5.00	7.17
EE	0.00	0.01	0.01	0.01
HU	0.40	1.09	1.47	1.67
LV	0.01	0.01	0.02	0.02
LT	0.09	0.16	0.19	0.22
MT	0.00	0.00	0.00	0.00
PL	1.36	3.15	3.97	4.67

Member State	2020	2030	2040	2050
RO	0.02	0.03	0.03	0.04
SI	0.06	0.19	0.30	0.35
SK	0.01	0.03	0.04	0.04
LU	0.00	0.00	0.00	0.00
HR	0.01	0.01	0.01	0.01
EU27	**94.29**	**159.30**	**196.80**	**231.21**

Source: Ecorys et al. (2023), impact assessment support study

3. Impacts of policy measure in terms of costs and cost savings

This section explains the inputs used and assumptions made to estimate the direct impacts of policy measures in terms of cost and cost savings. Synergies between the measures included in the options are taken into account in this section.

Estimations about costs and cost savings for infrastructure managers and allocation bodies are made on the basis of the (simplifying) assumption that there is one infrastructure manager / allocation body per Member State with a rail system. This results in a total of 25 infrastructure managers / allocation bodies: EU27 without Cyprus and Malta, which do not have a rail system.

PM1: Mandatory use of RFC one-stop shops for placing capacity requests for cross-border freight and passenger traffic

In the baseline, the use of the one-stop shops is optional and limited to freight traffic on lines designated to rail freight corridor. PM1 envisages making the use of the corridor one-stop shops mandatory for all cross-border traffic, including passenger and freight and all types of requests (annual timetable and ad-hoc), and extending the scope of the one-stop shop to the entire capacity management process, including changes after the first allocation of capacity.

The measure is intended to strengthen the role of the one-stop shops in the allocation of capacity, including through a better coordination of works restricting available capacity.

The measure will introduce harmonised rules for management of capacity involving more than one corridor by assigning clear responsibilities to the one-stop shops. This would require that requests for capacity on lines of more than one corridor will be submitted to a single one-stop shop and the latter will organise the construction of train paths in close cooperation with infrastructure managers involved.

Adjustment costs for infrastructure managers

In the baseline, there are 11 one-stop shops, one for each rail freight corridor. Each of them employs roughly 1 full time equivalent (FTE) and they are funded by infrastructure managers. In PM1, the number of employees is expected to increase to 3 to 5 FTEs per one-stop shop, depending on the traffic intensity for the different corridors. However, this would not result in additional labour costs for infrastructure managers as the measure essentially consists in shifting the coordination process for the management of capacity (train paths and work restricting the availability of capacity) from infrastructure managers to the one-stop shops. Therefore, the additional costs for infrastructure managers due to PM1 are expected to be negligible relative to the baseline.

Adjustment cost savings for railway undertakings (RU)

The costs savings for RUs and other applicants due to PM1 are expected to be limited relative to the baseline. The measure does not address a key limitation of the one-stop shops – namely that their scope is limited to on stage part of the overall capacity management process, namely the (initial) request for and allocation of a train path – therefore not simplifying significantly the process for the operators of cross-border train services. Therefore, no cost savings for RUs are considered for this policy measure.

Providing for a single point for submission of requests in the form of a single IT tool at EU level reduces the costs of managing capacity for cross-border capacity, by lifting the need to manage capacity in parallel in several national IT systems. The overall cost savings related to IT are estimated under PM24.

PM2-1: Introduce a harmonised, directly applicable EU legal framework for railway capacity and traffic management

This measure will abolish the rail freight corridors, including their governance structure and bodies, notably the corridor offices and one-stop shops. The evaluation of the RFC Regulation provides an overview of the costs related to operating and the governance of the corridors. These costs are mostly borne by the infrastructure managers.

Adjustment cost savings for infrastructure managers

The measure will result in adjustment costs savings, including direct labour costs related to the governance and operation of the rail freight corridors, overheads (including for IT) and cost of external services (transport market studies, some external services provided by RNE, etc.).

The evaluation of the RFC Regulation indicated that the total adjustment costs for the 11 RFCs are estimated at EUR 55 million for a period of 6 years, or an average of EUR 9.2 million per year in 2016 prices. EU funding represented EUR 35 million over the 6 years, or EUR 5.8 million per year in 2016 prices. Expressed in 2021 prices, this is equivalent to eligible costs of EUR 10 million per year, of which EUR 6.3 million per year being covered by EU funding. In the baseline, the eligible costs and EU funding are assumed to remain constant over time. Thus, PM2-1 would lead to adjustment costs savings for infrastructure managers of EUR 3.6 million per year relative to the baseline from 2025 onwards. Expressed as present value over 2025-2050, the total adjustment costs savings are estimated at EUR 66.7 million (in 2021 prices).

Administrative cost savings for infrastructure managers

In addition, PM2-1 also results in costs savings relative to the baseline for the collection and publication of the information contained in the network statement for national networks regarding the freight corridor, for producing customer satisfaction surveys and for monitoring the performance of rail freight services on the freight corridors and publishing the survey and monitoring results. Most of these represent administrative costs savings for the infrastructure managers.

According to the evaluation of the RFC Regulation, the overall costs for producing the management board's annual reports amount to an average of nearly EUR 30 000 per year per corridor, or EUR 330 000 for all corridors per year in the baseline. The abolition of the rail freight corridors in PM2-1 would thus result in administrative costs savings related to the production of management board's annual reports of EUR 330 000 per year from 2025 onwards relative to the baseline.

Expressed as present value over 2025-2050, the total costs savings are estimated at EUR 6.1 million.

The publication of the information extracted from the national network statements is an annual activity that is estimated to require on average 10 person-days of work per IM and 10 person-days of work for the administration of the rail freight corridors (usually organised in a permanent management office) in the baseline, assuming 8 hours of work per day. The information is then published via RNE's Customer Information Platform (CIP). To estimate the costs savings due to PM2-1, the tariffs per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) have been used (EUR 37.5 per hour in 2021 prices). The costs savings due to PM2-1 for IM (including RFCs) are thus estimated at EUR 107 869 per year from 2025 onwards (in 2021 prices). Expressed as present value over 2025-2050, the total costs savings are estimated at EUR 2 million relative to the baseline (in 2021 prices).

The collection of the input and the publication of the customer satisfaction surveys for each RFC is an annual activity. Most RFC management boards outsourced this activity to RNE. In the baseline, RNE dedicates 0.15 FTE per year and pays an annual fee of EUR 299 for an online survey tool. To estimate the costs savings, the tariffs per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 3 – technicians and associate professionals) have been used (EUR 31.1 per hour in 2021 prices). The costs savings due to PM2-1 related to the collection of the input and the publication of the customer surveys are estimated at around EUR 8 030 per year from 2025 onwards (in 2021 prices). Expressed as present value over 2025-2050, the total costs savings are estimated at EUR 147 859 million relative to the baseline (in 2021 prices).

Total administrative costs savings for IMs due to PM2-1 are estimated at EUR 0.4 million per year from 2025 onwards relative to the baseline (i.e. EUR 17 836 per year on average per infrastructure manager). Expressed as present value over 2025-2050, the total administrative costs savings are estimated at EUR 8.2 million relative to the baseline (in 2021 prices).

Adjustment cost savings for railway undertakings (RU) and terminal operators

The main costs for the railway undertakings and terminal operators in the baseline arise from the participation in the freight corridors' advisory groups. The participation in these groups is voluntary. In the context of the evaluation of the RFC Regulation, railway undertakings and terminal operators reported a wide range of costs linked to the participation in the advisory groups (mostly direct labour costs and travel costs) estimated at EUR 0 to 20 000 per RU annually in the baseline. Information from the management boards suggests that participation can vary considerably (as it is voluntary). Normally, a relatively small number of RUs and even smaller number of terminal operators participate in the work of the advisory groups of the corridors. Due to the high level of uncertainty about the cost for participation in the advisory groups and the varying numbers of participants, it was not possible to estimate the adjustment cost savings for RUs and terminal operators due to PM2-1.

Adjustment cost savings for public authorities (national public administrations and regulatory bodies, and EU funding)

National public administrations and regulatory bodies. Cost savings for public authorities would result mostly from terminating the participation in the executive boards, which includes direct

labour costs, but also overheads (like travel costs for an average of 2 meetings per year per RFC) for the Member States participating in the corridors[214].

The assumptions and the estimates for the labour, travel and accommodation costs are based on the Decision authorising the use of lump sum contributions for technical assistance under the Connecting Europe Facility – Transport sector, of 13 December 2021. The Decision provides the estimated costs for the period 2021-2024.

Labour costs are estimated for participation in corridor and cross-corridor meetings and internal coordination. For the period 2021-2024, they are estimated at EUR 313 830 per year. In the baseline scenario, these costs are assumed to remain constant over time in real prices. Thus, the abolition of rail freight corridors in PM2-1 would lead to labour costs savings of EUR 313 830 per year from 2025 onwards. Expressed as present value over 2025-2050, the total labour costs savings are estimated at EUR 5.8 million relative to the baseline (in 2021 prices).

The travel costs in the baseline and the respective savings due to PM2-1 are estimated only for physical meetings. The share of physical meetings is estimated at 40% of all meetings. This is based on the developments during the COVID-19 pandemic, suggesting that virtual meetings are an effective way to reduce travel costs but cannot fully replace physical meetings of a governance structure coordinating between members from different Member States and stakeholders groups. This assumption results in two physical meetings per corridor per year and two physical cross-corridor meetings per year.

The assumption is that costs for travel (a return trip either by rail or air, depending on the distance), accommodation (one night) and subsistence (one daily rate) for one person will be covered. The applicable rates are taken from Commission Decision C(2021)35 of 12 January 2021 authorising the use of unit costs for travel, accommodation and subsistence costs under an action or work programme under the 2021-2027 multi-annual financial framework.

For corridor-specific meetings, it was assumed that the meetings are held in the Member States involved in the corridor on a rotating basis. For cross-corridor meetings, it was assumed that (i) half of the meetings would take place in Brussels and (i) the other half at a well-accessible location other than Brussels. Historic information shows that such meetings are held in a variety of locations such that the exact locations of these meetings for the future cannot be established. Only for the sake of estimating the travel costs, the rates applicable to Vienna were applied, due to its central location and the accommodation rates which are comparable to the average across the EU. The travel and accommodation costs per year were thus estimated at EUR 56 120.

Thus, the abolition of rail freight corridors in PM2-1 would lead to travel and accommodation costs savings of EUR 56 120 per year from 2025 onwards. Expressed as present value over 2025-2050, the total travel and accommodation cost savings are estimated at EUR 1 million relative to the baseline (in 2021 prices).

Total adjustment costs savings for public authorities in PM2-1 are estimated at EUR 369 950 per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs savings are estimated at EUR 6.8 million relative to the baseline (in 2021 prices).

[214] Ireland, Cyprus, Malta and Finland do not participate in the governance of any rail freight corridor. Some Member States participate in several corridors.

EU funding. As explained above, part of the costs related to the governance and operation of the rail freight corridors, overheads (including for IT) and cost of external services (transport market studies, some external services provided by RNE, etc.) are eligible for EU funding. According to the evaluation of the RFC Regulation, the EU funding is estimated at EUR 6.3 million per year (in 2021 prices) and it is assumed to remain constant over time in real prices in the baseline. PM2-1 would thus result in adjustment costs savings for the EU estimated at EUR 6.3 million per year. Expressed as present value over 2025-2050, the adjustment costs savings are estimated at EUR 116.7 million (in 2021 prices).

Administrative cost savings for public authorities

Administrative cost savings for the public authorities would result from the abolishment of the biennial reports of the executive boards of the RFCs. The cost estimates are based on the Decision authorising the use of lump sum contributions for technical assistance under the Connecting Europe Facility – Transport sector, of 13 December 2021. The Decision provides the estimated costs for these reports for 2021-2024.

For the period 2021-2024, the costs for the biennial reports are estimated at EUR 139 031 per year. In the baseline scenario, these costs are assumed to remain constant over time in real prices. Thus, the abolition of rail freight corridors in PM2-1 would lead to administrative costs savings of EUR 139 031 per year from 2025 onwards. Expressed as present value over 2025-2050, the total administrative costs savings are estimated at EUR 2.6 million relative to the baseline (in 2021 prices).

PM2-2: Introduce a European network statement

The European network statement will define the detailed and harmonised rules and procedures applying on the entire EU railway network, in particular as regards cross-border cooperation within the new EU legal framework for railway capacity and traffic management, complementing the network statements of infrastructure managers on all rules and procedures that are harmonised across the EU. Network statements developed and published by individual infrastructure managers in accordance with Article 27 of Directive 2012/34/EU will need to be consistent with the general framework defined by the European network statement.

Adjustment costs for infrastructure managers

Infrastructure managers will need to contribute to the preparation of the European network statement by the European Network of Infrastructure Managers. Infrastructure managers will also need to amend the network statements in accordance with the requirements of the European network statement. The amendment is expected to lead to a one-off effort to ensure consistency, with relatively minor efforts for the preparation of the annual network statements. The costs for these activities are expected to be limited and are not further quantified.

Adjustment costs for the European Network of Infrastructure Managers

ENIM will need to prepare the European network statement in collaboration with individual infrastructure managers, consult stakeholders concerned, notably applicants, and engage with regulatory bodies. Only a one-off effort for the preparation of the European network statement is envisaged. The costs for these activities are expected to be limited and are not further quantified.

Enforcement costs for national regulatory bodies and for the European Network of Regulatory Bodies (the ENRRB)

The ENRRB must verify compliance of the European network statement with European legislation, in particular provisions on capacity and traffic management introduced by the present initiative. National regulatory bodies will need to assess the compliance of the network statements published by infrastructure managers with the European one and take action to ensure compliance, if needed.

The provisions of the European network statement would replace provisions that are included in the network statements of individual infrastructure managers in the baseline. A single conformity assessment of these provisions by the ENRRB replacing conformity assessments for each infrastructure managers in the EU by national regulatory bodies, in principle enable cost savings. However, such a single conformity assessment will also require that national regulatory bodies agree on a common assessment in the framework of the ENRRB, which will require additional coordination efforts. It is expected that the reduction in the workload due to the single conformity assessment of the provisions of the European network statement by the ENRRB will offset the workload required for additional coordination. Thus, no significant costs for the national regulatory bodies and the ENRRB are expected due to PM2-2.

PM3: Strategic capacity management phase

PM3 (included in PO2, PO3 and PO4) introduces a strategic capacity management phase, which (i) establishes a multi-annual planning to optimise the quantity and quality of the capacity offer and (ii) provides a reserve of capacity for flexible allocation to individual applicants.

This measure introduces a structured process for the strategic management of railway infrastructure capacity. The purpose of strategic planning is to optimise the use of the available rail infrastructure in line with the market needs of all segments of rail transport, while taking into account the need for infrastructure maintenance and renewal. The results of the process should be documented in planning documents (capacity strategy, model, network utilisation plans).

The strategic management process is steered by infrastructure managers who must involve operators of rail transport services and other stakeholders concerned (public authorities, non-RU applicants, terminals etc.) throughout the process and is subject to scrutiny by regulatory bodies.

The process is implemented in an incremental and continuous manner, covering a time horizon of at least 5 years. The process starts with a general planning for the long-term end of the planning horizon, which is gradually detailed and updated in the continuous planning process. The ultimate stage of the strategic capacity management process provides the basis for capacity allocation in the following timetable period (calendar year), in which capacity is allocated via new, flexible procedures (PM4).

The responsibility to carry out strategic capacity management is entrusted to individual infrastructure managers. Costs are expected to consist mainly of: (i) staff cost for infrastructure managers for carrying out the corresponding planning and consultation activities, (ii) staff cost for railway undertakings and other applicants for rail infrastructure capacity in providing input into and in reviewing the results of the planning process, and (iii) costs of regulatory bodies to scrutinise the strategic management phase.

The adjustment costs for infrastructure managers and railways undertakings of PM3 are jointly assessed together with PM4 and PM5. The measures are complementary to each other and the associated costs cannot be split between the measures. All three measures are included in PO2, PO3 and PO4.

Adjustment cost for infrastructure managers

The workload for infrastructure managers has been estimated based on assumptions about the planning and consultation activities, taking into account key influencing factors such as network length and the intensity of network utilisation. The key assumption is that the recurrent workload resulting from strategic capacity management is 3 FTE per 1 000 line-km for a network with the median traffic intensity (13 173 train-km per line-km per year). As the workload does not increase and decrease proportionally with the traffic intensity, the workload for the most intensively used network (48 604 train-km per line-km per year, around 3.7 times the median) is assumed to be 2.5 times the workload for the median traffic intensity network (7.5 FTE per 1 000 line-km), while the workload for the least intensively used network (3 856 train-km per line-km, around 29% of the median) is assumed to be 50% of the workload for the median traffic intensity network (1.5 FTE per 1 000 line-km). It is assumed that strategic capacity management is carried out for the lines part of the TEN-T core and extended core networks as included in the Commission's 2021 proposal for the TEN-T Regulation.

The recurrent adjustment costs for infrastructure managers are estimated at EUR 13.5 million relative to the baseline from 2026 onwards. Expressed as present value over 2025-2050, they are estimated at EUR 235.6 million relative to the baseline in PM3 (included in PO2, PO3 and PO4).

The workload to prepare the first version ever of the strategic planning documents is estimated to be significantly higher than the recurrent workload. The corresponding one-off costs are estimated at 15 FTE per 1 000 line-km for a network with median traffic intensity. This is equivalent to the recurrent workload of 5 years, reflecting the additional efforts required to prepare such documents from scratch. In order to take into account the effect of network load, the same correction factors were used as for the recurrent workload. The one-off adjustment costs for infrastructure managers are estimated at EUR 67.7 million relative to the baseline in 2025.

The one-off adjustment costs in 2025 and the recurrent adjustment costs in 2030 and 2050 relative to the baseline by Member State are provided in Table 24.

Table 24: One-off and recurrent adjustment costs for infrastructure managers by Member State due to PM3 relative to the baseline (in EUR)

	Costs for IMs		
	2025 (one-off)	2030 (recurrent)	2050 (recurrent)
BE	2 613 648	522 730	522 730
BG	236 092	47 218	47 218
CZ	849 054	169 811	169 811
DK	2 063 105	412 621	412 621
DE	19 350 581	3 870 116	3 870 116
EE	120 252	24 050	24 050
IE	424 449	84 890	84 890
EL	485 752	97 150	97 150
ES	5 638 356	1 127 671	1 127 671
FR	12 581 762	2 516 352	2 516 352
HR	177 375	35 475	35 475
IT	7 544 753	1 508 951	1 508 951
LV	217 754	43 551	43 551
LT	204 210	40 842	40 842
LU	214 911	42 982	42 982
HU	578 477	115 695	115 695
NL	2 291 988	458 398	458 398
AT	2 417 260	483 452	483 452
PL	1 798 400	359 680	359 680

	Costs for IMs		
	2025 (one-off)	2030 (recurrent)	2050 (recurrent)
PT	790 316	158 063	158 063
RO	718 772	143 754	143 754
SI	306 686	61 337	61 337
SK	284 078	56 816	56 816
FI	1 032 316	206 463	206 463
SE	4 723 847	944 769	944 769
Total	**67 664 196**	**13 532 839**	**13 532 839**

Source: Ecorys et al. (2023), impact assessment support study

The total one-off and recurrent adjustment costs due to PM3, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 303.5 million.

Adjustment cost for railway undertakings

The workload for railway undertakings and other applicants is more difficult to estimate due to the high number of railway undertakings active in the liberalised rail transport market and due to uncertainties about the exact implementation of the planning and consultation processes. Therefore, cost for railway undertakings and other applicants have been estimated at aggregate level, as a share of the total costs for infrastructure managers. This share is assumed to be 25% and applies both to recurrent and to one-of cost (first implementation of first strategic management phase).

The recurrent adjustment costs for railway undertakings are estimated at EUR 3.4 million relative to the baseline from 2026 onwards, while the one-off adjustment costs at EUR 16.9 million relative to the baseline in 2025.

The costs for railway undertakings relative to the baseline, including one-off adjustment costs in 2025 and the recurrent adjustment costs in 2030 and 2050, are provided by Member State in Table 25.

Table 25: One-off and recurrent adjustment costs for railways undertakings by Member State due to PM3 relative to the baseline (in EUR)

	Costs for RUs		
	2025 (one-off)	2030 (recurrent)	2050 (recurrent)
BE	653 412	130 682	130 682
BG	59 023	11 805	11 805
CZ	212 264	42 453	42 453
DK	515 776	103 155	103 155
DE	4 837 645	967 529	967 529
EE	30 063	6 013	6 013
IE	106 112	21 222	21 222
EL	121 438	24 288	24 288
ES	1 409 589	281 918	281 918
FR	3 145 441	629 088	629 088
HR	44 344	8 869	8 869
IT	1 886 188	377 238	377 238
LV	54 439	10 888	10 888
LT	51 053	10 211	10 211
LU	53 728	10 746	10 746
HU	144 619	28 924	28 924
NL	572 997	114 599	114 599
AT	604 315	120 863	120 863

	Costs for RUs		
	2025 (one-off)	2030 (recurrent)	2050 (recurrent)
PL	449 600	89 920	89 920
PT	197 579	39 516	39 516
RO	179 693	35 939	35 939
SI	76 672	15 334	15 334
SK	71 019	14 204	14 204
FI	258 079	51 616	51 616
SE	1 180 962	236 192	236 192
Total	**16 916 049**	**3 383 210**	**3 383 210**

Source: Ecorys et al. (2023), impact assessment support study

Expressed as present value over 2025-2050, the total (one-off and recurrent) adjustment costs for railway undertakings due to PM3 are estimated at EUR 75.8 million relative to the baseline, of which EUR 16.9 million one-off costs.

Enforcement cost for regulatory bodies

The costs for regulatory bodies related to regulatory scrutiny of the strategic management phase have been estimated at 5% of the adjustment cost for infrastructure managers, both for recurrent and for one-off cost.

The enforcement costs for regulatory bodies are estimated at EUR 0.7 million relative to the baseline from 2026 onwards, while the one-off adjustment costs at EUR 3.4 million relative to the baseline in 2025. Expressed as present value over 2025-2050, the total (one-off and recurrent) enforcement costs for regulatory bodies due to PM3 are estimated at EUR 15.2 million relative to the baseline, of which EUR 3.4 million one-off costs.

PM4: Introduce new procedures for capacity allocation in line with market needs, in particular for flexibility and reliability

The adjustment costs for infrastructure managers and railways undertakings are jointly considered for PM3, PM4 and PM5 as explained above. The measures are complementary to each other and the associated cost savings cannot be split between the measures. All three measures are included in PO2, PO3 and PO4.

The measure should increase the respect of infrastructure managers and railway undertakings (and other applicants) of commitments related to capacity. This should increase the stability in the planning process, thereby reducing the costs for repeated updates of the planning. On the side of infrastructure managers, fewer train paths should be modified or cancelled for reasons under the control of infrastructure managers, notably the re-scheduling of capacity restrictions to enable infrastructure works for repair, maintenance and renewals, the so-called planned temporary capacity restrictions (TCRs). On the side of the railway undertakings, capacity requests should be placed only once the exact capacity needs of the RUs are known, avoiding the current practise to place train path requests as a precautionary measure to ‘reserve’ capacity but without knowledge of the specific capacity needs (timing, routing, train parameters etc.)

The measure should result in a significant reduction of the number of changes to train paths, in particular for freight RUs, in conjunction with strategic capacity management (PM3) and with the economic incentives for stakeholders to respect commitments related to capacity (PM8). This is expected to result in adjustment cost savings for infrastructure managers and railway undertakings, who would need to process a smaller number of changes to train paths.

Adjustment cost savings for infrastructure managers

The basis for the estimation of costs savings resulting from new capacity allocation procedures is information about the capacity allocation process in the Commission's report on rail market monitoring[215], more specifically indicator 2.2 on allocated and rejected train paths, as contained in the TRAMOS database compiling RMMS data.[216,217]

On the basis of this information, the possible reduction in the number of train path requests and the associated adjustment cost savings were estimated as follows, drawing upon information from a business case prepared for the TTR initiative[218]:

- Step 1: Projected evolution of the number of train path requests. The number of train paths requests in the baseline and in the policy options is assumed to increase over time at the same rate as the projected rail traffic activity.
- Step 2: Estimation of changes to train paths in the baseline. The number of allocated and rejected paths includes also changes to train paths, as each request for a change to a train paths results either in a re-allocation or rejection of a train path. Based on the TTR business case, the number of changes to the train path per train in the baseline were assumed to be 0.7 for passenger trains, 2.3 for freight trains with capacity allocated in the annual timetable and 0.5 for freight trains with capacity allocated on an ad-hoc basis. The total number of changes to the train paths in the baseline is derived by multiplying the number of changes to the train path per train with the number of train path requests.
- Step 3: Estimate the reduction in the number of changes to train paths in the policy options. The reduction in changes to train paths relative to the baseline was estimated at 30% for passenger trains (0.2 changes per train in absolute terms), 43% for freight trains with capacity allocated in the annual process (1.0 changes per train in absolute terms) and 30% for freight train with capacity allocated on an ad-hoc basis (0.5 changes per train in absolute terms). These assumptions are more conservative than the assumptions made in the TTR business case, i.e. assume a lower reduction and, consequently, lower cost savings. The estimates also take into account the different evolution of rail traffic activity in the policy options, which has an impact on the number of train path requests. This results in different estimates for the total reduction of the number of changes to the train paths in PO2, PO3 and PO4.
- Step 4: Estimate the reduction in the workload and cost savings resulting from the reduction in the changes to train paths. The reduction in the workload was based on assumptions from the TTR business case analysis. The workload resulting from each change to a train path was estimated at 1.375 hours, which is 25% of the workload to prepare a train path in the first place, which in turn is estimated at 5.5 hours per train path. Staff cost savings for planning activities were estimated based on average unit staff cost (EUR/hour) for the ISCO 2 occupational level.

[215] Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council, SWD(2021) 1 final

[216] Accessible at https://webgate.ec.europa.eu/tentec/policy/tramos/.

[217] Prior to further calculation steps, the data from TRAMOS had to be standardised, as the definitions underlying the figures for different Member States are not harmonised. In some Member States, each individual running day is counted as an individual 'path allocation', i.e. a train running 365 days a year with the same timetable is counted as 365 path allocations, whereas in other MS such a train is counted as a single path allocation. The following assumptions regarding the average number of running days per request and year are: passenger trains – 250 running days per year; freight trains using capacity allocated in annual timetable: 100 running days per year; freight trains using ad hoc capacity: 10 running days per year.

[218] RailNetEurope and Forum Train Europe (2019) Redesign of the International Timetabling Process (TTR). Business Case. Draft Version 3.0, 15 May 2019 (https://cms.rne.eu/system/files/8.0_ttr_business_case_v3.0_2019-05-15_0.pdf).

Table 26 presents the number of train paths and the number of changes in train paths in the baseline in 2030 by Member State, the reduction in the number of changes in the train paths in PO2 relative to the baseline in 2030 and the costs savings for infrastructure managers (the same as for the rail undertakings as explained below) relative to the baseline in 2030. Table 27 and Table 28 show the changes relative to the baseline for PO3 and PO4 by Member State.

Table 32 shows the estimated annual cost savings relative to the baseline in 2030, 2040 and 2050 for PO2, PO3 and PO4 and the total costs savings expressed as present value over 2025-2050 relative to the baseline.

Adjustment cost savings for railway undertakings

The new process of capacity allocation will result in a reduction in the number of requests for amendments or cancellation of allocated capacity. This is expected to result in adjustment costs savings for railways undertakings.

For obvious reasons, each modification of a train path concerns both infrastructure managers and railway undertakings: irrespective which side requests a change initially, the other side will have to adjust its planning accordingly.

Therefore, cost savings for railway undertakings were estimated on the basis of the same approach and the same assumptions as for the infrastructure managers. In particular, the same assumptions were made regarding the work time needed to process each individual change, the qualification of the staff in charge of this task (ISCO 2) and the related unit staff costs. The cost savings for railway undertakings are presented in Table 29 (for PO2), Table 30 (for PO3) and Table 31 (for PO4).

Table 26: Estimation of cost savings for infrastructure managers from the reduction of changes to train paths for 2030 in PO2 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO2			Costs savings for IMs (in thousand EUR) in PO2 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 540	4 544	921	156	279	56	491
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 561	1 512	876	114	110	64	287
BG	789	430	22 044	552	989	11 022	159	433	3 333	2	5	35	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 291	6 025	6 421	290	155	165	610
DE	246 702	24 570	942 088	172 691	56 511	471 044	49 789	24 761	142 407	3 365	1 673	9 623	14 661
DK	10 635	217	2 741	7 445	499	1 371	2 138	218	413	152	16	29	197
EE	415	91	14	291	209	7	83	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	18	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 463	3 360	10 401	525	141	438	1 104
FI	1 297	106	59	908	244	30	263	107	9	15	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 720	5 393	0	297	340	0	637
HR	1 037	594	11 785	726	1 366	5 893	210	597	1 779	4	12	34	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 610	784	2 578	49	15	48	112
IE	742	0	0	519	0	0	151	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 422	5 052	5	204	302	0	506
LT	3 541	914	6 079	2 479	2 102	3 040	711	918	916	12	16	16	45
LU	1 939	264	199	1 357	607	100	389	265	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	79	1 033	0	2	21	0	22
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 917	1 229	1 712	118	75	105	298
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 124	1 177	10 093	83	24	204	311
PT	2 326	390	1 094	1 628	897	547	472	395	167	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	454	5 084	13	9	100	0	109
SE	3 919	2 545	1 769	2 743	5 854	885	795	2 583	269	50	161	17	227
SI	4 422	887	45 963	3 095	2 040	22 982	887	889	6 906	25	25	192	241
SK	4 184	3 651	16 451	2 929	8 397	8 226	840	3 662	2 475	18	77	52	148

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO2			Costs savings for IMs (in thousand EUR) in PO2 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	102 197	70 149	191 744	5 544	3 583	11 089	20 216

Source: Ecorys et al. (2023), impact assessment support study

Table 27: Estimation of cost savings for infrastructure managers from the reduction of changes to train paths for 2030 in PO3 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO3			Costs savings for IMs (in thousand EUR) in PO3 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 549	4 559	924	156	280	57	493
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 568	1 518	880	114	110	64	289
BG	789	430	22 044	552	989	11 022	160	435	3 347	2	5	36	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 341	6 051	6 448	291	155	166	613
DE	246 702	24 570	942 088	172 691	56 511	471 044	50 050	24 871	143 040	3 382	1 681	9 666	14 729
DK	10 635	217	2 741	7 445	499	1 371	2 150	219	415	153	16	30	198
EE	415	91	14	291	209	7	83	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	18	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 521	3 377	10 454	527	142	440	1 109
FI	1 297	106	59	908	244	30	265	108	9	15	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 735	5 409	0	298	341	0	639
HR	1 037	594	11 785	726	1 366	5 893	211	600	1 786	4	12	35	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 621	786	2 585	49	15	49	113
IE	742	0	0	519	0	0	152	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 434	5 066	5	205	302	0	508
LT	3 541	914	6 079	2 479	2 102	3 040	713	921	919	13	16	16	45
LU	1 939	264	199	1 357	607	100	390	266	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	80	1 036	0	2	21	0	22

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO3			Costs savings for IMs (in thousand EUR) in PO3 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 927	1 235	1 720	118	76	105	299
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 138	1 180	10 122	84	24	204	312
PT	2 326	390	1 094	1 628	897	547	473	396	167	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	456	5 109	13	9	100	0	110
SE	3 919	2 545	1 769	2 743	5 854	885	799	2 597	271	50	162	17	228
SI	4 422	887	45 963	3 095	2 040	22 982	889	891	6 920	25	25	192	242
SK	4 184	3 651	16 451	2 929	8 397	8 226	842	3 672	2 482	18	78	53	148
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	102 676	70 430	192 557	5 571	3 598	11 137	20 306

Source: Ecorys et al. (2023), impact assessment support study

Table 28: Estimation of cost savings for infrastructure managers from the reduction of changes to train paths for 2030 in PO4 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO4			Costs savings for IMs (in thousand EUR) in PO4 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 556	4 570	927	157	280	57	494
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 574	1 523	883	115	111	64	290
BG	789	430	22 044	552	989	11 022	160	437	3 357	2	5	36	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 378	6 069	6 467	292	156	166	615
DE	246 702	24 570	942 088	172 691	56 511	471 044	50 258	24 959	143 547	3 396	1 687	9 701	14 783
DK	10 635	217	2 741	7 445	499	1 371	2 158	220	416	154	16	30	199
EE	415	91	14	291	209	7	84	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	19	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 564	3 389	10 493	529	143	442	1 113
FI	1 297	106	59	908	244	30	267	108	9	16	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 749	5 424	0	299	342	0	641

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO4			Costs savings for IMs (in thousand EUR) in PO4 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
HR	1 037	594	11 785	726	1 366	5 893	212	601	1 790	4	12	35	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 630	788	2 590	49	15	49	113
IE	742	0	0	519	0	0	152	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 444	5 078	5	206	303	0	509
LT	3 541	914	6 079	2 479	2 102	3 040	714	924	921	13	16	16	45
LU	1 939	264	199	1 357	607	100	391	266	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	80	1 039	0	2	21	0	22
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 934	1 239	1 725	119	76	106	300
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 149	1 183	10 144	84	24	205	313
PT	2 326	390	1 094	1 628	897	547	475	398	168	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	457	5 127	13	9	101	0	110
SE	3 919	2 545	1 769	2 743	5 854	885	802	2 608	272	50	162	17	229
SI	4 422	887	45 963	3 095	2 040	22 982	891	892	6 930	25	25	192	242
SK	4 184	3 651	16 451	2 929	8 397	8 226	844	3 679	2 486	18	78	53	148
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	103 052	70 649	193 194	5 592	3 609	11 175	20 377

Source: Ecorys et al. (2023), impact assessment support study

Table 29: Estimation of cost savings for railway undertakings from the reduction of changes to train paths for 2030 in PO2 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO2			Costs savings for RUs (in thousand EUR) in PO2 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 540	4 544	921	156	279	56	491
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 561	1 512	876	114	110	64	287
BG	789	430	22 044	552	989	11 022	159	433	3 333	2	5	35	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 291	6 025	6 421	290	155	165	610

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO2			Costs savings for RUs (in thousand EUR) in PO2 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
DE	246 702	24 570	942 088	172 691	56 511	471 044	49 789	24 761	142 407	3 365	1 673	9 623	14 661
DK	10 635	217	2 741	7 445	499	1 371	2 138	218	413	152	16	29	197
EE	415	91	14	291	209	7	83	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	18	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 463	3 360	10 401	525	141	438	1 104
FI	1 297	106	59	908	244	30	263	107	9	15	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 720	5 393	0	297	340	0	637
HR	1 037	594	11 785	726	1 366	5 893	210	597	1 779	4	12	34	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 610	784	2 578	49	15	48	112
IE	742	0	0	519	0	0	151	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 422	5 052	5	204	302	0	506
LT	3 541	914	6 079	2 479	2 102	3 040	711	918	916	12	16	16	45
LU	1 939	264	199	1 357	607	100	389	265	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	79	1 033	0	2	21	0	22
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 917	1 229	1 712	118	75	105	298
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 124	1 177	10 093	83	24	204	311
PT	2 326	390	1 094	1 628	897	547	472	395	167	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	454	5 084	13	9	100	0	109
SE	3 919	2 545	1 769	2 743	5 854	885	795	2 583	269	50	161	17	227
SI	4 422	887	45 963	3 095	2 040	22 982	887	889	6 906	25	25	192	241
SK	4 184	3 651	16 451	2 929	8 397	8 226	840	3 662	2 475	18	77	52	148
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	102 197	70 149	191 744	5 544	3 583	11 089	20 216

Source: Ecorys et al. (2023), impact assessment support study

Table 30: Estimation of cost savings for railway undertakings from the reduction of changes to train paths for 2030 in PO3 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO3			Costs savings for RUs (in thousand EUR) in PO3 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 549	4 559	924	156	280	57	493
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 568	1 518	880	114	110	64	289
BG	789	430	22 044	552	989	11 022	160	435	3 347	2	5	36	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 341	6 051	6 448	291	155	166	613
DE	246 702	24 570	942 088	172 691	56 511	471 044	50 050	24 871	143 040	3 382	1 681	9 666	14 729
DK	10 635	217	2 741	7 445	499	1 371	2 150	219	415	153	16	30	198
EE	415	91	14	291	209	7	83	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	18	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 521	3 377	10 454	527	142	440	1 109
FI	1 297	106	59	908	244	30	265	108	9	15	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 735	5 409	0	298	341	0	639
HR	1 037	594	11 785	726	1 366	5 893	211	600	1 786	4	12	35	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 621	786	2 585	49	15	49	113
IE	742	0	0	519	0	0	152	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 434	5 066	5	205	302	0	508
LT	3 541	914	6 079	2 479	2 102	3 040	713	921	919	13	16	16	45
LU	1 939	264	199	1 357	607	100	390	266	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	80	1 036	0	2	21	0	22
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 927	1 235	1 720	118	76	105	299
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 138	1 180	10 122	84	24	204	312
PT	2 326	390	1 094	1 628	897	547	473	396	167	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	456	5 109	13	9	100	0	110
SE	3 919	2 545	1 769	2 743	5 854	885	799	2 597	271	50	162	17	228
SI	4 422	887	45 963	3 095	2 040	22 982	889	891	6 920	25	25	192	242
SK	4 184	3 651	16 451	2 929	8 397	8 226	842	3 672	2 482	18	78	53	148
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	102 676	70 430	192 557	5 571	3 598	11 137	20 306

Source: Ecorys et al. (2023), impact assessment support study

Table 31: Estimation of cost savings for railway undertakings from the reduction of changes to train paths for 2030 in PO4 relative to the baseline

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO4			Costs savings for RUs (in thousand EUR) in PO4 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
AT	12 644	4 526	6 118	8 851	10 410	3 059	2 556	4 570	927	157	280	57	494
BE	7 761	1 504	5 812	5 433	3 459	2 906	1 574	1 523	883	115	111	64	290
BG	789	430	22 044	552	989	11 022	160	437	3 357	2	5	36	42
CZ	56 049	5 985	42 518	39 234	13 766	21 259	11 378	6 069	6 467	292	156	166	615
DE	246 702	24 570	942 088	172 691	56 511	471 044	50 258	24 959	143 547	3 396	1 687	9 701	14 783
DK	10 635	217	2 741	7 445	499	1 371	2 158	220	416	154	16	30	199
EE	415	91	14	291	209	7	84	92	2	2	2	0	4
EL	641	36	123	449	83	62	129	36	19	4	1	1	5
ES	61 738	3 326	68 650	43 217	7 650	34 325	12 564	3 389	10 493	529	143	442	1 113
FI	1 297	106	59	908	244	30	267	108	9	16	6	1	22
FR	23 517	5 375	0	16 462	12 363	0	4 749	5 424	0	299	342	0	641
HR	1 037	594	11 785	726	1 366	5 893	212	601	1 790	4	12	35	50
HU	12 971	782	17 129	9 080	1 799	8 565	2 630	788	2 590	49	15	49	113
IE	742	0	0	519	0	0	152	0	0	10	0	0	10
IT	17 022	5 029	33	11 915	11 567	17	3 444	5 078	5	206	303	0	509
LT	3 541	914	6 079	2 479	2 102	3 040	714	924	921	13	16	16	45
LU	1 939	264	199	1 357	607	100	391	266	30	26	18	2	46
LV	396	1 030	0	277	2 369	0	80	1 039	0	2	21	0	22
NL	9 539	1 224	11 363	6 677	2 815	5 682	1 934	1 239	1 725	119	76	106	300
PL	20 508	1 172	66 984	14 356	2 696	33 492	4 149	1 183	10 144	84	24	205	313
PT	2 326	390	1 094	1 628	897	547	475	398	168	14	11	5	30
RO	2 245	5 032	86	1 572	11 574	43	457	5 127	13	9	101	0	110
SE	3 919	2 545	1 769	2 743	5 854	885	802	2 608	272	50	162	17	229
SI	4 422	887	45 963	3 095	2 040	22 982	891	892	6 930	25	25	192	242

	Train paths number in the baseline			Changes to train paths number in the baseline			Reduction in the train paths number in PO4			Costs savings for RUs (in thousand EUR) in PO4 relative to the baseline			
	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Passenger	Freight, annual	Freight, ad hoc	Total
SK	4 184	3 651	16 451	2 929	8 397	8 226	844	3 679	2 486	18	78	53	148
Total	506 979	69 680	1 269 102	354 886	160 266	634 557	103 052	70 649	193 194	5 592	3 609	11 175	20 377

Source: Ecorys et al. (2023), impact assessment support study

Table 32: Adjustment costs savings for infrastructure managers and railway undertakings relative to the baseline resulting from PM4, in PO2, PO3 and PO4 (in million EUR, 2021 prices)

Year(s)	Infrastructure managers			Railway undertakings		
	PO2	PO3	PO4	PO2	PO3	PO4
Total cost savings expressed as present value over 2025-2050 relative to the baseline						
2025–2050	415.3	418.6	423.9	415.3	418.6	423.9
Recurrent cost relative to the baseline						
2030	20.2	20.3	20.4	20.2	20.3	20.4
2040	24.9	25.1	25.6	24.9	25.1	25.6
2050	27.8	28.1	28.9	27.8	28.1	28.9

Source: Ecorys et al. (2023), impact assessment support study

PM5: Introduce transparent and harmonised methodologies and processes supporting a strategic partitioning and safeguarding railway infrastructure capacity

The ultimate purpose of this measure is to define objective and transparent methodologies to assign capacity in case demand exceeds supply. Such methodologies could be used in different stages of the capacity management process. The key application envisaged is the strategic capacity management phase (PM3) where such methodologies could help to safeguard capacities for different rail transport services but the measure could also be applied in the allocation of train paths to individual railway undertakings and other applicants (PM4) or as a part of procedures to ensure traffic continuity in the event of disruptions or planned non-availability of the network (PM6).

Costs resulting from this measure have been considered jointly with PM3, PM4, PM5 and are presented in the section above covering PM3.

PM6: Strengthen existing and introduce new mechanisms and procedures to ensure traffic continuity in the event of disruptions or planned non-availability of the network

The measure will require IMs to prepare contingency plans, which identify alternative routes for rail traffic in case of unforeseen disruptions (*force majeure* incidents: accidents, natural disasters etc.) or due to planned non-availability of infrastructure (notably due to works for infrastructure maintenance and renewal). These plans will not only identify the lines to be used in such cases but also, in so far as practicable and proportionate, comprise planning for the capacity available on such lines during contingencies.

In addition, the measure will introduce the possibility for unilateral cancellations of train paths by infrastructure managers in very specific cases of disruptions and taking into account socio-economic considerations, based on the methodologies developed as part of PM5.

Adjustment costs for infrastructure managers

The main adjustment costs would result from the workload to prepare and continuously update contingency plans providing capacity on alternative routes in the event of non-availability of the main lines and from the management and of allocation of during disruptions. Similar to PM3 this is assumed to result in recurrent workload for the preparation and implementation and in a one-off effort to prepare the first version of the contingency plans.

The recurrent effort is estimated at 0.75 FTE per 1 000 line-km for a network with the median traffic intensity (13 173 train-km per line-km per year) per year from 2026 onwards relative to the baseline, while the one-off costs for preparing contingency plans in 2025 at 3.75 FTE per 1 000 line-km for a network with median traffic intensity. This represents around 25% of the effort required for PM3 (strategic capacity management for normal, undisturbed situations), which takes into account that the planning for contingencies will not be as detailed as the planning for normal operations. Following the same approach for the calculation of the costs as in PM3, the one-off adjustment costs for infrastructure managers are estimated at EUR 16.9 million in 2025, and the recurrent adjustment costs at EUR 3.4 million from 2026 onwards relative to the baseline. The total one-off and recurrent adjustment costs due to PM6, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 101.5 million.

Adjustment costs for railway undertakings

Railway undertakings will provide input to the contingency management by IMs such that market needs are properly taken into account. The RUs will provide first input to prepare contingency plans and review and make suggestions for the contingency plans prepared by IMs. It is estimated that this will require one fourth of the effort for IMs. This assumption takes into account the respective tasks of infrastructure managers, planning and management, and railway undertakings, providing input. The one-off adjustment costs for railway undertakings are estimated at EUR 4.2 million in 2025, and the recurrent adjustment costs at EUR 0.8 million from 2026 onwards relative to the baseline. The total one-off and recurrent adjustment costs for railway undertakings due to PM6, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 25.4 million.

Arrangements for coordinating contingency between RUs will not be mandated by this measure and it will be done on voluntary basis. Thus, the costs related to arrangements for coordinating contingency are not assessed.

The measure will make a positive contribution due to increased reliability for trains of higher priority. The impact from the increased reliability is presented in section 4 of Annex 4 below.

Enforcement costs for national regulatory bodies and the European Board of Regulators

Regulatory bodies and the European Board of Regulators will provide regulatory supervision of contingency management by infrastructure managers and ENIM, covering both the preparation of contingency plans and the management of actual contingencies.

The enforcement costs for regulatory bodies and the ENRRB are estimated at 5% of the costs for infrastructure managers, both for recurrent and for one-off costs. Thus, the one-off enforcement costs are estimated at EUR 0.8 million in 2025, and the recurrent enforcement costs at EUR 0.2 million from 2026 onwards relative to the baseline. The total one-off and recurrent enforcement costs for regulatory bodies and the ENRRB due to PM6, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 5.1 million.

PM7: Strengthen the monitoring of quality of service and customer satisfaction on the freight corridors

The measure will introduce a mandatory and harmonised set of performance indicators covering all relevant aspects of rail infrastructure service (capacity and traffic management) and rail transport services, based on a consultation of railway undertakings, terminals and customers of rail freight services. The indicators will be defined in a non-legislative act by the Commission.

The measure builds on Article 19(2) of the RFC Regulation, which requires monitoring the performance of rail freight services on the freight corridors and the publishing of the results once a year, but does not define specific performance indicators and leaves it to the management boards to define those for each corridor.

Administrative costs for infrastructure managers

Infrastructure managers will need to collect or extract, process, check the data required for these indicators and publish them. The effort required to do so would differ considerably depending on the availability of the data in digital format, the IT tools used by the IMs, the size of the network, the volume of traffic, etc. Assessing the precise effort for each individual IMs is not possible at this stage, but it is estimated that on average each IM would need 1 FTE. The administrative costs for IMs are estimated at EUR 1.3 million per year relative to the baseline from 2025 onwards. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 23.9 million relative to the baseline (in 2021 prices).

Administrative costs for railway undertakings

Railway undertakings will need to contribute by providing input for the decision-making process for the indicators, but also by scrutinising the data and the indicators themselves.

Providing detailed calculations on the administrative costs for railway undertakings is not possible, as the participation in the process will be voluntary and it is possible that smaller RUs will provide input via stakeholder organisations. Nevertheless, it can be expected that the costs would be at around 10% of the costs for IMs. The administrative costs for railway undertakings are estimated at EUR 0.1 million per year relative to the baseline from 2025 onwards. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 2.4 million relative to the baseline (in 2021 prices).

Administrative costs for terminal operators

The tasks for terminal operators will be similar to those for railway undertakings. The same logic and limitations to the estimates apply. Costs for terminal operators are estimated to be at around 10% of the costs for IMs. The administrative costs for terminal operators are estimated at EUR 0.1 million per year relative to the baseline from 2025 onwards. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 2.4 million relative to the baseline (in 2021 prices).

PM8: Uphold commitments related to capacity (introduce effective and reciprocal economic incentives to strengthen respect by all stakeholders of commitments related to capacity)

The measure introduces fees levied (i) on railway undertakings and other applicants for not using capacity that has been allocated to them and (ii) on infrastructure managers for modifying or cancelling capacity that has been allocated to applicants. The purpose of these fees is to incentivise all stakeholders to respect their commitments with respect to capacity requested (railway undertakings) and capacity allocated (infrastructure managers). The respect of commitments should reduce problems resulting from (i) an "overbooking" of capacity by railway undertakings, which can result in a waste of capacity if capacity is not released sufficiently earlier or not at all and (ii) avoidable manipulation cost resulting from repeated changes to train paths.

The rate of the fee will need to be sufficiently high as to dissuade both RUs and IMs from defaulting on their commitments. It is possible that the rate will differ between Member States, as it will be calculated on the basis of economic indicators that would differ between Member States. The fees will not apply to cases of *force majeure*.

The measure complements the introduction of new procedures for capacity allocation (PM4), by ensuring that capacity safeguarded for flexible ad-hoc allocation is not misused by applicants to 'block' capacity for their own use.

Charges for railway undertakings

The purpose of the measure is to provide economic incentives to railway undertakings and infrastructure managers in the form of charges for cancellations and changes to allocated capacity, with a view to reduce changes to capacity commitments with negative impacts on other stakeholders.

The measure is not designed to generate additional net infrastructure charges for railway undertakings or infrastructure managers but it is rather meant to have a dissuasive effect (negative incentive). Therefore, charges are assumed to be zero for railway undertakings and infrastructure managers if aggregated over the entire period of the analysis. In the unlikely case that one group (RUs or IMs) would consistently out-perform the other group, net payments could persist over longer time periods but it is impossible to anticipate this with any degree of certainty.

It is also unclear if or to what extent such charges will be passed on to customers. This could in particular apply to rail freight transport, where changes relative to earlier planning may actually be the result of requests by customers of rail transport services.

In addition, if the policy measure is effective, it should result in a drastic reduction of changes to capacity requests, implying that in any case charges for RUs would be negligible. Therefore, no cost resulting from this measure are considered in the impact assessment.

Charges for infrastructure managers

The arguments regarding the charges for railway undertakings apply in an analogous way to infrastructure managers. Therefore, the net additional charges resulting from PM8 are assumed to be close to zero.

However, for this assumption to hold, the performance of infrastructure managers with respect to capacity management needs to improve significantly. The efforts necessary for such performance improvements are reflected in the estimation of costs for the strategic capacity management phase (PM3), for new and strengthened procedures for contingency management (PM6), for the implementation of digital data exchange (PM24) and for the digitalisation and automation of capacity management (PM25).

Adjustment cost savings

The measure is expected to contribute to a significant reduction in the number of changes to train paths. This reduction will lead to direct cost savings for infrastructure managers and railway undertakings for the processing of such changes and the adjustment of the resource planning of infrastructure managers and railway undertakings. These cost savings cannot be attributed to a single policy measure and have therefore been estimated jointly for PM3, PM4 and PM8 and they are presented under PM4 above.

In addition, this measure will contribute to a better utilisation of available infrastructure capacity, due to a reduction of railway undertakings' practice to "overbook" capacity. The benefits of additional capacity have been estimated separately and are presented in section 4.1.

PM9: Strengthen capacity-related rights of applicants (railway operators and others) vis-à-vis infrastructure managers, in particular for cross-border capacity and in the event of changes to allocated capacity

The measure will require infrastructure managers to manage train paths as a single, integral entity (from origin to destination), also when this involves more than one rail network. In practice this means that IMs will:

- Accept requests and communicate allocation decisions in a single place and in one operation.
- Ensure that any post-allocation changes to train paths – in terms of timing, routing, parameters, (e.g. due to capacity restrictions) – must be made in a way that ensures a viable train path, coordinated across the rail networks (e.g. no negative dwelling times at border crossings; no discontinuities in routing, no changes to train parameters, etc.) and must be communicated to RUs in a single operation.
- IMs will accept cancellations of train paths due to *force majeure* irrespective of the network concerned by the incident, i.e. they will not charge cancellation charges where the event that affected the train took place on another network.

This measure is closely related to PM25, as described below.

Adjustment costs for infrastructure managers

No considerable increase in costs related to the coordination of capacity allocation is expected from this measure. However, a crucial precondition for infrastructure managers to implement this measure is the deployment of supporting IT systems and application to

coordinate changes to allocated train paths. The cost of introducing such systems and applications are considered under PM25. This will allow infrastructure managers to manage changes to train paths in a collaborative manner, on the basis of agreed processes defined in the European network statement (PM2-2). No considerable increase in costs related to the coordination of capacity allocation is expected from this measure.

Adjustment costs for ENIM

In policy options 3 and 4, the ENIM and the Network Coordinator assist the IMs in the coordination of capacity allocation across several networks, in monitoring the compliance of IMs with the agreed processes defined in the European network statement (PM2-2) and in monitoring the outcome of the capacity allocation process.

Adjustment cost savings for railway undertakings

The positive effects from the simplification of the capacity allocation process for RUs will mostly result from an increased stability of capacity allocated by infrasatructure managers. The corresponding cost savings have been estimated under PM4.

PM10: Introduce an independent expert body in charge of reviewing performance of rail infrastructure and transport services

The body is composed of independent experts, fulfilling their mandate in a personal capacity and bringing together a broad range of senior-level expertise (industry, academia, customers of rail services, etc.).

The body will provide analysis and advice to the Commission, to ENIM and to the ENRRB on the development and implementation of performance monitoring (PM11) and on initiatives and instruments to improve performance related to capacity management (e.g. PM3, PM4, PM5, PM6, PM8, PM9), traffic management (PM17) and market monitoring (PM18-2). In PO4, the performance review body will in particular provide advice on the development and implementation of the European performance scheme (PM13).

The body will collect and use information from different stakeholder groups, but mostly from ENIM, individual infrastructure managers, railway undertakings, terminal operators and customers of rail transport services.

Adjustment costs for the European Commission

PM10 would result in adjustment costs for the European Commission. The most important part of the costs is represented by recurrent labour costs. The number of members is estimated at 11 (a minimum of 2 members with work experience for an infrastructure manager, railway undertaking, terminal operator, shipper or similar, in academia and a chair).

The adjustment costs for the expert body are estimated on the basis of the existing Performance Review Body of the single European sky[219]. The Union budget provides for a special allowance of a maximum of EUR 600 in the form of a daily unit cost for each working day for the members of the Performance Review Body.

[219] Commission Implementing Decision (EU) 2016/2296 (OJ L 344, 17.12.2016, p. 92).

An average of 15 working days per year from 2025 onwards is assumed for the members of the body relative to the baseline. The adjustment costs are estimated at EUR 99 000 per year from 2025 relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs are estimated at EUR 1.8 million relative to the baseline (in 2021 prices).

Adjustment costs for ENIM

ENIM will provide support services to the performance review body, namely (i) technical support services and (ii) secretariat services.

The technical support services cover data collection, processing and calculation of performance indicators and are an integral part of the activities of ENIM in performance monitoring (subtask (ii) of PM11).

The workload for the secretariat services is estimated at 0.2 FTE from 2025 onwards relative to the baseline. To estimate the costs, the tariffs per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) have been used (37.5 EUR per hour in 2021 prices). The adjustment costs for ENIM are estimated at EUR 12 884 per year from 2025 onwards. Expressed as present value over 2025-2050, the total adjustment costs are estimated at EUR 237 242 relative to the baseline (in 2021 prices).

PM11: Introduce a monitoring function at European level covering (i) compliance with agreed rules and procedures and (ii) the performance of infrastructure and transport services

ENIM will perform the task of (i) monitoring compliance with common European rules and procedures, as set out in the harmonised EU legal framework for capacity and traffic management (PM2-1) and in the European network statement (PM2-2) and of (ii) monitoring the performance of cross-border capacity and traffic management with support from the Network Coordinator.

Monitoring activities should cover the entire capacity and traffic management process on a continuous basis, from strategic to operational phases. These activities should cover any activities carried out at national level by infrastructure managers, in particular in the implementation of PM2-2, PM3, PM4, PM5, PM6, PM8, PM13 and PM17. therefore, only the additional workload and costs at EU level relative to the baseline are considered here.

In carrying out its monitoring tasks, the Rail Network Coordinator coordinates / cooperates with the following stakeholders:

- Performance review body (PM10)
- Individual IMs
- Member States
- RUs and other applicants
- Customers of rail transport services (and/or representative organisations).

Enforcement costs for ENIM

The monitoring will be performed by the Network Coordinator, on behalf of ENIM.

The workload for compliance monitoring (sub-task i) is estimated at 1 FTE to monitor the compliance of 10 infrastructure managers / allocation bodies, resulting in a total workload of approximately 2.5 FTE for 25 Member States with a rail system[220].

Ex-post monitoring of performance of rail infrastructure and transport services (sub-task ii) will involve tasks such as the definition of performance indicators, the collection of information from European-level IT systems such as RINF, the European Capacity Model Tool, PCS, TIS, and from other sources (including at national level), compiling, verifying, analysing of information, as well as reporting and consulting stakeholders on the results and developing proposals for measures to improve performance. The work will be focused on cross-border traffic, checking the performance and quality of service, for example as regards the consistency of the strategic planning of capacity between different market segments. The total workload for sub-task ii relative to the baseline is estimated at 8 FTEs from 2025 onwards.

The overall workload for PM11 for ENIM is thus estimated at 10.5 FTE from 2025 onwards relative to the baseline. Total labour costs are estimated using the tariff per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) (37.5 EUR per hour in 2021 prices). Enforcement costs for ENIM are estimated at EUR 0.7 million per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, total enforcement costs are estimated at EUR 12.5 million relative to the baseline (in 2021 prices).

Regarding performance monitoring, a precondition for ENIM to be in a position to carry out this task is the introduction of central IT systems at EU level and of IT interfaces of this central systems to the systems of individual IMs. The corresponding costs are considered under PM24 and PM25.

Adjustment costs for infrastructure managers

The analysis of ENIM will be based on information prepared by individual IMs. To a large extent, the Network Coordinator will extract such information from documents prepared by infrastructure managers and IT systems. However, IMs would need to provide additional information that cannot be obtained from readily available material and/or in an automated manner, e.g. on the practical implementation of processes or on aspects that cannot be formalised and/or quantified. The workload assumed to respond to such requests is estimated at 1 FTE per infrastructure manager; this estimate covers contributions from experts in different departments of the infrastructure managers. Adjustment costs for IMs are estimated at EUR 1.3 million per year from 2025 onwards relative to the baseline. The total adjustment costs expressed as present value over 2025-2050, are estimated at EUR 24 million relative to the baseline (in 2021 prices).

Enforcement costs for regulatory bodies

[220] Some Member States have more than one rail infrastructure manager; in some Member States the number is significant. For example, Germany has a total of 180 accredited rail IMs (see https://www.eba.bund.de/SharedDocs/Downloads/DE/Eisenbahnunternehmen/EIU/eiu_oeff.xlsx) but a single one, DB Netz AG, is responsible for 33 193 km of lines which include the entire network of European and national importance (e.g. all TEN-T lines are part of the network of DB Netz AG). For the sake of simplicity, the analysis abstracts from the specific situation in each Member State and assumes one IM per Member State.

No additional enforcement costs for regulatory bodies result from this measure. Verifying infrastructure mangers' compliance with legislation is a task that is already foreseen in the baseline; the only difference is that regulatory bodies would check compliance with European rules rather than national ones as a consequence of this measure, with no impacts on costs.

Enforcement costs for the ENRRB

No additional enforcement costs for the ENRRB result from this measure.

Adjustment costs for RUs

Railway undertakings should be involved in the performance monitoring process, e.g. by providing input to the selection and definition of performance indicators, verifying and interpreting results and designing improvement measures. Given the high number of railway undertakings in the EU and the difficulty to anticipate their exact contributions to the process, the cost estimates are based on the assumption that RUs' costs will be approximately 25% of costs for IMs. Adjustment costs for RUs are estimated at EUR 0.3 million per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, they are estimated at EUR 6 million relative to the baseline (in 2021 prices).

Adjustment costs for terminal operators and for customers of rail transport services (multimodal operators, shippers etc.)

These stakeholder groups should be involved in the performance monitoring process, e.g. by providing input to the selection and definition of performance indicators, verifying and interpreting results and designing improvement measures. Given the high number of companies in these stakeholder groups in the EU and the difficulty to anticipate their involvement and exact contributions to the process, the costs cannot be estimated.

PM12: Entrust regulatory bodies with the responsibility to review the contractual agreements concluded between Member State authorities and infrastructure managers and to assess their consistency with Member States' indicative rail infrastructure development strategies, and entrust the network of regulatory bodies to identify and promote best practices for such agreements

Directive 2012/34/EU requires (i) Members States to prepare an 'indicative rail infrastructure development strategy' (Article 8(1)) and (ii) Member State authorities and infrastructure managers to conclude multi-annual contractual agreements (Article 30 and Annex V). Contractual agreements contain elements such as payments/funds allocated, performance targets to be achieved, incentives for performance improvements with respect to all aspects of infrastructure management, including maintenance and renewal, and must cover a period of not less than 5 years.

This measure aims to strengthen implementation and to trigger a broad dialogue on the issue involving all relevant stakeholders, in particular the operators of rail transport services, infrastructure managers, Member State authorities, the European Commission and others.

Enforcement costs for regulatory bodies

Regulatory bodies will evaluate the correspondence between the objectives set in the indicative rail infrastructure development strategies and the contractual agreements and assess the implementation of the agreements. The measure will require regulatory bodies to monitor on continuous basis the implementation of the agreements and possibly prepare reports for the ENRRB on 5 years basis. This will result in additional labour costs estimated at 0.1 FTE per year. The annual costs are estimated at EUR 129 875 per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, they are estimated at EUR 2.4 million relative to the baseline (in 2021 prices).

Costs for participation in meetings organised by the ENRRB in relation to this measure are estimated at EUR 60 000 per year from 2025 onwards relative to the baseline (i.e. covering 2 meetings per year and 1 participant per regulatory body). Expressed as present value over 2025-2050, they are estimated at EUR 1.1 million relative to the baseline (in 2021 prices).

Total enforcement costs for regulatory bodies due to PM12 are estimated at EUR 0.2 million per year from 2025 onwards. Expressed as present value over 2025-2050, they are estimated at EUR 3.5 million relative to the baseline (in 2021 prices).

Possible additional costs could arise in cases where penalties will be levied for non-implementation of the agreements and possible litigation, but such additional costs cannot be estimated.

Enforcement costs for the ENRRB

The ENRRB will collect information about the outcome of the actions of the regulatory bodies. The outcome of this process could be European guidelines and recommendations on the structure, content, priorities and review of such agreements with the purpose of promoting best practices. This is estimated to require 1 FTE from 2025 relative to the baseline, with annual costs estimated at EUR 64 442. Expressed as present value over 2025-2050, the total costs are estimated at EUR 1.2 million relative to the baseline (in 2021 prices).

Adjustment costs for RUs, terminal operators and rail customers

Stakeholders could be invited to discussions on this topic in the Single European Rail Area Forum or in meetings set up by the ENRRB. Meetings in the forum on this issue can be combined with discussions of other topics, so no additional costs are estimated for this specific action.

PM13: Introduce a European performance scheme to improve operational performance of rail services and provide a framework for national performance schemes

Performance schemes are an instrument defined in Article 35 of Directive 2012/34/EU to improve the performance of the rail network. As they are designed to work nationally, the incentives provided by the schemes are less effective for cross-border traffic (e.g. by disregarding delays incurred on a previous network).

In PM13, the Commission will consult the sector and adopt a European performance scheme, which could identify a minimum set of elements to be included in national performance schemes. The Commission will assess the compliance of the national

performance scheme after they have been reviewed by ENIM and the ENRRB. PM13 is expected to lead to adjustment costs for ENIM and ENBR, as discussed below.

Adjustment cost for IMs

National performance schemes are implemented already now. They will need to be amended and further developed in line with future European requirements. No significant additional costs are expected for the IMs relative to the baseline.

Adjustment costs for ENIM

In order to prepare a proposal for a European performance scheme, ENIM is expected to need to evaluate the existing performance schemes. The evaluation will result in one-off costs for an evaluation study of approximately EUR 2.5 million in 2025, which could be carried out by the network coordinator.

The Network Coordinator will need to collect information, monitor and analyse the implementation of the scheme and propose changes and improvements to the rules to ENIM. This is estimated to require 2 FTEs, with annual costs estimated at EUR 128 844 from 2025 onwards relative to the baseline.

The assessment of the compliance of national performance schemes with the European one will also require organising 2 meetings per year by ENIM, estimated at EUR 60 000 per year for the reimbursement of the travel expenses of the participants.

Total adjustment costs for ENIM are estimated at EUR 2.7 million in 2025 and EUR 0.2 million from 2026 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs are estimated at EUR 6 million relative to the baseline (in 2021 prices) of which EUR 2.5 million one-off costs in 2025.

Adjustment costs for the ENRRB

The assessment of the compliance of national performance schemes with the European one will require 1 FTE for the ENRRB, with annual costs estimated at EUR 64 422 from 2025 onwards relative to the baseline. In addition, the ENRRB is expected to organise 2 meetings per year, estimated at EUR 60 000 per year for the reimbursement of the travel expenses of the participants.

Total adjustment costs for the ENRRB are estimated at EUR 0.1 million from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, they are estimated at EUR 2.3 million relative to the baseline (in 2021 prices).

PM14: Strengthen corridor governance and formalise a cross-corridor governance layer with defined competences

The measure requires the establishment of a governance structure addressing all cross-corridor issues for infrastructure managers (management boards) and Member States (executive boards).

Adjustment costs for public administrations

The measure can be implemented by turning the existing Network of Executive Boards (an organisation of the members of the RFC executive boards) and its secretariat into an

entity set up on the basis of an EU legal act, as the executive board of the RFCs. ENIM will adopt rules that would apply for all corridors (like the framework for capacity allocation), assess RFCs' performance, provide input on sector guidelines (RNE guidelines), follow the implementation of political declarations, disseminate good practices, and address horizontal issues.

Based on the current experience, this would require on average organising 2 meetings per year and a secretariat of 2 people who work annually approximately 80 hours in total on organising ENIM's business. Considering the fact that these meeting already take place and that many meetings are being organised as videoconferences, the costs from any additional activities are estimated to be negligible relative to the baseline.

Adjustment costs for infrastructure managers

The measure can be implemented in a similar fashion for an RFC management board at EU level by designating the existing RFC Network as the entity that will ensure better coherence of the work of the management boards by identifying common approaches, common templates and best practices, provide input on sector guidelines (RNE guidelines), contribute with the identification of specific implementation measures to political declarations on rail and address horizontal issues. The RFC Network representative will also be able to discuss such issues with the Network of Executive Boards and contribute to the decision-making process in that entity.

Based on the current experience, this would require on average organising 2 meetings per year of 25 IM representatives and a secretariat of 2 people who work annually approximately 80 hours in total on organising ENIM's business. Considering the fact that these meeting already take place and that many meetings are being organised as videoconferences, the costs from the additional activities are estimated to be negligible relative to the baseline.

PM15: Introduce binding rules and procedure for the coordination of traffic management between infrastructure managers and between infrastructure managers and the operation of terminals

This measure introduces binding rules, procedures and objectives for the coordination of rail and terminal capacity and for operations at terminals that affect train performance.

Adjustment costs for terminal operators

The measure will ensure that terminal operators provide information on available capacity to infrastructure managers with the purpose of better coordinating rail infrastructure and terminal capacity and simplifying the planning process for railway undertakings.

The obligation to provide information on capacity availability stems from the Recast Directive and from Commission Implementing Regulation (EU) 2017/2177 (in particular Article 6(3) on real-time reporting of capacity availability). Therefore, the measure is not expected to result in significant costs for terminal operators relative to the baseline.

Terminal operators will also be obliged to provide early warnings for delays in terminals using the procedures defined in the technical specifications relating to telematics applicants for freight (TAF TSI). The latter is defined in Commission Regulation (EU) No 1305/2014. The measure will only clarify existing legal obligations.

Thus, PM15 is not expected to result in significant additional costs for terminal operators relative to the baseline, as it clarifies existing obligations for the provision of information and confirms that infrastructure managers must take this information into account for capacity allocation and traffic management.

Adjustment costs for infrastructure managers

Infrastructure managers will be obliged to develop the necessary procedures to ensure that terminal operators on their network can provide the information indicated above. They will be obliged to take into account such information in capacity allocation and traffic management. Infrastructure managers will also be obliged to pass on the information on delays to other infrastructure managers and to railway undertakings. In terms of workload, 5 FTEs are estimated to be needed in 2025 for setting up the procedures (one-off) and 2 FTEs from 2026 onwards for recurrent work. Total labour costs are estimated using the tariff per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) (37.5 EUR per hour in 2021 prices). The one-off adjustment costs are estimated at EUR 322 109 in 2025 relative to the baseline, followed by recurrent adjustment costs of EUR 128 844 from 2026 onwards. Expressed as present value over 2025-2050, total adjustment costs are estimated at EUR 2.6 million relative to the baseline (in 2021 prices) of which EUR 0.3 million one-off costs in 2025.

Adjustment cost savings for railway undertakings

The improved ease of access to information on availability of capacity at terminals and on delays should result in reduced efforts for retrieving such information and improve the reliability of rail freight services. The cost reductions are, however, difficult to estimate.

PM16: Introduce a high-level advisory / coordination platform at European level involving all stakeholders involved in multimodal rail freight transport

The platform replaces the current advisory groups at corridor level, set up in accordance with Article 8(7) and 8(8) of Regulation 913/2010. In many cases, corridor lines are included in more than one RFC, which created duplication of the meetings for some railway undertakings and terminal operators.

The recently created Single European Rail Area Forum is the choice for the implementation of this measure. The forum would replace the Single European Railway Area Committee (SERAC) Working Group on RFCs.

Adjustment costs for infrastructure managers

The current 11 advisory groups for railway undertakings and 11 advisory groups for terminal operators hold on average 2 meetings per year. These groups will be abolished. The cost savings from the termination of the advisory groups are addressed in relation to PM2-1.

The groups will be replaced by a more flexible approach, where most of the consultations will take place in a single forum. The measure will also provide the possibility for setting up targeted sub-groups to discuss specific topics (e.g. exchange of information on estimated time of arrival), or regional issues (e.g. problems with dwelling times at certain border crossings or organisation of traffic for busy infrastructure like the Brenner pass).

The adjustment costs for infrastructure managers (IM) are estimated in terms of participation of 1 IM representative in 2 annual forum meetings and in 2 technical sub-groups. The additional resources for participation in sub-groups on specific issues as indicated above are covered in other policy measures (e.g. on digitalisation). The costs for the participation (i.e. travel costs) in 2 annual forum meetings by all infrastructure managers' representatives are estimated at EUR 60 000 per year (i.e. EUR 30 000 per meeting) from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, total adjustment costs are estimated at EUR 1.1 million relative to the baseline (in 2021 prices).

Adjustment costs savings for railway undertakings

The costs for participation in the consultation activities for railway undertakings are very difficult to estimate as shown by the evaluation of the RFC Regulation, where estimates ranged from EUR 0 to 20 000 per year for different operators.

It is expected that PM16 would result in a decrease in costs relative to the baseline, as the meetings will mostly take place in a single forum. Any additional meetings in sub-groups format would be sporadic in nature. It was however not possible to estimate the costs savings for railways undertakings due to PM16.

PM17: Introduce a European framework for the cross-border coordination of rail traffic management, including terminals and other rail facilities, based on the principles of collaborative decision-making by adopting basic principles

The measure refers to voluntary decentralised collaboration between rail stakeholders. In terms of rail operations, the framework covers cross-border coordination of traffic between infrastructure managers and the coordination between infrastructure managers and railway undertakings.

As regards multimodal freight transport, the framework involves also terminals, taking into account the links to other transport modes at all levels of the logistics chain (transport operators, organisers and customers).

The task to develop the framework will be given to ENIM and the Network Coordinator and the framework can be developed in a gradual manner, starting with a focus on rail and a set of core functionalities.

The framework should be developed based on a close involvement of all stakeholders concerned, notably infrastructure managers, railway undertakings, operators of terminals and other rail services facilities, multimodal operators, customers of (freight) transport services, public authorities at European and national level, R&D organisations and system suppliers. In particular, the elaboration of this framework should be carried out in close coordination with the European Union Agency for Railways and Europe's Rail Joint Undertaking, in particular to ensure full consistency with the work on technical specifications for interoperability, notably TAF TSI and OPE TSI, and on the system pillar and innovation pillar. The rules and procedures making up the framework should be included in network statements and, in the PO3 and PO4, in the European network statement (measure 2-2). Rules and procedures that go beyond the scope of network statements should be documented in an appropriate manner, e.g. guidelines / handbooks, standards, other reference documents such as description of service facilities in accordance with Commission Implementing Regulation 2017/2177.

Adjustment costs for ENIM

Infrastructure managers are expected to have the leading role in the development of the framework. They will also need to reflect the rules on collaborative decision making in their network statements. ENIM (together with the Network Coordinator) will have to set out the general rules for the measure. The programme steering and management, the development of processes, rules and tools by the Network Coordinator are estimated to result in one-off costs adjustment costs of EUR 5 million in 2025 relative to the baseline. Monitoring the effective implementation of the framework, providing feedback to operational stakeholders, regularly evaluating the impacts of the framework and further developing it would require 10 FTEs from 2026 onwards relative to the baseline. The estimate is motivated by the variety of performance challenges across Europe, the need to stay in close touch with actual operations and to engage in conceptual developments related to IT and operational processes; it is also in line with experiences of implementing collaborative decision-making in aviation[221]. Total labour costs are estimated using the tariff per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) (37.5 EUR per hour in 2021 prices). Thus, recurrent adjustment costs are estimated at EUR 644 218 from 2026 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs for ENIM are estimated at EUR 16.2 million, of which one-off costs of EUR 5 million.

Adjustment costs for infrastructure managers

The implementation of this measures will require the deployment of IT interfaces to exchange traffic management information in real-time. The corresponding costs are considered as part of PM24 and PM25.

In terms of activities, PM17 implies the engagement with other stakeholders (railways undertakings, terminal and intermodal operators, etc.) at strategic level. It also implies intensifying the operational coordination of traffic management with neighbouring infrastructure managers. In terms of engagement with other stakeholders at strategic level, the additional workload in terms of FTEs at Member State level is assumed to be a function of the length of the network. However, the relationship is not linear as small IMs would need to allocate a 'base level' of resources. Overall, at EU level the engagement with other stakeholders is estimated to require 33.3 FTE from 2026 onwards relative to the baseline. The additional workload associated to intensifying the operational coordination of traffic management with neighbouring infrastructure managers is estimated by assuming one additional FTE per infrastructure manager, plus 0.25 FTEs for each neighbouring infrastructure manager. At EU level, the operational coordination of traffic management with neighbouring infrastructure managers is estimated to result in 42.5 additional FTEs from 2026 onwards relative to the baseline. Total labour costs are estimated using the tariff per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) (EUR 37.5 per hour in 2021 prices). The adjustment costs for infrastructure managers are estimated at EUR 8.8 million from 2026 onwards relative to the baseline. Expressed as present value over 2025-2050, they are estimated at EUR 220.3 million.

[221] See the ex-post impact assessment of collaborative decision-making at airports by Eurocontrol, https://www.eurocontrol.int/sites/default/files/2019-04/a-cdm-impact-assessment-2016.pdf.

The estimated adjustment costs for infrastructure managers by Member State and type of activity are provided in Table 33.

Table 33: Recurrent adjustment costs for infrastructure managers by Member State due to PM17 relative to the baseline (in EUR)

	Costs for cross-border coordination		Cost for stakeholder consultation		Total costs	
	2030	2050	2030	2050	2030	2050
BE	233 550	233 550	96 369	96 369	329 918	329 918
BG	175 162	175 162	102 601	102 601	277 764	277 764
CZ	233 550	233 550	175 176	175 176	408 726	408 726
DK	175 162	175 162	81 669	81 669	256 832	256 832
DE	321 131	321 131	575 587	575 587	896 718	896 718
EE	145 969	145 969	60 825	60 825	206 794	206 794
IE	116 775	116 775	71 349	71 349	188 124	188 124
EL	145 969	145 969	78 020	78 020	223 989	223 989
ES	175 162	175 162	261 536	261 536	436 698	436 698
FR	262 744	262 744	408 212	408 212	670 956	670 956
HR	175 162	175 162	81 991	81 991	257 153	257 153
IT	204 356	204 356	280 340	280 340	484 696	484 696
LV	175 162	175 162	70 926	70 926	246 089	246 089
LT	175 162	175 162	71 685	71 685	246 848	246 848
LU	204 356	204 356	58 387	58 387	262 744	262 744
HU	262 744	262 744	150 286	150 286	413 030	413 030
NL	175 162	175 162	88 384	88 384	263 546	263 546
AT	291 937	291 937	116 279	116 279	408 216	408 216
PL	204 356	204 356	298 423	298 423	502 780	502 780
PT	145 969	145 969	80 662	80 662	226 631	226 631
RO	175 162	175 162	193 766	193 766	368 929	368 929
SI	233 550	233 550	61 453	61 453	295 003	295 003
SK	233 550	233 550	96 733	96 733	330 283	330 283
FI	145 969	145 969	129 026	129 026	274 995	274 995
SE	175 162	175 162	195 635	195 635	370 797	370 797
Total	**4 962 936**	**4 962 936**	**3 885 323**	**3 885 323**	**8 848 258**	**8 848 258**

Source: *Ecorys et al. (2023), impact assessment support study*

Adjustment cost savings for infrastructure managers

Optimisation of the exchange of information through the scheme should result in more time for infrastructure managers for identifying delays (in particular at departures) for freight trains. This, in combination with PM15, should allow for better capacity allocation and traffic management, reduction of effort for planning and amending train paths. The potential cost savings depend on the effectiveness of the scheme and the number of terminals that would participate. The effectiveness of the scheme could differ considerably between terminals, as they serve different market segments, provide different rail-related services and operate the rail infrastructure in the terminals with different approaches.

At present there is only one feasibility study commissioned by RFC Rhine-Alpine, which noted that ‘as most of the key performance indicators for the proposed milestones are not monitored today, it is not possible to define clear start values/benchmarks and

consequently it is not possible to estimate detailed savings'.[222] The study concluded that there is a strong link to digitalisation of information exchange between stakeholders (digitalisation is included in PM24) and pointed out to a complex interaction of the collaborative decision-making with other factors. Thus, it was not possible to estimate the adjustment cost savings for infrastructure managers.

Adjustment costs for railway undertakings

The adjustment costs for railways undertakings are estimated at around 25% of those of infrastructure managers and ENIM. The relation in costs is motivated by the fact that infrastructure managers and ENIM are charge of traffic management on the network, such their processes potentially need to be adjusted to implement this measure; the impacts on the operational processes of RUs is comparatively lower. One-off adjustment costs in 2025 are estimated at EUR 1.3 million, followed by recurrent adjustment costs estimated at EUR 2.4 million from 2026 onwards. Expressed as present value over 2025-2050, total adjustment costs for railway undertakings are estimated at EUR 42.6 million relative to the baseline (in 2021 prices) of which one-off costs of EUR 1.3 million.

Adjustment costs for terminal operators and intermodal operators

The adjustment costs for terminal operators and intermodal operators are estimated at around 10% of those of infrastructure managers and ENIM. This motivated by the much lower complexity of rail-related elements of terminal operations compared to tasks of infrastructure managers and ENIM, namely managing the traffic on entire networks. One-off adjustment costs in 2025 are estimated at EUR 0.5 million, followed by recurrent adjustment costs estimated at EUR 0.9 million from 2026 onwards. Expressed as present value over 2025-2050, total adjustment costs for terminal operators and intermodal operators are estimated at EUR 17 million relative to the baseline (in 2021 prices) of which one-off costs of EUR 0.5 million.

Cost savings for railway undertakings (and shunting operators), terminal operators and intermodal operators

Costs savings for railway undertakings, terminal operators and intermodal operators due to PM17 are strongly related to other policy measures. The cost savings for these measures cannot be split between the measures and are reported under the benefits resulting from an increase in punctuality (see section 4.2 of Annex 4).

PM18-1: Conducting continuous transport market monitoring and analysis at European level, carried out by infrastructure managers in cooperation with the performance review body

This measure introduces a systematic and continuous analysis of the evolution of demand for passenger and freight transport services in the form of prognoses or scenarios. Market monitoring and analysis should cover all transport modes, making it possible to identify the potential to shift transport volumes from other modes to rail and to provide input in the capacity management process, in particular the strategic capacity management phase (PM3). The market analysis will be carried out at European level by sector stakeholders on the basis of voluntary cooperation.

[222] https://cip.rne.eu/apex/download_my_file?in_document_id=9865

Adjustment costs for infrastructure managers

Measure PM18-1 is included in PO2, where there is no central IM coordination entity.[223] Therefore, the infrastructure managers will need to set up a task force and outsource the study. The data collection and analysis of the transport market are estimated on the basis of the current costs of the RFCs and the feasibility study of RailNetEurope. They provide an indication about the frequency and the possible costs for such a study.

Costs for transport market studies for RFCs vary considerably, from EUR 14 925 to EUR 459 000. The costs for all RFCs are approximately EUR 2 million. Considering the importance of the transport market study for the strategic planning phase, for which it needs to produce more detailed results than the existing RFC studies, it is expected that the costs would be higher than those for the market studies by RFCs. The one-off costs for the study in 2025 are estimated at EUR 4 million. Possible updates of the study are assumed to take place every 5 years, and estimated at approximately 30% of the original cost. Expressed as present value over 2025-2050, the total costs for the study and the updates are estimated at EUR 9.5 million relative to the baseline (in 2021 prices), of which one-off costs of EUR 4 million.

The task force set up by the infrastructure managers would need to draft and agree on terms of reference for the study. Due to its complexity, the workload is estimated at 240 hours (approximately 30 full working days for one employee) for each IM in 2025. The one-off adjustment costs are estimated at EUR 181 221 in 2025 relative to the baseline.

In addition to the preparation of a European transport market study, transport market monitoring and analysis involves further tasks, including engagement with customers and potential customers of freight transport and/or their representative organisations, coordinating with national authorities on transport market monitoring (ministries, regulatory bodies). Furthermore, the results of transport market monitoring must be taken into account in strategic capacity management (PM3). The recurrent workload for these tasks (including project management for the update of the transport market study) is estimated at 0.5 FTE per infrastructure manager. The recurrent adjustment costs are estimated at EUR 0.6 million from 2026 onwards relative to the baseline[224]. Expressed as present value over 2025-2050, the total adjustment costs for drafting and agreeing on the terms of reference for the study and for the monitoring of the transport market are estimated at EUR 10.1 million relative to the baseline (in 2021 prices), of which one-off costs of EUR 0.2 million.

Total adjustment costs for PM18-1 for infrastructure managers, expressed as present value over 2025-2050, are estimated at EUR 19.6 million of which EUR 4.2 million one-off costs in 2025.

Adjustment costs for the Commission (performance review body)

The costs for the performance review body are included in PM10.

Adjustment costs for railway undertakings

[223] PM18-2 is a variant of this measure in which EU-level transport market analysis is carried out by ENIM in a centralised manner.

[224] Ireland, Cyprus, Malta and Finland do not participate in the governance of any rail freight corridor and are assumed not to participate in the recurrent task related to PM18-1.

Railway undertakings, terminal operators, shippers and other relevant stakeholders should provide input to market monitoring and analysis and be involved in validating the results and drawing conclusions, e.g. for strategic capacity management. However, as they are in a contribution role their workload will be significantly lower than that of infrastructure managers. Due to the wide range of stakeholder potentially interested, the overall workload is assumed to be 25% of that cost of infrastructure managers. It is assumed that costs will mainly accrue to railway undertakings. The adjustment costs are estimated at EUR 142 581 per year from 2026 onwards. Expressed as present value over 2025-2050, the total costs adjustment costs are estimated at EUR 2.5 million relative to the baseline (in 2021 prices).

PM18-2: Conducting continuous transport market monitoring and analysis at European level, carried out by ENIM and the Network Coordinator

In PM18-2 the tasks of market monitoring and analysis, in particular carrying out the transport market study at EU level, are performed by ENIM (with the support of the Network Coordinator).

Adjustment costs for ENIM

The costs for the transport market study and its updates are expected to be the same as in PM18-1. The one-off costs for the study in 2025 are estimated at EUR 4 million. Possible updates of the study are assumed to take place every 5 years, and estimated at approximately 30% of the original cost. Expressed as present value over 2025-2050, the total costs for the study and the updates are estimated at EUR 9.5 million relative to the baseline (in 2021 prices), of which one-off costs of EUR 4 million.

The annual activities would require the Network Coordinator) to liaise with the infrastructure managers and other stakeholders, analyse the results of the transport market study, draft and update the terms of reference, meet the contractors doing the study, discuss methodological issues, draw conclusions from the study results with a view for the strategic capacity management, reach out to potential final customers of rail freight transport services, etc. The Network Coordinator will do these activities on behalf of the ENIM and the individual IMs. This approach will allow for cost reductions relative to PM18-1 due to centralising these activities. The network coordinator is estimated to need 5 FTEs from 2025 onwards for market monitoring, project management for the transport market study and its updates, discussions with ENIM, IMs and other stakeholders and dissemination of results. Total labour costs are estimated using the tariff per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 2 – professionals) (37.5 EUR per hour in 2021 prices). Adjustment costs are estimated at EUR 322 109 from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total recurrent adjustment costs for ENIM are estimated at EUR 5.9 million relative to the baseline.

Total adjustment costs for PM18-2 for ENIM are estimated at EUR 15.4 million expressed as present value over 2025-2050 relative to the baseline (in 2021 prices), of which EUR 4 million one-off costs.

Adjustment costs for infrastructure managers

Infrastructure managers will contribute to market monitoring and analysis at EU level (including by engaging other stakeholders and especially RUs). They will contribute to the

study and will make use of the results at national level. This implies in particular taking into account the results in the strategic capacity management phase. The recurrent workload assumed for these activities is 0.5 FTE per IM, estimated at EUR 570 326 per year from 2026 onwards. Expressed as present value over 2025-2050, the total recurrent adjustment costs for IMs for PM18-2 are estimated at EUR 9.9 million relative to the baseline (in 2021 prices).

Adjustment costs for the Commission (performance review body)

The costs for the performance review body are included in PM10.

Adjustment costs for railway undertakings

The costs for other stakeholders are the same as for PM18-1. It is assumed that costs will mainly accrue to railway undertakings. The adjustment costs are estimated at EUR 142 581 per year from 2026 onwards. Expressed as present value over 2025-2050, the total costs adjustment costs are estimated at EUR 2.5 million relative to the baseline (in 2021 prices).

PM19: Strengthening the competences of the European Network of Regulatory Bodies (the ENRRB) and introducing a secretariat supporting its work

The European Network of Regulatory Bodies acts as regulatory body on matters involving a European or cross-border dimension, supervises the functioning of the designated Network Coordinator (measure 20-1) and scrutinises the European network statement (measure 2-2). It acts on its own initiative or upon stakeholders' complaints related to cross-border services.

The European network ensures a consistent implementation of the functions of regulatory bodies on European and cross-border matters on the basis of European legislation as amended by this initiative (see measure 5) by adopting binding decision in cases of diverging practices of national regulatory bodies. The network will also adopt opinions, guidelines, reports, recommendations, common positions and best practices on its own initiative. In order to perform its duties, the network can oblige national regulatory bodies to provide information and statistics. The network will have a decision-making body made up of representatives of the national regulatory bodies and a secretariat set up and paid for by the regulatory bodies. The secretariat will be established as a self-standing body with own resources.

Adjustment costs for the regulatory bodies

The decision-making body of the network will include a member and an alternate from each Member State with rail network. The workload for the secretariat of the network, which will prepare the opinions, guidelines, reports, recommendations, common positions and identify, describe the best practices, organise the work of national regulatory bodies in working groups, etc. is estimated at 5 FTEs per year from 2025 onwards relative to the baseline. It will act as a virtual body and no costs for offices are foreseen. Adjustment costs are estimated at EUR 322 109 per year from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs for PM19 are estimated at EUR 5.9 million.

The national regulatory bodies will contribute to the work of the ENRRB via participation with experts in working groups. The participation and the mandate of the working groups can vary considerably and for this reason these costs cannot be estimated.

PM20-1: Empower the European Network of Infrastructure Managers (ENIM) as a coordination structure for capacity and traffic management, by assigning it with the responsibilities to: (i) define harmonised EU procedures, rules and tools, (ii) support and monitor implementation of such procedures, rules and tools and (iii) coordinate capacity management between networks as well as by appointing an entity to support ENIM in the operational implementation of these functions (the 'Network Coordinator')

The cost estimates for this measure cover the role of ENIM as decision-making body. All costs of the Network Coordinator for specific tasks resulting from the key three responsibilities of ENIM (point (i) to (iii) in the title) are covered under the policy measures resulting in such tasks. The decision-making role results in comparatively limited costs related to the decision-making, i.e. organising and following up to the decisions made by the representatives of individual infrastructure managers and for coordinating with other bodies and stakeholders in the rail sector.

Adjustment costs for ENIM

The decision-making role of ENIM requires a limited number of regular meetings of representatives of individual infrastructure managers, which requires secretarial support. The resulting workload is estimated at 3 FTEs from 2025 onwards for preparing a minimum of 2 annual meetings and ENIM recommendations. The total annual labour costs amount to approximately EUR 193 265. Expressed as present value over 2025-2050, total adjustment costs for ENIM are estimated at EUR 3.6 million.

PM20-2: Empower the European Network of Infrastructure Managers as coordination and as planning / operational structure for capacity and traffic management, including all the responsibilities and the operational entity referred to in PM20-1, and with the addition of decision-making responsibilities in capacity management (PM22) and operational functions in traffic management (PM23)

The comments regarding the costs considered under PM20-1 apply in an analogous manner to PM20-2. However, due to the larger set of responsibilities of ENIM and the Network Coordinator (in particular measures PM22 and PM23), the workload is assumed to be higher than for PM20-1.

Adjustment costs for ENIM

The workload for ENIM is estimated at 5 FTEs from 2025 onwards for preparing a minimum of 2 annual meetings, ENIM recommendations and also covering other responsibilities related to capacity management. The total annual labour costs amount to approximately EUR 322 109. Expressed as present value over 2025-2050, total adjustment costs for ENIM are estimated at EUR 5.9 million.

PM21: Introduce an EU-level function supporting cross-border coordination of capacity management between infrastructure managers, including consultation and escalation mechanisms involving applicants and regulatory bodies.

This policy measure requires ENIM to ensure that the actual results of the capacity management and allocation processes, notably as defined in PM3, PM4, PM5, PM8, are such that they support seamless and interoperable cross-border rail transport services in line with market needs. This operational implementation of this support function will be carried out by the network coordinator, the operational entity supporting the European network of infrastructure managers, in cooperation with individual infrastructure managers.

The estimation of costs for the different stakeholder groups is based on the following assumptions:

- The need for coordination concerns mainly the strategic capacity management phase (PM3) as fully consistent.
- Coordination will be carried out jointly by individual infrastructure managers supported by ENIM as a facilitator. This means that the measure results in costs both for individual infrastructure managers and for ENIM.
- The coordination process will include a consultation mechanism to involve railway undertakings and other applicants for capacity to ensure market needs are properly taken into account and it will be subject to regulatory supervision, both by national regulatory bodies and by the ENRRB. These activities will results in costs for railway undertakings and regulatory bodies, including the ENRRB.
- The basic factor determining the workload resulting from the coordination of capacity management for any given pair of infrastructure managers is the number of rail border crossings to which coordination should apply. The geographical scope of cross-border coordination under this measure is assumed to be the core and extended core network as defined in the Commission's 2021 proposal for revising the TEN-T Regulation.[225] This includes 73 rail border crossings, most of which serve both passenger and freight transport. In addition to the number of border crossings, two contextual factors affecting workload and costs are taken into account: (i) the length of the two networks concerned (ii) the network utilisation of the networks concerned.

Based on these common assumptions, costs for individual stakeholder groups were estimated as follows.

Adjustment costs for infrastructure managers

The costs resulting from this measure were estimated as follows:

- Step 1: The starting point is the number of rail border crossings part of the TEN-T core and extended core network per Member State.[226] For each border crossing, a workload of 0.2 FTE for each of the infrastructure managers involved is assumed, i.e. a staff resource of 1 FTE can cover 5 border crossings.
- Step 2: This basic value is then corrected, individually for each network, taking into account the length of lines included in TEN-T (core and extended core network). This reflects the fact that larger networks will result in a higher workload due to longer train journeys and a greater length of lines to be taken into account in the coordination.

[225] See COM(2021)812), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0812.

[226] The fact that in some Member States more than one infrastructure managers is concerned by the TEN-T core and extended core network was neglected for the sake of simplicity. In any case, at least in some of the Member State concerned (e.g. HU), there is a single allocation body which should ensure coordination of capacity management.

However, the effect is assumed to be less than proportional due to economies of scale and scope. The factor for the longest network (DE at 9 656 km) has been set at 2.5, despite a length of 7.4 times of the median (1 297 km). The factor for the shortest network (LU at 112 km) has been set at 0.25. Correction factors for intermediate values of network length were calculated on the basis of linear interpolation.

- Step 3: A second correction factor takes into account the impact of network utilisation on the workload for coordination. More intensively used networks create additional challenges for cross-border coordination, with a higher probability of conflicts between cross-border and domestic traffic and less margin to resolve such capacity conflicts. A range of correction factors was applied, assuming that the effect of network utilisation on workload is less than proportional: 2.5 for the most intensively used network (NL at 48 604 train-km per line-km, 3.7 times the median value of 13 173 train-km per line-km) and 0.25 for the least intensively used network (EL at 3 856 train-km per line-km). Correction factors for intermediate values of network utilisation were calculated on the basis of linear interpolation.
- Step 4: The overall workload per Member State is derived as the product of the number of border crossings, the basic workload of 0.2 FTE per border crossing and the two correction factors, taking into account the increase in rail traffic over time. As PM21 is included in PO3 the increase in the rail traffic of PO3 has been considered for the estimations.
- Step 5: The annual staff costs per infrastructure manager resulting from the measure were estimated on the basis of the average unit staff cost at ISCO 2 occupational level.

The estimated adjustment costs for infrastructure managers in 2030 relative to the baseline (in 2021 prices), by Member State, are provided in Table 34. Adjustment costs for 2030, 2040 and 2050 relative to the baseline are provided in Table 35. Expressed as present value over 2025-2050, total adjustment costs for infrastructure managers are estimated at EUR 80.4 million relative to the baseline.

Table 34: Estimation of workload and staff costs for infrastructure managers related to PM21 (included in PO3) in 2030 relative to the baseline, by Member State

MS	Border crossings (number)	Network length TEN-T (km)	Additional workload relative to the baseline (FTE)	Unit staff cost (EUR/hour)	Additional staff cost relative to the baseline (EUR)
AT	13	1 202	5.1	44.6	391 243
BE	11	1 250	3.7	52.9	334 495
BG	4	1 737	0.5	7.7	7 150
CZ	7	1 466	2.0	18.7	65 375
DE	20	9 524	17.6	49.1	1 483 568
DK	1	917	0.3	51.8	25 189
EE	1	436	0.0	18.0	1 473
EL	2	1 735	0.1	21.7	4 536
ES	5	9 002	2.1	30.6	108 674
FI	1	1 297	0.1	42.5	9 847
FR	14	9 655	8.9	45.8	702 295
HR	2	693	0.1	14.1	3 486
HU	11	1 602	2.7	13.7	63 344
IE	0	440	0.0	49.4	0
IT	5	5 630	2.5	43.4	188 382
LT	2	845	0.2	12.8	4 853
LU	4	112	0.4	48.4	29 650

MS	Border crossings (number)	Network length TEN-T (km)	Additional workload relative to the baseline (FTE)	Unit staff cost (EUR/hour)	Additional staff cost relative to the baseline (EUR)
LV	2	978	0.1	14.4	3 703
NL	5	797	1.9	44.6	142 473
PL	7	4 744	2.9	14.7	73 571
PT	2	1 462	0.5	21.0	18 089
RO	4	2 874	0.7	14.3	16 156
SE	4	3 925	1.5	45.3	116 121
SI	5	556	0.8	20.2	27 845
SK	11	729	1.8	15.4	46 410
Total		**63 608**	**56.5**		**3 867 927**

Source: TENtec geographical information system; RMMS / TRAMOS database; Ecorys et al. (2023), impact assessment support study

Adjustment cost for ENIM

ENIM is considered to take a support role through the Network Coordinator such that the workload for coordination depends less on the concrete situation of different border crossings; instead, it is mainly determined by the number of border crossings.

The workload was estimated based on the following assumptions:

- A staff resource of 1 FTE is sufficient to support the coordination of 5 border crossings, i.e. the resources for one border crossing are estimated at 0.2 FTE.
- The scope of the cross-border coordination covers the 73 rail border crossings which are part of the core and extended core network in the Commission's 2021 proposal for revising the TEN-T Regulation.[227]
- Staff costs are estimated on the basis of the EU average for the ISCO 2 occupational level.

The adjustment costs for ENIM are estimated at EUR 0.9 million per year from 2025 onwards. Expressed as present value over 2025-2050, they are estimated at EUR 17.3 million relative to the baseline. The estimated adjustment costs for ENIM are provided in Table 35.

Enforcement costs for regulatory bodies and the ENRRB

Coordination activities of infrastructure managers and of ENIM under this measure are subject to regulatory scrutiny, both by (national) regulatory bodies and by the ENRRB with a view to (i) verify and enforce compliance with EU legislation and (ii) to ensure fair and non-discriminatory access to infrastructure capacity for railway undertakings and other applicants for infrastructure capacity. This will result in enforcement costs for regulatory bodies and the ENRRB.

These costs are estimated at 5% of the costs for infrastructure managers and ENIM, or EUR 0.2 million in 2030 and EUR 0.3 million in 2050 relative to the baseline. Expressed as present value over 2025-2050, they are estimated at EUR 4.9 million relative to the

[227] See COM(2021)812), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0812.

baseline. The enforcement costs for regulatory bodies and the ENRRB are provided in Table 35.

Table 35: Adjustment costs for ENIM and for infrastructure managers, and enforcement costs for RBs/ENRRB due to PM21 relative to the baseline (in million EUR, 2021 prices)

Year(s)	ENIM	Individual IMs	RBs/ENRRB
	Total costs expressed as present value over 2025-2050 relative to the baseline		
2025–2050	17.3	80.4	4.9
	Recurrent cost relative to the baseline		
2030	0.9	3.9	0.2
2040	0.9	4.8	0.3
2050	0.9	5.4	0.3

Source: TENtec geographical information system; RMMS / TRAMOS database; Ecorys et al. (2023), impact assessment support study

Adjustment cost savings for railway undertakings

PM21 is expected to benefit railway undertakings and other applicants for infrastructure capacity. The most direct benefit are reductions in workload and costs in managing capacity for cross-border rail transport services, resulting from a reduction in the need for railway undertakings to address inconsistencies in the capacity offered by infrastructure managers for cross-border trains.[228]

The reduction in workload and adjustment costs for railway undertakings has been estimated as follows:

- The starting point for the estimations is the number of cross-border train paths as reported in the report on rail market monitoring and the corresponding TRAMOS database.
- There is anecdotal evidence that a significant share of cross-border train paths suffers from inconsistencies between the capacity provided by individual infrastructure managers, e.g. regarding aspects such as inconsistent timing and routing on cross-border sections, in particular in the event of changes to the initial planning.[229] Such changes come from infrastructure managers to accommodate works scheduled only after the allocation of train paths. Some investigations carried out by rail freight corridors indicate a share up to 80%[230]. As systematic information on this issue is not available, the following conservative assumptions regarding the share were made: 4% of train paths allocated in the annual allocation process and 10% of the train paths allocated on an ad-hoc basis suffer from inconsistencies. The absolute number of inconsistencies results from the total number of cross-border train paths and the shares assumed. The evolution of the number of inconsistencies was assumed to grow in line with rail traffic activity in PO3 until 2050.
- The reduction in workload and costs for railway undertakings are driven by the reduction in the number of inconsistencies. As a conservative estimate, it was assumed that 50% of the inconsistencies can be avoided as a result of this measure.

[228] Ultimately, better coordination between infrastructure managers will also provide operational and commercial benefits through improving operational quality (notably via higher punctuality) and by increase in the capacity available.

[229] Notable example: changes to train paths.

[230] Add reference to presentation of North Sea-Baltic RFC.

- The workload and costs for RUs to resolve each inconsistency were estimated on the basis of the same assumptions as for PM4 (i.e. each inconsistency takes 1.375 hours of work by staff at ISCO 2 occupational level to be resolved).

The estimates of adjustment cost savings for railway undertakings in 2030, by Member State, relative to the baseline are provided in Table 36. The adjustment cost savings for railway undertakings in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs savings expressed as present value over 2025-2050 relative to the baseline, are provided on Table 36.

Table 36: Adjustment cost savings for railway undertakings due to PM21 (included in PO3) in 2030, by Member State, relative to the baseline (in EUR, 2021 prices)

	Reduction in cross-border train path inconsistencies		Costs savings for RUs (EUR)		
	Annual	Ad hoc	Annual	Ad hoc	Total
AT	4 453	2 734	273 082	167 629	440 711
BE	5 073	304	369 163	22 132	391 295
BG	3	192	28	2 045	2 074
CZ	7 688	6 475	197 564	166 401	363 965
DE	235	4 912	15 886	331 943	347 829
DK	4	92	295	6 566	6 860
EE	2	1	50	21	71
EL	62	25	1 844	740	2 584
ES	0	0	0	0	0
FI	0	2	6	99	105
FR	3 451	0	217 304	0	217 304
HR	6	271	121	5 247	5 368
HU	2 340	3 649	43 996	68 601	112 598
IE	0	0	22	0	22
IT	4 050	8	241 825	454	242 279
LT	1 865	417	32 741	7 328	40 069
LU	15	9	1 006	622	1 628
LV	1 675	0	33 258	1	33 259
NL	4 903	3 247	300 576	199 077	499 652
PL	449	4 903	9 074	99 047	108 121
PT	222	269	6 397	7 776	14 173
RO	9	3	183	68	251
SE	2 492	26	155 200	1 620	156 819
SI	11	923	309	25 613	25 922
SK	4 439	3 378	93 920	71 475	165 395
Total	**43 448**	**31 840**	**1 993 850**	**1 184 504**	**3 178 354**

Source: rail market monitoring report / TRAMOS database; TTR business case and Ecorys et al. (2023), impact assessment support study

Table 37: Adjustment cost savings for railway undertakings resulting from PM21 (included in PO3) relative to the baseline (in million EUR, 2021 prices)

Year(s)	Railway undertakings
Total costs expressed as present value over 2025-2050 relative to the baseline	
2025–2050	64.2
Recurrent cost relative to the baseline	
2030	3.2
2040	3.8
2050	4.3

Source: rail market monitoring report / TRAMOS database; TTR business case and Ecorys et al. (2023), impact assessment support study

PM22: Entrusting ENIM with the competence to prepare, for all rail lines part of the European transport corridors, the strategic capacity management phase and to approve the outcomes of the capacity allocation process

PM22 transfers responsibility for the planning in the strategic capacity management phase (PM3 and PM5) from infrastructure managers to ENIM and the Network Coordinator for the strategically most important lines of the TEN-T network, the core and the extended core network as defined in the Commission's 2021 proposal to revise the TEN-T Regulation.[231] This has the following consequences on adjustment cost:

1. The cost for the strategic capacity management phase are borne by ENIM instead of the infrastructure managers. However, it is assumed that the sum of these costs at EU level will not change significantly, as the transfer of responsibility primarily shifts but does not change the magnitude of the workload.
2. The transfer of responsibility removes the discontinuity in strategic capacity management at the borders between infrastructure managers included in the core and extended core network, as these lines are all managed by the Network Coordinator. At the same time, it creates new discontinuities at nodes where lines of the core and extended core network, managed by the Network Coordinator, are connected to the rest of the rail network, managed by infrastructure managers. This creates a need for coordination. Furthermore, close coordination between the Network Coordinator and infrastructure managers is needed because not all management and operational functions are transferred to the Network Coordinator, including the scheduling of works for infrastructure repair, maintenance and renewal, capacity (train path) allocation and traffic management. The need for coordination will be most intense in network nodes where lines included and not included in the TEN-T (extended) core network are linked to each other. The workload resulting from these coordination activities is assumed to result in adjustment costs for infrastructure managers.

Adjustments costs for ENIM

In line with the explanations above, the adjustment costs for ENIM resulting from PM22 are assumed to be the same as the sum of the costs of the strategic capacity management phase for infrastructure managers in PM3, i.e. costs are simply shifted from infrastructure managers to ENIM.

Adjustment costs for infrastructure managers

As outline above the adjustment costs for infrastructure managers result from the coordination between ENIM and infrastructure managers to ensure consistency in strategic capacity management where the lines in the competence of ENIM (TEN-T core and extended core network) and of infrastructure managers meet (rest of the rail network).

They are estimated as follows:

- Step 1: The basis for estimating the workload for coordination are the urban nodes included in the Commission's 2021 proposal to revise the TEN-T Regulation. This includes a total of 404 urban nodes located on the TEN-T network and with access to the rail network.

[231] COM(2021) 812 final of 14 December 2021.

- Step 2: The basic workload per node was assumed to be 0.5 FTE for a node of a population of 1 million inhabitants in the corresponding NUTS3 region. This assumption implies that 1 FTE is sufficient to cover 2 nodes of 1 million population each.
- Step 3: A first correction factor considers the population of the node as a proxy for the complexity of the rail network and of the rail services connected in a given node, both of which increase the workload for coordination. The correction factor varies between 7.5 for a population of 20 million inhabitants, 1.0 for the reference population of 1 million and 0.25 for nodes with a population of less than 100 000 inhabitants. The correction factors assume that the workload increases less than proportionally with the population node, due to economies of scale and scope.
- Step 4: A second correction factor was applied to take into account the impact of network utilisation on the workload resulting from coordination activities. Due to the lack of more detailed information, this was done at the level of overall utilisation of the entire rail network at the level of Member States concerned. The factor varies between 2.5 for the most intensively used network (NL at 48 604 train-km per line-km and year), 1.0 for the median network utilisation (13 173 train-km per line-km and year) and 0.25 for the least intensively used network (EL at 3 856 train-km per line-km and year). Again, the workload increases less than proportionally with the network utilisation. It takes into account the projected network utilisation levels over time, due to the increased rail traffic.
- Step 6: The basic workload (0.5 FTE per node) multiplied by the two correction factors gives the estimated workload per node. Staff cost resulting from the workload were estimated on the basis of the average staff unit costs for the ISCO 2 occupational level per Member State.

The adjustment cost for infrastructure managers in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs expressed as present value over 2025-2050 relative to the baseline, are provided on Table 38.

Enforcement costs for regulatory bodies and the ENRRB

Coordination activities of infrastructure managers and of ENIM under this measure are subject to regulatory scrutiny, both by (national) regulatory bodies and by the ENRRB with a view to (i) verify and enforce compliance with EU legislation and (ii) to ensure fair and non-discriminatory access to infrastructure capacity for railway undertakings and other applicants for infrastructure capacity. This is expected to result in enforcement costs for regulatory bodies and the ENRRB.

These costs are estimated at 5% of the combined adjustment costs of infrastructure managers and ENIM. The enforcement costs in 2030, 2040 and 2050 relative to the baseline and the total enforcement costs expressed as present value over 2025-2050 relative to the baseline are provided in Table 38.

Table 38: Adjustment costs for infrastructure managers and enforcement cost for regulatory bodies and the ENRRB due to PM22 relative to the baseline (in million EUR, 2021 prices)

Year(s)	Individual IMs	RBs/ENRRB
	Total costs expressed as present value over 2025-2050 relative to the baseline	
2025–2050	253.4	12.7
	Recurrent cost relative to the baseline	
2030	12.3	0.6

2040	15.1	0.8
2050	16.9	0.8

Source: Ecorys et al. (2023), impact assessment support study

Adjustment cost savings for railway undertakings

Similarly to PM21, PM22 is expected to benefit railway undertakings and other applicants for infrastructure capacity. The most direct benefit is the reduction in costs for managing capacity for cross-border rail transport services, resulting from a reduction in the need for railway undertakings to address inconsistencies in the capacity offered by infrastructure managers for cross-border trains.[232]

The key difference is that due to the centralisation of the strategic capacity management phase, the reduction in inconsistencies at borders between infrastructure managers is assumed to be higher. More specifically, the assumed share of inconsistencies removed is 90% percent compared to the baseline, both for capacity allocated in the annual timetable and on an ad-hoc basis. All other input data and assumptions are the same to those used in the cost estimates for PM21.

The estimates of adjustment cost savings for railway undertakings in 2030, by Member State, relative to the baseline are provided in Table 39. The adjustment cost savings for railway undertakings in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs savings expressed as present value over 2025-2050 relative to the baseline, are provided in Table 40.

Table 39: Adjustment cost savings for railway undertakings due to PM22 in 2030, by Member State, relative to the baseline (in EUR, 2021 prices)

	Reduction in cross-border train path inconsistencies		Costs savings for RUs (EUR)		
	Annual	Ad hoc	Annual	Ad hoc	Total
AT	8 037	4 933	492 827	302 516	795 343
BE	9 164	549	666 854	39 982	706 835
BG	5	347	51	3 693	3 745
CZ	13 882	11 692	356 732	300 460	657 193
DE	425	8 877	28 709	599 882	628 591
DK	7	167	533	11 863	12 396
EE	4	2	90	38	128
EL	112	45	3 328	1 335	4 663
ES	0	0	0	0	0
FI	0	3	11	179	189
FR	6 230	0	392 282	0	392 282
HR	11	489	218	9 478	9 697
HU	4 224	6 587	79 418	123 833	203 251
IE	1	0	39	0	39
IT	7 311	14	436 478	817	437 294
LT	3 364	753	59 070	13 220	72 289
LU	27	17	1 813	1 120	2 933

[232] Ultimately, better coordination between infrastructure managers will also provide operational and commercial benefits through improving operational quality (notably via higher punctuality) and by increase in the capacity available. These benefits are estimated in section 4 of this Annex, covering the transport impacts of the four policy options.

LV	3 021	0	60 002	2	60 003
NL	8 857	5 866	542 981	359 629	902 609
PL	810	8 846	16 373	178 714	195 087
PT	400	486	11 554	14 044	25 598
RO	17	6	331	124	455
SE	4 503	47	280 505	2 926	283 432
SI	20	1 663	557	46 176	46 732
SK	8 008	6 094	169 416	128 928	298 345
Total	78 440	57 483	3 600 172	2 138 958	5 739 129

Source: rail market monitoring report / TRAMOS database; TTR business case and Ecorys et al. (2023), impact assessment support study

Table 40: Adjustment cost savings for railway undertakings resulting from PM22 relative to the baseline (in million EUR, 2021 prices)

Year(s)	Railway undertakings
Total costs savings expressed as present value over 2025-2050 relative to the baseline	
2025–2050	116.7
Recurrent cost relative to the baseline	
2030	5.7
2040	6.9
2050	7.9

Source: rail market monitoring report / TRAMOS database; TTR business case and Ecorys et al. (2023), impact assessment support study

PM23: Introduce an operational function at European level supporting the coordination of traffic management, in particular for the management of major disruptions ('crisis cell')

The cell will be staffed by infrastructure managers. It will organise and support coordination between operational stakeholders, including infrastructure managers, railway undertakings, customers of rail transport services and other relevant actors. It will carry out an independent ex-post evaluation of the management of actual crises and incidents ('return on experience'). The task will be entrusted to the network coordination entity.

Adjustment costs for ENIM

The tasks stemming from the measure will be entrusted to the network coordination entity. The 'crisis cell' will require that staff is always available for organising communication between the relevant stakeholders. The workload for the 'crisis cell' is estimated at 40 FTEs per year for experts at ISCO 2 level (professionals) and 3 FTEs per year for experts at ISCO 1 level (legislators, senior officials and managers). Adjustment costs are estimated at EUR 2.8 million from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total recurrent adjustment costs for PM23 are estimated at EUR 52.2 million. The network coordinator will provide offices and equipment and these are thus not considered in the costs calculations.

Adjustment cost savings for infrastructure managers

No significant labour costs savings are expected for infrastructure managers due to this measure, as the management of the incidents will remain the responsibility of the infrastructure managers and the 'crisis cell' will only provide improved coordination.

Adjustment costs for other stakeholders

There will be no additional costs for other stakeholders (in particular railway undertakings and terminal operators). They will be able to receive information from a single source, but they could still relate information to infrastructure managers or to the 'crisis cell'.

PM24: Introduce legal requirements on the harmonised exchange of digital information supporting capacity and traffic management as well as customer information

The measure will introduce legally binding deadlines for infrastructure managers for the implementation of digital information exchange with railway undertakings and other rail stakeholders in accordance with the technical specifications for interoperability on telematics applications for freight (TAF TSI[233]).

It will also introduce a legal requirement for infrastructure managers to provide the technical description of the railway network in the context of the network statement via the register of infrastructure (RINF[234]). The publication of the register is an existing obligation[235], and no additional costs are expected for the obligation to use the register in the network statements relative to the baseline.

The adjustment costs associated to this measure are estimated on the basis of the business case developed by RailNetEurope[236], which uses cost estimates prepared by infrastructure managers for investments needed for the implementation of the Timetable Redesign Project and own estimates of RNE. The project involves making all IMs' and RUs' systems TAF TSI compliant, but it does not identify the costs for this specific element. It is estimated that approximately 10% of the overall IT costs are attributable to achieving TAF TSI compliance. Compliance is mostly related to the structure and format of the data submitted by infrastructure managers and railway undertakings to other stakeholders. This would require the development and deployment of digital interfaces for existing systems compliant with TAF TSI. More detailed explanations on the steps for calculating the costs are presented under PM25.

Adjustment cost for infrastructure managers

The estimates of adjustment costs for infrastructure managers in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs expressed as present value over 2025-2050 relative to the baseline, are provided in Table 41. Expressed as present value over 2025-2050, the total adjustment costs for IMs are estimated at EUR 74.5 million, of which one-off costs of EUR 56.1 million.

[233] Commission Regulation (EU) No 1305/2014 of 11 December 2014 on the technical specification for interoperability relating to the telematics applications for freight subsystem of the rail system in the European Union and repealing the Regulation (EC) No 62/2006 (Text with EEA relevance), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014R1305-20210418

[234] Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU.

[235] Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (recast).

[236] https://cms.rne.eu/system/files/8.0_ttr_business_case_v3.0_2019-05-15_0.pdf

Table 41: Adjustment costs for 'the network', individual infrastructure managers, and railways undertakings due to PM24 relative to the baseline (in million EUR, 2021 prices)

Year(s)	ENIM	Individual IMs	RUs
	Total costs expressed as present value over 2025-2050 relative to the baseline		
2025–2050	4.5	74.5	282.8
	One-off costs relative to the baseline		
One-off	2.7 €	56.1	282.8
	Recurrent costs relative to the baseline		
2030	0.1	2.1	0.0
2040	0.1	0.0	0.0
2050	0.1	0.0	0.0

Source: Ecorys et al. (2023), impact assessment support study

Adjustments costs for ENIM

As explained above, PM24 concerns the introduction of TAF TSI-compliant interfaces. It is estimated that approximately 10% of the overall IT costs of PM25 are attributable to achieving TAF TSI compliance, as explained under PM25. The estimates of adjustment costs for ENIM in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs expressed as present value over 2025-2050 relative to the baseline, are provided in Table 41. Expressed as present value over 2025-2050, the total adjustment costs for ENIM are estimated at EUR 4.5 million, of which one-off costs of EUR 2.7 million.

Adjustment costs for railway undertakings

Limited information was identified in the literature and during the stakeholders' consultation. Drawing on the TTR Business Case prepared by RailNetEurope, the IT costs for railway undertakings are assumed to be roughly 30% of the total IT costs for infrastructure managers and RUs. Discussions with RNE confirmed this assumption.

The costs for railway undertakings that can be attributed to this initiative concern mainly the deployment of interoperable interfaces, which allow railway undertakings to interact with infrastructure managers via automated digital information exchange. RU-specific functionalities, such as planning of resources of railway undertakings (e.g. locomotive and train driver scheduling), were not taken into account as they are part of the baseline. The entirety of IT costs for railway undertakings are assigned to PM24. More explanations on the steps for estimating the IT costs are provided under PM25.

The estimates of adjustment costs for railway undertakings relative to the baseline are provided in Table 41. The total costs (i.e. one-off costs) are estimated at EUR 282.8 million.

PM25: Comprehensive digitalisation and automation of capacity and traffic management providing a single interface at EU level and seamless end-to-end services for applicants (railway operators)

Adjustment cost for infrastructure managers

Infrastructure managers are already investing in the digitalisation of capacity allocation services and in exchanging information across IT systems for capacity allocation, which

are part of the baseline. Investments cover also the deployment of new functionalities to existing and planned IT systems or as part of planned system upgrades.

The adjustment costs related to IT systems for PM25 are estimated on the basis of the business case prepared by RNE[237], which uses cost estimates prepared by infrastructure managers for investments needed for the implementation of the Timetable Redesign Project and own estimates of RNE. These costs cover also the changes needed to ensure compatibility with TAF TSI (included in PM24). The costs for individual IMs are not available, but the available information on the IT systems in use[238] suggests that they can vary considerably.

The IT investment costs are considered one-off costs, with investment expenditures assumed to take place in the period 2025-2029.

RNE's business case was used as an indicator of the scale of the costs, but the costs had to be adjusted due to the different time frame, and also to reflect baseline developments. The information provided by RNE indicates that some investments have already been planned for the period 2022-2024. However, the only verifiable information available about these investments concerns a project receiving co-financing under CEF. Total costs under this project amount to approximately EUR 147 million for 2022-2024. As the initiative is envisaged to come into effect from 2025, all investments prior to this year are part of the baseline.

RNE's business case estimates IT costs up to 2029. It envisages costs for a central system and for individual IT systems of the IMs. RNE's business case estimates total IT costs (including for IT for the Network Coordinator) of EUR 949 million, expressed in 2020 prices. These estimates cover IT investments and training for 20 IMs and RUs.

The following steps have been followed to estimate the costs for the impact assessment:

Step 1: First, the total IT investment costs have been transformed in 2021 prices. The ratio between the IM and RU costs has been identified. Discussions with RNE confirmed the assumption that RUs' total costs would be approximately 30% of the total IT costs and the IMs' costs the remaining 70% of the total IT costs. As the costs covered only 20 IMs, they have been further adjusted to account for 25 IMs.

Step 2: As explained above, the IT costs estimated by RNE also covered planned costs for the period 2022-2024, which are part of the baseline. In order to estimate the costs due to the initiative, the costs for 2022-2024 have been deducted from the total IT investment costs, drawing on the CEF project mentioned above. In addition, the IT developments for RUs will focus on ensuring compliance with TAF and TAP TSIs. Therefore, the IT investment costs for RUs are included in PM24 and removed from the calculation of the costs for PM25. They are estimated at EUR 60 million per year on average between 2025 and 2029.

Step 3: In the third step, the costs for ENIM have been estimated. The share of ENIM's costs is based on the CEF funding application mentioned above, where RNE's costs (the

[237] RailNetEurope (2019) Redesign of the International Timetabling Process (TTR). Business Case. Draft version 3.0. 15 May 2019, https://cms.rne.eu/system/files/8.0_ttr_business_case_v3.0_2019-05-15_0.pdf.
[238] As indicated in the impact assessment support study (Ecorys et al., 2023), IMs have different IT systems and varying level of digitalisation of services.

possible future network coordinator) are about 5% of the total costs. Thus, the share of ENIM's IT investment costs is estimated at 5% of the total IM costs.

Step 4: In the fourth step, IT maintenance costs are estimated.

Calculating software maintenance costs is very difficult as they depend on a number of technical parameters: software architecture, programming language, validation and testing procedures, documentation requirements, frequency of software upgrades, hardware requirements, etc. Furthermore, software maintenance costs include performance and functionality improvements, which are directly related to new functionalities, but also software license payments, staff training, etc., which are not directly related to the new IT functionalities, but are rather standard business costs, which will occur without the implementation of PM25.

Therefore, for IM's it has been assumed that maintenance costs represent around 15% of the annual average IT investment costs. They are attributed to software maintenance for a period of up to 5 years after the full implementation of the new IT functionalities (from 2025 to 2034). Software maintenance costs post-2034 are no longer attributed to the additional functionalities, but represent standard software maintenance costs and are not reflected in the calculations.

The same assumptions were made for ENIM, except that software maintenance costs were extended until 2050, as it is assumed that only limited elements of the IT system developed for the Network Coordinator would be put in place and maintained without the implementation of this initiative. As explained in Section 3.2 above, TTR cannot be implemented in full without changes to the legal framework.

Step 5: Estimate the costs for TAF/TAP TSI compliance. It is assumed that 10% of the total IM's IT costs are assigned to achieving compliance with TAF and TAP TSIs. Therefore, the total cost of PM25 for IMs is reduced by 10%. These costs are then allocated to PM24

The estimates of adjustment costs for infrastructure managers in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs expressed as present value over 2025-2050 relative to the baseline, are provided in Table 42. Expressed as present value over 2025-2050, the total adjustment costs for IMs are estimated at EUR 670.7 million, of which one-off costs of EUR 504.8 million.

Table 42: Adjustment costs for individual infrastructure managers and 'the network' due to PM25 relative to the baseline (in million EUR, 2021 prices)

Year(s)	ENIM	Individual IMs
	Total costs expressed as present value over 2025-2050 relative to the baseline	
2025–2050	40.9	670.7
	One-off costs relative to the baseline	
One-off	24.2 €	504.8
	Recurrent cost relative to the baseline	
2030	0.9	18.9
2040	0.9	0.0
2050	0.9	0.0

Source: Ecorys et al. (2023), impact assessment support study

Adjustment costs for ENIM

The digitalisation of capacity management and the new process outlined in PM3, PM4 and PM5 will require digital information exchanges between IMs. In PO2 this information exchange will be carried out by RNE, but it will be of voluntary nature. In PO3 and PO4 ENIM and the network coordinator will be responsible on the basis of legal obligations.

The investments and related operational costs for IT will accrue to the EU rail network coordinator (supervised by ENIM in PO3 and PO4) or to RNE (in PO2). As RNE is expected to be the network coordinator in PO3 and PO4, in practice there is no difference in the allocation of these costs for POs 2, PO3 and PO4.

The adjustment costs for ENM are estimated on the basis of the business case developed by RNE[239], which made estimates for RNE's investment needs for the implementation of the Timetable Redesign Project. The calculations are explained in the section above on adjustment costs for IMs.

The estimates of adjustment costs for ENIM in 2030, 2040 and 2050 relative to the baseline and the total adjustment costs expressed as present value over 2025-2050 relative to the baseline, are provided on Table 42. Expressed as present value over 2025-2050, the total adjustment costs for ENIM are estimated at EUR 40.9 million, of which one-off costs of EUR 24.8 million.

Europe's rail is also working on digitalisation of rail-related services, but these are considered to go beyond the functionalities considered for this policy measure.

4. Direct transport impacts per policy option

4.1. Impacts on infrastructure capacity

4.1.1. Methodology, data and assumptions

The effect of the policy measures on infrastructure capacity were estimated by simulating the implementation of the measures with the use of TPS software application on a digital twin of the EU rail network. The impacts were simulated via the use of 3 representative case studies, which depict different congested lines on the EU network: single track, double track and cross-border. During the modelling exercises, it was ensured that the models depicted a situation that can be considered representative for the EU (i.e. a realistic mix of trains, no section-specific unique traffic restrictions, etc.). None of these modelled use cases is a one-to-one depiction of an operational section, but rather a representative EU use case. Each use case was modelled separately. Nevertheless, the capacity planning that was represented in the models could result in an actual, operational timetable on these use case sections.

The TPS software application could handle large scale networks and could model the complete European network, if the microscopic infrastructure information was available from all EU infrastructure managers. As this was not the case and only selected infrastructure data was available, 3 sample models were used, which represent a congested double track line, a congested single-track line and a congested border crossing section. These were built up using sample data from real network sections. The types of trains used

[239] https://cms.rne.eu/system/files/8.0_ttr_business_case_v3.0_2019-05-15_0.pdf

were imported from the TPS database that includes more than 5 000 different type of trains. Train frequencies, stopping patterns and other parameters were aligned with mixed line sections of the European network declared as congested.

The modelling includes mainly manual (timetable planning) work. It followed common basic rules of timetabling to ensure proper connections and interchange options between regional and long-distance passenger trains, etc.

Expert assessment and stakeholders' consultation results were used as input for the modelling of the effect of the policy options. The ability to offer additional train paths, in particular on congested lines, was selected as one of the key results of the impact of the policy options. The focus was on incorporating a maximum number of train paths. This also resulted in a reduction of the transport time due to more coordinated and informed path planning.

The modelling of the impacts of the policy measures on rail infrastructure capacity for the policy options required the development of different model variants of a timetable. This was performed in seven steps:

Step 1: A variant of the timetable for the 3 case studies (hereafter 'the basic variant of the timetable') was prepared, assuming no further EU level action. This variant of the timetable was cross-checked with e.g. train numbers, train patterns, stopping patterns and runtimes from published timetables or historic data provided by RailNetEurope[240] for comparable lines. This variant reflects the baseline.

Step 2: A variant of the timetable was constructed which represented the maximum possible utilisation of the network's capacity and includes elements which are planned to be achieved with policy measures like reduced border stopping times and less stops overall due to better cross-border coordination of train paths. This variant reflects PO4.

The assumptions used in step 2, and the subsequent steps, are presented below:

- This variant assumes full implementation of the policy measures included in PO4, solving conflicts and inefficiencies through a transparent overview (and decision making power) from an EU and not only national perspective. Therefore, in this variant the train paths were planned with the minimum train sequence (minimum block occupation time).
- It assumes that the policy measures addressing coordination of infrastructure works across borders are fully implemented and less trains are affected and cancelled due to uncoordinated infrastructure works.
- The additional capacity generated in this variant of the timetable should not affect negatively any of the services (neither passenger, nor freight) regarding their transport time, if possible.
- The variant of the timetable did not focus on avoiding bypassing stops or crossings on the singe track line just for reducing the transport time. This results only in a minor (up to moderate) improvement of the average speed, but in a significant increase of available paths to be offered to the market.

[240] RailNetEurope provides access to data introduced by infrastructure managers in the Train Information System.

- Around 50% of the additional capacity for freight was planned by incorporating capacity bands (capable to be used by different train setups and speeds), which are dedicated for train path requests submitted after the adoption of the annual timetable[241]. These timetable bands offer an increased flexibility compared to a fixed train path and can be used by both passenger and freight transport services.
- Different sizes of the bands were included using the maximum of space between fixed passenger services. Some could be used by up to 5 trains depending on the difference in train category and speed, some only by up to 2 trains.

Step 3: In the third step, to represent PO3, a resistance factor was introduced that automatically increases the minimum train sequence (increasing the specific block occupation time by a factor scalable by the user) and therefore limits the capacity utilisation relative to PO4, by creating conflicts in the model. These conflicts were then checked and solved either by adjusting the train paths whenever possible, or by deleting certain trains paths (trains services) if necessary to allow the construction of a conflict free timetable. Table 43 shows the result of these adjustments to the train paths.

This also had an effect on the maximum number of trains which would be possible to handle in the capacity bands. Only moderate additional resistance was assumed because most policy measures that lead to higher utilisation of the network's capacity are included in PO3.

Step 4: In the fourth step the resistance factor was increased, to represent PO2. This is because the measures included in PO2 are expected to have a weaker effect on the utilisation of the network's capacity relative to PO3. This is especially the case for the international component (harmonised and checked rules). A similar approach was followed as described in step 3.

For PO1, the basic variant of the timetable was modelled for the selected time slots. This was done to reflect the measures specific to PO1 (the mandatory use of RFC one-stop shops for all cross-border traffic, combined with a more advanced digitalisation of rail-related services and improved national planning systems). The main benefits, albeit very limited, are expected from an improvement of international (freight) services, resulting in slightly more optimised train paths and a reduction in cross-border waiting times. This is in line with the views expressed by stakeholders in interviews which have indicated expectations for improvement, although very limited, in PO1.

Step 5: The results on additional rail infrastructure capacity were calibrated and verified.

The outputs of this step, which are obtained using the TPS application, consist in the number of additional train paths and the punctuality improvements induced by each policy option.

The results of the policy options were cross checked to see if the magnitude of the effects with regard to additional train runs is in line with the respective results of the pre-assessment by experts, the relevant studies of RNE/FTE and other studies. The modelled decrease in transport time for the freight trains is slightly lower than shown by other studies, but as explained above this is connected and justified by the focus on

[241] As already explained above, unlike passenger, the majority of rail freight traffic cannot be planned on time for the annual timetable.

incorporating additional trains, resulting in some additional train stops for some train paths.

Step 6: The modelled results were extrapolated to estimate the effect on the entire EU rail network and over time, using also input from Eurostat and RMMS.

Three factors, explained in detail below, were used for deriving the results:

- The time frame, which is split into three time horizons (2030, 2040, 2050).
- The track type – more specifically the distinction between national single track, national double track and international/cross-border sections.
- The congestion status of the lines.

Step 7: The results of the TPS application in terms of increase in available train paths on congested sections of the network are used as input in the TRUST model, assuming that:

(i) additional available train paths are allocated both to passengers and freight transport;

(ii) the demand for additional rail paths fully matches the new supply, meaning that all additional train paths on congested sections of the rail network are fully exploited;

(iii) the additional trains running on congested sections will travel on routes extending beyond the congested section (bottleneck effect of congested sections).

In addition, improvements in punctuality from the TPS application are used as input in the TRUST model, in terms of reduction of travel time.

As a result, the TRUST model estimates the increase in passenger and freight transport activity in terms of train-kilometres. The model then converts the output expressed in train-kilometres into results expressed in passenger-kilometres and tonne-kilometres by taking into account occupancy rates and load factors for passenger and freight trains respectively.

Table 43: Summary of the results of the modelling of additional train paths in 2050 after the application of resistance factors

	Number of train paths	Baseline	PO4		PO3		PO2	
Single track	**Total by type / % increase comparted to baseline**	**83**	**126**	**52%**	**110**	**33%**	**100**	**20%**
	Passenger	46	46	0%	46	0%	46	0%
	local	*38*	*38*	*0%*	*38*	*0%*	*38*	*0%*
	long-distance	*8*	*8*	*0%*	*8*	*0%*	*8*	*0%*
	Freight	37	80	116%	64	73%	54	46%
	domestic	*16*	*16*	*0%*	*16*	*0%*	*16*	*0%*
	international	*21*	*64*	*205%*	*48*	*129%*	*38*	*81%*
	Planned speed	**69.4**	**77**	12%	**73**	5%	**73**	5%
	Passenger	74.3	74	0%	74	0%	74	0%
	local	*69.8*	*70*	*0%*	*70*	*0%*	*70*	*0%*

	Number of train paths	Baseline	PO4		PO3		PO2	
	long-distance	*95.6*	*96*	*0%*	*96*	*0%*	*96*	*0%*
	Freight	63.2	79	25%	72	14%	72	13%
	domestic	*55.1*	*73*	*33%*	*75*	*36%*	*73*	*33%*
	international	*69.4*	*81*	*16%*	*71*	*2%*	*71*	*2%*
Double track	**Number of train paths**	**660**	**691**	**5%**	**672**	**2%**	**662**	**0%**
	Passenger	547	547	0%	547	0%	547	0%
	local	*496*	*496*	*0%*	*496*	*0%*	*496*	*0%*
	long-distance	*51*	*51*	*0%*	*51*	*0%*	*51*	*0%*
	Freight	113	144	27%	125	11%	115	2%
	domestic	*13*	*13*	*0%*	*13*	*0%*	*13*	*0%*
	international	*100*	*131*	*31%*	*112*	*12%*	*102*	*2%*
	Planned speed	**72.9**	**73**	0%	**75**	2%	**75**	2%
	Passenger	74.0	74	0%	74	0%	74	0%
	local	*72.7*	*73*	*0%*	*73*	*0%*	*73*	*0%*
	long-distance	*86.6*	*87*	*0%*	*87*	*0%*	*87*	*0%*
	Freight	67.9	70	3%	77	13%	77	13%
	domestic	*59.4*	*72*	*21%*	*72*	*21%*	*72*	*21%*
	international	*69.0*	*70*	*1%*	*77*	*12%*	*78*	*13%*
Cross-border	**Number of train paths**	**776**	**860**	**11%**	**821**	**6%**	**796**	**3%**
	Passenger	595	595	0%	595	0%	595	0%
	local	*552*	*552*	*0%*	*552*	*0%*	*552*	*0%*
	long-distance	*43*	*43*	*0%*	*43*	*0%*	*43*	*0%*
	Freight	181	265	46%	226	25%	201	11%
	domestic	*54*	*54*	*0%*	*54*	*0%*	*54*	*0%*
	international	*127*	*211*	*66%*	*172*	*35%*	*147*	*16%*
	Planned speed	**59.1**	**61**	3%	**61**	2%	**60**	2%
	Passenger	56.8	57	0%	57	0%	57	0%
	local	*54.7*	*55*	*0%*	*55*	*0%*	*55*	*0%*
	long-distance	*83.8*	*84*	*0%*	*84*	*0%*	*84*	*0%*
	Freight	66.6	70	5%	70	6%	70	5%
	domestic	*57.7*	*66*	*14%*	*66*	*14%*	*66*	*14%*
	international	*70.4*	*71*	*1%*	*72*	*2%*	*71*	*2%*

Time frame for the extrapolation

As explained, all policy options are assumed to be implemented from 2025 onwards. However, depending on the policy option, a different timeframe for the full implementation of the policy measures included in the options is assumed. This means that the full effect of the measures included in the different policy options on the availability of additional infrastructure capacity is achieved at different points in time.

Table 44 summarises the assumptions used for the effects of the policy measures included in the options on the availability of the additional infrastructure capacity.

Table 44: Effects of the policy measures on the availability of the additional infrastructure capacity

	2030	2040	2050
PO1	100%	100%	100%
PO2	90%	100%	100%
PO3	80%	100%	100%
PO4	60%	90%	100%

Source: Ecorys et al. (2023), impact assessment support study

This means that, for example for PO4, only 60% of the benefits of the policy measures on the availability of additional infrastructure capacity will be realised by 2030. By 2050, the policy measures included in PO4 will have full effect on the availability of the additional infrastructure capacity as modelled with the TPS software application mentioned above.

The implementation schedule is based on stakeholders' consultation and expert opinion[242]. It reflects the fact that PO3 and PO4 include measures for the setting up of structures at EU level, the adoption of detailed rules and procedures, their continuous updating and improvement, in-depth performance monitoring and improvement, deployment of software applications, etc., which will take time to fully implement and lead to the expected benefits in full.

A more sophisticated approach with different implementation schedules for the different policy measures was also considered, but it would have resulted in a large number of scenarios with different implementation assumptions.

Type of line (single, double and international)

As explained above, each use case employed one of three types of lines: a single-track line, a double-track line and a cross-border line, with the latter featuring both double-track and single-track lines. The increase in the number of available train paths as well as the development of train speed was modelled for all three types of lines (i.e. the three use cases) and each policy option. To extrapolate the results to the European network, the increase in the number of available train paths had to be applied to the corresponding type of line.

Currently, no specific data is available indicating the transport volumes per type of line, i.e. transport volumes for single track, double track and cross-border per Member State. Using both Eurostat values as well as the figures provided in the 8th RMMS report[243], an estimation of the difference in traffic volumes was performed. The data for section-specific and country-specific network length was used as the starting point. However, the network length alone does not indicate the transport volume on the sections. Therefore, sample lines from each country were randomly selected to get an approximation of the network traffic density for single-track and double-track lines. Combining the network length with the traffic density allows for an estimation of the weighted single-track and

[242] For more information on the stakeholders' consultation, see Ecorys et al., (2023) impact assessment support study.

[243] https://transport.ec.europa.eu/transport-modes/rail/market/rail-market-monitoring-rmms_en

weighted double-track share for each country's rail volumes. Finally, the share of international traffic was derived directly from the RMMS figures.

Table 45: Shares of rail traffic volumes by section types and national/international, by country

Country	Weighted single track share	Weighted double track share	Share of international traffic	Share of national traffic
AT	34%	66%	79%	21%
BE	9%	91%	48%	52%
DK	29%	71%	94%	6%
ES	40%	60%	15%	85%
FI	76%	24%	37%	63%
FR	6%	94%	37%	63%
DE	31%	69%	42%	58%
EL	49%	51%	97%	3%
IE	58%	42%	0%	100%
IT	26%	74%	53%	47%
NL	15%	85%	84%	16%
PT	56%	44%	24%	76%
SE	64%	36%	39%	61%
BG	56%	44%	41%	59%
CY	-	-	-	-
CZ	60%	40%	64%	36%
EE	81%	19%	92%	8%
HU	69%	31%	82%	18%
LV	63%	37%	98%	2%
LT	56%	44%	78%	22%
MT	-	-	-	-
PL	33%	67%	39%	61%
RO	52%	48%	14%	86%
SI	52%	48%	98%	2%
SK	52%	48%	89%	11%
LU	22%	78%	74%	26%
HR	78%	22%	68%	32%
EU-27	**34%**	**66%**	**53%**	**47%**

Source: Ecorys et al. (2023), impact assessment support study. Note: international and national traffic are counted separately.

Congestion status

The congestion status determines to which extent the model results are applied to the matching network sections. The analysis assumed 3 types of congestion status for the sections of the network that influences the factor of the application of the model results: congested, highly utilised and non-congested.

In general, the support study concluded that there is very limited to no data available on the future status of congestion. For the extrapolation of direct impacts, assumptions had to be made that gave an estimation on the future status of congestion in different Member States. The assumptions used for the 3 types of congestion status (i.e. congested lines, highly utilised lines and non-congested lines) are described below.

Congested lines are defined in EU legislation[244], but the figures are underreported by infrastructure managers. Therefore, the support study used a broader definition of congested lines based on UIC's recommendations on maximum usage of rail infrastructure (over 110% of UIC's maximum recommended usage). For highly utilised lines the definition again employed UIC's recommendation with use rates of 85% - 110% of UIC's maximum recommended usage. The support study collected additional information from stakeholders on congestion, which allowed for a more realistic estimation of the length of the congested lines in 2030, 2040 and 2050.

The projected share of congested and highly utilised infrastructure for the whole EU network is 6.5%, 9.2% and 14.6% respectively in 2030, 2040 and 2050. In other words, congestion is expected to increase steadily until 2050 due to growing traffic and despite investments in rail infrastructure (including upgrades and new infrastructure).

For the congested share of the network, the model results of the matching section type were directly applied. This means that the congested lines (single, double or international) showed the same relative increase in train paths as the modelled ones (respectively for single, double or international lines).

For highly utilised network sections, only 80% of the increase in the availability of infrastructure capacity was considered. In other words, the additional capacity created by the policy measures in the different policy options was reduced by 20%. This number is based both on an expert assessment as well as on the comparison of network utilisation rates for congested and highly utilised lines according to UIC's recommendations. Additional capacity was also assigned to non-congested lines.

It was not possible to carry out the extrapolation using trains' origin-destination data, due to the lack of detailed data. Nevertheless, the bottleneck effect of congestion is taken into account in the extrapolation results. When relieving congestion on a part of the network, this also has a positive effect on the rest of the O/D route, since the total number of available train paths on that route is limited by the congested section.

To model this effect on a European level, it was decided to apply the findings of a study conducted by RISE ICT/SICS[245] that investigated the potential increase of capacity on a selected line without any other (negative) effects on timetabling or capacity allocation processes. The study concluded that the additional capacity amounts to 30%. Therefore, a factor of 0.3 is applied to the non-congested part of the network, meaning that the matching section type will receive 30% of the modelled additional capacity for the corresponding time frame.

4.1.2. Results

This section presents the modelling results regarding the number of train paths on the modelled sections/lines as well as the results of the extrapolation on European level for the different policy options. The results represent direct benefits for railway undertakings.

As explained above, 3 case studies were considered (each representing a different type of lines) and each having a different number and mix of trains (see Table 46).

[244] See Articles 3(20) and 47 of Directive 2012/34/EU. Stakeholders claim that infrastructure managers tend to underreport congestion.
[245] Aronsson, M. et. al.: *Uncovered capacity in Incremental Allocation* (2017).

Table 46: Number of daily train paths per train type and use case (basic variant of the timetable)

Train (path) type	Single track	Double track	Cross-border
Passenger	46	547	629
local	*38*	*496*	*586*
long-distance	*8*	*51*	*43*
Freight	37	113	198
domestic	*16*	*13*	*65*
international	*21*	*100*	*133*
Total	**83**	**660**	**827**

Source: Ecorys et al. (2023), impact assessment support study

Policy measures common for PO2, PO3 and PO4, most notably the strategic capacity planning (i.e., PM3, PM4 and PM5), change the way in which capacity is planned, allocated and coordinated. However, the options contain different measures on coordination and these differences have an effect on the number of available train paths, with PO4 having the highest impact due to employing a central entity at EU level with an operational/capacity overview, a neutral stakeholder independent decision-making power fully enabling the potential for maximising traffic by fully coordinating cross-border capacity allocation and other measures which enable an optimised capacity allocation.

The additional train paths are assumed to be generated by a more efficient, coordinated and/or harmonised infrastructure capacity planning and allocation. These capacity gains apply to the whole network and thus provide benefits for freight as well as for passenger services.

Table 47 provides the result of the modelling exercise producing different variants of the timetable with additional number of train paths for the three use cases and time horizons.

Table 47: Additional train paths per use case compared to the basic variant of the timetable

Policy Option	Use Case Model	2030	2040	2050
PO2	Single Track	17	17	17
	Double Track	2	2	2
	Cross Border	14	14	14
Total additional train paths PO 2		**33**	**33**	**33**
PO3	Single Track	19	27	27
	Double Track	11	16	16
	Cross Border	32	45	45
Total additional train paths PO 3		**62**	**88**	**88**
PO4	Single Track	22	34	43
	Double Track	16	25	31
	Cross Border	78	94	117
Total additional train paths PO 4		**116**	**153**	**191**

Source: Ecorys et al. (2023), impact assessment support study

In comparison to the basic variant of the timetable, the average number of train paths for 2030-2050 increases by roughly 10% for PO4, by 5% for PO3, by 2% for PO2 and by 0.2% for PO1. It must be kept in mind that the use cases in PO2, PO3 and PO4 are constructing a timetable for congested lines. Theoretically, the increase of the number of train paths offered on a line that is not congested could be much higher. However, as

explained above, the real-world effect of the policy options on the supply of train paths for freight on non-congested lines (with limited existing constraints for an extended offer) is much lower[246].

Since the policy options contain several measures, which mainly affect cross-border traffic, the effect on this model is higher. Unlike the single track and double track case studies, the cross-border case study contains a border with two different IMs on the two sides planning their national timetables independent from each other. While some cross-border trains have to wait for a long time in the baseline scenario due to bad coordination of the timetables between both IMs, the trains can cross the border fast with perfectly coordinated timetables in PO4.

As mentioned above, for the extrapolation of the results, a 0.8 factor was applied to highly utilised (but not congested) lines and a 0.3 factor was applied to the respective outputs of the use case models for each time horizon for the non-congested line. The full effect that was modelled in the use cases was used for congested lines. As the share of congested and highly utilised network increases steadily for the whole period analysed in the impact assessment (see assumption above), the effects of the policy options also increase with time. Using the model results outlined above as input, the extrapolation on EU level yields the following results for additional train paths at country level (see Table 48), measured as an increase in percentage points compared to the extrapolation of the basic variant of the modelled timetable for the three use cases to the whole EU rail network.

Table 48: Extrapolation of available train paths compared to the extrapolation of the basic variant of the timetable for the whole EU rail network

Policy Option	Member State	2030	2040	2050
PO2	AT	1.16%	1.25%	1.45%
	BE	1.48%	1.63%	1.73%
	DK	1.32%	1.46%	1.64%
	ES	2.80%	2.85%	4.39%
	FI	3.37%	3.47%	3.50%
	FR	0.89%	1.06%	1.20%
	DE	2.15%	2.33%	2.56%
	EL	0.77%	0.77%	0.77%
	IE	4.11%	4.11%	4.11%
	IT	1.40%	1.48%	1.81%
	NL	1.21%	1.31%	1.54%
	PT	3.99%	4.56%	4.56%
	SE	4.18%	4.30%	4.63%
	BG	2.34%	2.34%	2.34%
	CY	0.00%	0.00%	0.00%
	CZ	1.90%	1.90%	1.90%
	EE	1.04%	1.28%	1.30%
	HU	1.35%	1.40%	1.54%
	LV	0.76%	0.76%	0.88%
	LT	1.32%	1.32%	1.44%

[246] As mentioned above, a study conducted by RISE ICT/SICS concluded that a non-congested line can handle up to 30% of additional capacity without any conflicts in other timetabling elements.

Policy Option	Member State	2030	2040	2050
	MT	0.00%	0.00%	0.00%
	PL	1.54%	1.56%	1.60%
	RO	2.91%	2.91%	2.91%
	SI	0.75%	0.76%	0.89%
	SK	0.97%	0.97%	0.97%
	LU	0.89%	1.48%	1.48%
	HR	2.01%	2.01%	2.01%
	EU total	**1.72%**	**1.82%**	**2.01%**
PO3	AT	1.70%	2.56%	2.88%
	BE	2.08%	3.20%	3.56%
	DK	2.11%	3.30%	3.67%
	ES	3.34%	4.98%	5.85%
	FI	3.96%	5.75%	5.89%
	FR	1.38%	2.27%	2.66%
	DE	2.71%	4.23%	4.59%
	EL	1.31%	1.84%	1.84%
	IE	4.80%	6.86%	6.86%
	IT	1.85%	2.88%	3.26%
	NL	1.92%	2.92%	3.31%
	PT	3.99%	7.13%	7.13%
	SE	4.51%	7.27%	7.58%
	BG	2.86%	4.08%	4.08%
	CY	0.00%	0.00%	0.00%
	CZ	2.46%	3.51%	3.51%
	EE	1.59%	2.70%	2.81%
	HU	1.89%	2.75%	2.91%
	LV	1.30%	1.83%	2.11%
	LT	1.85%	2.63%	2.77%
	MT	0.00%	0.00%	0.00%
	PL	2.02%	2.89%	2.97%
	RO	3.41%	4.87%	4.88%
	SI	1.29%	1.84%	2.13%
	SK	1.51%	2.13%	2.13%
	LU	1.39%	2.53%	2.53%
	HR	2.57%	3.65%	3.65%
	EU total	**2.24%**	**3.40%**	**3.67%**
PO4	AT	2.16%	3.65%	5.12%
	BE	2.66%	4.61%	6.48%
	DK	2.72%	4.81%	6.71%
	ES	3.99%	6.76%	9.60%
	FI	4.63%	7.53%	9.67%
	FR	1.89%	3.47%	5.15%
	DE	3.34%	5.88%	7.98%
	EL	1.70%	2.70%	3.40%
	IE	5.69%	9.10%	11.38%
	IT	2.33%	4.08%	5.73%
	NL	2.48%	4.26%	6.04%

Policy Option	Member State	2030	2040	2050
	PT	4.54%	9.26%	11.58%
	SE	5.22%	9.56%	12.48%
	BG	3.41%	5.45%	6.83%
	CY	0.00%	0.00%	0.00%
	CZ	2.98%	4.78%	6.00%
	EE	2.01%	3.85%	5.04%
	HU	2.35%	3.83%	5.07%
	LV	1.69%	2.69%	3.91%
	LT	2.30%	3.68%	4.83%
	MT	0.00%	0.00%	0.00%
	PL	2.49%	4.01%	5.18%
	RO	4.02%	6.43%	8.06%
	SI	1.68%	2.71%	3.93%
	SK	1.92%	3.06%	3.85%
	LU	1.79%	3.55%	4.45%
	HR	3.09%	4.93%	6.18%
	EU total	**2.77%**	**4.73%**	**6.39%**

Source: Ecorys et al. (2023), impact assessment support study

The effect of the policy measures, aggregated at the level of policy options, on the availability of infrastructure capacity at EU level is provided in Table 49.

Table 49: Increase in available and usable capacity on the EU27 rail network in terms of train-km, relative to transport activity (train-km) in the baseline

	2030	2040	2050
PO1	0.2%	0.2%	0.2%
PO2	1.5%	1.8%	2.0%
PO3	2.6%	3.4%	3.7%
PO4	3.3%	5.3%	6.4%

Source: Ecorys et al. (2023), impact assessment support study

Estimating the value of the additional train paths for rail freight

The benefits from increases in capacity relative to the baseline are considered indirectly in the form of cost savings for RUs resulting from better operational conditions on congested parts of the network (sections and nodes): congestion on a line implies that the cost per train-km of operating additional trains on the line increase the closer a line is to saturation, i.e. the cost function is non-linear. Implementing measures increasing capacity on a line (such as the ones considered under this initiative) means that the cost of operating trains on congested lines will decrease for a constant volume of traffic (as the degree of capacity utilisation decreases). These costs savings have been considered as a proxy for the benefits of the additional capacity resulting from such measures, providing a lower limit of the value (utility) of additional train services to society at large (people and businesses). It is assumed that most of these benefits are passed through to the customers of rail transport services.

These cost savings occur on the congested and heavily utilised sections of the network. Categories of costs which are influenced by capacity increases on congested and highly utilised sections of the rail network are:

- personnel costs (e.g. train drivers)
- traction and energy costs
- cost of holding up capacity (vehicles).

The cost savings are estimated using the following steps:

1. Calculate the additional train kilometres resulting from the additional train paths produced by the policy measures.
2. Separate the rail network's congested and highly utilised parts for all options.
3. Estimate the changes in train operating costs induced by better capacity management. They are estimated at EUR 0.6 per train kilometre (without rail track charges)[247].
4. Weighing by performance weights taken from service quality analysis of the options (see the section below on the impacts on punctuality).
5. Deriving the cost savings for all years of the evaluation horizon.

The benefits from capacity increase for rail freight, expressed as present value over 2025-2050 relative to the baseline are provided in Table 50.

Table 50: Benefits from capacity increase for rail freight, expressed as present value over 2025-2050, in million EUR (2021 prices)

Option	PO1	PO2	PO3	PO4
Benefits from capacity increase	139.5	1 156.7	1 525.1	1 653.3[248]

Source: Ecorys et al. (2023), impact assessment support study

Estimating the value of the additional train paths for passenger rail

The quantification of benefits of passenger transport stemming from capacity increase is based on proxy calculations because a highly sophisticated approach using differentiated supply and demand data was not possible. As a way of proxy estimation, the calculation of benefits from capacity gains for passenger transport was based on a triangulation using information from two approaches:

1. Backcasting approach using the results for traffic shifted to rail from the modal split calculations
2. Direct estimation of the utility stemming from additional passenger trains using an implicit utility approach.

[247] The cost savings were estimated in a micro-study for 3 train types carried out as part of the modelling exercises for the timetable variants. A methodological study of BVU, TNS and KIT (2016) for the German Federal Transport Master Plan 2030 was also used in order to take into account different incremental costs for 3 different types of freight trains (single wagon, part block trains; full block trains and container trains).

[248] The lower figure for savings in PO4 compared to PO3 is connected to achieving 100% implementation and full impact later than in PO3. In an optimum case the implementation of the capacity relevant functions in the central entity are implemented in PO4 in the same timeframe as in PO3, and only some specific functions will be implemented later. Then the savings in PO4 would be at least equal to PO3, if not higher considering the complete period until 2050. However, a specific split for the implementation of different departments of the central entity was not modelled.

Approach 1 - Backcasting includes the following steps:

- Step 1: Use the data from the modelling of the impacts with the ASTRA model (in train-kilometres, passenger-kilometres) for the baseline and the four policy options
- Step 2: Calculate the differentials between of the values for each policy option vis-à-vis the baseline
- Step 3: Calculate the additional utilities by backward chaining.
- Step 4: Calculate the additional utilities of the policy options using the differentials of service parameters derived in the punctuality analysis (see the section below).
- Step 5: Develop tables with yearly time series and combine option results with measures.

Steps 1 and Step 2 used the changes in the passenger transport activity from the ASTRA model. Step 3 includes the backward chaining process of utility. This is based on the cost elasticity (% change of traffic relating to a 1% change of costs) and leads to the result that the additional utility can be measured by the ratio of additional traffic over the cost elasticity multiplied by the differential of the customers' average willingness to pay and the average price which they pay.

$U^{add} = \frac{\Delta q}{\varepsilon}$ (VOT-p)

U^{add} – additional utility

ε – cost elasticity of passenger transport (if possible, differentiated by shares of regional, national transport, differentiated by travel purposes; otherwise: average figures taken from a methodological study[249])

Δq – change in traffic in passenger km (value for policy option – baseline value)

p – price per passenger km

VOT – gross value of time/passenger km (assumed travel distance > 300 km)

Based on a literature review[250] an estimated VOT-p value of EUR 0.003 per passenger-kilometre was used for the calculations. This assumption that the value VOT-p is positive (it could in principle also be negative) is explained by the cost reductions achieved by the RUs and the increased market dynamics following from better prospects for new businesses on rail passenger transport in a market which is presently governed by incumbents.

Approach 2 - Direct estimation of the utility has been applied for achieving a higher certainty about the order of magnitude for the results of backcasting. The calculation process is described by the following steps:

[249] KCW, StatisticEye and HTC (2018): Gutachten zur Bestimmung der Elastizität der Nachfrage der Eisenbahnverkehrsunternehmen, Berlin.

[250] KCW, StatisticEye and HTC (2018): Gutachten zur Bestimmung der Elastizität der Nachfrage der Eisenbahnverkehrsunternehmen. Berlin. ITP, Planco und TUBS (2015): Grundsätzliche Überprüfung und Weiterentwicklung der Nutzen-Kosten-Analyse im Bewertungsverfahren der Bundesverkehrswegeplanung. München. PTV, TCI und H.U. Mann (2015): Methodenhandbuch zum Bundesverkehrswegeplan 2030. Karlsruhe. DLR und TTS (2022: Handlungsoptionen für eine ökologische Gestaltung der Transportmittelwahl im Güterfernverkehr. Berlin.

- Step 1: Use the data from the modelling of the impacts with the ASTRA model (in train-kilometres, passenger-kilometres) for the baseline and the four policy options
- Step 2: Calculate the differentials between of the values for each policy option vis-à-vis the baseline
- Step 3: Multiply the differentials by train-kilometres cost change according to the rule of the half
- Step 4: Multiply by the ratio of gross value added passenger over freight trains
- Step 5: Take result for PO4 as benchmark and differentiate the results for the other policy options according to the service parameters derived in the punctuality analysis (see the section below).
- Step 6: Allocate the yearly result for 2030, 2040 and 2050 to a full time profile.

Step 3 uses a similar approach compared to the measurement of the implicit utility of additional freight transport (see above). The cost differentials of passenger train-km are weighted by the ratio of gross value added for passenger over freight trains, taking the figures from the literature[251].

The benefits from capacity gains for passenger rail, expressed as present value over 2025-2050 relative to the baseline are provided in **Table 51**.

Table 51: Benefits from capacity increase for passenger rail, expressed as present value over 2025-2050, in million EUR (2021 prices)

	PO1	PO2	PO3	PO4
Benefits from capacity increase	102.6	824.3	1 050.6	1 105.8

Source: Ecorys et al. (2023), impact assessment support study

The results of application of approach (2) yields a benefit of around EUR 1 238 million, i.e. the benefits are estimated to be about 12% higher. For the purpose of the impact assessment, a conservative approach - approach (1) – has been used.

4.2. Impacts on train punctuality

4.2.1. Increase in punctuality of freight and passenger rail traffic

The impacts on punctuality were estimated using assumptions on the effect of the policy measures and data from RMMS and RFC performance reports on punctuality. The effects on punctuality were classified as high, medium and low, with each category having a different factor to calibrate the effect of the measures.

The punctuality data identifies 18 delay reasons. They are classified in 3 categories:

- delays due to systematic mismatch (capacity planning and allocation phase),
- delays on the main line (operational delays) and
- delays in the first/last mile of train operations (including terminals and shunting yard operations).

The following steps were followed:

Step 1: Derive base figures for punctuality

[251] BNetzA (2021): Marktuntersuchung Eisenbahnen 2020. Berlin. Section 1.3.2.

- Calculate aggregated punctuality figures per region (northern Europe, central and eastern Europe, western Europe and southern Europe)
- Derive weighted punctuality share per region on the basis of national punctuality figures
- Derive weighted share of 'Systematic Mismatch' per region
- Calculate the relative influence of first and last-mile delays on freight punctuality
- Derive punctuality improvement figures for the different delay reasons and for each region
- Derive weighted punctuality share per region

Step 2: Assess the delay reasons and their influence on delays

Step 3: Estimate the impact of policy measures on these delay reasons

Step 4: Adjust the impact based on limited growth modelling and the implementation schedule

The calculations assumed that 50% of the trains that are delayed at the end of a transport run would also cause delays at the start of the next transport run. This assumption resulted in secondary delay[252] calculations, which were checked against and were in line with existing data from the RFC performance reports. Secondary delays reflect the fact that not only are trains with a delayed arrival exposed to being delayed at their next departure, but also that a delayed arrival has negative effects on the overall network (such as insufficient terminal capacity to handle the peaks that are due to deviations in arrival times) that then results in delayed arrivals.

The calculations present results for changes in punctuality for passenger and freight trains in 2030, 2040 and 2050, reflecting the assumption that some measures would need more time to be fully implemented.

The estimations attempt to take into account the future developments that would influence rail punctuality both positively and negatively. These include:

- The implementation of the proposed revision of the TEN-T Regulation and other (accompanying) infrastructure construction works;
- The gradual and comprehensive digitalisation of rail-related services in Europe;
- The increase in volume for freight, as outlined in the baseline, leading to big operational challenges.

The development of a fully-fledged baseline on punctuality would face a number of difficulties and uncertainties (e.g. most of the investment decisions are taken either by national/regional governments or private companies and are difficult to predict). Instead expert assumptions were used that punctuality will deteriorate by 1% in 2030 and then improve by 5 and 10%, in 2040 and 2050 respectively. The baseline projections for punctuality are provided in section 2.2. These estimates were used in a limited growth model to calculate the changes in the effectiveness of the policy measures that correlate with a change in the baseline punctuality value. The policy measures' effectiveness is in

[252] Secondary delays are delays caused by reasons that lie outside the transport run and are instead caused by other delays on the network. While these secondary delays cannot be directly impacted by the policy measures, an improvement of the primary delay causes reduces the effect of these delays on the network, and thus reduces secondary delays.

reverse relation to the baseline value. The impacts on train punctuality in terms of increase of the percentage of punctual trains is presented below.

Table 52: Impacts of policy options on train punctuality, values are the increase in the share of punctual trains in percentage points relative to the baseline, for freight rail

Development punctuality: freight				
Region	**Punctuality PO1**	**Punctuality PO2**	**Punctuality PO3**	**Punctuality PO4**
Northern Europe	4.7%	10.1%	12.5%	14.1%
Central and eastern Europe	15.2%	24.1%	32.0%	37.4%
Southern Europe	12.3%	14.0%	20.3%	24.4%
Western Europe	7.4%	15.8%	19.7%	22.3%
Europe total	**9.7%**	**17.2%**	**22.2%**	**25.6%**

Source: Ecorys et al. (2023), impact assessment support study

Table 53: Impacts of policy options on train punctuality, values are the increase in the share of punctual trains in percentage points relative to the baseline, for passenger rail

Development punctuality: passenger				
Region	**Punctuality PO1**	**Punctuality PO2**	**Punctuality PO3**	**Punctuality PO4**
Northern Europe	0.5%	2.0%	3.2%	3.4%
Central and eastern Europe	0.8%	3.6%	5.8%	6.4%
Southern Europe	0.7%	3.6%	5.7%	6.5%
Western Europe	0.4%	2.8%	4.7%	5.2%
Europe total	**0.5%**	**3.0%**	**4.9%**	**5.4%**

Source: Ecorys et al. (2023), impact assessment support study

4.2.2. Operational cost savings for railway undertakings

The improvements in punctuality were also calculated as time saved, which allowed for calculating cost savings for RUs. Time savings will have a positive effect on other stakeholders as well, but the assumption is that the biggest effect will be on railway undertakings.

The reduction in delay minutes relate to the baseline in 2030, 2040 and 2050. The figures for 2020 are presented to illustrate the scale of the reduction.

Table 54: Reduction in delay minutes for freight rail in the policy options relative to the baseline in 2030, 2040 and 2050

Saved delay minutes: freight						
Region	**Country**	**Delay minutes: 2020**	**Punctuality improvement PO1**	**Punctuality improvement PO2**	**Punctuality improvement PO3**	**Punctuality improvement PO4**
Northern Europe	DK	97 225	4 544	9 774	12 134	13 732
	EE	8 062	377	810	1 006	1 139
	LV	32 819	1 534	3 299	4 096	4 635
	LT	5 255	246	528	656	742
	FI	173 214	8 095	17 412	21 618	24 464
	SE	527 549	24 653	53 032	65 842	74 510

Saved delay minutes: freight						
Region	**Country**	**Delay minutes: 2020**	**Punctuality improvement PO1**	**Punctuality improvement PO2**	**Punctuality improvement PO3**	**Punctuality improvement PO4**
	NO	77 430	3 618	7 784	9 664	10 936
	Total	**921 554**	**43 066**	**92 640**	**115 016**	**130 158**
Central and eastern Europe	SI	425 793	64 666	102 530	136 187	159 437
	SK	512 982	77 908	123 525	164 074	192 085
	HR	258 025	39 187	62 132	82 528	96 617
	RO	446 421	67 799	107 497	142 785	167 161
	BG	153 155	23 260	36 879	48 986	57 348
	HU	760 185	115 451	183 051	243 140	284 649
	CZ	1 211 475	183 990	291 721	387 483	453 633
	PL	2 695 426	409 361	649 053	862 115	1 009 294
	Total	**6 463 462**	**981 621**	**1 556 389**	**2 067 297**	**2 420 223**
Southern Europe	EL	38 625	4 748	5 422	7 834	9 426
	IT	1 426 424	175 338	200 240	289 295	348 093
	PT	179 575	22 074	25 209	36 420	43 822
	ES	118 904	14 616	16 692	24 115	29 016
	Total	**1 763 528**	**216 776**	**247 563**	**357 664**	**430 357**
Western Europe	AT	524 123	38 841	83 007	103 343	116 931
	BE	158 121	11 718	25 042	31 177	35 277
	FR	1 000 664	74 156	158 479	197 304	223 247
	DE	5 630 876	417 287	891 781	1 110 258	1 256 239
	IE	638	47	101	126	142
	LU	10 173	754	1 611	2 006	2 270
	NL	39 760	2 947	6 297	7 840	8 870
	CH	288 442	21 376	45 682	56 873	64 351
	Total	**7 652 797**	**567 125**	**1 212 000**	**1 508 927**	**1 707 326**
Total	**16 801 342**		**1 808 588**	**3 108 591**	**4 048 904**	**4 688 065**

Source: Ecorys et al. (2023), impact assessment support study

Table 55: Reduction in delay minutes for freight rail in the policy options relative to the baseline in 2030, 2040 and 2050

Saved delay minutes: passenger						
Region	**Country**	**Delay minutes: 2020**	**Punctuality improvement PO1**	**Punctuality improvement PO2**	**Punctuality improvement PO3**	**Punctuality improvement PO4**
Northern Europe	DK	395 518	1 801	7 717	12 475	13 504
	EE	5 387	25	105	170	184
	LV	5 242	24	102	165	179
	LT	28 027	128	547	884	957
	FI	128 574	585	2 508	4 055	4 390
	SE	1 109 785	5 052	21 652	35 004	37 891
	NO	309 047	1 407	6 030	9 748	10 552

Saved delay minutes: passenger						
Region	**Country**	**Delay minutes: 2020**	**Punctuality improvement PO1**	**Punctuality improvement PO2**	**Punctuality improvement PO3**	**Punctuality improvement PO4**
	Total	**1 981 581**	**9 021**	**38 661**	**62 501**	**67 656**
Central and eastern Europe	SI	182 564	1 523	6 529	10 555	11 643
	SK	368 132	3 072	13 165	21 284	23 478
	HR	194 319	1 622	6 949	11 235	12 393
	RO	1 841 703	15 368	65 864	106 481	117 458
	BG	106 585	889	3 812	6 162	6 798
	HU	1 603 414	13 380	57 342	92 704	102 261
	CZ	1 353 811	11 297	48 416	78 272	86 342
	PL	1 116 390	9 316	39 925	64 546	71 200
	Total	**6 766 918**	**56 467**	**242 003**	**391 238**	**431 572**
Southern Europe	EL	47 320	343	1 716	2 717	3 060
	IT	3 526 956	25 578	127 890	202 492	228 070
	PT	244 205	1 771	8 855	14 020	15 791
	ES	818 424	5 935	29 677	46 988	52 923
	Total	**4 636 905**	**33 627**	**168 137**	**266 217**	**299 844**
Western Europe	AT	576 107	2 476	16 093	27 234	29 710
	BE	787 133	3 383	21 988	37 210	40 593
	FR	2 885 383	12 400	80 601	136 401	148 801
	DE	9 222 141	39 633	257 612	435 959	475 592
	IE	79 322	341	2 216	3 750	4 091
	LU	108 617	467	3 034	5 135	5 601
	NL	584 066	2 510	16 315	27 611	30 121
	CH	946 109	4 066	26 429	44 725	48 791
	Total	**15 188 877**	**65 275**	**424 288**	**718 026**	**783 301**
Total	**28 574 281**		**164 391**	**873 089**	**1 437 982**	**1 582 373**

Source: Ecorys et al. (2023), impact assessment support study

For rail freight, the methodology for estimating cost savings due to improvements in punctuality included the following steps and assumptions:

Step 1: Estimate the economic value of delays:

- Taking data from studies in Germany as reference[253];
- The values of delay are derived from surveys and statistical analysis for different commodity groups.
- Purchasing power parities (Eurostat) are applied for adjusting to country price conditions and estimate the values of delay in all Member States.

Step 2: Establish the future commodity mix over the next decades[254]

[253] PTV, TCI und H.-U. Mann (2015): Methodenhandbuch zum Bundesverkehrswegeplan 2030. Freiburg and BVU und TNS Infratext (2016); Entwicklugn eines Modells zur Berechnung von modalen Verlagerungen im Güterverkehr für die Ableitung konsistenter Bewertungsansätze für die Bundesverkehrswegeplanung. Freiburg.

- Use data on present shares of transported commodities
- Estimate the decrease in the transport volumes until 2050, more specifically of traditional train cargo goods, as coal and other fossil fuels will be phased out (in line with the European Green Deal).
- Estimate the commodity groups to be gained by railway transport, which are currently not transported by rail.
- Determine the composition of future commodity mix.

Step 3: Derive average values of delay per wagon-minute.

Step 4: Match values of delay, PPP and delay minutes for all policy options.

Step 5: Calculate costs savings for 2030, 2040 and 2050 and applying linear interpolation for the years in-between.

Delays are available per train, so for freight 30 wagons per trains were assumed.

Cost savings for freight RUs, expressed as present value over 2025-2050 relative to the baseline are provided in **Table** .

Table 56: Benefits from punctuality/reliability gains for freight rail, expressed as present value over 2025-2050, in million EUR (2021 prices)

Option	PO1	PO2	PO3	PO4
Benefits from punctuality/reliability gains	53.4	407.5	509.8	520.3

Source: Ecorys et al. (2023), impact assessment support study

For passenger rail, the methodology for estimating cost savings due to improvements in punctuality included the following steps and assumptions:

Step 1: Estimate the average number of passengers per train for all Member States using statistics on train-km and passenger-km and the number of passengers as a proxy.

Step 2: Estimate the share of passenger category per travel purposes (work, leisure, etc.[255]).

Step 3: Estimate the willingness-to-pay using value of travel figures from literature for the different categories of travel purposes[256].

Step 4: Weigh the willingness to pay for the different categories with PPP to reflect income differences between Member States.

[254] The estimates were based on expert opinion and the following studies: Umweltbundesamt (2022): Handlungsoptionen für eine ökologische Gestaltung der Transportmittelwahl im Güterfernverkehr, UBA Texte 50/22; Umweltbundesamt (2022): Handlungsoptionen für eine ökologische Gestaltung der Langstreckenmobilität im Personen- und Güterverkehr. UBA Texte 52/22.

[255] Using the study PTV, TCI und H.-U. Mann (2015): Methodenhandbuch zum Bundesverkehrswegeplan 2030, Freiburg.

[256] Values taken from the study BVU und TNS Infratext (2016); Entwicklugn eines Modells zur Berechnung von modalen Verlagerungen im Güterverkehr für die Ableitung konsistenter Bewertungsansätze für die Bundesverkehrswegeplanung, Freiburg.

Step 5: Calculate costs savings for 2030, 2040 and 2050 and applying linear interpolation for the years in-between.

Cost savings for passenger RUs, expressed as present value over 2025-2050 relative to the baseline are provided in **Table 57**.

Table 57: Benefits from punctuality/reliability gains for passenger rail, expressed as present value over 2025-2050, in million EUR (2021 prices)

Option	PO1	PO2	PO3	PO4
Benefits from punctuality/reliability gains	19.3	93.8	148.2	144.7

Source: Ecorys et al. (2023), impact assessment support study

4.3. Impacts on temporary capacity restrictions

Temporary capacity restrictions (TCRs) are a major issue for rail. A number of policy measures address the problem. The estimation of their impact is focused on identifying the scale of the effects. Providing a more detailed estimate, which would include estimates of cost savings for the different stakeholders, is not possible due to lack of sufficient data on costs (for IMs, RUs, etc.) and implemented versus planned works.

The analysis included the following steps:

Step 1: Identify the share of international traffic using RMMS figures and provide average values for 4 regions (northern Europe, central and eastern Europe, southern Europe and western Europe). Some measures focus on cross-border coordination and thus have a bigger effect on cross-border traffic.

Step 2: Use the number and duration of existing TCRs (over 16 500 cases collected by RFCs) to establish 3 categories of works depending on their impact: high, medium and low. Each of those 3 categories results in a different combination of 4 outcomes (cancellations; re-routings; operative disruptions, which still allow trains to use the regular route; no impact on the trains).

Step 3: Assign an impact factor (using 4 categories: high, medium, low and no impact) for each policy measure on each of the four possible outcomes from the TCRs.

Step 4: Calculate the impact from the different policy measures on freight and passenger and sum up the effects per policy option.

The overall result indicates the potential effect (positive or negative) that the measures can have expressed in percentage terms. It was not possible to translate this effect into physical units (e.g. reduction in number of cancelled trains, train kilometres saved from avoided or improved re-routing, etc.), as such an analysis would be very complex and would require voluminous data. Consequently, it was also not possible to monetise the positive effect of the measures, even though it is clear that they can result in considerable cost savings for RUs (e.g. by reducing the number of cancelled trains), but also for other stakeholders.

Table 58: Potential effect of the policy options on the TCR for total rail

Development TCR impact: total				
Region	**TCR impact PO1**	**TCR impact PO2**	**TCR impact PO3**	**TCR impact PO4**
Northern Europe	-4.9%	-13.1%	-16.7%	-17.5%
Central and eastern Europe	-6.3%	-11.9%	-16.3%	-16.5%
Southern Europe	-5.4%	-11.2%	-14.6%	-15.2%
Western Europe	-5.8%	-11.6%	-15.6%	-15.9%
Europe total	**-5.8%**	**-11.8%**	**-15.8%**	**-16.1%**

Source: Ecorys et al. (2023), impact assessment support study

Some policy measures have a bigger impact on cross-border traffic, which is predominantly freight, hence the results differ between passenger and freight.

Table 59: Potential effect of the policy options on the TCR for rail freight

Development TCR impact: freight				
Region	**TCR impact PO1**	**TCR impact PO2**	**TCR impact PO3**	**TCR impact PO4**
Northern Europe	-8.1%	-14.4%	-20.0%	-20.6%
Central and eastern Europe	-9.6%	-13.2%	-18.9%	-18.9%
Southern Europe	-9.1%	-12.5%	-17.6%	-18.0%
Western Europe	-9.5%	-13.0%	-18.5%	-18.6%
Europe total	**-9.3%**	**-13.2%**	**-18.7%**	**-18.8%**

Source: Ecorys et al. (2023), impact assessment support study

Table 60: Potential effect of the policy options on the TCR for passenger rail

Development TCR impact: passenger				
Region	**TCR impact PO1**	**TCR impact PO2**	**TCR impact PO3**	**TCR impact PO4**
Northern Europe	-4.1%	-12.8%	-15.8%	-16.7%
Central and eastern Europe	-5.0%	-11.4%	-15.3%	-15.5%
Southern Europe	-4.7%	-11.0%	-14.1%	-14.7%
Western Europe	-5.0%	-11.3%	-15.0%	-15.3%
Europe total	**-4.9%**	**-11.4%**	**-15.1%**	**-15.4%**

Source: Ecorys et al. (2023), impact assessment support study

4.4. Impacts on the reliability of rail transport services

The approach to estimating the impacts of the policy measures on reliability is similar to the one for TCRs. The differences come from the nature of the challenges to reliability, which for the purpose of the impact assessment are considered to be incidents. This adds an additional dimension, namely the probability of such an incident.

Step 1: Identify the share of international traffic using RMMS figures and provide average values for 4 regions (northern Europe, central and eastern Europe, southern Europe and western Europe). Some measure focus on cross-border coordination and thus have a bigger effect on cross-border traffic.

Step 2: Use data from RNE on the sections (both directions) Vienna-Bruck; Divaca–Koper; Vienna-Bratislava to establish assumptions for the:

- Type of incidents;
- Effect of incidents on traffic (the effect being expressed in 4 outcomes: cancellations; re-routings; operative disruptions, which still allow trains to use the regular route; no impact on the trains);
- Number of affected trains per day on a line where a certain type of incident might occur: for example, the data showed that low-impact incidents are often caused by people (overcrowded trains, bomb warnings on large train stations, suicides, etc.) and are more likely to happen on network sections with a higher transport volume. Weather-related incidents (e.g. freezing temperatures) happen indiscriminately of the train volume.

Step 3: Apply probability factors on the occurrence of the different types of incidents for the 4 different regions.

Step 4: Assign an impact factor (using 4 categories: high, medium, low and no impact) for each policy measure on each of the four possible outcomes from the incidents.

Step 5: Calculate the impact from the different policy measures on freight and passenger and sum up the effects per policy option.

Similar to the case of estimating the impact of policy measures on TCRs, the overall result indicates the potential effect (positive or negative) that the measures can have expressed in percentage terms. It was not possible to translate this effect into physical units (e.g. reduction in number of cancelled trains, train kilometres saved from avoided or improved re-routing, etc.), as such an analysis would be very complex and would require voluminous data. Consequently, it was also not possible to monetise the positive effect of the measures, even though it is clear that they can result in cost savings for many stakeholder groups.

Table 61: Potential effect of the policy options on the reliability: total rail

Total				
Region	**Incident impact PO1**	**Incident impact PO2**	**Incident impact PO3**	**Incident impact PO4**
Northern Europe	-1.9%	-2.6%	-5.5%	-17.8%
Central and eastern Europe	-2.1%	-2.7%	-5.9%	-18.5%
Southern Europe	-1.6%	-2.4%	-4.9%	-16.2%
Western Europe	-1.9%	-2.5%	-5.4%	-17.6%
Europe total	**-1.93%**	**-2.55%**	**-5.51%**	**-17.70%**

Source: Ecorys et al. (2023), impact assessment support study

Incidents tend to impact freight more than passenger traffic due to the longer routes of freight trains. Therefore, the impacts were estimated separately.

Table 62: Potential effect of the policy options on the reliability: freight rail

Freight

Region	Freight rail traffic (million train km)	%	Incident impact PO1	Incident impact PO2	Incident impact PO3	Incident impact PO4
Northern Europe	75.82	10.1%	-2.5%	-5.3%	-9.0%	-22.0%
Central and eastern Europe	194.57	26.0%	-2.5%	-5.1%	-8.8%	-22.2%
Southern Europe	78.75	10.5%	-2.5%	-5.9%	-9.5%	-21.6%
Western Europe	398.11	53.3%	-2.5%	-5.3%	-9.0%	-22.0%
Europe total	**747.25**	**100.0%**	**-2.51%**	**-5.28%**	**-9.00%**	**-22.03%**

Source: Ecorys et al. (2023), impact assessment support study

Table 63: Potential effect of the policy options on the reliability: passenger rail

Passenger						
Region	**Pax rail traffic (million train km)**	**%**	**Incident impact PO1**	**Incident impact PO2**	**Incident impact PO3**	**Incident impact PO4**
Northern Europe	287.39	9.8%	-1.8%	-1.8%	-4.6%	-16.7%
Central and eastern Europe	508.62	17.4%	-1.9%	-1.9%	-4.8%	-17.1%
Southern Europe	429.67	14.7%	-1.5%	-1.8%	-4.1%	-15.2%
Western Europe	1 694.50	58.0%	-1.8%	-1.8%	-4.6%	-16.6%
Europe total	**2 920.19**	**100.0%**	**-1.78%**	**-1.85%**	**-4.62%**	**-16.60%**

4.5. Impacts on rail transport activity per policy option

This section shows the impacts of the policy options on rail transport activity, by Member State. The estimation is based on the ASTRA model and is linked to the quantification of direct impacts.

The assessment of the impacts per policy options is based on the following assumptions:

- All additional available train paths are entirely allocated to passenger and freight transport.
- The demand for additional rail paths fully matches the new supply, meaning that all additional train paths result in additional traffic.

The impacts of the policy options on the rail freight activity in terms of train-km at EU level is presented in Table 64.

Table 64: Impacts of the policy options on rail freight activity in terms of train-km at EU level, relative to the baseline

	2020	2030	2040	2050
Baseline (million train-km)	746	1 228	1 448	1 633
% changes to the baseline				
PO1		0.2%	0.2%	0.2%
PO2		1.7%	1.9%	2.2%
PO3		2.7%	3.6%	3.9%
PO4		3.5%	5.6%	6.7%

Source: Ecorys et al. (2023), impact assessment support study

The impacts of the policy options on the passenger rail activity in terms of train-km at EU level is presented in Table 65.

Table 65: Impacts of the policy options on passenger rail activity in terms of train-km at EU level

	2020	2030	2040	2050
Baseline (million train-km)	2 588	3 328	4 109	4 590
% changes to the baseline				
PO1		0.2%	0.2%	0.2%
PO2		1.7%	2.0%	2.3%
PO3		2.8%	3.8%	4.0%
PO4		3.6%	5.9%	7.0%

Source: Ecorys et al. (2023), impact assessment support study

The impacts of the policy options on rail freight activity in tonnes-kilometres, by Member State, relative to the baseline are provided in Table 66 to Table 69.

Table 66: Impacts of PO1 on rail freight activity (expressed in tonne-km) – percentage changes relative to the baseline

	Rail freight activity (% change to the baseline)		
	2030	2040	2050
AT	0.1%	0.2%	0.3%
BE	0.4%	0.5%	0.8%
DK	0.2%	0.4%	0.5%
ES	0.1%	0.1%	0.2%
FI	0.1%	0.1%	0.1%
FR	0.1%	0.1%	0.2%
DE	0.2%	0.3%	0.4%
EL	0.4%	0.4%	0.4%
IE	5.3%	2.6%	2.0%
IT	0.1%	0.1%	0.2%
NL	0.4%	0.6%	0.7%
PT	0.1%	0.1%	0.1%
SE	0.2%	0.4%	0.4%
BG	0.1%	0.1%	0.1%
CZ	0.1%	0.1%	0.1%
EE	0.3%	1.0%	1.2%
HU	0.0%	0.0%	0.1%
LV	0.1%	0.2%	0.3%
LT	0.3%	0.5%	0.6%
PL	0.1%	0.1%	0.1%
RO	0.0%	0.0%	0.0%
SI	0.1%	0.2%	0.2%
SK	0.1%	0.1%	0.1%
LU	0.5%	0.5%	0.7%
HR	0.1%	0.1%	0.3%
EU level	0.1%	0.2%	0.3%

Source: Ecorys et al. (2023), impact assessment support study

Table 67: Impacts of PO2 on rail freight activity (expressed in tonne-km) – percentage changes relative to the baseline

	Rail freight activity (% change to the baseline)		
	2030	2040	2050
AT	1.4%	1.5%	1.6%
BE	2.1%	2.4%	2.6%
DK	4.1%	5.0%	5.0%
ES	2.6%	3.5%	4.0%
FI	3.4%	3.5%	3.9%
FR	1.4%	1.5%	1.8%

	Rail freight activity (% change to the baseline)		
	2030	2040	2050
DE	2.0%	2.2%	2.5%
EL	3.4%	4.3%	5.5%
IE	5.4%	2.8%	2.3%
IT	1.7%	2.0%	2.5%
NL	2.1%	2.3%	3.0%
PT	2.0%	3.3%	4.6%
SE	4.1%	5.1%	5.0%
BG	1.9%	1.8%	3.4%
CZ	1.9%	2.2%	2.2%
EE	1.1%	2.7%	2.7%
HU	1.2%	1.4%	1.6%
LV	0.4%	0.5%	0.7%
LT	0.9%	1.3%	1.6%
PL	1.5%	1.7%	1.8%
RO	1.8%	2.6%	2.7%
SI	1.6%	1.9%	1.9%
SK	1.5%	1.7%	1.7%
LU	3.0%	2.4%	2.7%
HR	3.1%	4.1%	5.4%
EU level	1.8%	2.1%	2.4%

Source: Ecorys et al. (2023), impact assessment support study

Table 68: Impacts of PO3 on rail freight activity (expressed in tonne-km) – percentage changes relative to the baseline

	Rail freight activity (% change to the baseline)		
	2030	2040	2050
AT	2.4%	3.0%	3.2%
BE	3.3%	4.5%	5.1%
DK	5.0%	8.0%	8.0%
ES	4.9%	6.5%	6.8%
FI	4.3%	4.7%	6.5%
FR	2.8%	2.9%	3.3%
DE	3.3%	4.3%	4.5%
EL	3.9%	5.1%	6.7%
IE	5.5%	3.1%	2.6%
IT	3.6%	3.5%	4.7%
NL	3.6%	3.9%	5.8%
PT	2.2%	3.6%	5.0%
SE	4.8%	7.8%	7.5%
BG	2.0%	1.7%	4.5%
CZ	2.6%	3.7%	3.7%
EE	1.1%	2.7%	3.2%
HU	1.5%	1.9%	2.8%
LV	0.4%	0.6%	0.8%
LT	0.9%	1.3%	1.7%
PL	2.0%	2.7%	3.0%
RO	1.9%	2.8%	3.0%
SI	2.1%	2.9%	3.7%
SK	1.9%	2.7%	3.0%
LU	4.4%	3.7%	4.1%
HR	3.3%	4.4%	7.8%
EU level	2.7%	3.6%	4.0%

Source: Ecorys et al. (2023), impact assessment support study

Table 69: Impacts of PO4 on rail freight activity (expressed in tonne-km) – percentage changes relative to the baseline

	Rail freight activity (% change to the baseline)		
	2030	2040	2050
AT	2.5%	3.9%	4.8%
BE	3.4%	5.6%	7.8%
DK	6.9%	10.7%	13.0%
ES	5.1%	10.8%	14.4%
FI	5.6%	8.2%	9.8%
FR	2.9%	5.1%	7.9%
DE	4.1%	6.7%	8.0%
EL	3.9%	6.7%	10.8%
IE	5.6%	3.9%	3.8%
IT	3.6%	2.9%	9.4%
NL	3.6%	4.4%	9.8%
PT	2.3%	4.9%	7.3%
SE	5.9%	10.3%	11.9%
BG	2.0%	2.0%	6.1%
CZ	3.0%	4.9%	5.6%
EE	1.2%	3.2%	4.0%
HU	1.6%	2.4%	2.8%
LV	0.4%	0.7%	1.0%
LT	1.0%	1.6%	2.2%
PL	2.7%	4.0%	4.9%
RO	2.7%	4.2%	3.8%
SI	2.1%	3.4%	5.5%
SK	2.0%	3.4%	4.2%
LU	4.4%	5.2%	7.1%
HR	3.3%	5.5%	13.2%
EU level	3.3%	5.2%	6.7%

Source: Ecorys et al. (2023), impact assessment support study

4.6. Sensitivity analysis

It should be noted however that there is high uncertainty regarding the estimates of the impacts of the policy measures on infrastructure capacity are described in section 4.1 of this Annex. As explained in section 8.4 of the impact assessment, there are two main factors that create uncertainty: the higher level of complexity and ambition of a policy option and the effectiveness of the coordination between infrastructure managers and ENIM regarding traffic that goes both on TEN-T lines and the rest of the network.

Section 8.4 of the impact assessment presents the assumptions and the effect of the uncertainty on the estimates of available capacity for all POs, as well as the effect on the direct benefits for POs 3 and 4. The latter two were selected as they had the highest benefit to cost ratio.

It should be noted that these have a relatively high impact on the benefits of the POs (both direct and indirect), but a relatively limited impact on the cost estimates. The latter is due to the fact that the cost of most policy measures are not directly dependent on traffic. The reason is that many of the measures concern the establishment of new rules and procedures and setting up the necessary structures to ensure their implementation. Only PM21 (included in POs 3 and 4) and PM22 (included in PO4) depend on traffic volumes, as these PMs cover activities related to coordinating and planning traffic.

The results of the sensitivity analysis on freight transport activity for POs 3 and 4 (upper bounds and lower bounds) are presented in the tables below, and compared to the central value estimates.

The results of the sensitivity analysis on the available capacity were used to analyse the effect of the uncertainty on the direct benefits. This analysis was only carried out for POs 3 and 4, which have the highest benefit to cost ratios as shown in section 7.2.

Table 70: Direct benefits stemming from the additional freight and passenger capacity for sensitivity analysis on PO3 and PO4, expressed as present value over 2025-2050 relative to the baseline, in EUR million (in 2021 prices)

	Policy option 3			Policy option 4		
	Lower bound	Central value	Upper bound	Lower bound	Central value	Upper bound
Direct benefits from a capacity increase – freight	1 148.1	1 525.1	1 606.7	916.2	1 653.3	1 845.2
Direct benefits from a capacity increase - passenger	541.9	1 050.6	1 157.7	570.1	1 105.8	1 219.0
Total	1 690.0	2 575.7	2 764.4	1 486.3	2 759.1	3 064.2

Ecorys et al. (2023), impact assessment support study

The sensitivity analysis shows that PO4 results in considerably lower direct benefits (increase of capacity) for the lower bound (even below the lower bound of PO3) compared to the central value, whereas PO3 shows lower degree of uncertainty.

The impact of the available capacity on the external costs under the upper and lower bound cases is shown in the table below.

Table 71: Reduction in external costs, expressed as present value over 2025-2050 compared to the baseline, in EUR million (2021 prices) (UB – upper bounds; LB – lower bounds; CV – central value)

External cost	CO2	Air pollutants	Fatalities and injuries	Road congestion	Total
Policy option 3 - UB	3 416	709	2 945	2 490	9 559
Policy option 3 - CV	3 309	681	2 802	2 375	9 167
Policy option 3 - LB	2 404	487	2 100	1 770	6 762
Policy option 4 - UB	5 417	1 132	4 632	3 888	15 069
Policy option 4 - CV	4 979	1 027	4 194	3 531	13 730
Policy option 4 - LB	2 534	527	2 177	1 825	7 064

Source: Ecorys et al. (2023), impact assessment support study

Similar to the effects on the direct impacts, the effect on external costs is most noticeable for the lower bound of PO4.

ANNEX 5: DATA AND INFORMATION ABOUT THE RAIL SECTOR

1. Uncoordinated temporary capacity restrictions (TCRs)

Annex VII of Directive 2012/34/EU obliges IMs to publish all capacity restrictions and the preliminary results of a consultation with the applicants for TCRs of more than 7 consecutive days and for which more than 30% of the estimated traffic volume on a railway line per day is cancelled, re-routed or replaced by other modes of transport. The impact assessment support study was not focused on reporting statistics on the implementation of the Annex, but rather on identifying cases where TCRs had a considerable adverse effect on traffic. Therefore the information collected in the external support study includes mostly input from RUs and stakeholder organisations. The examples collected demonstrate a number of issues with TCRs and how they affect rail traffic.

1 Increase in the number of works affecting rail

The support study collected information about the high number of works planned or implemented in 2022. Although the evidence is anecdotal, RUs and other stakeholders have expressed concerns in meetings with the Commission services related to the increase in number of planned works, following lengthy periods of poor network maintenance. This increase is illustrated by some figures in the support study referring to the number of works in Germany, Poland and Slovakia.

2 Frequent changes to the initial planning for the works

Another grievance of RUs is the poor implementation of the schedules for rail infrastructure maintenance. The support study refers to examples in Belgium where a large number of TCRs were cancelled or changed. Such changes mean that the cancelled works would need to be carried out later on. This could result in additional cancellations by RUs, which may not able to use the available capacity if the changes to the works are announced late, and may need to cancel services when the works actually take place.

3 Lack of coordination of works between IMs

The support study provides several examples of poorly coordinated infrastructure works by IMs in several Member States and also with a third country. These uncoordinated works can result in reductions or even complete cancellations of rail freight services (one example quoted a full closure for a week).

4 Late announcement of works

Despite the legal obligations on providing information on the planning on works in a timely manner, laid down in the Recast Directive, the support study collected examples of late announcements of works. These included situations where some IMs could not construct alternative train paths on time or where limitations (e.g. no use of electric locomotives) were not communicated early enough.

Further details are available in the section ‘Uncoordinated temporary capacity restrictions (TCRs)’ in Annex 6 of the support study.

2. Reliability of rail services

The share of cancelled train services is used as an indicator of reliability. The information on the reliability of rail is collected for both passengers and freight services since 2015 and is published biannually (see RMMS reports).

Reliability data are not comprehensive, as data for passenger and especially for rail freight services in the EU is not provided consistently by all Member States..

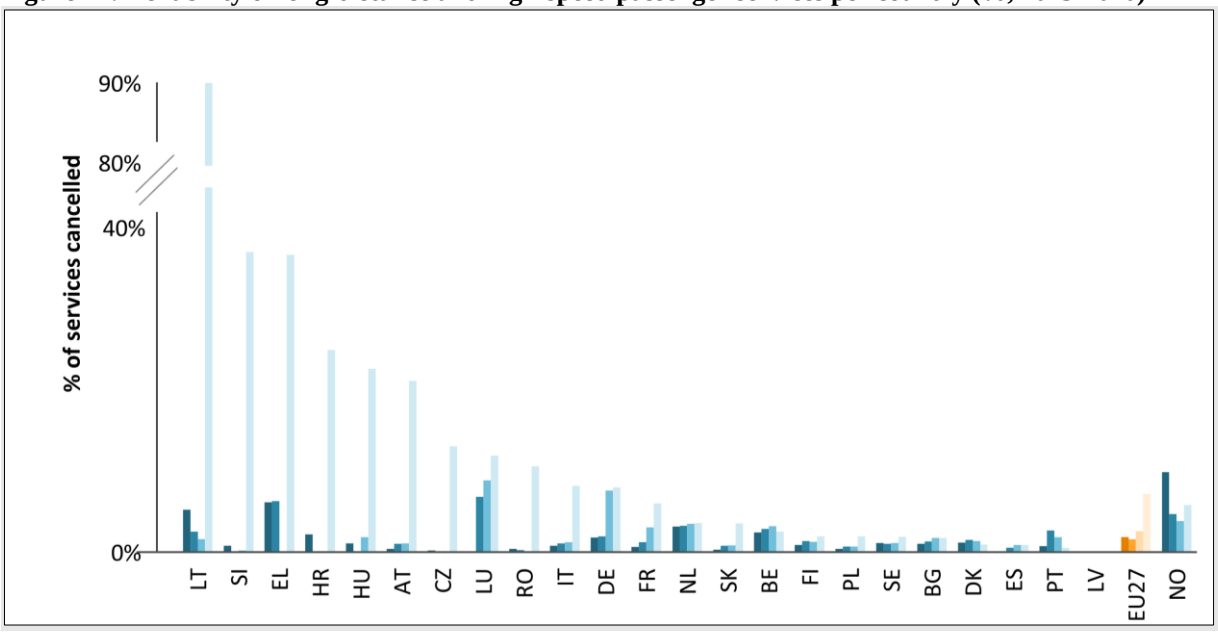
For passenger services, data are broken down in two categories: regional and local services; and long-distance and high-speed services. For freight, the breakdown distinguishes between domestic and international services. The data on the reliability of freight services shows considerable differences between Member States, which reflects both different national circumstances as well as differences in definitions resulting in data quality issues.

Despite the data limitations, however, a clear difference in reliability of passenger and freight can be observed, with freight services being subject to cancellations much more often than passenger services. This is especially true until 2019: owing to the Covid-2019 pandemics, in the course of 2020 a considerable portion of all rail passenger services was cancelled due to the successive restrictions to the mobility of persons, particularly on international services. Rail freight services were affected to a lower extent. Preliminary data for 2021 and 2022 show that reliability is increasing and can be assumed to gradually return to pre-pandemics levels.

The figures below show the percentage of cancelled trains for long-distance and high-speed passenger rail257 and for freight services. Several Member States report cancellations at or above 30% for freight. Ireland reported the highest domestic cancellation rate with 62.2%, and Bulgaria the highest international cancellation rate with 55%. On the passengers' side, up until the outbreak of the pandemics cancellations were typically below 2%.

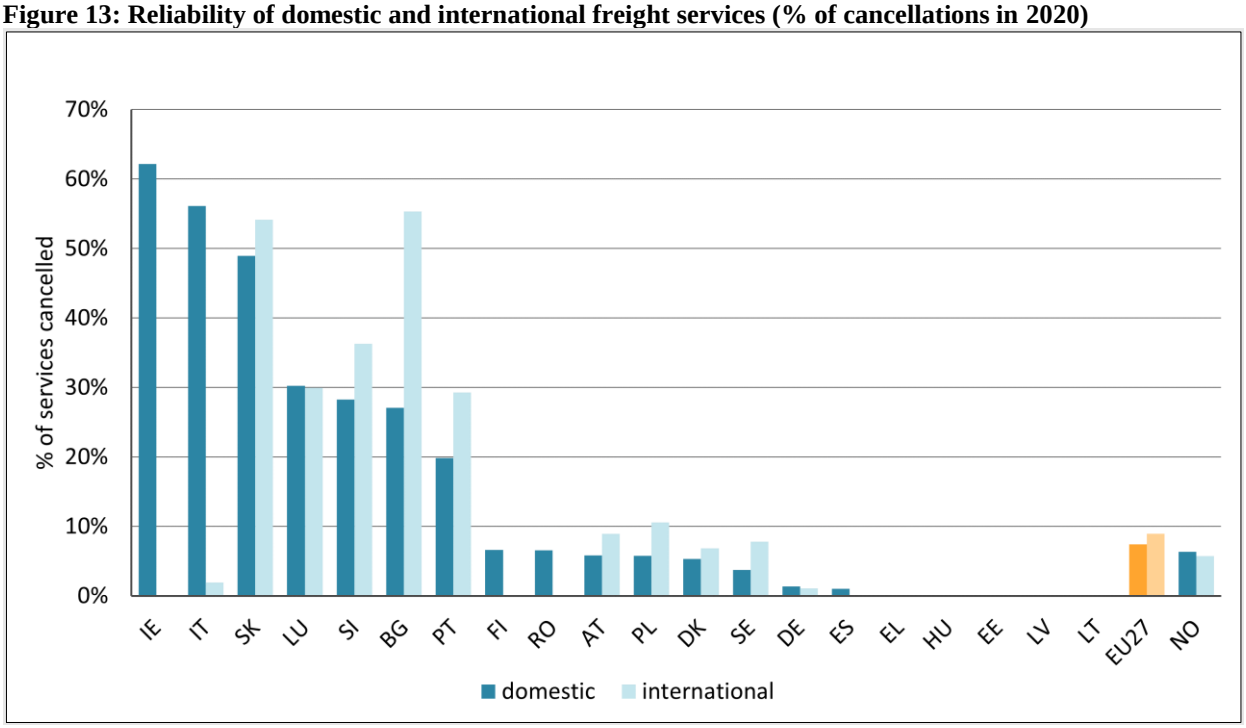
[257] Freight is normally competitive on long distances (usually above 300 km), hence the comparison is drawn with long-distance and high-speed passenger rail.

Figure 12: Reliability of long-distance and high-speed passenger services per country (%, 2015-2020)



Source: RMMS, 2022. No 2015 data for LU, ES and LV, and 2019 for EL and HR.

Figure 13: Reliability of domestic and international freight services (% of cancellations in 2020)



Source: RMMS, 2022. No data for BE, HR; CZ, FR and NL. No data for international freight services cancelled in 2020 in IE, FI, RO, ES and EL.

Reliability issues prove to be particularly problematic when they concern cross-border traffic. On this particular subject, the evaluation of the RFC Regulation identified four key challenges

affecting the effectiveness of cross-border coordination in the event of disturbances on the rail network:

- Limited availability of diversionary routes with appropriate infrastructure parameters (e.g. electrification, loading gauge, etc.).
- Barriers related to operational and safety-related requirements (e.g. requirements for train drivers as regards knowledge of operational rules and language), in particular if diversionary routes involve a network not part of the normal itinerary.
- Limited ability of infrastructure managers to provide – possibly significant amounts of – capacity on diversionary routes on short notice, in particular if more than one infrastructure manager is concerned.
- Lack of cooperation between railway undertakings, e.g. by applying prohibitive pricing for traction services provided by railway undertakings able to operate on the alternative routes.

3. Punctuality of rail services

The share of rail services arriving on time is used as an indicator of punctuality.

RMMS reports provide an overview of punctuality for passenger and freight services. Like for reliability,

- For passenger services, data is available for two categories: regional and local services; and long-distance and high-speed services
- For freight, data is available for domestic and for international freight services

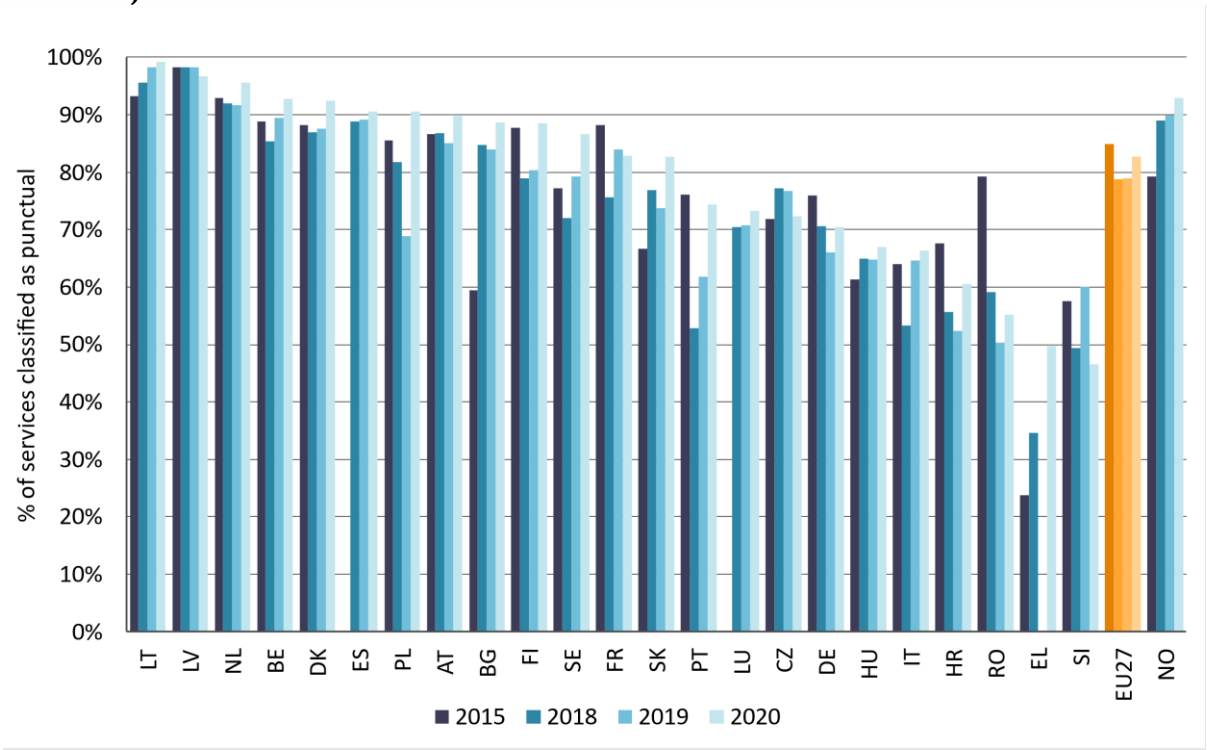
The data for freight shows considerable differences between Member States, which reflects different national circumstances, but it might also suggest data quality issues.

Despite the data limitations, a clear difference in reliability of passenger and freight can be observed, with freight services being less punctual. It should be noted that passenger trains are considered on time if their arrival is within 5 minutes of the scheduled time, while for freight the threshold is 15 minutes. The figures below show the percentage of trains arriving on time for long-distance and high-speed passenger rail and for freight services.

According to data reported in RMMS, international services suffer from poor punctuality since services running on time[258] on average were slightly above 60% in 2019 and declined to less than 50% in 2020. Although limited, the information available shows that the punctuality of cross-border rail freight services is highly variable at country level. However, 2020 EU averages clearly show that freight services perform worse than passenger ones in terms of punctuality.

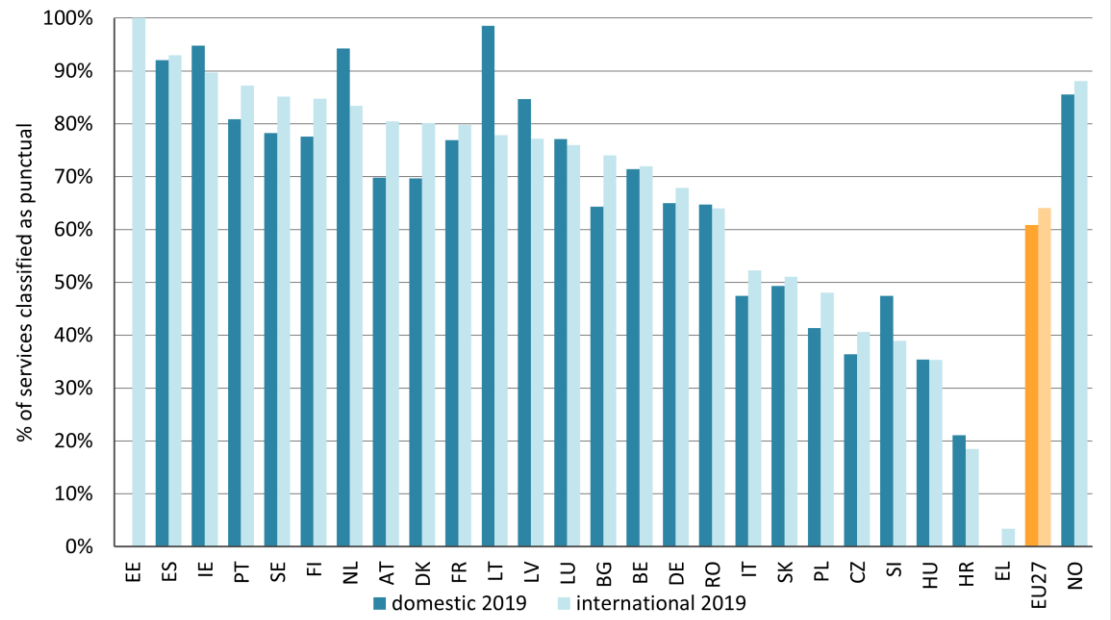
[258] RMMS defines freight services arriving on time as those having a delay of 15 minutes or less.

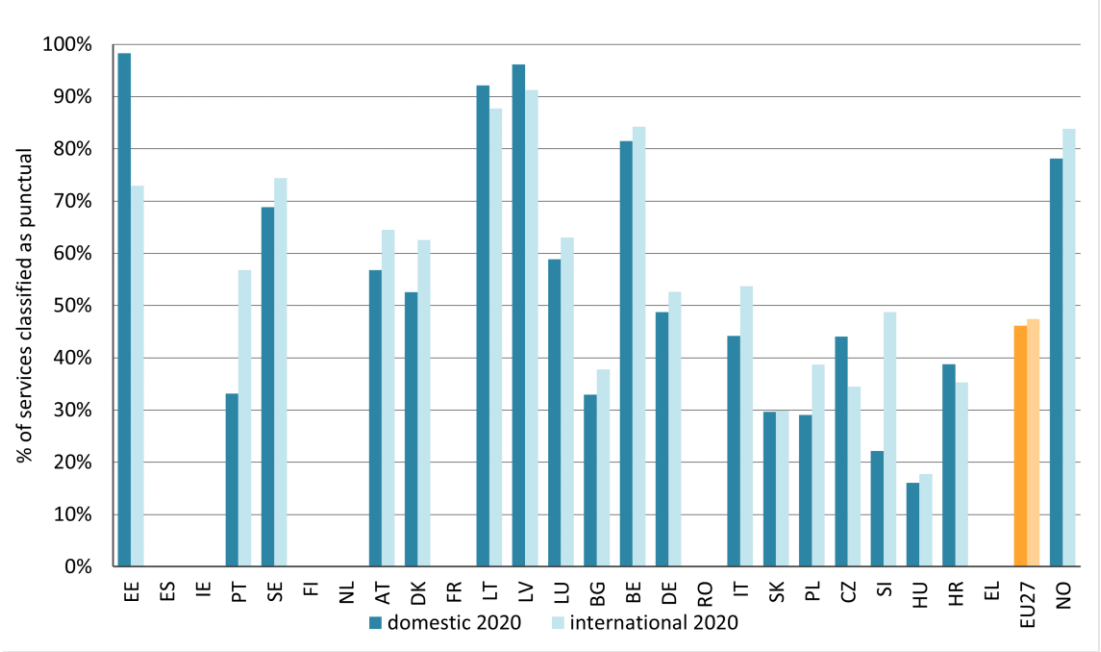
Figure 14: Punctuality of long-distance and high-speed passenger services per country (%, 2015 and 2018-2020)



Source: RMMS, 2022. No 2015 data for EE, ES and LU, 2019 for EL and EE and 2020 for EE.

Figure 15: Punctuality of domestic and international freight services per country (%, 2019 and 2020)





Source: RMMS, 2022. Data for ES, IE, FI, NL, FR, RO, and EL on international freight services not available. Data for 2019 on domestic freight services for EE and EL not available.

The problems of rail freight in terms of punctuality are further described by the data provided by the RFCs. In regard to punctuality along the RFCs, the tables below provide data on the share of freight trains running punctual at origin and at destination (i.e., with a delay ≤ 30 minutes[259]), i.e. at the entry and at the exit points of the rail freight corridors respectively. The data shows how delays often occur at departure and increase as the train is running.

[259] Unlike RMMS, RFCs apply a limit of 30 instead of 15 minutes to measure freight trains' punctuality.

Table 72: Punctuality at origin (RFC entry) (share of trains with delay ≤ 30 minutes, 2018, 2019, 2020)

Corridor	2018	2019	2020
RFC1 – Rhine Alpine	65.0%	66.0%	70.0%
RFC2 - North Sea Mediterranean	78.0%	78.0%	78.5%
RFC3 - Scandinavian Mediterranean	70.0%	70.0%	71.0%
RFC4 - Atlantic	-	-	81.8%
RFC5 - Baltic Adriatic	44.0%	48.0%	50.0%
RFC6 - Mediterranean	56.0%	56.0%	64.0%
RFC7 - Orient/East Med	44.0%	45.0%	47.0%
RFC8 - North Sea Baltic	55.0%	56.0%	57.0%
RFC9 - Rhine Danube	47.0%	38.0%	44.0%
RFC10 - Alpine Western Balkan*	-	-	-
RFC11 – Amber**	-	-	45.0%

Note: *RFC in operation since 2020; **RFC in operation since 2019

Source: Impact assessment support study report (Ecorys et al., 2023) based on RNE data.

Table 73: Punctuality at destination (RFC exit) (share of trains with delay ≤ 30 minutes, 2018, 2019, 2020)

Corridor	2018	2019	2020
RFC1 – Rhine Alpine	55.0%	55.0%	59.0%
RFC2 - North Sea Mediterranean	70.0%	71.0%	71.5%
RFC3 - Scandinavian Mediterranean	59.0%	60.0%	64.0%
RFC4 - Atlantic	-	-	78.1%
RFC5 - Baltic Adriatic	31.0%	32.0%	38.0%
RFC6 - Mediterranean	45.0%	43.0%	52.0%
RFC7 - Orient/East Med	36.0%	35.0%	36.0%
RFC8 - North Sea Baltic	47.5%	45.0%	48.0%
RFC9 - Rhine Danube	29.0%	22.0%	28.5%
RFC10 - Alpine Western Balkan*	-	-	-
RFC11 – Amber**	-	-	30.0%

Note: *RFC in operation since 2020; **RFC in operation since 2019

Source: Impact assessment support study report (Ecorys et al., 2023) based on RNE data.

4. Punctuality of international trains at selected border crossing points

This data shows the additional delays accumulated by cross-border traffic, some of which can be addressed by better coordination between IMs.

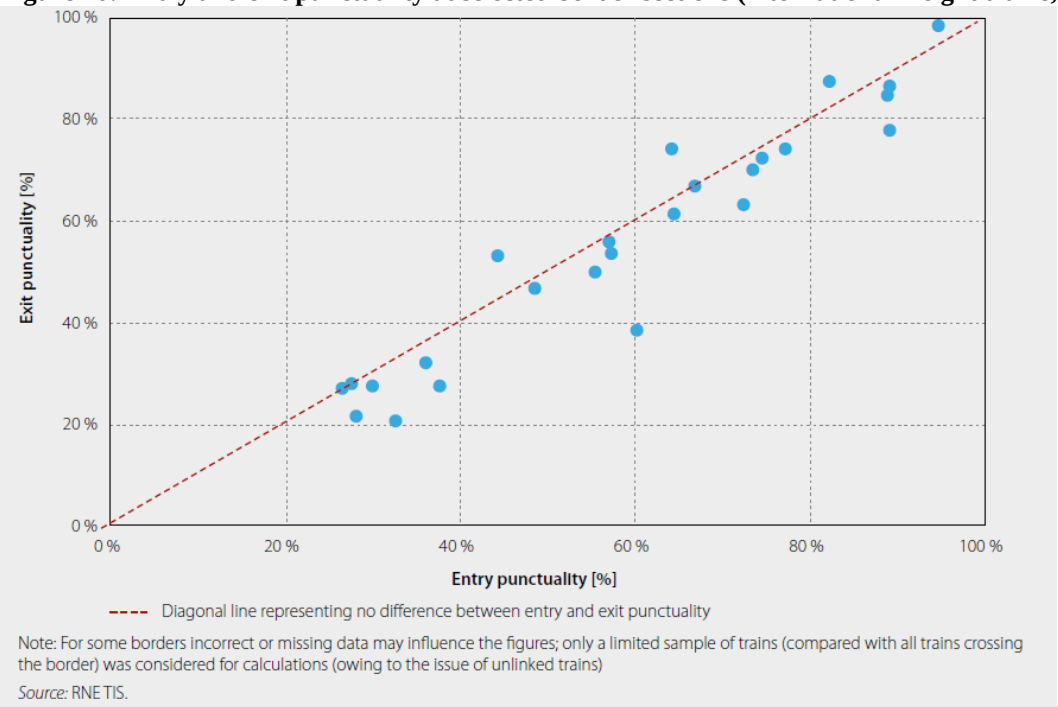
The metrics proposed focus on the difference between the entry and exit punctuality at selected border sections, as defined for policy advice within the RNE border section project[260]. Entry and exit punctualities are measured as percentages of trains arriving in or leaving the border section with a delay of less than 30 minutes for freight trains and less than 5 minutes for passenger trains. The figures are calculated as averages (over 2021) weighted on the yearly number of trains considered at each location. Given that in some cases trains may change number once they cross borders and therefore may not be captured in the available dataset (i.e., unlinked numbers), the real traffic volumes at the borders could be higher than the figures considered.

The data are calculated by RNE based on data in TIS and following the results of the RNE Border section project. The border sections vary in length from 10 to 30 km, covering both sides of the border and all major points where procedures related to border crossing normally occur. Only a sample of the 250 border crossing points analysed for the EU network (i.e., the 31 border crossing points with the best data quality) was used to obtain the figures provided.

On average (for 15 out of the 18 border sections with both freight and passenger train crossings reported), the punctuality of freight trains appears to be lower than the punctuality of passenger trains; the difference between entry and exit punctuality is more than 11% in eight border sections for freight services and in five border sections for passenger trains.

[260] See RNE's website for further information (https://cms.rne.eu/printpdf/train-performance-mgmt/content/border-performance-conference).

Figure 16: Entry and exit punctuality at selected border sections (international freight trains, 2021)

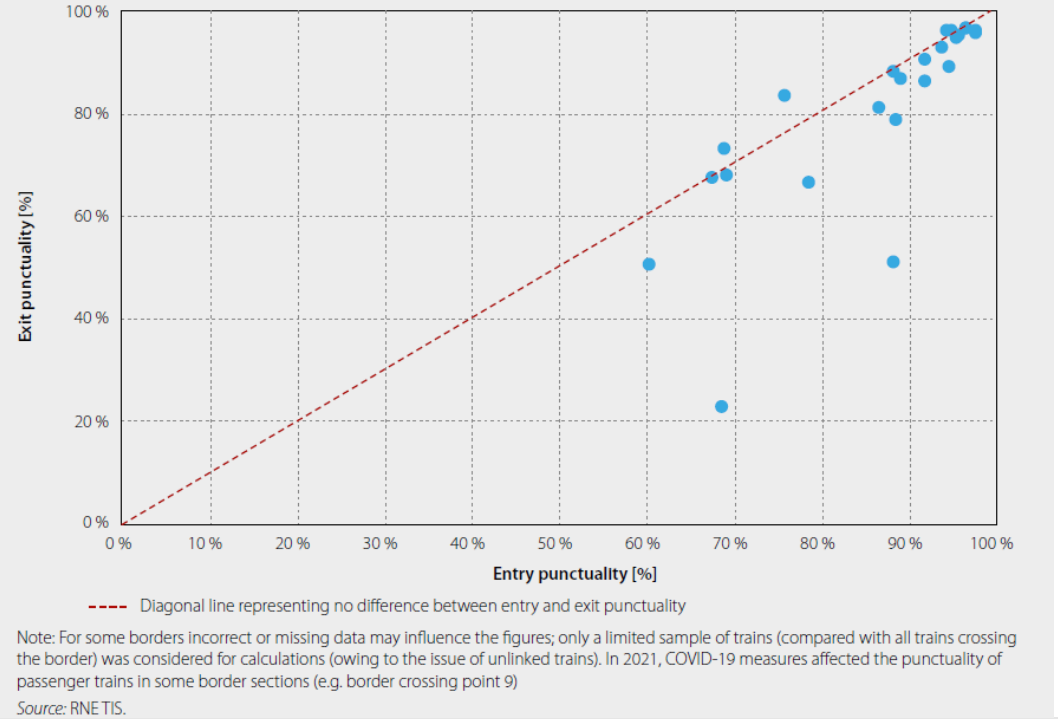


Note: For some borders incorrect or missing data may influence the figures; only a limited sample of trains (compared with all trains crossing the border) was considered for calculations (owing to the issue of unlinked trains)

Source: RNE TIS.

Source: Impact assessment support study report (Ecorys et al., 2023) based on ERA, 2022 Report on Railway Safety and Interoperability in the EU

Figure 17: Entry and exit punctuality at selected border sections (international passenger trains, 2021)



Note: For some borders incorrect or missing data may influence the figures; only a limited sample of trains (compared with all trains crossing the border) was considered for calculations (owing to the issue of unlinked trains). In 2021, COVID-19 measures affected the punctuality of passenger trains in some border sections (e.g. border crossing point 9)

Source: RNE TIS.

Source: Impact assessment support study report (Ecorys et al., 2023) based on ERA 2022 Report on Railway Safety and Interoperability in the EU

5. Speed of international rail freight services

The collected information on the average timetabled speed of cross-border rail freight services in the EU is limited since not all Member States are covered.

Although limited, the evidence collected shows that the average timetable speed of international freight trains in the EU is generally low and this leads to non-competitive transit times in comparison with the road mode. The latest data reported in the RMMS Report (see table below) shows that in 2020, for the Member States for which information is available, the average timetabled speed of international freight services ranged from 27.0 km/h (Bulgaria) up to 71.3 km/h (Slovakia).

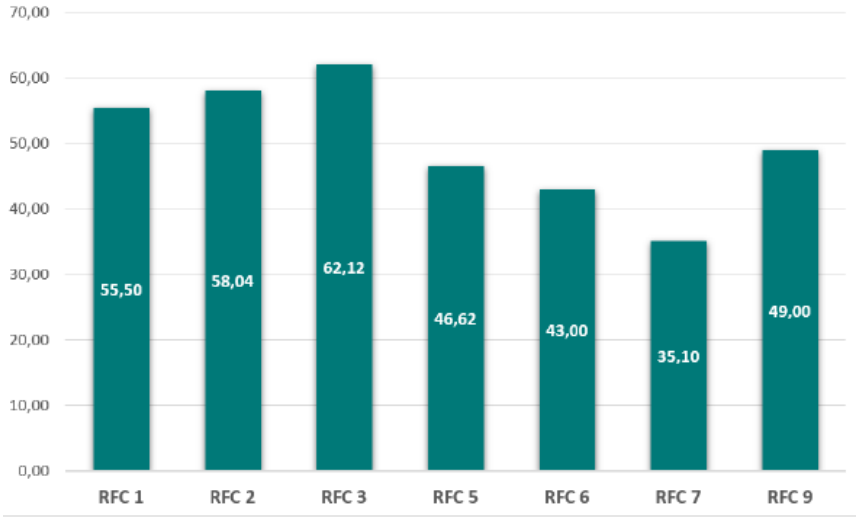
Table 74: Average timetabled speed of international freight services per country (Km/h, 2018 and 2020)

Country	2018	2020
SI	70	70
DK	66.6	67
CZ	60	60
IT	53	53
ES	52.3	-
FR	50.3	50.0
LU	50.1	50.5
PT	45.7	41.1
SK	44	71.3
BE	40.8	40.9
LT	38.2	57.2
LV	35.2	38.2
HR	28.5	32.9
PL	26.3	31.0
BG	24.5	27.0
RO	-	-
NL	-	-
HU	-	-
EE	-	-

Source: 8th RMMS Report

RFCs could not improve considerably the overall speed of rail freight. In 2019 the commercial speed[261] along rail freight corridors ranged from 35 km/h (on the Orient/East-Med) to 62 km/h (on the Scandinavian-Mediterranean).

Figure 18: Average commercial speed on RFCs (km/h, 2019)



Source: Impact assessment support study report (Ecorys et al., 2023). Source: (Railistics GmbH & Econlab Consulting, 2021) RFC Baltic-Adriatic. Measures necessary for achieving the objectives of the Transport Market Study

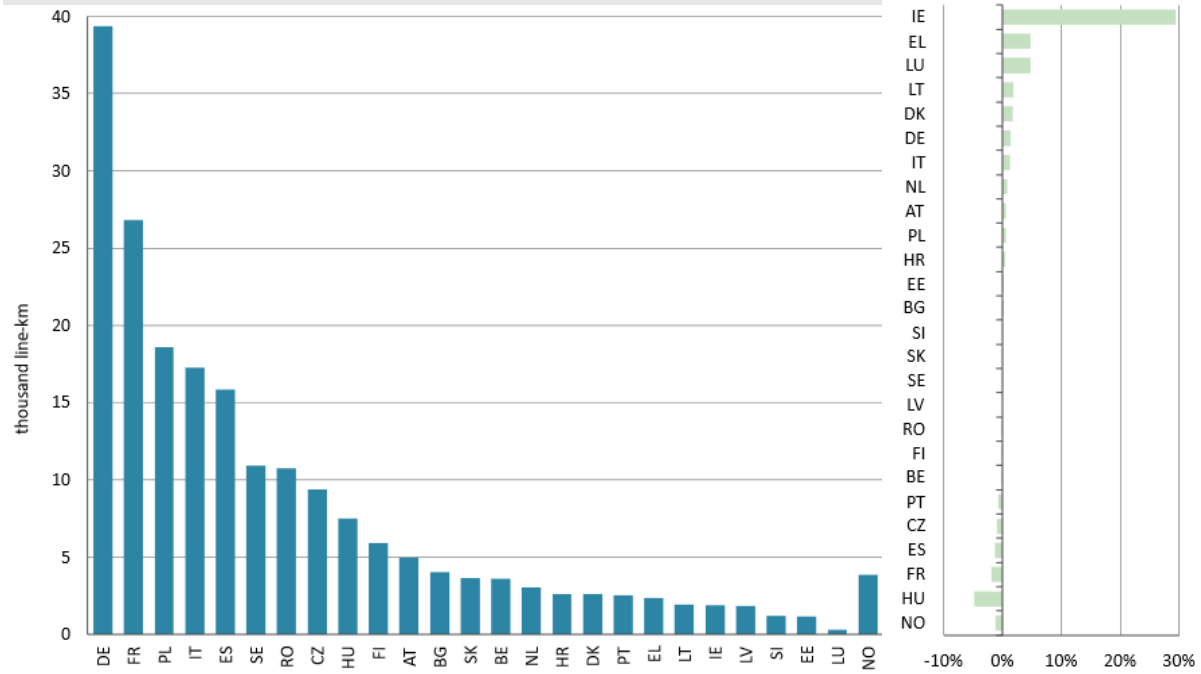
It is worth noting that the data on timetable speed above does not reflect the actual speed of rail freight services in operation, which is typically lower than the planned speed due to delays in operation. Moreover, door-to-door speed or (for intermodal traffic) terminal-to-terminal speed falls significantly below the one indicated due to time-consuming first/last mile operations (terminals, shunting, distribution to private sidings).

6. Congested sections and overall length of rail networks

The figure below shows the reported length of the national rail networks of the EU Member States plus Norway. There is no data for Cyprus and Malta since these Member States do not have railways.

[261] The planned speed of PaPs from origin to destination, which includes any required intermediate stops.

Figure 19: Length of national networks per country (thousand line-km, 2020) and relative change (2015-2020)



Source: 8th RMMS Report.

Article 47 of the Recast Directive defines congested infrastructure. It covers two scenarios:

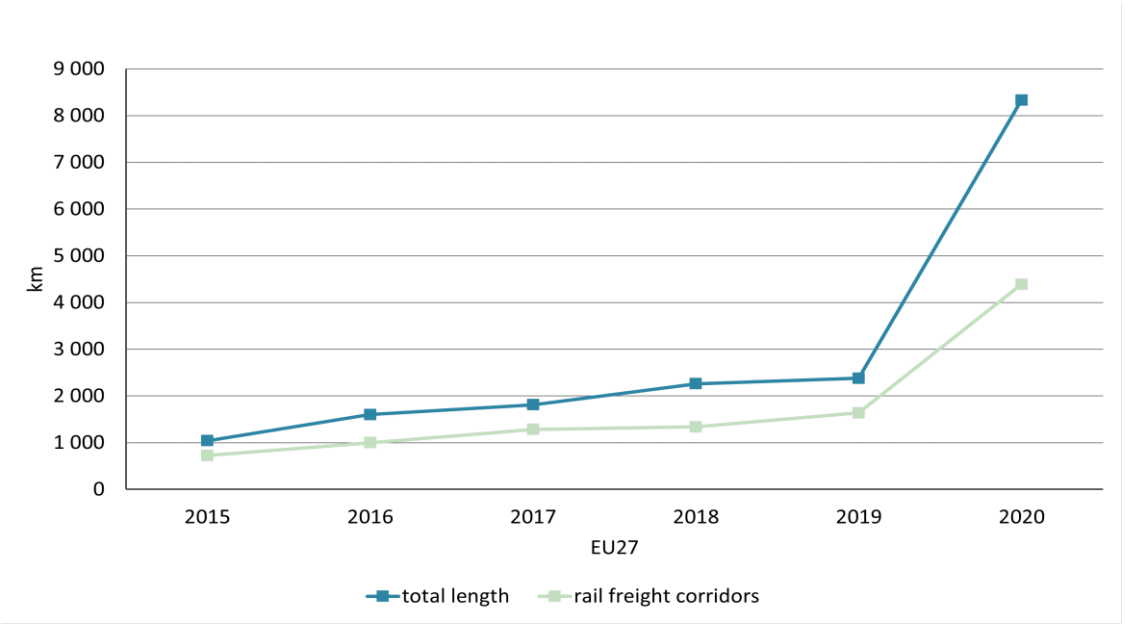
- Infrastructure which can no longer satisfy requests for infrastructure capacity adequately;
- Infrastructure which can be expected to suffer from insufficient capacity in the near future.

The first scenario envisages that the IMs should first complete the coordination of the requested train paths and consultation with applicants, before they establish that a section of the infrastructure can no longer meet demand adequately.

The two scenarios result in an immediate declaration by the IM that the section(s) is(are) congested. The IM then has to carry out a capacity analysis (Article 50 of the Recast Directive) and within 6 months of completion of the analysis produce a capacity-enhancement plan (Article 51 thereof). Failure to implement the plan could result in an obligation for the IM to stop levying track access charges for the congested infrastructure.

The stringent requirements on how IMs are required to address congestions create incentives to avoid declaring infrastructure as congested. The official figures on congestion are reported by IMs as follows:

Figure 20: Length of congested lines (2015-2020) in km



Source: RMMS Report 2022

Although a consistent increase in the length of congested rail infrastructure is observed in most Member States throughout the period, the impressive increase in the length of congested tracks (more than eight times the 2015 level, almost quadruple for parts included in rail freight corridors) is largely due to a change in the criteria used to declare a section congested in Italy.

The support study collected information from stakeholders on congested rail infrastructure and on potential congestion. Unfortunately, stakeholders provided almost no information on the future status of congestion, neither for 2030 nor for the other time horizons. Regarding the status of highly utilised lines, stakeholders provided no projections.

However, stakeholders and in particular RUs provided information on the current status of congestion, with 170 additional congested sections[262]. The input shows the differences in the perception of IMs and other stakeholders of the state of the rail network.

7. Evidence of rail infrastructure capacity requested, allocated and used

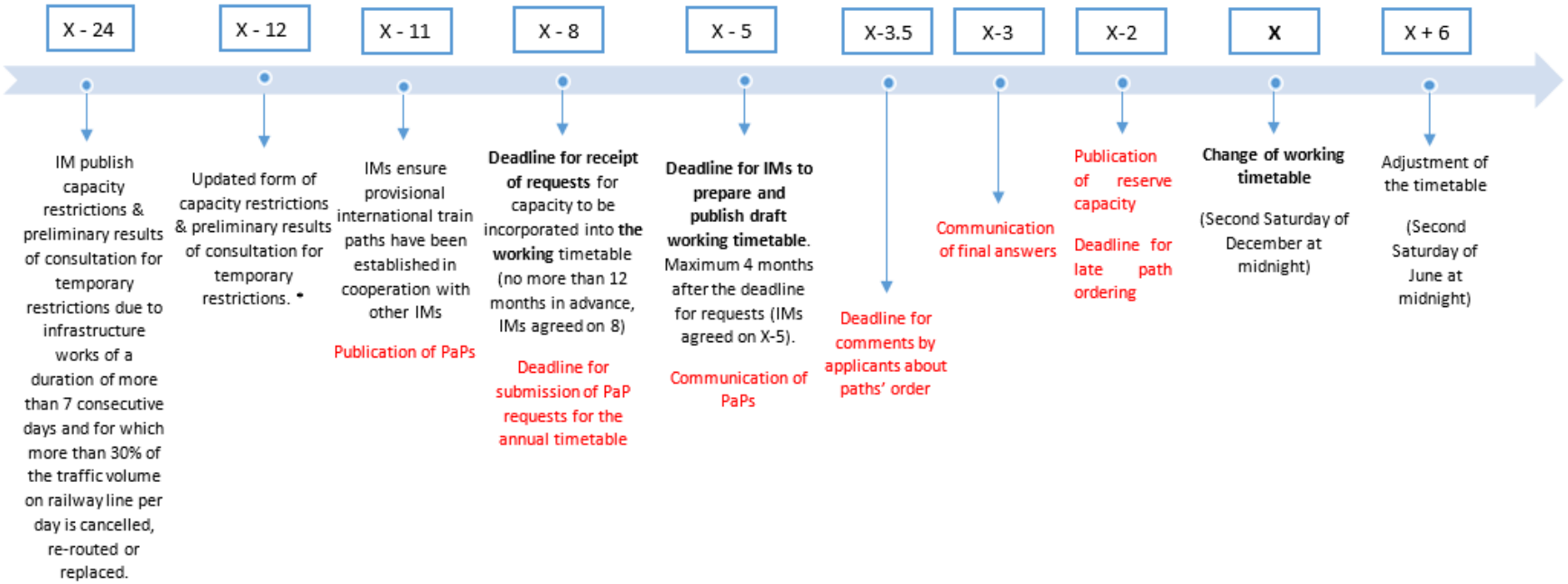
Currently the Recast Directive and the RFC Regulation set the framework for capacity allocation with two intertwined streams. The Recast Directive sets the framework for the annual timetable and the rules for ad hoc capacity requests. The RFC Regulation defines additional rules for the RFC lines for which the corridor one-stop shops offer PaPs as part of the annual timetabling process and reserve capacity to respond to ad hoc requests. A simplified version of the timeline for preparing the annual timetable including PaPs can be described as follows (the text in red indicates the actions related to RFCs):

[262] See Ecorys et al., 2023, Annex 6, section Congestion on the European rail network.

Timeline for the allocation process

X = Change of working timetable.

Numbers indicate months.



* The coordination before the second publication shall be completed:

(a) no later than 18 months before the change of the working timetable if more than 50 % of the estimated traffic volume on a railway line per day is cancelled, re-routed or replaced by other modes of transport for a duration of more than 30 consecutive days

(b) no later than 13 months and 15 days before the change of the working timetable period if more than 30 % of the estimated traffic volume on a railway line per day is cancelled, re-routed or replaced by other modes of transport for a duration of more than seven consecutive days

(c) no later than 13 months and 15 days before the change of the working timetable period if more than 50 % of the estimated traffic volume on a railway line per day is cancelled, re-routed or replaced by other modes of transport for a duration of seven consecutive days or less

In addition to the timeline above, ad hoc requests can be placed after X-2 (deadline for late path requests) until X+12 (the end of the annual timetable period). Ad hoc requests fall outside the annual timetable (placed too late to be there or for an already running timetable).

The process described above, combined with an obligation for IMs to 'meet all requests for infrastructure capacity'[263], results in limited capacity remaining for ad hoc requests. This residual capacity could suffer from limitations that make it less attractive, especially on highly utilised sections of the network. The reserve capacity in the RFC Regulation was intended to address this issue in regard to freight, but the Regulation was not implemented in a way that would allow for the effective use of reserve capacity[264].

The outcome is that RUs have an incentive to book capacity in the annual timetable, which means as early as 8 months (with a possibility for late request to be placed 2 months) before the start of the annual timetable. This means that for some trains running in the end of the annual timetable the planning needs to be ready as early as 20 months before the train run. For some rail market segments and especially for many freight services, such an early planning is not feasible. Therefore, the requests placed in the annual timetable are normally based on last-years requests and RUs' projections, which do not allow for precise planning. Reservation charges for capacity that was ordered, but not used are optional, meaning that RUs often face no disincentives to engage in early booking of capacity.

This approach results in some capacity either not being used, or capacity requests being changed after the entry into effect of the annual timetable.

There is no comprehensive statistics on cancelled and amended capacity. However, anecdotal evidence shows that the issue is particularly problematic for congested and highly utilised lines and illustrates how significant the practice of booking and then not using capacity can be. Some examples collected in the support study show that in some cases less than 60% of the capacity that was ordered was actually used[265].

8. Changes / modifications of timetable requests

As explained in section 7 above, the existing rules on capacity allocation incentivise applicants to request capacity as part of the process of constructing the annual timetable, even if applicants are not fully aware of their capacity needs for the whole period of the timetable. One of the consequences of this behaviour is that capacity requests need to be amended later on, when the applicant has more precise information about the capacity needed to provide a concrete rail service.

There is no comprehensive overview of the process of submission, modification and cancellation of capacity requests for the whole EU rail network, but the support study did collect some statistical information from infrastructure managers and stakeholder organisations.

Findings from the Business Case study of the TTR Project show that generally the number of changes/modifications of the annual timetable requests initiated by IMs and freight companies is

[263] See in particular Article 45(1) of Directive 2012/34/EU.
[264] See the conclusions of the evaluation of Regulation (EU) 913/2010 for further details.
[265] See section Requested, allocated and used capacity of Annex 6 to Ecorys et al. (2023) for further details.

more than two times higher than the number of the original requests. Changes are significantly higher for the freight applicants than for the passenger applicants, as shown in the table below (Changes and modifications of path requests).

Table 75: Changes and modifications of path requests (timetables for 2014, 2015, 2016)

		TT 2014	TT 2015	TT 2016
Freight applicants*	Total annual TT requests	12 616	14 514	11 964
	Total modifications	28 887	32 420	28 893
	% of total	**229%**	**223%**	**241%**
Passenger applicants**	Total annual TT requests	1 438	1 401	1 475
	Total modifications	1 012	1 013	1 050
	% of total	**70%**	**72%**	**71%**
Infrastructure Managers***	Total annual TT requests	131 254	135 449	136 889
	Total modifications (X-12 to X-0)	291 010	284 767	309 971
	% of total path requests	**222%**	**210%**	**226%**

Notes:
* Freight applicants SNCB Logistics, DB Cargo and BSL Cargo
** Passenger applicants Trenitalia and DB Fernverkehr
***Infrastructure manages SBB, ADF, DB, PKP, RFI, SNCF, SZDC
Source: (RNE & Forum Train Euroope, 2019) Redesign of the International Timetabling Process (TTR) - Business Case. Draft version 3.0

The RNE study suggests that any change requires an additional administrative effort of at least 25% of the request's cost. This is an estimated percentage emerging as a 'linear approximation of the effort for the change of the request or the allocated path. The value is chosen based on the combination of the experience values of timetable planning experts and the logarithmic formula applied in the operational research (semi-elasticity)'[266].

9. Information supporting the 'SME test' for railway undertakings

Table 76 below compares the total annual revenue of incumbent and competitor freight and passenger railway undertakings per Member States for the year 2018. Figures were obtained by applying the respective competitor and incumbent market shares of freight and passenger RUs as published in the 10th market monitoring report of IRG Rail (IRG Rail, 2020), the independent association of rail regulatory bodies, to the total annual revenue of freight and passenger RUs as reported in the 7th RMMS report (RMMS, 2018).

Table 76: Total revenue from freight and passenger RUs per MS, 2018

Member State	Revenue of railway undertakings, total in EUR million			
	Passenger		Freight	
	Incumbents	Competitors	Incumbents	Competitors
AT	1 795.8	193.1	807.6	286.5

[266] See section 7.1 of the business case study.

BG	118.4	0	64.6	54.4
CZ	1 337.9	353.6	598.3	182.6
DE	13 861.6	1 818.4	3 553.9	1 951.1
DK	1 180.4	223.7	0	73.7
EE	56.7	0.3	0	48.3
EL	109.5	3.8	13.0	0.4
ES	3 401.0	0	163.2	43.8
FI	416.6	0	325.1	7.3
FR	14 386.2	0	1 172.1	163.7
HR	96.6	0	46.8	35.9
HU	240.8	9.7	195.0	228.1
IE	220.9	0	4.4	0.0
IT	5 652.2	907.8	474.8	208.0
LT	27.3	0	418.9	0.3
LU	203.7	0	27.7	0
LV	76.6	0.8	259.2	83.7
NL	2 708.2	61.8	193.0	0
PL	670.9	569.4	1 122.7	932.3
PT	248.1	39.6	0	89.0
RO	-	-	67.3	83.5
SE	1 050.2	199.8	371.9	278.1
SI	83.2	0	7.8	1.8
SK	107.4	7.6	334.0	139.6
TOTAL	**48 050.2**	**4 389.4**	**10 221.3**	**4 892.1**

Source: RMMS 7th edition (2018), IRG Rail 10th market monitoring report (2020).
Note: No data for BE (passenger and freight) and RO (passenger).

Table 77 below shows the number of competitor RUs and the average revenue per competitor RU for passenger rail and for rail freight in each member state. The number of competitor RUs was

estimated based on data from IRG Rail's 10th market monitoring report (IRG Rail, 2020). Taking into account the figures from Table 76 for the whole freight and passenger market, and the estimated number of competitor RUs, the average revenue per competitor RU was derived.

Table 77: Number of competitor freight and passenger RUs per MS and average revenue per competitor RU per MS, 2018

Member State	Number of competitor RUs		Average revenue per competitor RU, in EUR million	
	Passenger	Freight	Passenger	Freight
AT	11	42	17 6	6 8
BG	0	13	-	4 2
CZ	28	94	12 6	1 9
DE	141	173	12 9	11 3
DK	5	11	44 7	6 7
EE	1	1	0 3	48 3
EL	1	1	3 8	0 4
ES	0	10	-	4 4
FI	0	2	-	3 7
FR	2	22	-	7 4
HR	0	10	-	3 6
HU	3	27	3 2	8 4
IE	2	0	-	-
IT	18	21	50 4	9 9
LT	0	1	-	0 3
LU	0	0	-	-
LV	2	3	0 4	27 9
NL	11	27	5 6	-
PL	10	86	56 9	10 8
PT	1	1	39 6	89 0
RO	5	21	-	4 0

SE	6	9	33 3	30 9
SI	0	6	-	0 3
SK	3	46	2 5	3 0
TOTAL	***250***	***627***	***20***	***13***

Source: RMMS 7th edition (2018), IRG Rail 10th market monitoring report (2020). Note: No data for BE (passenger and freight) and RO (passenger). Revenue figures in the "Total" column show the arithmetic average revenue per competitor RU across all Member States.

An analysis of market actors also finds that a number of railway undertakings fall in the SME category. Table 1Table 78 below provides a non-exhaustive list of examples of such railway undertakings and their respective headcount and annual revenue.

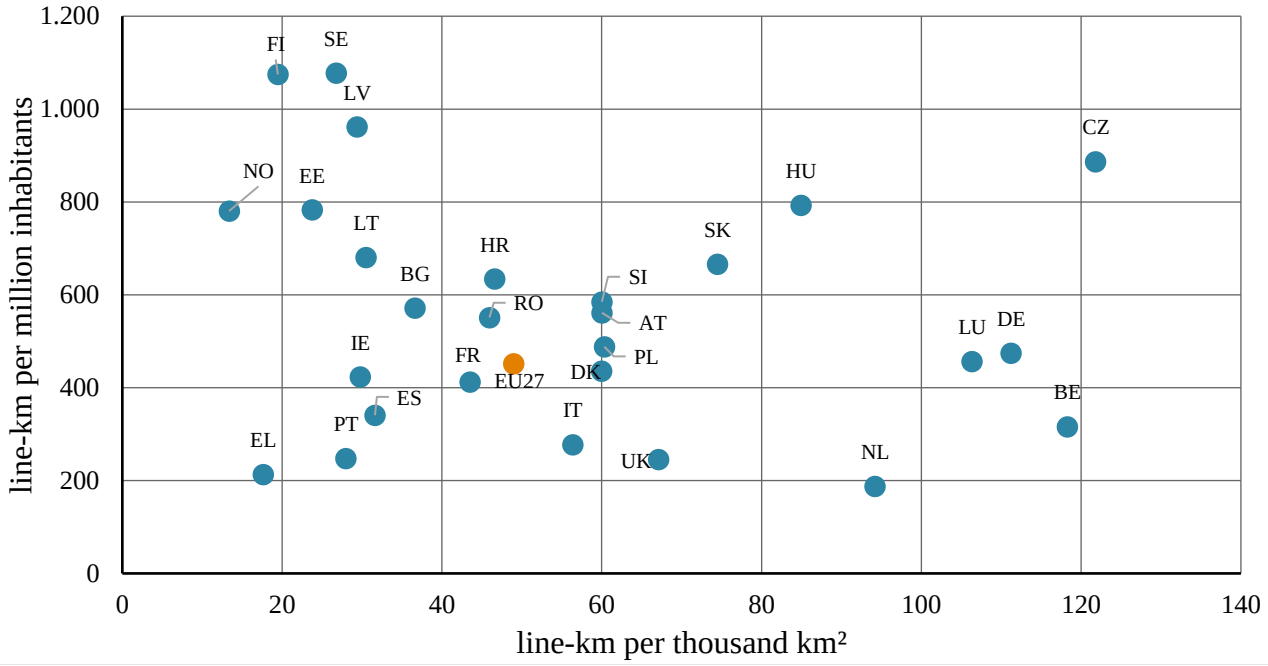
Table 78: Examples of railway undertakings falling in the SME category

Company name	Staff size and reference year	Annual renue (in EUR million) and reference year
HSL Logistik GmbH	78 (in 2020)	70 (in 2020)
IDS Cargo	150 (in 2021)	20 (in 2021)
EP Cargo	33 (in 2018)	33 (in 2018)
Snalltaget	50 (in 2021)	Not available

10. Regional differences of the rail network and rail markets in EU

The density of the rail network in the EU differs considerably between Member States with central Europe having on average a higher density in terms of line kilometres per square kilometre than the peripheral regions.

Figure 21: Density of railway network relative to surface area and population per country (line-km per million people and line-km per thousand km², 2018)



The intensity in the use of the rail network also differs considerably between Member States, as does the type of traffic. Passenger traffic measured in train kilometres dominates most of the EU rail network with an EU average of roughly 80% and with Ireland being the extreme case with 97% of the traffic taken by passenger trains, while Lithuania being at the other end with 38%.

Table 79: Relative share of passenger and freight train-km on total train-km per country (%, 2019 and 2020)

Member State	Total passenger services (train-km) 2020 [k train-km]	Total freight services (train-km) 2020 [k train-km]	Total passenger services (train-km) 2019 [k train-km]	Total freight services (train-km) 2019 [k train-km]	Percentage of total volume of passenger 2019 [%]	Percentage of total volume of freight 2019 [%]	Percentage of total volume of passenger 2020 [%]	Percentage of total volume of freight 2020 [%]
IE	15 860.0	449.0	18 090.0	445.0	98%	2%	97%	3%
DK	72 768.0	3 382.0	73 314.9	3 239.6	96%	4%	96%	4%
LU	7 060.0	385.4	7 530.0	495.9	94%	6%	95%	5%
NL	137 982.0	10 499.0	153 066.0	11 202.0	93%	7%	93%	7%
EL	7 944.2	1 098.3	10 069.7	992.1	91%	9%	88%	12%
ES	124 901.0	22 749.0	200 191.0	26 455.0	88%	12%	85%	15%
IT	260 039.0	47 239.0	332 311.0	48 429.0	87%	13%	85%	15%
FR	283 568.0	54 076.0	364 735.0	58 888.0	86%	14%	84%	16%
PT	27 351.3	5 824.0	30 895.8	6 776.7	82%	18%	82%	18%
BE	80 816.0	11 843.0	86 500.0	19 000.0	82%	18%	87%	13%
HU	84 330.4	18 795.4	83 394.3	20 199.8	81%	19%	82%	18%
SE	116 302.0	35 051.0	132 454.0	35 601.0	79%	21%	77%	23%
CZ	132 182.1	35 864.7	136 106.8	38 878.2	78%	22%	79%	21%
EE	5 233.6	1 342.4	5 754.2	1 662.2	78%	22%	80%	20%
DE	844 000.0	235 000.0	856 000.0	253 000.0	77%	23%	78%	22%
AT	113 388.4	39 741.7	120 259.7	42 783.9	74%	26%	74%	26%
RO	51 504.0	25 695.0	63 584.0	22 902.0	74%	26%	67%	33%

Member State	Total passenger services (train-km) 2020 [k train-km]	Total freight services (train-km) 2020 [k train-km]	Total passenger services (train-km) 2019 [k train-km]	Total freight services (train-km) 2019 [k train-km]	Percentage of total volume of passenger 2019 [%]	Percentage of total volume of freight 2019 [%]	Percentage of total volume of passenger 2020 [%]	Percentage of total volume of freight 2020 [%]
FI	33 804.0	13 921.0	36 759.0	14 711.0	71%	29%	71%	29%
BG	20 314.4	8 837.0	20 691.5	8 474.4	71%	29%	70%	30%
HR	12 840.0	7 179.0	15 337.0	6 494.0	70%	30%	64%	36%
PL	167 653.8	77 499.6	180 277.2	82 343.3	69%	31%	68%	32%
SK	32 454.9	14 079.0	35 696.0	25 479.0	58%	42%	70%	30%
SI	7 611.2	10 011.1	9 942.1	10 666.4	48%	52%	43%	57%
LV	5 880.1	4 666.5	5 926.4	8 141.9	42%	58%	56%	44%
LT	6 015.0	9 671.0	6 972.0	9 850.0	41%	59%	38%	62%
EU27	2 651 803.4	694 899.1	2 985 857.6	757 110.4	80%	20%	79%	21%

Source: 8th RMMS report

The differences in the share of domestic and international traffic are quite big for passenger traffic, where virtually in all Member States domestic traffic dominates. With a few exceptions of mostly central EU Member States where international traffic is over15%, the majority of Member States are well below this threshold and many are below the EU average of 6.8%.

Table 80: Passenger traffic volumes (domestic, international and proportion of international on total) by country (pax-km in 2018)

Member State	Proportion of international traffic 2018 [%]
LU	29.2%
LT	27.6%
AT	23.0%
SI	20.2%
CZ	17.2%
BE	15.9%
FR	10.2%
SK	8.0%
DK	6.8%
RO	6.6%
LV	6.5%
DE	6.2%
EE	4.6%
HU	4.5%
IE	4.3%
HR	4.0%
PL	3.8%
SE	3.6%
FI	3.2%
PT	2.5%
ES	2.4%
NL	1.9%
BG	1.5%
IT	1.2%
EL	0.2%
EU27	6.8%

Source: 7th RMMS report

The situation in rail freight is more diverse and in some cases international traffic dominates rail freight (e.g. in Slovenia, the Baltic Member states and some central EU Member States with relatively smaller territory).

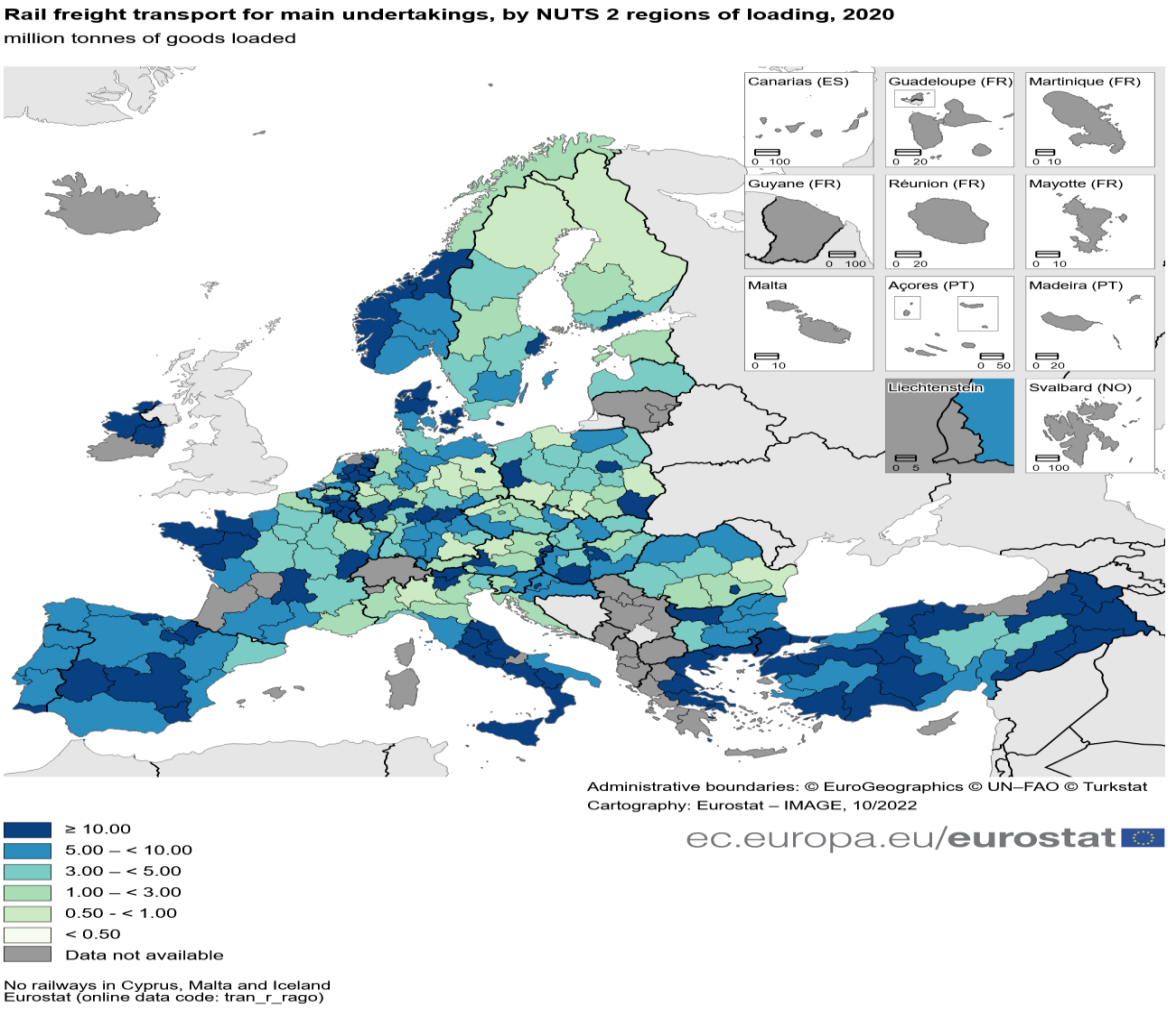
Table 81: Rail freight traffic volumes (domestic, international and proportion of international on total) by country (tonne-km, 2018)

Member state	Proportion of international traffic 2018 [%]
SI	98%

Member state	Proportion of international traffic 2018 [%]
LV	98%
EL	97%
DK	94%
EE	92%
SK	89%
NL	84%
HU	82%
AT	79%
LT	78%
LU	74%
HR	68%
CZ	64%
IT	53%
BE	48%
DE	42%
BG	41%
PL	39%
SE	39%
FR	37%
FI	37%
PT	24%
ES	15%
RO	14%
IE	0%
EU27	52%

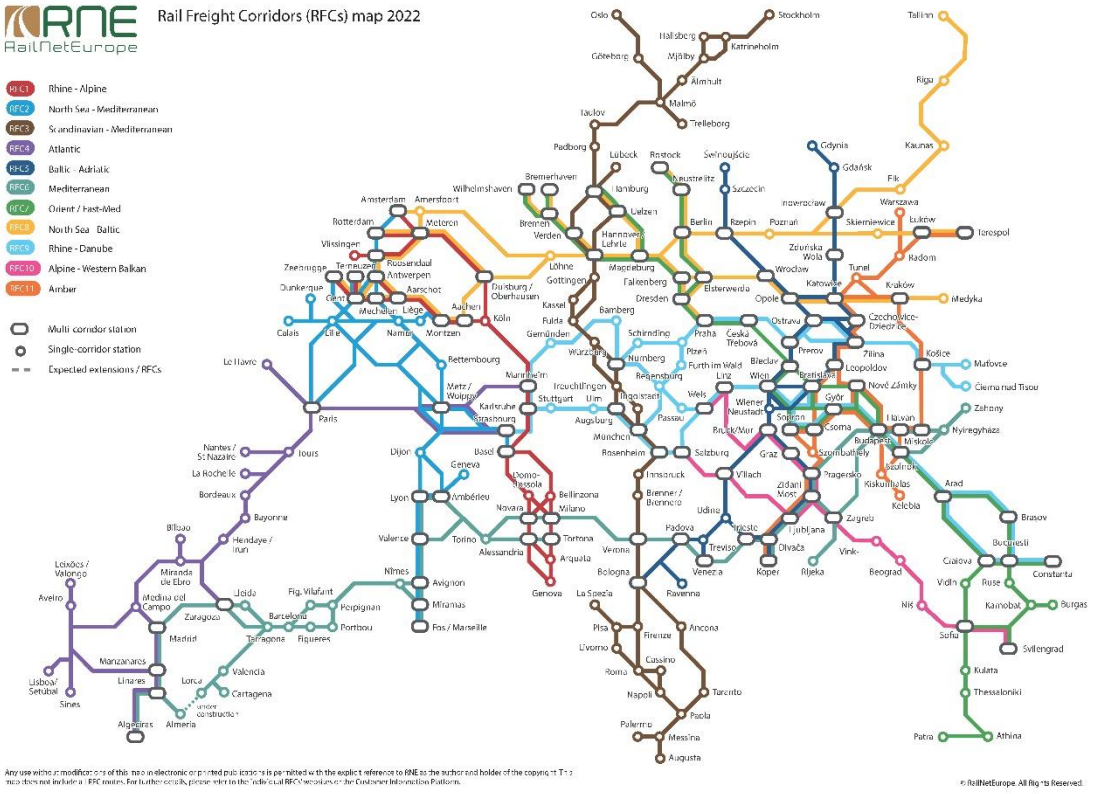
Source: 7th RMMS report

Figure 22: Rail freight transport by NUTS2-level region



Source: Eurostat

Figure 23: Map of the 11 rail freight corridors as established under the RFC Regulation



ANNEX 6: RETAINED POLICY MEASURES

This Annex provides a brief description of the individual policy measures considered in the impact assessment and their allocation to policy options outlined in chapter 5.

Problem driver / specific objective	**Policy measures**		**Policy options**			
	Title	**Description**	PO1	PO2	PO3	PO4
PD1 Legal and procedural obstacles for capacity management SO1 Enable alternative capacity management procedures through	PM1 - **Mandatory use of RFC one-stop shops:** Make use of the corridor one-stop shops mandatory and clarify the functions of the corridor one-stop shops in capacity management and allocation for cross-border traffic.	Currently the use of the one-stop shops is optional and limited to freight traffic on lines designated to rail freight corridor. This measure makes the use of the one-stop shops mandatory for all cross-border traffic, including passenger and freight and all types of requests (annual timetable and ad-hoc), and extends the scope of functions of the one-stop shops to the entire capacity management process (instead of only covering capacity allocation) in order to do away with the need to interact with individual infrastructure managers for all capacity management activities falling outside of capacity requests and allocation. It assigns to the one-stop shop the obligation to coordinate works restricting available capacity, publish information about them in accordance with Annex VII of the Recast Directive, monitor and report the adherence to the published schedule, consult stakeholders on the planning, report to the management boards the concerns of RUs and indicate any planning inconsistencies and take other actions necessary to ensure minimising the effect of planned works on rail traffic.	X			
	PM2-1 - Introduce a harmonised, directly applicable **EU legal framework** for **railway capacity and traffic management**, supporting better utilisation of railway network capacity, including via more dynamic and market-oriented traffic and capacity management, and fair	Introduce a new framework for the use of railway infrastructure capacity, replacing the rules relating to rail capacity and traffic management defined in Directive 2012/34/EU and Regulation (EU) 913/2010. The scope of the new framework will be based on the provisions relating to rail capacity allocation and traffic management in the aforementioned Directive and Regulation. The new framework defines the key principles for the management of infrastructure capacity, i.e. rail capacity and traffic management. More detailed rules supporting a harmonised implementation will be set out in delegated and implementing acts.		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
changes to legislation	competition between rail operators.					
	PM2-2 - **Introduce a 'European network statement'** defining common, harmonised rules and procedures for rail capacity and traffic management applicable on the entire EU rail network, complementing network statements of individual infrastructure managers; clarifying the status of infrastructure managers' network statements.	The European network statement will define the detailed and harmonised rules and procedures applying on the entire EU railway network, in particular as regards cross-border cooperation within the new EU legal framework for railway capacity and traffic management. The Commission will define the European network statement in an implementing act, following consultation of the European Network of Infrastructure Managers (currently meeting in PRIME - Platform of Rail Infrastructure Managers in Europe. Network statements developed and published by individual infrastructure managers in accordance with Article 27 of Directive 2012/34/EU will need to be consistent with the general framework defined by the European network statement. The network statements of individual infrastructure managers in accordance with Article 27 of Directive 2012/34/EU will become legally binding.			X	X
	PM3 - **Introduce a strategic capacity management phase**, which (i) establishes a multi-annual planning to optimise the quantity and quality of the capacity offer and (ii) provides a reserve of capacity for flexible allocation to individual applicants.	This measure introduces instruments and a structured process for the strategic management of railway infrastructure capacity. The purpose of strategic planning is to optimise the use of the available rail infrastructure in line with the market needs of all segments of rail transport, while taking into account the need for infrastructure maintenance and renewal. The strategic management phase builds on the 'capacity strategy' prepared as part of PM4. The strategic management process is steered by infrastructure managers but must involve operators of rail transport services and other stakeholders concerned (public authorities, non-RU applicants, terminals etc.) throughout the process, and is subject to scrutiny by regulatory bodies. The process is implemented in an incremental and continuous manner over at least 5 year cycles. It starts with a general planning at the beginning of the process and it is gradually detailed and reviewed to get closer to timetables. The final, most detailed phase of the strategic planning cycle, covering the next timetable year, provides a basis for the capacity allocation process, in particular the new procedures for the flexible capacity allocation proposed as part of PM4.		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		The multiannual strategic plans for capacity allocation will be subject to approval by ENIM, following a consultation of the ENRRB and stakeholders. ENIM will be assisted by an operational body (Network Coordinator), in the process of analysis of the strategic planning.				
	PM4 - **Introduce new procedures for capacity allocation** in line with market needs, in particular for flexibility and reliability, based on the outcomes of the strategic capacity management phase (PM3).	Introduce new procedures to allocate capacity, in particular with a view to accommodate capacity needs that do not fit in a pre-determined, annual schedule for capacity allocation. Certain cross-border rail market segments (big part of freight) do not always have enough information to request capacity before the adoption of the annual timetable by IMs. They may also need to provide a service of longer duration than 1 year to a customer. The measure will provide legal certainty, security and predictability for railway undertakings and boost their competitiveness vis-à-vis other modes. It aims to an increased respect of commitments related to capacity from the side of both IMs and RUs (and other applicants). This measure is closely related to the concept of a 'rolling planning' allocation process in the context of the 'Timetable Redesign' project.		X	X	X
	PM5 - Introduce **transparent and harmonised methods, based on socio-economic criteria, supporting the management of capacity on infrastructure where demand exceeds supply**; methods should be applied in strategic capacity management (PM3), capacity allocation (PM4) and in contingency management (PM6).	The purpose of this measure is to 'partition' total infrastructure capacity available with the objective of safeguarding capacity for different market segments of rail transport (and for infrastructure works), taking into account their total benefits and costs to society (internal and external benefits and costs). The results of the process are documented in a 'capacity strategy', which provides the basis for the strategic capacity management phase (PM3). The process should involve, as a starting point, a transparent methodology reflecting the social, economic and environmental costs and benefits of different segments of rail transport. The overall method should be harmonised across Europe. The specific parameters of the method (e.g. values attached to different types of internal and external costs and benefits) can differ between networks to take into account national specificities and will be adopted via an implementing act, following a proposal by ENIM (assisted by the rail Network Coordinator). The methodology should be subject to a stakeholder consultation process, involving notably Member States, regulatory bodies (via the ENRRB) and other public authorities, potential applicants and other interested stakeholders. The final outcome of this measure is the adoption by infrastructure managers of a 'capacity strategy' which provides a basis for the strategic management process (PM3).		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
	PM6 - Strengthen existing and introduce new mechanisms and **procedures to ensure traffic continuity** in the event of disruptions or planned non-availability of the network (infrastructure works).	Introduce the possibility for unilateral cancellations of train paths by infrastructure managers in very specific cases of disruptions. Provide a methodology in the form of non-legislative EU act for identifying societal benefits and selecting the train paths to be cancelled. Cancellations should be employed where there are clear benefits to society in the form of running certain types of trains instead of others on the alternative routes. The specific parameters of the method will be adopted in an implementing act which will be based on input by ENIM, following consultation of the Member States, regulatory bodies (via the ENRRB) and other interested stakeholders. The mechanism could involve some sort of pre-planning, allowing fast implementation when an interruption occurs. The measure should apply to non-availability of the network affecting already allocated capacity, whether entirely unplanned (*force majeure* incidents or disruptions, e.g. natural disasters, accidents) or 'planned' (e.g. infrastructure works scheduled during current working timetable). The measure could follow the new rules on partitioning capacity available to different type of traffic (measure PM5). The measure could be considered as optional, i.e. providing for a mechanism for applicants to voluntarily cancel their train paths in cases of disturbance.		X	X	X
PD2 Insufficient incentives to improve performance	PM7 - **Strengthen the monitoring of service quality and customer satisfaction on the freight corridors**, notably by introducing a mandatory and harmonised set of performance indicators covering all relevant aspects of rail infrastructure service and rail transport services.	Introduce a mandatory and harmonised set of performance indicators covering all relevant aspects of rail infrastructure service (capacity and traffic management) and rail transport services, based on a consultation of railway undertakings, terminals and customers of rail freight services. The indicators will be defined in a non-legislative act by the Commission. The measure builds on Article 19(2) of the RFC Regulation which leaves it to the corridors' management boards to define specific performance indicators.	X			

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
SO2 Strengthen incentives to improve performance	PM8 - **Uphold commitments related to capacity:** Introduce effective and reciprocal economic incentives to strengthen respect by all stakeholders of commitments related to capacity.	The non-respect of capacity-related commitments, both by infrastructure managers and by applicants/railway undertakings, results in wasted efforts and costs for other stakeholders involved or (in the worst case) blocks capacity that cannot be used for alternative purposes once released. Such costs are essentially external costs for individual stakeholders. Internalising these costs by introducing economic incentives should therefore improve the overall efficiency of the capacity management process. The measure relates in particular to the concept of 'commercial conditions' developed in the TTR project. The measure complements the introduction of new procedures for capacity allocation (PM4), by ensuring that capacity safeguarded for flexible ad-hoc allocation is not misused by applicants to 'block' capacity for their own use. Economic incentives could be introduced (i) via the infrastructure charging scheme, notably by extending the concept of reservation charges (Article 36 of Directive 2012/34/EU), or (ii) by extending the concept of performance schemes (Article 35 of Directive 2012/34/EU) from the operational phase to the capacity allocation phase. In the latter case, the measure becomes related to the introduction of a 'European performance scheme' (PM13).		X	X	X
	PM9 - **Strengthen capacity-related rights of applicants** (railway undertakings and others) vis-à-vis infrastructure managers, in particular for cross-border capacity and in the event of changes to allocated capacity.	Address the systematic disadvantages cross-border traffic faces in capacity allocation and in operations compared to domestic traffic by requiring infrastructure managers to manage train paths as a single, integral entity (from origin to destination), also when this involves more than one rail network. This translates into IMs being required to: • Accept requests and communicate allocation decisions in a single place and in one operation. • Ensure that any post-allocation changes to train paths – in terms of timing, routing, parameters, (e.g. due to capacity restrictions) –results in a viable train path, coordinated across the rail networks (e.g. no negative dwelling times at border crossings; no discontinuities in routing, no changes to train parameters, etc.) and must be communicated to RUs in a single operation. With respect to legal and commercial issues, any discrimination of train paths involving more than one network should be eliminated to the extent possible, e.g. as regards cancellations by the infrastructure manager due to *force majeure* incidents.		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
	PM10 - **Entrust an independent expert body with reviewing the performance** of rail infrastructure and transport services, providing advice to European Commission, the network of regulatory bodies (PM19) and other rail sector stakeholders.	The body provides analysis and strategic guidance to the Commission, ENIM and the ENRRB on the development and implementation of performance monitoring. It identifies issues of strategic importance for performance, proposes uniform methodology for performance monitoring, including performance indicators (PM11), assesses the results and provides suggestions on corrective measures to the stakeholders concerned on capacity management (PM3-6, PM9, PM9), traffic management (PM17) and market monitoring (PM18-2).In particular, the performance review body provides advice on the development and implementation of the European performance scheme (PM13). The body is composed of independent experts, fulfilling their mandate in a personal capacity and bringing together a broad range of senior-level expertise, including from industry, academia, customers of rail services. The 'performance review body' established in the aviation sector (designated in Commission Implementing Decision 2016/2296 on the basis of Article 11(2) of Regulation (EU) 549/2004) supporting the Commission and other stakeholders on issues related to the performance of air navigation services and network functions, in particular the performance scheme, can provide a template for the selection of members, and the competences, functions and tasks of this expert body. The body envisaged in this policy measure shares similarities with the 'performance review body' which exists in aviation, both in terms of its purpose and as regards the members who will compose the body, who should be experienced, senior-level individuals which are not affiliated to any stakeholders actively involved in the sector in order to avoid that vested interests influence its analysis and recommendations. The key difference between this performance body and the performance body in the aviation sector concerns the status of the body: whereas the performance body in aviation implements a binding performance regime defining performance objectives at EU level, the formal competences of the body proposed for rail are more limited as the body would only exert an advisory role.			X	X
	PM11 - **Introduce a support and monitoring function at EU level** covering (i) compliance with agreed rules and procedures and (ii) the performance of	Introduce requirements for ENIM to take charge of monitoring compliance and performance of cross-border capacity and traffic management with support from the Network Coordinator. Monitoring of compliance refers to measures PM2-1 (harmonised EU legal framework for capacity and traffic management) and PM2-2 (European network statement).			X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
	infrastructure and transport services. The function involves the central entities of IMs (PM20-1/PM20-2) and the network of regulatory bodies (PM19).	Monitoring of compliance should cover the entire capacity management process on a continuous basis, from strategic to close-to-operational phases, including the results of the process and the process itself – not just an 'ex-post' monitoring In carrying out its compliance and performance monitoring tasks, the Rail Network Coordinator cooperates / coordinates with the following: • New performance review body (PM10) • Individual IMs • Member States • RUs and other applicants • Regulatory bodies / the regulatory entity at EU level (PM19) • Partners in multimodal logistics chains (operators of terminals, service facilities, wagon keepers etc.) • Customers of rail transport services / multimodal freight transport services				
	PM12 - Entrusting regulatory bodies with the **review of multi-annual agreements between Member State authorities and infrastructure managers** to assess their consistency with the European performance scheme (PM13) and Member States' indicative rail infrastructure development strategies. Entrusting the network of regulatory bodies to identify and promote best practices for such agreements.	Directive 2012/34/EU requires (i) Members States to prepare an 'indicative rail infrastructure development strategy' (Article 8(1)) and (ii) Member State authorities and infrastructure managers to conclude multi-annual contractual agreements (Article 30 and Annex V). These agreements are basically performance contracts governing the provision of rail infrastructure and services by infrastructure managers. They must contain elements such as payments/funds allocated, performance targets to be achieved, incentives for performance improvements with respect to all aspects of infrastructure management, including maintenance and renewal, and must cover a period of not less than five years. The impact of capacity restrictions related to infrastructure works on rail traffic, in particular freight, gives rise to repeated grievances from rail operators and their customers. The concerns raised relate in particular to lacking coordination and stability of the planning and the volume of capacity restrictions. Multi-annual contracts are an existing tool (defined in Directive 2012/34/EU) to improve performance of infrastructure managers and should help to address these issues. However, with a few exceptions (e.g. Germany and France) there has not been a systematic review of these agreements and their implementation so far.				X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		This measures aims to close this gap and to trigger a broad dialogue on the issue involving all relevant stakeholders, in particular the operators of rail transport services, infrastructure managers, Member State authorities, the European Commission and others. The outcome of this process could be European guidelines and recommendations on the structure, contents, priorities and review of such agreements with a view to promote best practices.				
	PM13 - **Introduce a European performance scheme** to improve operational performance of rail services and providing a framework for national performance schemes.	Performance schemes are an instrument defined in Article 35 of Directive 2012/34/EU to improve the performance of the rail network. They are implemented at national level and do not always adequately account of the specificities of cross-border traffic, potentially rendering the incentives provided by the regimes less effective for cross-border traffic (e.g. by disregarding delays incurred on a previous network). In addition, national performance schemes do not necessarily ensure that targets defined at national level are sufficiently consistent to improve the performance of cross-border traffic. A European performance scheme can provide a common framework supporting the harmonisation of national performance regimes, e.g. in the form of a minimum set of elements to be included in performance schemes, such as common objectives, performance indicators, incentives or similar. The interplay between national and European performance schemes could be based on the approach adopted for the performance scheme relating to air navigation services for the Single European Sky which requires national performance targets to be consistent with European-wide ones (Implementing Regulation (EU) 2019/317, in particular Article 14).				X
PD3 Insufficient mechanisms for stakeholder coordination	PM14 - **Strengthen governance of rail freight corridors** and formalise a cross-corridor governance layer with defined competences	This measure aims to close gaps in the existing governance of the freight corridors, e.g. missing involvement of customers of freight transport services. It complements the governance at corridor level with a formal structure for cross-corridor coordination entrusted with competences on issues that concern all cross-border rail traffic, such as the adoption of a framework for capacity allocation, providing input on sector guidelines (RNE guidelines), following the implementation of political declarations, disseminating good practices, discussing performance of RFCs, etc. It ensures implementation of the functions assigned to the freight corridors' governance in	X			

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		the context of the European transport corridors.				
SO3 Introduce more effective mechanisms for stakeholder coordination	PM15 - Introduce **binding rules and procedures along corridors** for the coordination of traffic management between infrastructure managers and between infrastructure managers and the operation of terminals.	Article 16 of Regulation 913/2010 only defines the generic requirement to 'put in place procedures for coordinating traffic management along the freight corridor' which has resulted in limited to no implementation activities. This measure therefore introduces binding rules and procedures and objectives for the coordination of rail and terminal capacity and of operations at terminals that affect train performance. The objective of this measure is to improve the efficiency of train operations via stronger coordination and improved communication between different stakeholders resulting in the reduction of dwelling times at terminals, provide early warnings for delays on the rail network or in terminals and improved transparency for customers with the purpose of providing reliable estimated time of arrival information. The measure should take into account existing legal requirements, e.g. ''including real-time information on capacity availability and temporary capacity restrictions of the service facility, where available'' (Article 6(3) of Implementing Regulation 2017/2177).	X			
	PM16 - **Introduce a high-level advisory / coordination platform at European level** involving all stakeholders involved in multimodal rail freight transport	The purpose of this measure is to provide an inclusive platform open to relevant stakeholders with the objective of providing high-level advice, identifying priorities and proposing action to overcome barriers and exploit opportunities for cross-border rail freight transport, including in multimodal context. The measure replaces the current advisory groups at corridor level set up in accordance with Article 8(7) and 8(8) of Regulation 913/2010. The purpose of this measure is similar the 'coordination mechanisms' to be set up at national level in accordance with Article 7e of Directive 2012/34 but at European level. Coordination must be ensured with these coordination mechanisms where relevant. The setup of the platform should take into account best practice examples of national coordination mechanisms (the UK case was cited as good practice by various stakeholders). The platform should be complementary to existing platforms, in order to avoid overlaps and duplication to the extent possible, including by replacing them if needed, in particular: • the Single European Railway Area Committee (SERAC) • the SERAC Working Group on RFCs;		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		• the Sector Statement Group; • the Digital Transport and Logistics Forum (DTLF); • the Railway Safety and Interoperability Committee (RISC); • any related platforms set up at sector level (e.g. the RU/IM Telematics Joint Sector Group);The measure could be implemented in the form of a Commission Expert Group.				
	PM17 - **Introduce a European framework for the cross-border coordination of rail traffic management**, including terminals and other rail facilities, based on the principles of collaborative decision-making.	This measure implies the development of a comprehensive framework for cooperation between stakeholders with the objective to optimise cross-border traffic management and operations, including in terminals and other rail service facilities, and taking into account the interfaces with other modes of transport. The implementation of this framework should be decentralised, based on the principles of 'collaborative decision-making' as successfully adopted by other transport modes (in particular aviation): each stakeholder is responsible for managing traffic and operations within its geographical and operational area of competence. In terms of rail operations, the framework should focus on the cross-border coordination of traffic management between infrastructure managers and the coordination between infrastructure managers and railway undertakings. As regards multimodal freight transport, the framework should aim at (i) an optimisation of multimodal operations on a terminal-to-terminal basis, taking into account the links to other transport modes, and (ii) the improvement of customer information (tracking & tracing, estimated time of arrival etc.) at all levels of the logistics chain (transport operators, organisers and customers). The framework can be developed in a gradual manner in which, starting from a focus on rail and a set of core functionalities, the scope and the set of functionalities can be enlarged over time. The framework should be developed based on a close involvement of all stakeholders concerned, notably infrastructure managers, railway undertakings, operators of terminals and other rail services facilities, multimodal operators, customers of (freight) transport services, public authorities at European and national level, R&D organisations and system suppliers. In particular, the elaboration of this framework should be carried out in close coordination with the European Union Agency for Railways and Europe's Rail Joint		X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		Undertaking, in particular to ensure full consistency with the work on technical specifications for interoperability, notably TAF TSI and OPE TSI, and on the system pillar and innovation pillar. The rules and procedures making up the framework should be included in network statements and, in the policy options 3 and 4, in the European network statement (PM2-2). Rules and procedures that go beyond the scope of network statements should be documented in an appropriate manner, e.g. guidelines / handbooks, standards, other reference documents such as description of service facilities in accordance with Commission Implementing Regulation 2017/2177.				
	PM18-1 - Conducting continuous **transport market monitoring and analysis carried out by infrastructure managers in cooperation with the performance review body**	This measure introduces a systematic and continuous analysis of the evolution of demand for passenger and freight transport services in the form of prognoses or scenarios. Market monitoring and analysis should cover all modes, making it possible to identify the potential to shift transport volumes from other modes to rail. This is an important support function, in particular for strategic capacity planning (PM3) but can also serve as an input to rail investment planning at European and national levels and for the strategic planning of sector stakeholders in general (e.g. investment planning of terminals and transport operators). Carrying out market analysis at European level reflects the strong cross-border dimension of rail transport, in particular freight and creates synergies, as the elaboration of prognoses requires specific expertise, tools and data. A widely accepted market analysis at European level can provide a common reference and basis for analysis at national or regional levels or on more specific issues. This measure is carried out by sector stakeholders on the basis of voluntary cooperation.		X		
	PM18-2 - Conducting continuous **transport market monitoring and analysis at European level**, carried out by a central entity (variant of PM18-1).	This is a variant of PM18-1, with the key difference that ENIM is in charge of implementation with the support of the Rail Network Coordinator.			X	X
	PM19 - **Strengthening the competences of the European**	The network complements national regulatory bodies on matters involving a European or cross-border dimension, supervises the functioning of the designated Network Coordinator			X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
	network of regulatory bodies (Article 57 of Directive 2012/34/EU) and introducing a secretariat supporting its work.	PM20-1) and scrutinises the European network statement 5PM2-2). The entity is responsible for a consistent implementation of the functions of regulatory bodies on European and cross-border matters on the basis of European legislation as amended by this initiative (see measure 5) by adopting binding decisions in cases of diverging practices of national regulatory bodies. The secretariat will be established as a self-standing body with own resources. Legislative changes would mainly consist in defining a more concrete and broad set of concrete competences and functions of the European regulatory entity, e.g. by clarifying and strengthening the provisions of Article 57 of Directive 2012/34/EU and Article 20 of Regulation (EU) 913/2010.				
	PM20-1 – **Empower the European Network of Infrastructure Managers (ENIM) as a coordination structure for capacity and traffic management**, by assigning it with the responsibilities to: (i) define harmonised EU procedures, rules and tools, (ii) support and monitor implementation of such procedures, rules and tools and (iii) coordinate capacity management between networks as well as by **appointing an entity to support ENIM in the operational implementation of these functions** (the **'Network Coordinator'**).	The purpose of the entity is to facilitate cooperation of infrastructure managers based on a set of defined competences, functions and tasks, which are covered by separate measures. In organisational terms, competences, functions and tasks of the central entity would be assigned to the European Network of Infrastructure Managers (Article 7f of Directive 2012/34/EU) in charge of strategic steering and decision-making (defining objectives, strategies and work programmes) and an operational body in charge of implementing strategy and work programme. Pre-existing entities could be designated to take over the role of the operational body (Network Coordinator), e.g. RailNetEurope. The designation of Eurocontrol as the network manager in charge of ATM network functions (on the basis of Regulation 551/2004) or the designation of EURiD as the entity in charge of managing 'eur' domain names (on the basis of Regulation 551/2004) can serve as blueprints for the designation procedure. This measure replaces the governance of the rail freight corridors defined in Regulation (EU) 913/2010.			X	

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
	PM20-2 – **Empower the European Network of Infrastructure Managers (ENIM) as coordination and as planning / operational structure for capacity and traffic management**, including all the responsibilities in PM20-1, and with the addition of **decision-making responsibilities in capacity management** (PM22) and **operational functions in traffic management** (PM23).	The organisation of the entity can be the same as in measure 20-1 (i.e. empowering the European Network of Infrastructure Managers). Resource needs for setup and operation of the entity will be higher due to the additional responsibilities linked to additional competences of the entity. The additional competences, functions and tasks of the entity derive in particular from measures 22 and 23.				X
	PM21 – Introduce an **EU-level function supporting cross-border coordination of capacity management between infrastructure managers**, including **consultation and escalation mechanisms** involving **applicants and regulatory bodies**.	**Conflict resolution entrusted to central entities.** Entrusting the ENIM (PM20-1/PM20-2) with the task to identify and find solutions to conflicts resulting from the non-alignment or disagreement between infrastructure managers relating to capacity management. If ENIM cannot provide a solution satisfactory for applicants concerned, the matter is forwarded to the network of regulatory bodies for a binding decision. Decision-making competences part of the capacity management process, including the strategic management phase (measure 3) as well as the allocation process (in accordance with Directive 2012/34/EU and as amended by measure 4) are largely in the remit of individual infrastructure managers, with a central entity at EU level playing mainly a monitoring role. Infrastructure managers must ensure cross-border consistency across the entire capacity management process, in close coordination with applicants and railway undertakings, in a coordination process implemented at an appropriate level (bilateral, regional, corridor). The escalation mechanism proposed in this measure addresses cases in which this coordination process does not result in consistent outcomes. It empowers the central entity (measure 2 1) with the competence to take final, binding decision to resolve any conflicts or			X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
		inconsistencies, following consultation of all parties concerned. The decision of the central entity is subject to review by the network of regulatory bodies.				
	PM22 - **Strategic capacity management phase entrusted to the central entity.** Entrusting the central entity (PM20-2), for all rail lines part of the European transport corridors, with decision-making competence relating to the strategic capacity management phase and with the competence to approve the outcomes of the capacity allocation process.	This measure assigns the central entity at European level (measure 20-2) with the competence to approve key outcomes of the capacity management and allocation process on lines part of the core and extended core network as defined in the proposal to revise the TEN-T Regulation, i.e. the lines of the highest importance for cross-border transport. The purpose of the measure is to strengthen the central entity's mandate to defend the interests of cross-border rail transport over and above policy measure 21, in which it has the role of an arbitrator in an escalation process covering cases of non-alignment or disagreement . For this purpose, the central entity would be obliged to achieve a set of defined objectives relating to cross-border rail transport. Basically, the measure implies that the central entity has a 'veto right' as regards the capacity management process, e.g. with regard to outcomes of the strategic planning phase (capacity model, capacity offer etc.) and the allocation process (e.g. allocation decisions).				X
	PM23 - Introduce an operational function at EU level supporting the coordination of traffic management, in particular for the management of major disruptions and crises **('crisis cell')**.	This measure establishes a single point of contact for rail crisis management at European level for stakeholders at various levels (operational, customers, media, political) available 24/7, benefitting from economies of scale and scope as compared to current incident management at corridor-level. The cell organises and supports coordination between operational stakeholders, including infrastructure managers, railway undertakings, customers of rail transport services and other relevant actors. It supports the improvement of crisis / incident management by carrying out an independent ex-post evaluation of the management of actual crises and incidents ('return on experience'). Staff deployed for the 'crisis cell' takes over related tasks in undisturbed conditions, in particular in performance analysis / monitoring / management. This task will be entrusted to the network coordination entity.				X
PD4 Insufficient digital	PM24 - **Introduce legal requirements on the harmonised exchange of digital information** supporting capacity and traffic	Introduce legally binding deadlines for infrastructure managers for the implementation of digital information exchange with railway undertakings and other rail stakeholders in accordance with the technical specifications for interoperability on telematics applications for freight (TAF TSI).	X	X	X	X

Problem driver / specific objective	Policy measures		Policy options			
	Title	Description	PO1	PO2	PO3	PO4
support tools SO4 Support the deployment of digital tools for capacity and traffic management	management as well as customer information.	Introduce a legal requirement for infrastructure managers to provide the technical description of the railway network in the context of the network statement via the register of infrastructure (RINF). Related legal obligations could be introduced alternatively: • as part of the 2022 revision of TAF TSI (however, this is subject to a rather lengthy standard transition period for new requirements introduced in TSIs of 7 years from the proposal); or • via rail market legislation by granting applicants the right to request/receive infrastructure capacity and operational information (tracking & tracing etc.) in accordance with TAF TSI.				
	PM25 - Comprehensive digitalisation and automation of capacity and traffic management based on **a single interface at EU level and seamless end-to-end services for applicants** (railway operators).	Introduce an obligation for IMs to use a single European IT interface or application to organise data exchange related to capacity management with RUs and between different infrastructure managers. Compliance with TAF/TAP TSIs might need to be addressed in other initiatives. The information must be complete, accurate and constantly updated throughout the entire process, it must cover capacity available for traffic and capacity not available for traffic (irrespective of the reason, including capacity allocated to an applicant, TCRs, asset failures, accidents or natural incidents, permanent or temporary closures of lines). Introduce a legal requirement for IMs to provide real-time operational information (train location, estimated time of arrival/handover and similar) for all trains in a single place at EU level (functionally) and in a TAF TSI-compliant format. Related legal obligations could be introduced: • either as part of the 2022 revision of TAF TSI (however, this is subject to a rather lengthy standard transition period for new requirements introduced in TSIs of 7 years from the proposal); or • via rail market legislation by granting applicants the right to request/receive infrastructure capacity and operational information (tracking & tracing etc.) in accordance with TAF TSI.		X	X	X

ANNEX 7: DESCRIPTION OF THE TTR PROJECT

1. Genesis

The initial impetus for the Timetable Redesign Project dates back to 2014. The starting point was the firm demand of rail freight operators for a new capacity management process that better reflects the needs and constraints of freight traffic. The scope of the initiative soon widened to include the needs of freight and passenger transport as well as capacity for infrastructure works due to maintenance and renewal of networks. The initiative was finally formalised by RailNetEurope's General Assembly in 2016 with the adoption of a first framework process and the recognition that implementation of the initiative will require significant changes to the processes and framework conditions, such as IT tools and legal basis. Major milestones involve the approval of the TTR process components and TTR pilot projects by RailNEtEurope and Forum Train Europe in May 2017, the launch of the EU and national implementation projects in December 2018 and September 2019, the first go-live of a TTR process in 2021 (publication of 'capacity strategies'), the adoption of the final concept documentation in December 2021 and an acceleration of implementation in 2022.

The launch of the TTR initiative coincides with the establishment and going operational of the first group of rail freight corridors in 2014 which provides an early-on indication that the services and products offered by infrastructure managers via the corridors did not respond to market needs.

2. Objectives

The initiative pursues the following high-level objectives:

- Optimise the use of the capacity of the existing network, avoiding waste of capacity resulting from inadequate capacity management processes;
- Increase the quality of capacity, meeting the needs of passenger and freight transport markets;
- Harmonise capacity management in Europe to facilitate cross-border train services, increasing the stability and reliability of capacity;
- Automate capacity management to optimise use of resources;
- Improve the competitiveness of rail vis-à-vis other modes.

3. Key elements

The TTR project builds on a number of key elements[267]:

- "Advance planning": TTR introduces a new and harmonised process for capacity management and allocation covering several years in advance.
- "Rolling planning": TTR introduces a flexible processes for the allocation of infrastructure capacity during the period of the current working timetable and with the possibility for RUs to be granted the right for infrastructure usage beyond the current timetable period.

[267] These "elements" are similar to the Better Regulation concept of "policy measures".

- "Commercial conditions": TTR introduces financial incentives designed to incite both IMs and RUs to limit changes to allocated capacity with a view to stabilise the planning process.
- "Digital capacity management": TTR introduces an ecosystem of IT systems supporting capacity management building on a combination of upgrades to IMs' existing IT systems and a 'central IT layer' at EU level.
- "International leading entities": TTR relies on entities to ensure the effective coordination of the actual contents of the planning process and to ensure adherence to commonly agreed standards.

Many of the elements of the TTR programme have provided important input to the definition of policy measures for this impact assessment, including notably the introduction of a strategic capacity management phase (PM3), the introduction and further development of processes to allocate capacity in line with market needs (PM4), the reciprocal economic incentives supporting stakeholders in making best use of capacity (PM8), the introduction of process to monitor implementation of harmonised EU processes and tools by infrastructure managers (PM11) as well as an effective support of processes by digitalising and automating capacity management (PM24, PM25)[268].

4. Ownership and support

The TTR project is a sector-driven initiative to modernise the management of rail capacity[269], including as a central element the preparation of the working timetable. The programme has been steered by RailNetEurope, an association established by all "main" infrastructure managers from the EU Members States as well as a number of non-EU Member States, notably Switzerland and Serbia (which provide transit lines connecting EU Member States). The programme's objectives, approach and key documents have been approved by the Members at various occasions. Implementation projects have been set up by all infrastructure managers to ensure a harmonised and interoperable implementation of the programme at the level of infrastructure managers.

The project has been developed in close coordination with railway undertakings, via expert and representative organisations such as Forum Train Europe[270], European Rail Freight Association[271], the Alliance of Passenger Rail New Entrants[272] and the Community of European Railway and Infrastructure Companies[273].

Other stakeholders, notably regulatory bodies and Member States, have been regularly involved in a number of formats involving events and bilateral exchanges and have

[268] See Annex 6 for a description of the policy measures.

[269] The management of rail capacity involves as a key element of the working timetable, which is reflected in the project's name.

[270] https://www.forumtraineurope.eu/

[271] https://erfarail.eu/

[272] https://www.allrail.eu/

[273] https://www.cer.be/

expressed support on the project's objectives in a number of high-political declarations[274].

[274] For example a sequence of declarations by the Council presidencies of the Netherlands (Rotterdam Declaration, 2016), Austria (Vienna Declaration, 2018) and Germany (Berlin Declaration, 2020).

ANNEX 8: EFFECTIVENESS OF THE DIFFERENT POLICY OPTIONS

This annex provides more detailed explanations on the assessment of effectiveness of the policy options, complementing the analysis in section 7.1.

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear
	PO1	PO2	PO3	PO4	
Specific policy objective 1: Enable more effective capacity management procedures in the legal framework					
Expected increase in available and usable rail infrastructure capacity, meeting the needs of different rail market segments.	Positive impact on the available and usable rail infrastructure capacity. Benefits to RUs due to the increase in the available capacity estimated at EUR 242.1 million, expressed as present value over 2025-2050 relative to the baseline.	Strong positive impact on the available and usable rail infrastructure capacity. Benefits to RUs due to the increase in the available capacity estimated at EUR 1 981 million, expressed as present value over 2025-2050 relative to the baseline.	Strong positive impact on the available and usable rail infrastructure capacity. Benefits to RUs due to the increase in the available capacity estimated at EUR 2 575.7 million, expressed as present value over 2025-2050 relative to the baseline.	Strong positive impact on the available and usable rail infrastructure capacity. Benefits to RUs due to the increase in the available capacity estimated at EUR 2 759.1 million, expressed as present value over 2025-2050 relative to the baseline.	
Expected improvement in performance of rail transport services, notably	Positive impact on punctuality. Benefits to RUs due to improvements in	Strong positive impact on punctuality. Benefits to RUs due to improvements in	Strong positive impact on punctuality. Benefits to RUs due to improvements in	Strong positive impact on punctuality. Benefits to RUs due to improvements in	

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear

	PO1	PO2	PO3	PO4
punctuality, resulting in an increase of rail traffic.	punctuality estimated at EUR 72.7 million, expressed as present value over 2025-2050 relative to the baseline. Increase in rail traffic estimated at 0.2% in 2030 (8.2 million train-km) and 0.2% in 2050 (13.9 million train-km) relative to the baseline.	punctuality estimated at EUR 501.3 million, expressed as present value over 2025-2050 relative to the baseline. Increase in rail traffic estimated at 1.7% in 2030 (77.6 million train-km) and 2.2% in 2050 (139.6 million train-km) relative to the baseline.	punctuality estimated at EUR 658 million, expressed as present value over 2025-2050 relative to the baseline. Increase in rail traffic estimated at 2.7% in 2030 (125.1 million train-km) and 4% in 2050 (249.1 million train-km) relative to the baseline.	punctuality estimated at EUR 664.9 million, expressed as present value over 2025-2050 relative to the baseline. Increase in rail traffic estimated at 3.6% in 2030 (162.6 million train-km) and 7% in 2050 (432.8 million train-km) relative to the baseline.
Specific policy objective 2: Strengthen incentives to improve performance of rail infrastructure and rail transport services				
Cost savings for IMs and applicants from better quality and management of capacity, notably resulting from a reduction in cancelled or modified train path requests.	No impact.	Strong positive impact on capacity management and allocation process, notably from greater stability of allocated paths (PM4). Costs savings for IMs estimated at EUR 20.2 million in 2030	Strong positive impact on capacity management and allocation process, notably from greater stability of allocated paths (PM4). Costs savings for IMs estimated at EUR 20.3 million in 2030 and 28.1 million in 2050	Strong positive impact on capacity management and allocation process, notably from greater stability of allocated paths (PM4). Costs savings for IMs estimated at EUR 20.4 million in 2030

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear

	PO1	PO2	PO3	PO4
		and 27.8 million in 2050 relative to the baseline (EUR 415.3 million, expressed as present value over 2025-2050).	relative to the baseline (EUR 418.6 million, expressed as present value over 2025-2050).	and 28.9 million in 2050 relative to the baseline (EUR 423.9 million, expressed as present value over 2025-2050).
Expected improvement of planning and implementation of infrastructure works resulting in reducing their negative impact.	Positive impact on reducing the negative effect of TCRs (less train path amendments and cancellations because of works) due to improving the monitoring of quality of service and customer satisfaction on the freight corridors (PM7).	Strong positive impact on reducing the negative effects of TCRs (less train path amendments and cancellations because of works) due to the introduction of financial incentives to strengthen commitments by IMs to allocated capacity (PM8). Reducing the negative impact of TCRs on capacity allocation by requiring	Strong positive impact on reducing the negative effects of TCRs (less train path amendments and cancellations because of works) by implementing PM8 and PM9. Strengthen performance monitoring, including for the quality of capacity, by introducing an independent performance monitoring body (PM10).	Strong positive impact on reducing the negative effects of TCRs (less train path amendments and cancellations because of works) by implementing PM8, PM9 and PM10. Furthermore, entrust regulatory bodies with the responsibility to review the contractual agreements concluded between Member State authorities and

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear

	PO1	PO2	PO3	PO4
		cross-border trains to receive complete train paths (origin to destination), which will require taking into consideration all TCRs (PM9).		infrastructure managers and identify early problems with the funding and implementation of works (PM12).
Specific policy objective 3: Introduce more effective mechanisms for coordination between stakeholders, in particular across borders				
Expected improvement of coordination procedures between all stakeholders involved in a freight train run.	Negligible impact. The policy option introduction of binding rules and procedures on cooperation (PM15) and strengthens performance monitoring (PM7). However, due to the continuation of the corridor-based approach, and the fragmentation that it results in, involvement of stakeholder outside IMs and RUs is expected to remain	Positive impact due to improved coordination between IMs and between IMs and terminal operators due to the . Improving coordination by establishing a high-level coordination platform at European level including all stakeholders involved in multimodal rail freight transport (PM16).	Strong positive impact with the implementation of PM15, PM16 and PM17. In addition, a central entity for IMs will contribute to better coordination on capacity allocation with the support of a Network Coordinator (PM20-1). The entity will take decisions on possible conflicts in strategic	Strong positive impact with the implementation of PM15, PM16 and PM17. In addition, a central entity will do the strategic planning for important cross-border lines, approve the capacity allocation process and ensure coordination with IMs for cross-border traffic (PM20-2 and PM22).

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear

	PO1	PO2	PO3	PO4
	limited for resource reasons: The increase in punctuality is estimated at 0.x percentage points (from X to Y).	Ensure coordination of IMs with terminal operators and other stakeholders by providing a framework for collaborative decision making (PM17).	planning (PM21).	
Expected increase in reliability of rail transport, in cases of *force majeure*.	Limited positive impact on reliability of rail by introducing binding rules and procedure for the coordination of traffic management between infrastructure managers and between infrastructure managers and the operation of terminals (PM15). All IMs involved in the run of an international train will be informed promptly of delays	Positive impact on the reliability of rail by requiring contingency planning facilitating the management of force major disruptions or planned non-availability of the network (PM6). Improved operational coordination between stakeholders involved in rail transport via the introduction of a European framework for the	Strong positive impact due to the implementation of PM6 and 17, reinforced for cross-border traffic by the operational support of the Network Coordinator in coordinating IMs' contingency plans (PM21).	Strong positive impact due to the implementation of the measures in PO3 and, in addition, the operational support of a crisis cell at EU level, which will support the coordination of traffic management in the event of major disruptions and crises.

Key: Impacts expected					
××	×	O	✓	✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Strongly positive	Unclear

	PO1	PO2	PO3	PO4
	and coordinate traffic management based on a limited set of agreed rules and procedures.	cross-border coordination of rail traffic management, including terminals and other rail facilities, based on the principles of collaborative decision-making (PM17).		
Specific policy objective 4: Support the deployment of digital tools to enable better capacity and traffic management				
Extent to which IT tools for capacity requests, capacity planning and allocation and traffic management respond to the needs of all rail market segments	Positive impact through the speeding up of digital information exchange related to capacity and traffic management (PM24).	Strong positive impact by implementing PM24 and introducing comprehensive digitalisation and automation of capacity and traffic management for IMs based on based on interoperable IT systems and seamless end-to-end services for applicants.	Strong positive impact by implementing PM24 and introducing comprehensive digitalisation and automation of capacity and traffic management for IMs based on based on interoperable IT systems and seamless end-to-end services for applicants.	Strong positive impact by implementing PM24 and introducing comprehensive digitalisation and automation of capacity and traffic management for IMs based on based on interoperable IT systems and seamless end-to-end services for applicants.

ANNEX 9: DISCARDED POLICY OPTIONS

This annex provides more detailed explanations on why a number of policy measures which were contemplated in the preparatory phases of the impact assessment were discarded.

Discarded policy measure	Reason for discarding
(i) Involving the customers of rail freight services in the governance of the corridors in order to strengthen market orientation and the focus on customers' needs	The measure was intended to close the gap that end customers are not involved in the governance of the rail freight corridors, as identified in the evaluation of Regulation 913/2010. Early contacts with stakeholders made it clear that customers aim for a high-level, strategic engagement with the rail sector; this has been confirmed in interviews with representatives of freight customers, such as CLECAT (European Association for Forwarding, Transport, Logistics and Customs Services). An involvement of rail freight customers in the governance of the 11 existing corridors would not fulfil the criteria of efficiency and proportionality and the measure was therefore discarded.
(ii) Require mandatory establishment of an independent legal entity for each rail freight corridor	The measure was intended to increase the resources available to the bodies of the rail freight corridors (one-stop shops, permanent management offices) and to increase their accountability. The measure was discarded because interlocutors involved in the corridor structures focused on a clarification and extension of the responsibilities of the corridor bodies as a means to strengthen their effectiveness. The question of organisational form was not addressed in the stakeholder consultation. The measure would not meet the criterion of effectiveness and was therefore discarded.
(iii) Introducing EU rules for terminal operations involving rail (e.g. on rights to service the lines of the facility, how to deal with incidents involving temporary and partial closures, etc.).	The measure was intended to address the absence of effective coordination of rail and terminal operations, as identified in the evaluation of Regulation 913/2010. In the consultation, representatives of terminals emphasised the lack of information but emphasised that operations need to be driven by industry. Regulating terminal operations, a largely unregulated activity, was considered inappropriate to improve the coordination between terminals and railways. On this basis, it was concluded that the measure would not meet the criteria of proportionality and coherence and was therefore discarded. The retained PM17 provides a more industry-driven alternative to achieve the same objective.
(iv) Set up an entity at supra-national level with the task of monitoring / supervising all or selected cross-border flows in real-time and in the post-operational phase, based on an end-to-end approach, i.e. along the entire multimodal logistics chain.	The measure was intended to provide an integration function to support end-to-end control of freight transport operations, which in particular for multimodal freight transport involve a high number of stakeholders for a single train run. Stakeholders did not express support for such a function if introduced in isolation, questioning how such an entity could intervene in operations as opposed to just observe. The measure was considered not to meet the criterion of effectiveness and was therefore discarded. The retained PM17 addresses the issue in a more structure approach by first introducing a framework for collaborative decision-making at an operational level, which may or may not involve the monitoring / supervising entity proposed under this measure.
(v) Require a stronger centralisation	This measure aimed to provide a more ambitious alternative to the

Discarded policy measure	Reason for discarding
of IT tools for capacity and traffic management at EU level.	retained policy measure 25 (digitalisation and automation of capacity and traffic management) via a stronger reliance of central systems developed from scratch. In the consultation, stakeholders emphasised that the choice of technological solutions should not be made in legislation but rather left to the sector ('technological neutrality'). Thus, the measure was not considered to meet the criterion of coherence and proportionality and discarded.