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REVIEW OF CHARGING PRACTICES FOR THE MINIMUM ACCESS PACKAGE IN EUROPE

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Introductory remarks

This review on charging practices for the minimum access package covers the following countries for the which the RB is a member of IRG-Rail: ***Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and The Netherlands.***

The document provides an ***overview of charging practices as they stand at the time of writing****. IRG-Rail intends to review it as further information becomes available.*

Table of content

1. General objectives of the document 1

2. Review of Charges 4

2.1 Scope of regulatory bodies' mission 9

2.2 Documents examined in the charges review 13

2.3 Publication of the review and other regulatory decisions 15

2.4 Review Focus 16

2.4.1 Direct Costs 19
2.4.2 Market segmentation & Mark-up Calculation 24
2.4.3 Total level of charges and costs 38

2.5 Other elements of the charging system 41

2.5.1 Congestion and scarcity charges 41
2.5.2 Environmental charges 42
2.5.3 Performance schemes 42
2.5.4 Reservation charge 44

2.6 Charging unit 46

2.7 Traffic forecasts 47

3. Cost Modelling 48

3.1 Direct Cost 48

3.1.1 Subtraction Methodolgy 54
3.1.2 Engineering 54
3.1.3 Econometric 56
3.1.4 Criteria for Direct Cost Calculation and Modulation 57

3.2 Total Costs 61

3.2.1 Definition of total cost 61
3.2.2 Review of the IM's investment programmes 66
3.2.3 Financing of the IM's investment programmes (replacement, expansion and maintenance investments) 67
3.2.4 The impact of public grants on charges 68
3.2.5 The cost of capital 72
3.2.6 The regulatory asset base 73
3.2.7 Valuation of assets 73

3.3 Multi-annual contracts 75

3.4 Efficiency 75

4. Complaints on charging issues 77

Table of figures

Figure 1: Schematic illustration of review process of RBs for direct costs 17
Figure 2: Heatmap of Segmentation Criteria in Freight 30
Figure 3: Heatmap of Segmentation Criteria in Passenger Services 34
Figure 4: Heatmap of Direct Cost Criteria in Freight Services 58
Figure 5: Heatmap of Direct Cost Criteria in Passenger Services 58

1. General objectives of the document

The Directive 2012/34/EU, also known as the Recast, is the legal basis for establishing the principles governing rail-charging systems in Europe. The Recast requires EU Member States to establish charging frameworks that meet the management independence initially laid down in Directive 91/440/EC, and sets out in particular the principles of accounting, legal organisation and decision-making separation between railway companies and the State, and between infrastructure managers (IMs) and railway undertakings (RUs). A regulatory body (RB), legally distinct and independent from any other public and private entity and independent from the IM, is responsible to guarantee fairness and transparency.

This framework is crucial for a successful functioning of the European railway market. As a result, Member States are moving towards more transparent capacity allocation and charging systems. In particular, the charging system has several key objectives. It obviously provides a mechanism for the IM to recover costs. However, it can also be used to incentivise the optimal use and provision of the infrastructure. For example, charges based on cost provide incentives to rail operators to use the infrastructure where the benefits of utilization would exceed their costs. Furthermore, it can incentivise railway undertakings to find ways to reduce the costs they place on the network by, for example, investing in less damaging trains. The purpose of this document is to present an overview of the practices and regulatory principles used in the charging system for the minimum access package, as well as other charges referred to Directive 2012/34/EU across the countries whose regulatory bodies are members of IRG-Rail

IRG-Rail intends to expand this overview report and all IRG-Rail members and European rail regulatory bodies are invited to participate and submit information on their charging systems when available. The overview first published in October 2012 has been updated several times. The second version provided an addendum (section 3) that explained the regulatory bodies' general roles in charging issues. The third version included descriptions on the role of regulatory bodies in respect of investments (section 3.4) and gave an overview on the impact of public grants on charges (section 3.4). The fourth version included new countries and added tables summarizing the main information included in section 3. This report is the fifth version. It takes account of all recent changes to national legislation to keep the document up do date and adds an-in depth analysis of direct cost criteria and market segments. The current update restructured the report and added new overviews on the review process of RBs. It also leveraged more on papers already published by IRG rail in the meantime. IRG-Rail will continue and update the report as necessary.

The review of charging systems should allow IRG-Rail to:

1. Obtain a common understanding of charging practices as applied in a number of European countries;
2. Explore common frameworks for the review of charging practices given by Directive 2012/34/EU, as amended;
3. Inform the future activities and areas of focus of IRG-Rail.

This report will usually refer to a country while talking about the practices of the main IM, the RB or the legislative implementation. This allows for a better reading and usually the main IM manages the biggest network within a country. On occasion, the paper presents practices of different IMs within a country and will indicate whenever this is the case. The information of this report includes the following countries, respective RBs, domestic incumbent companies and main IMs:

Table 1: Overview of countries, RBs, domestic incumbent, and main IM

Country	Regulatory Body	Domestic Incumbent(s)	Main IM
Austria	Schienen-Control Kommission	OEBB-Personenverkehr AG (passenger traffic) Rail Cargo Group (freight traffic)	OEBB-Infrastruktur AG
Belgium	Regulatory Body for Railway Transport	SNCB	Infrabel
Bulgaria	Railway Administration Executive Agency	BDZ	National railway Infrastructure Company (NRIC)
Croatia	HAKOM	HŽPP (HŽ Putnički prijevoz)	HŽ Infrastruktura d.o.o.
Czech Republic	UPDI	CD	SZ
Denmark	Jernbanenaevnet	DSB	Banedanmark
Estonia	Estonian Competition Authority	AS Eesti Liinirongid	
Finland	Finnish Rail Regulatory Body (Traficom)	VR (VR-Group Ltd)	Finnish Transport Infrastructure Agency (FTIA).
France	Autorité de Régulation des Transports	SNCF Voyageurs	SNCF Réseau
Great Britain	Office of Rail and Road	None	Network Rail
Germany	Bundesnetzagentur	DB FV, DB Cargo, DB Regio (DB AG)	DB Netz AG
Greece	Regulatory Authority for Railways		OSE SA
Hungary	Rail Regulatory Body	MÁV-START Zrt.	MÁV Magyar Államvasutak Zrt.
Ireland	Commission for Railway Regulation		

Country	Regulatory Body	Domestic Incumbent(s)	Main IM
Italy	Autorità di Regolazione dei Trasporti	Trenitalia	Rete Ferroviaria Italiana SpA (RFI)
Kosovo	Railway Regulatory Authority	SH.A'' Trainkos''	
Latvia	State Railway Administration	"Pasažieru vilciens" JSC (passenger) and "LDZ CARGO" LLC (freight)	"Latvijas dzelzceļš" SJSC
Lithuania	Communications Regulatory Authority	LTG Cargo and LTG Link	LTG Infra
Luxembourg	Institut Luxembourgeois de Régulation	CFL (Société Nationale des Chemins de fer Luxembourgeois)	IM : CFL (Société Nationale des Chemins de fer Luxembourgeois) AB: ACF (Administration des Chemins de Fer)
North Macedonia	Macedonian Railway Regulatory Agency		
Norway	Statens jernbanetilsyn	Vygruppen AS	Bane NOR SF
Poland	Urząd Transportu Kolejowego	PKP Szybka Kolej Miejska w Trójmieście “PKP INTERCITY” S.A. PKP Cargo S.A. PKP LHS Sp. z o.o.	PKP PLK SA (PKP)
Portugal	AMT -	CP	IP, S.A.
Romania	Consiliul Național de Supraveghere din Domeniul Feroviar	SNTF CFR Călători SNTF CFR Marfă	Compania Națională de Căi Ferate CFR SA
Serbia	Directorate for Railways		
Slovakia	Dopravný úrad / Transport authority	ZSSK (Železničná spoločnosť Slovensko)	Železnice Slovenskej republiky (ŽSR)
Slovenia	AKOS	SŽ (Slovenske železnice)	SŽ-Infrastruktura
Spain	Comisión Nacional de los Mercados y la Competencia	RENFE	ADIF
Sweden	Transportstyrelsen	SJ AB (passenger) Green Cargo AB (freight)	Trafikverket
Switzerland	Schiedskommission im Eisenbahnverkehr	SBB (Schweizerische Bundesbahnen)	SBB
The Netherlands	Autoriteit Consument & Markt	NS Groep N.V. (passenger), DB Cargo Nederland N.V. (freight)	ProRail B.V.

2. Review of Charges

According to Directive 2012/34/EU, Annex II-1, the charges specified in the network statements should cover the items included in the minimum access package which are:

a. Handling of requests for infrastructure capacity;
b. The right to utilise capacity which is granted;
c. Use of railway infrastructure, including track points and junctions;
d. Train control including signalling, regulation, dispatching and the communication and provision of information on train movement;
e. Use of electrical supply equipment for traction current, where available;
f. All other information required to implement or operate the service for which capacity has been granted.

The main charging principles laid down in Directive 2012/34/EU provide that:

- Charges for the use of rail infrastructure must be paid to the IM and be used to finance its activities (Article 31 (1) of Directive 2012/34/EU);
- The charges for the minimum access package must be set at the cost that is directly incurred as a result of operating the train service (Article 31 (3) of Directive 2012/34/EU);
- Charges can also be levied to reflect scarcity of capacity of an identifiable segment of the infrastructure during periods of congestion (Article 31 (4) of Directive 2012/34/EU) or take account of environmental effects (Article 31 (5) of Directive 2012/34/EU);
- Article 32 defines the following exceptions to the charging principles of the Directive 2012/34/EU:
    - In order to obtain full recovery of costs, IMs are allowed to levy a mark-up if the market can bear it and provided that market segments have been defined (Article 32 (1) of Directive 2012/34/EU). Under this exception, the level of charges must not exclude the use of infrastructure by market segments which can pay at least the cost that is directly incurred as a result of operating a railway service, plus a rate of return that the market can bear;
    - Additionally, for specific future investment projects, or specific investment projects that have been completed after 1988, the IM may set or continue to set higher charges on the basis of the long-term costs of such projects if they increase efficiency or cost-effectiveness or both and could not otherwise be or have been undertaken (Article 32 (3) of Directive 2012/34/EU).
- Infrastructure charging schemes must also encourage railway undertakings and the IM to minimise disruption and improve the performance of the railway network through a performance scheme (Article 35 of Directive 2012/34/EU).

Table 2 below provides an overview of the application of charges for the minimum access package of the main IMs across countries whose RB is a member of IRG-Rail. The table is based on the

charging practices in countries detailed in the Annexes[1]. It does not represent the full regulatory framework of each country as a regulatory framework may allow different solutions/options that the IM does not necessarily adopt. It provides information on the following charging characteristics:

- **Charge(s) reflecting direct costs according to Article 31(3) of Directive 2012/34/EU**: "[w]*ithout prejudice to paragraph 4 or 5 of this Article or to Article 32, the charges for the minimum access package and for access to infrastructure connecting service facilities shall be set at the cost that is directly incurred as a result of operating the train service*";
- **Charge(s) under Article 32 (3) of Directive 2012/34/EU (long term costs):** "[f]*or specific future investment projects, or specific investment projects that have been completed after 1988, the infrastructure manager may set or continue to set higher charges on the basis of the long-term costs of such projects if they increase efficiency or cost-effectiveness or both and could not otherwise be or have been undertaken. Such a charging arrangement may also incorporate agreements on the sharing of the risk associated with new investments";*
- **Annual prices:** the table indicates whether charges change every year or not; this may also include yearly price changes due to indexation.
- **Mark-ups and market segmentation according to Article 32 (1) of Directive 2012/34/EU**: "[i]*n order to obtain full recovery of the costs incurred by the infrastructure manager a Member State may, if the market can bear this, levy mark-ups on the basis of efficient, transparent and non-discriminatory principles, while guaranteeing optimal competitiveness of rail market segments. The charging system shall respect the productivity increases achieved by railway undertakings"*;
- **Discounts under Article 33 (3) of Directive 2012/34/EU:** "[i]*nfrastructure managers may introduce schemes available to all users of the infrastructure, for specified traffic flows, granting time-limited discounts to encourage the development of new rail services, or discounts encouraging the use of considerably underutilised lines";*
- **Levy for the impact of public service operation contract under Article 12 of Directive 2012/34/EU:** "*[m]ember States may, under the conditions laid down in this Article, authorise the authority responsible for rail passenger transport to impose a levy on railway undertakings providing passenger services for the operation of routes which fall within the jurisdiction of that authority and which are operated between two stations in that Member State"*;
- **Incentives under Articles 30 (1) of Directive 2012/34/EU: "***[i]nfrastructure managers shall, with due regard to safety and to maintaining and improving the quality of the infrastructure service, be given incentives to reduce the costs of providing infrastructure and the level of access charges".*

[1] Note: this table only refers to the mainline network of the incumbent. Other countries have a mixed usage of their whole network.

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Table 2: Overview of charging practices across countries

Country	Charge(s) reflecting direct costs (Article 31 (3) of Directive 2012/34/EU)	Annual prices?	Market segments? (Article 32 (1) of Directive 2012/34/EU)	Mark-ups *"if the market can bear this"* (Article 32 (1) of Directive 2012/34/EU)	Discounts (Article 33 (3) of Directive 2012/34/EU)	Levy for the impact of PSO contracts (Article 12 of Directive 2012/34/EU)	Incentives under Article 30 (1) of Directive 2012/34/EU	Charge(s) under Article 32 (3) of Directive 2012/34/EU (long term costs)
Austria	✓	✓	✓	✓	✗	✗	n/a	✗
Belgium	✓	✓	✓	✓	✗	✗	✗	✓
Bulgaria	✓	✓	✗	✗	✓	✗	✓	✗
Croatia	✓	✓	✓	✗	✗	✗	✗	✗
Czech Republic	✓	✓	✗	✗	✗	✗	✗	✗
Denmark	✓	✓	✗	✗	✗	✗	✓	✓
Estonia	✗	✓	✗	✗	✓	✗	✗	✗
Finland	✓	✓	✗	✗	✗	✗	✗	✗
France	✓	✓	✓	✓	✓	✗	✗	✓
GB	✓	✓	✓	✓	✓	✗	✓	✗
Germany	✓	✓	✓	✓	✓	✗	✓	✗
Greece	✓	✓	✗	✗	✗	✗	✓	✗
Hungary	✓	✓	✓	✓	✓	✓	n/a	✗
Italy	✓	✓	✓	✓	✓	✗	✓	✗
Latvia	✓	✓	✓	✓	✗	✗	✗	✗
Lithuania	✓	✓	✓	✓	✗	✗	✓	✗
Luxembourg	✓	✓	✗	✗	n/a	n/a	n/a	✗
Norway	✓	✓	✓	✓	✓	✗	✓	✗
Poland	✓	✓	✓	✓	✓	✗	✓	✓
Portugal	✗	✓	✗	✗	✗	✗	✗	✗
Romania	✓	✓	✗	✗	✓	✗	✓	✗
Slovakia	✓	✗	✓	✗	✓	✗	✓	✗

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Country	Charge(s) reflecting direct costs (Article 31 (3) of Directive 2012/34/EU)	Annual prices?	Market segments? (Article 32 (1) of Directive 2012/34/EU)	Mark-ups *"if the market can bear this"* (Article 32 (1) of Directive 2012/34/EU)	Discounts (Article 33 (3) of Directive 2012/34/EU)	Levy for the impact of PSO contracts (Article 12 of Directive 2012/34/EU)	Incentives under Article 30 (1) of Directive 2012/34/EU	Charge(s) under Article 32 (3) of Directive 2012/34/EU (long term costs)
Slovenia	✓	✗	✗	✗	✗	✓	✓	✓
Spain	✓	✓	✓	✓	✓	✗	✗	✗
Sweden	✓	✓	✓	✓	✗	✗	✗	✓
Switzerland	✓	✓	✓	✓	✓	✗	✗	✗
The Netherlands	✓	✓	✓	✓	✗	✗	✗	✓

Findings of this charging review show that:

- In most countries, the charging models are based (at least partly) on the principle of direct costs, which are generally calculated on basis on the marginal costs incurred by the IM for the use of the infrastructure. This reflects the fact that some governments support IMs through a subsidy (see par. 3.4 for more details regarding this very important issue), while others enable the IM to recover some of its costs through the charging framework in the form of mark-ups. The methods by which direct or marginal costs are estimated and the charges' design vary between countries.
- Seven countries have included provision for the recovery of long term costs as in Article 32 (3) of Directive 2012/34/EU. However, there are very few practical applications of the provision. There is for instance the Diabolo project in Belgium, the high speed line Amsterdam-Breda-Belgian border in The Netherlands, the rail line between Stockholm and the Arlanda airport in Sweden[2] and the the Oresund Bridge between Sweden and Denmark[3], and the Channel Tunnel linking France to GB.
- A few countries take account of external effects. Similar approaches are being considered in other countries. Austria, The Netherlands, Switzerland and Germany[4], have introduced a joint noise differentiated charge for freight trains.
- Seventeen countries apply a market segmentation and 15 of these countries also charge a mark-up.

There are also differences in the periodicity of access charges reviews. In GB charges are reviewed every five years, whereas in most other countries, for example in Poland, this is done on an annual basis. In Italy, while the regulatory period lasts five years, at the beginning of the regulatory period access charges are calculated for each of the five years (taking into account for inflation, productivity goal and traffic forecasts). In Germany, GB and Hungary while the regulatory period lasts five years, access charges are updated every year (adjusting, as an example, for inflation, productivity and traffic forecasts).

Depending on the number of IMs in each country, charging practices may also differ within countries. Our analysis has unless otherwise noted only focused on general trends for the main IM within each country and does not address charging systems of local passenger or freight networks that are not part of the mainline network of the incumbent. Some IMs do calculate separate direct cost for different parts of the network. According to Article 5 (1) of Implementing Regulation

2 This infrastructure is not managed by the main infrastructure manager Trafikverket, but by A-Train AB.

[3] This refers to the charge levied on the Swedish side of the bridge. The Öresund Bridge is managed by another IM (Öresundsbro Konsortiet) separate from the main IM Trafikverket. However, Trafikverket collect the charges and forwards them to Öresundsbro Konsortiet.

[4] This system will face out in Germany by the end of 2020.

2015/909, IMs can proceed this way if they can demonstrate to the RB that direct cost parameters significantly differ for different parts of the network. This is the case, for instance, for Spain, where the IM calculates separate direct cost for high speed and conventional lines, given that maintenance costs are significantly higher for high speed lines. In some countries costs do not distinguish between different parts of the network. Regulation (EU) 2015/909 at Article 3 (2) states: "The Member State may decide that the infrastructure manager applies the costs of efficient service provision for the purposes of calculation of direct costs on a network-wide basis.

This section also approaches the role of RBs in the context of charging review in the different countries. Most RBs are involved in the review of access charging. However, their roles and degree of involvement differ significantly from one country to another. In some countries like Italy, the RB can impose specific criteria and principles that must be followed by the IM in the determination of the access charges. The "prescriptions" may include costing and pricing rules as well as specific economic values (as for example in the application of the CAPM/WACC formula).[5]

In the following, the paper presents a summary of the review of charges by section, *i.e.* (1) scope of regulatory bodies' mission, (2) documents examined in the charges review, (3) publication of the review and other regulatory decisions, (4) review focus, (5) other elements of the charging system, (6) charging unit, (7) traffic forecasts. Tables synthetizing the main information are included when suitable.

2.1 Scope of regulatory bodies' mission

Although most railway regulatory bodies (*e.g.* the Austria, Danish, Norwegian, Finnish, Polish and Swiss regulatory bodies) are only responsible for the regulation of the railway market, some RBs have a wider spectrum of responsibilities in the transport sector. For example, the Belgian regulatory body also regulates Brussels Airport Operations. In Italy, the Autorità di Regolazione dei Trasporti (ART), beside railways, also regulates airports, highways, local public land transport and taxi, martitime transport and ports. The Slovakian Transport Authority is also responsible for air and water transports. The Swedish Transport Agency is the regulatory body for rail, roads, maritime routes, and the whole aviation sector. The French regulatory body regulates the rail, road and coach sector regulation, the regulation of airports, and the economic regulation of the Parisian metropolitan rail infrastructure manager and control of transport data producers' compliance to the obligation to open data and of the neutrality of multimodal information provision. In GB, the Office of Rail and Road (ORR) regulates the rail industry's health and safety performance, ensures that the rail industry is competitive and fair and has a monitoring function for roads. The Portuguese Regulator (AMT) regulates land transport and roadway infrastructure, railway regulation, regarding

[5] The proposal of the IM is submitted to the RB, that verifies its compliance with the ex-ante regulation as above. The declaration of conformity, upon which charges may be applied, may be made conditional upon the fulfilment of prescriptions also indicated by the RB.

infrastructure managers and rail transport operators, commercial ports and maritime and waterway transport.

A few regulatory bodies are also responsible for the regulation of other network industries such as telecommunications and postal services as in Lithuania, Slovenia, The Netherlands or Germany. For The Netherlands and Germany, the energy sector (electricity and gas) and energy grid expansion are also part of the regulatory body's competences. The Spanish and the Romanian[6] regulatory bodies are also supervising more general competition-related issues. Indeed, CNMC, the Spanish RB, also merges other regulatory bodies, such as Energy, Telecommunications, Postal Service and Airport Tariffs; as well as the Competition Authority. The Dutch RB, ACM, is also the regulator of these sectors and the Competition Authority. Additionaly, ACM is also charged with enforcement of consumer protection laws (Consumer Authority), but is not responsible for the enforcement of rail passengers' rights.

Within the railway sector, the RBs members of IRG-Rail can also be responsible for issues other than economic regulation. This includes passenger rights in Austria, GB, Slovenia, Portugal and Italy[7] or safety as in Slovakia. In GB and Poland and Greece, the regulatory body is responsible for economic rail market regulation, licensing, safety regulation and passenger rights. In GB, the regulator also acts as the competition authority for rail related matters. The Swedish Transport Agency is also the National Safety Agency (NSA) in charge of licensing and safety regulation. In Hungary, the regulatory body is also in charge for licensing and passenger rights, and operates in close cooperation with the NSA that is responsible for rail safety regulation.

[6] Within the Romanian Competition Authority functions also the Supervision Council in the Naval field.

[7] In Italy, ART has competences on passenger rights for the following transportation modes: railways, bus and navigation.

Table 3: Overview of Additional Duties of RBs across countries

	Additional duties regarding railways			Competition Authority	Additional duties in different sectors						
	Railway safety	Railway licensing	Railway passenger rights		Roads	Aviation	Maritime	Electricity	Gas	Telecommunications	Postal services
Austria	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗	✗
Belgium	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗
Bulgaria	✓	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
Croatia	✗	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓
Czech Republic	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗
Denmark	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
Estonia	✗	✗	✗	✗	✗	✓	✗	✓	✓	✗	✓
Finland	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
France	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗
GB	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗
Germany	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
Greece	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗
Hungary	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Italy	✗	✗	✓	✗	✓	✓	✓	✗	✗	✗	✗
Latvia	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Lithuania	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
Luxembourg	✗	✗	✗	✗	✗	✓	✗	✓	✓	✓	✓
Norway	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Poland	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Portugal	✗	✗	✓	✗	✓	✗	✓	✗	✗	✗	✗
Romania	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗

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	Additional duties regarding railways			Competition Authority	Additional duties in different sectors						
	Railway safety	Railway licensing	Railway passenger rights		Roads	Aviation	Maritime	Electricity	Gas	Telecommunications	Postal services
Slovakia	✓	✓	✓	✗	✗	✓	✓	✗	✗	✗	✗
Slovenia	✗	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓
Spain	✗	✗	✗	✓	✗	✓	✗	✓	✓	✓	✓
Sweden	✓	✓	✓	✗	✓	✓	✓	✗	✗	✗	✗
Switzerland											
The Netherlands	✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓

2.2 Documents examined in the charges review

When reviewing the charges, the regulatory bodies examine a variety of documents. In addition to the network statement, some regulators also investigate accounts or accounting system of the IM and regulatory statements. Regulatory statements are documents that the IM provides as information to the RB about its business. This might entail written statements to comply with accounting specifications set by the RB or more detailed explanations of the methodology.

Depending on the country, other documents are examined. These range from studies or technical reports that the IMs are obliged to prepare, to business plans, cost models and charging methodologies, contracts with the State and with railway undertakings, and the opinions of stakeholders on charges. Some RBs may also adopt non-binding opinions on the IMs business plan as referred to in Article 8 (3), which can be given as a task to the RB according to Article 56 (4) of the Directive 2012/34/EU. Table 4 provides an overview on these issues.

These differences are due to the existence of diverse national legal frameworks, different obligations of IMs and railway undertakings and different processes of establishing charges. In Hungary, for instance, in addition to the annual charging document, the regulatory body examines the charging methodology set for a five-year period.

In some cases, the cost data is provided at an aggregated level, even though the IM may possess more detailed data. In some countries, among others The Netherlands, Germany, GB, Slovenia, Italy and Romania, the regulatory bodies can enforce pecuniary penalties to compel IMs and RUs to provide information. In Portugal, the IM has always provided the necessary information and whenever more detail was needed, it was provided.

Some regulators have reported that they organise public consultations, prior to the issue of their decision on charges. This is the case in The Netherlands, GB, Italy, Portugal, Slovakia, Poland and Germany, for example. The majority of RB publishes their decisions or opinions.

Table 4: Overview of Reviewing Process

	Documents considered for reviews				Consultations on reviews	Publication of decisions or opinions
	Network Statement	Accounts of IM	Regulatory Statements	Business Plans		
Austria	✓	✓	✗	✗	✗	✓
Belgium	✓	✗	✓	✗	✗	✓
Bulgaria	✓	✓	✗		✓	✓
Croatia	✓	✓	✓		✗	✓
Czech Republic	✓	✓	✗	✗	✓	✓
Denmark	✓	✗	✓		✗	✓
Estonia					✓	✓
Finland	✓	✓	✓	✗	✗	✓
France	✓	✓	✓	✓	✓	✓
GB	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓
Greece	✓	✗		✓	✗	✗
Hungary	✓	✓	✓		✗	✓
Italy	✓	✓	✓	✓	✓	✓
Latvia	✓	✓	✓		✗	✓
Lithuania	✓	✓	✓	✗	✗	✓
Luxembourg	✓	✓	✓	✗	✗	✓
Norway	✓	✓	✗	✗	✓	✓
Poland	✓	✗	✓	✗	✓	✓
Portugal	✓	✓	✓		✓	✓
Romania	✓	✓	✓	✗	✗	✓
Slovakia	✓	✓	✓	✗	✓	✓
Slovenia	✓	✓	✓		✗	✗
Spain	✓	✓	✓	✗	✗	✓
Sweden	✓	✗	✗	✗	✗	✓
The Netherlands	✓	✓	✗	✗	✓	✓

2.3 Publication of the review and other regulatory decisions

Not all IRG-Rail members publish the result of their charging reviews. Some members systematically publish the review and some have not done so to date but intend to do so. The German regulatory body publishes the decisions of the ruling chamber. Furthermore, it only has a legal obligation to publish an annual report and a report on its activities every two years; it also issues press releases and publishes all decisions. The Belgian regulatory body publishes an annual report. It also publishes on its websites the main decisions. The Italian RB publishes all its regulatory measures on its website, including those concerning access charges to rail infrastructure and related issues. In Sweden, the regulatory body publishes all its decisions on its website.

In Poland, all decisions on charges for access and use of rail infrastructure are published as required under Polish law where decisions of public administrations (such as the Office of Rail Transport) are public information. The Spanish regulatory body has a legal obligation to publish the charging review as well as an annual activities report. The Romanian regulatory body is legally required to publish an annual activities report, issue press releases, and publishes studies about the railway sector as well as all issued decisions. Other members only publish reviews based on complaints or *ex-officio* investigations; this is the case in Denmark, Finland or Slovenia. The GB regulatory body publishes both its draft and final determination, together with any relevant consultation documentation or technical reports produced in the course of the periodic review. The same situation applies in Italy, where the new system of access charges was adopted following several public consultations and a final assessment by ART on the coherence of the actual set of charges designed by the IM with the regulation in place.

Regulatory bodies address the confidentiality issues based on domestic legal framework regarding any sensitive information that may be contained in their published decisions or reviews. For instance, in Poland, Germany, France, GB and Romania some parts of the decisions are not published if they are considered as a business secret of the IM or other involved party. In Italy, the documents submitted by the stakeholders in the consultation process are published on the RB's website; however, interested parties may ask to remove commercially sensitive information. In Portugal, following a public consultation and a final assessment, the regulatory body publishes the final decision on the charges review.

2.4 Review Focus

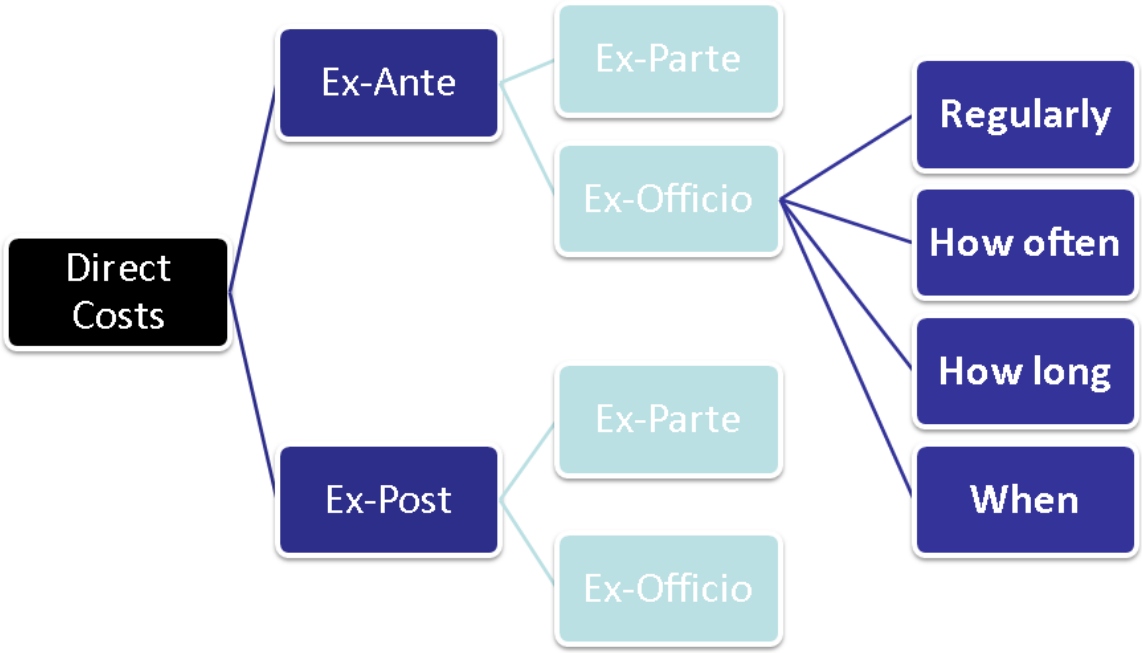
All regulatory bodies are required to review charges, the methodology and/or the level of charges[8]. The Directive 2012/34/EU does not define the review process, so the competences of RBs are very different across countries. RBs usually review three main areas. These are:

- Direct costs
- Market segmentation & mark-up calculation
- Total level of charges / costs (including WACC)

This list is not exhaustive and some RBs review additional areas, i.e. operating efficiency targets, based on domestic legislation. This report also covers other elements of the charging system in Section 2.5. Furthermore, this does not mean that RBs conduct separate charges review for each of these areas or any subset of them. Some RBs may review all areas in one big review process, for instance jointly when reviewing the network statements. In this case, the representation of this country would be identical in each area. There are also RBs that conduct regular reviews every year but conduct more in depth reviews every five years (for instance in Germany). If that is the case, the respective country might be shown twice to differentiate the minor and major review of the respective area.
In many cases, the charges review process tends to be structured across three different dimensions which is illustrated for direct costs by Figure 1 in a schematic way. The branching thereafter is the same for ex-ante and ex-post but it is only shown for ex-ante.

[8] For some regulatory bodies, the legal basis for this mission could be different from the transposition of the Directive 2001/14/EC or the Directive 2012/34/EU.

Figure 1: Schematic Illustration of Review Process of RBs for Direct Costs



Ex-Ante vs. Ex-Post

The first main cut off point is whether the RB has a competence to review the respective area before the system for the respective area is put into force. For instance, concerning direct costs, the IM might present his calculations to the RB that reviews these calculations before RUs actually pay them as charges, hence ex-ante. When RBs conduct a review after the implementation of a system in one of the respective area, this is considered as an ex-post review. E.g. the RB reviews the current direct costs charges, while RUs already pay them to the IM or the network statements describing direct costs or mark-ups have already been published. Given that this is the main cut off point, the following tables are split between these two different regimes.

Ex-Parte vs. Ex-Officio

A review can be triggered, ex-officio, out of the own accord of the RB or because it is mandated by the law (that could also imply that the IM starts the review process by handing in an application). For instance, the law may require a review of the direct cost methodology every five years. This could also imply a declaration of conformity. Furthermore, RUs or other market participants and entities can have the possibility to request a review (Ex-Parte). There may also be differences between countries where parties may request an ex-parte review. We consider four possible answer categories. 1.) “IM” as the concerned IM of the review 2.) “Other IM” if another IM can request a review, 3.) “RU” for any RU able to request a review 4.) “Other” for any other entity, e.g. a local authority or an association representing RUS or other groups. Furthermore all groups may have rights to appeal reviews or decisions.

Time dimension

In case the RB is doing an ex-officio review[9], the paper explores the timing of this review. This is why the table includes four columns to structure the time dimension of the ex-offico review:

- Regularly: A Yes/No column, if the review is done regularly or not
- How often: A column indicating the periodicity of the review, for instance, annually or every 5 years.
- How long: A column indicating the amount of time the RB usually needs for the review. This could for instance be a time period of 4 weeks or 2 months.
- When: A column indicating that some RBs conduct a review always at the same point in time with respect to the beginning of an upcoming timetable period as defined by Annex 7 (2) of the Directive 2012/34/EU. For instance, the review could take place 12 month before the start of the time table period, indicated by "X-12Month".
- Extension possible: A Yes/No column, if the review can be extended if need be.[10]

There are no questions about the timing of the ex-parte reviews or complaints because Article 56 (9) already sets a maximum limit for these kind of complaints. The following chapters discuss each of the principles separately and present overview tables of the process. It is important to underscore that national specificities remain.

[9] We focus on the time dimension of the ex-office review, because we expect this to be more structured as these would not depend on another party to kick of a review.

[10] We do not discuss the process who could request the extension and who could grant it, because this it out of the scope of the current analysis.

2.4.1 Direct Costs

The most fundamental charging principles direct costs are as follows:

- In the definition of charges, direct costs should be identified. In fact, Article 31 (3) of the Directive 2012/34/EU states that "*Without prejudice to paragraph 4 or 5 of this Article or to Article 32, the charges for the minimum access package and for access to infrastructure connecting service facilities shall be set at the cost that is directly incurred as a result of operating the train service*". This principle applies to the minimum access package (the methodology for the calculation of the cost that is directly incurred is given by the European Implementing Regulation 2015/909 of June 2015. In November 2016, IRG-Rail issued a document presenting engineering and econometric methodologies which may be used to calculate direct costs[11]);

Section 3.1 takes a closer look at the modelling of direct costs, but here the focus is on the procedural aspects. The two following tables show how each RB reviews the direct costs principle as discussed in the previous section showing the ex-ante and then the ex-post process:

[11] IRG-Rail, An introduction to the calculation of direct costs in respect of Implementing Regulation 2015/909, November 2016.

Table 5: Ex-Ante Review Process of Direct Costs by RBs

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Austria	✓	✗	✗	✗	✓	✓	For every timetable period			✓
Belgium	✓	✗	✗	✗	✓	✓	Every 5 years	3 months		✓
Czech Republic	✓	✓	✓	✓	✗	✗				
France	✗	✗	✗	✗	✓	✓	Every 3 years	2 months	X-12 months	✗
GB	✓	✓	✓	✗	✓	✓	Every 5 years	undetermined	X-18 months	-
Germany	✓	✗	✓	✓	✓	✓	Annually	2 Months	X- 14 M	✓
Germany	✓	✗	✓	✓	✓	✓	Every 5 years	undetermined	X- 3-4 years	✓
Greece					✓		At need			
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	4/5 months	X- 12/18 monts	
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	2/3 months	„Bridge year“ (i.e. one year before the implementation of the new charge system)	
Poland	✓	✓			✓	✓	Annually	90 days	X-9 Months	✗
Romania	✗	✗	✗	✗	✓	✓	At need		At need	✓
Slovakia	✓	✓	✓	✓	✗	✗	At need	-	At need	
Spain	✗	✗	✗	✗	✓	✓	Annually	3 months	X-7 months	✓
The Netherlands	✓	✗	✗	✗	✓	✓	Approval for max. 5 years	6 months	X- 24 Months	✓

Table 6: Ex-Post Review Process of Direct Costs by RBs

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Austria	✓	✗	✓	✓	✓	✓	At need	At need		
Belgium	✓	✗	✓	✗	✓		At need			
CZ	✓	✓	✓	✓	✗	✗				
Finland			✓	✓	✓	✗	At need	-	At need	
France	✓	✓	✓	✓	✗	✗				
GB	✗	✗	✓	✗	✗	✗				
Germany	✓	✗	✓	✓	✓	✗				✓
Greece					✓		At need			
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✓	✗	✓	✓	✓	✗	At need			
Romania	✓	✗	✓	✓	✓	✓	At need		At need	
Latvia	✓	✗			✓	✓				
Lithuania	✗	✗	✓	✗	✓	✗	At need	Not specified	Not specified	✗
Luxembourg	✓	✗	✓	✓	✓	✗				
Norway	✓	✓	✓	✓	✓	✗	Not specified			✓
Poland			✓		✓	✗	At need	-	At need	✗
Slovakia	✓	✓			✓	✗				
Slovenia			✓		✓		At need, recommended 5 years		At need	✗

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Spain	✓		✓	✓	✓	✗		Three months		✓
Sweden					✓	✗	Not specified	Not specified	Not specified	
The Netherlands	✗	✗	✓	✓	✓	✗				✗

We received information from 14 countries about the ex-ante review of direct costs (Table 5) and 21 countries provided information about their ex-post review (Table 6). Germany and Italy are listed twice because they have different types of ex-ante reviews. Germany for instance has a periodic review every five years at the beginning of its regulatory period and annually reviews direct costs for each time table period and network statement. This applies to market segmentation and mark-ups and total charges as well. In Italy, ex-ante regulation refers to regulation adopted before any action is taken by the regulated entity. The RB firstly defines principles and criteria to be applied by the IM in the construction of the charging system with regards to direct costs as well as the other areas concerned with charging system. A public consultation with stakeholders ensues thereupon (including a hearing). Once the principles and criteria are finally adopted by the RB, taking into account the results of the public consultation, the IM sets the charges and submits its charging proposal to the RB for assessment of compliance. The RB's final approval of the charging system may be conditional. The charging system may not apply before a decision is adopted by the RB. On account of the above, the RB's assessment of compliance of the charging system proposed by the IM belongs to the ex-ante regulation referred to in the text (decision taken before the application of the charges).

Looking at the ex-parte review for direct costs either ex-ante or ex-post, the affected IM can in many countries initiate or appeal a review. This is not the case for ex-ante in Italy, Romania and Spain. For ex-post, it is for GB, Lithuania, and The Netherlands. There are a few cases that another IM can initiate or appeal a review. There are countries in which another affected RU or another institution can initiate a review, but it is not very often the case and practices are quite diverse. In Austria for instance, authorized applicants (a company that is not usually part of the market but still ordering track paths) can initiate an ex-post review of direct costs by the RB.

It seems that fewer countries have ex-ante ex-officio reviews for direct costs compared to ex-post reviews (12 compared to 18 countries). The ex-ante reviews are conducted regularly in all countries but Hungary. This usually happens either annually or every three or five years. In some countries, they are also done at need. In contrast, ex-post reviews are not often conducted regularly (3 countries). In most countries ex-officio reviews are conducted at need or it is not specified how often they are done (10 countries).

For ex-ante reviews, some countries have a predefined time length ranging from two months to six months and the reviews start around several months to almost two years before the beginning of the next timetable period. The countries that do bigger reviews (for instance GB and Germany) do not have a predefined time length and the reviews in Germany start several years before the affected timetable period.

Given that not many countries do regular ex-post reviews of direct cost, there are also few examples where the duration and the timing is predefined**.** For ex-ante reviews, some countries (7) indicate that a time extensions is possible. This is only the case for three countries for ex-post reviews.

2.4.2 Market segmentation & Mark-up Calculation

The process of reviewing the market segmentation and mark-up calculation is generally analysed jointly, because if mark-ups are charged the regulatory body is responsible for controlling the list of market segments that is identified in the network statement of the IM (Article 32 (1) of Directive 2012/34/EU).

The French, Italian, German, and British main IMs for example consider market segments when calculating charges. In general, market segmentation differentiates passenger services from freight traffic. Further segments may extend this segmentation, for instance for freight in GB, Italy and Germany. On the subject, IRG-Rail has published a report named "Initial approach to market segment definition and criteria for an assessment of mark-ups in consideration of Directive 2012/34/EU".[12]

As for direct costs, we first discuss the process of how the market segmentation & mark-up calculation, if applied by the IM, is reviewed by the RB according the scheme of Figure 1.

[12]https://www.irg-rail.eu/download/5/10/IRG-Rail167-Initialapproachtomarketsegmentsdefinitionandcriteriaforanassessmento.pdf

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Table 7: Ex-Ante Review Process of Market Segmentation & Mark-up Calculation by RBs

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Austria	✓	✗	✓	✓	✓	✓	Market segments at least every five years Mark-up annually			
Belgium	✗	✗	✗	✗	✗	✗				
Finland	✗	✗	✗	✗	✓				Before imposing mark-ups	
France	✗	✗	✗	✗	✓	✓	Every 3 years	2 months	X-12 months	✗
GB	✓	✓	✓	✗	✓	✓	Every 5 years	undetermined	X-18 months	
Germany	✓	✗	✓	✓	✓	✓	Annually	2 Months	X- 14 M	✓
Germany	✓	✗	✓	✓	✓	✓	Every 5 years	undetermined	X- 5-6 years	✓
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	4/5 months	X- 12/18 months	
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	2/3 months	„Bridge year“ (i.e. one year before the implementation of the new charging system)	
Lithuania	✓	✗	✗	✗	✓	✗	The defined list of market segments is reviewed	Not specified	Not specified	✗
Poland	✓				✓	✓	Annually	90 days	X-9 Months	✗
Romania	✓	✗	✓	✓	✓	✓	When the IM proposes a new segment	undetermined	X-18	
Slovakia	✓	✗	✗	✗	✓	✓	At need.			

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Spain	✗	✗	✗	✗	✓	✓	Segments are reviewed every time the IM proposes a new segment and if circumstances change. If so, annually	3 months	X-7 months	
The Netherlands	✓	✗	✗	✗	✓	✓	List of market segments reviewed after maximum five years or when the IM adds a new segment	6 months	X-21	✓

Table 8: Ex-Post Review Process of Market Segmentation & Mark-up Calculation by RBs

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Belgium	✓	✗	✓	✗	✓	✗	At need	3 months	At need	
Finland	✗	✗	✓	✓	✓	✗	At need		At need	
France	✓	✓	✓	✓	✗					
Germany	✓	✗	✓	✓	✓	✗				✓
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✓	✗	✓	✓	✓	✗				
Romania	✓	✗	✓	✓	✓	✗	At need. Segments and marks-up are reviewed every time the IM proposes a new segment.	Not specified	Not specified	
Lithuania	✓	✗	✓	✗	✓	✗	At need	Not specified	Not specified	✗
Norway	✓	✓	✓	✓	✓	✗	Not specified			✓
Poland			✓		✓	✓	Annually	-	After the time table period	✗
Portugal										
Slovakia	✓	✗	✗	✗	✓	✓	At need.			
Spain	✓	✗	✓	✓	✓	✗		Three months		✓
Sweden					✓	✗	Not specified	Not specified	Not specified	
The Netherlands	✗	✗	✓	✓	✓	✗				✗

We received information from 14 countries about the ex-ante review of market segmentation and mark-ups (Table 7) and 15 countries provided information about their ex-post review (Table 8). One reason we might have received less information here is that the IMs in some countries only charge direct costs without any segmentation or mark-ups. As for direct costs, Germany and Italy appear twice and the same explanation applies. In Finland, there is no market segmentation nor mark-ups, but if there were mark-ups, the IM would have to report every five years to the Ministry of Transport and Communications and the RB on the mark-ups and whether the mark-ups have encouraged RUs to improve their productivity and competitiveness within the meaning of the Directive 2012/34/EU.

Also similar to direct costs, the affected IM is frequently able to initiate or appeal either an ex-ante or ex-post review of the market segmentation and mark-ups. There are only a few cases where another IM can initiate or appeal a review and some cases where RUs or other entities can do so. This seems to be more often the case for ex-post reviews.

As for direct costs, the ex-ante reviews are mostly conducted regularly and usually either annually or every three or five years. In some countries, they are also done at need. In contrast, ex-post reviews are not often conducted regularly (2 countries). In most countries ex-officio reviews are conducted at need or it is not specified how often they are done (7 countries).

For ex-ante reviews, some countries have a predefined time length ranging from two months to 6 months. The reviews take play around several month to almost two years before the beginning of the next timetable period. The countries that do bigger reviews (for instance GB and Germany) do not have a predefined time length and the reviews start several years before the affected timetable period.

Given that not many countries do regular ex-post reviews of market segmentation and mark-ups, there are also few examples where the duration and the timing is predefined.

2.4.2.1 Guidelines for segmentation

In some countries, general guidelines have been developed to evaluate the proposed segmentation. Based on these guidelines, more specific criteria can be derived to operationalize the segmentation. Two examples are GB and Germany.

For GB, the RB has provided guidance on how market segments should be differentiated and the German IM's approach is described in Annex 6.1. of its network statement. One could summarize both approaches as follows:

- definition of market segments should be practical, comprehensive and objective;
- market segments should, as far as possible, have common characteristics (materially, spatially, or temporally) of some kind that place them, as a class, in a different commercial position against another identifiable class; and
- choice of market segments should not distort incentives.[13]

These guidelines may help to develop more specific criteria to define practical segments.

2.4.2.2 Segmentation Criteria

This section discusses different criteria that are used for segmentation in some countries. This is not to be confused with an evaluation of specific segments or segment pairs as requested in Article 32 (1). Criteria refer to a broader understanding of characteristics that might be used to segment the market. The aim is not to look at different segments, but to show which criteria an IM could use to define segments, regardless of the final segmentation. There appears to be, at least, five different cases of how a criterion can be considered by IMs:

- Applied
  The criterion is directly or at least partly used for the definition of one or more segments. For instance, dangerous goods to define a freight segment
- Discussed not applied
  The criterion is discussed in the network statement or other documents issued by the IM, but the IM argues that it is not necessary or reasonable to use it. This might change in the future.
  For instance, the IM could discuss the use of ad hoc as a criterion to segment services but come to the conclusion that it is not necessary to use it, because there is no demand for it.
- Discussed not practical
  The criterion is discussed in the network statement but the IM argues that he cannot use it or observe it. For instance, commodities (except dangerous goods) could be discussed

[13] By that we mean that RUs would change their behaviour to stay within a certain segment, because it is cheaper, although they would original fit into another segment

but not used for segmentation because the IM claims that he cannot observe the content of wagons.

- Not discussed
  There is no discussion about this criterion in the network statement of the main IM. This can also be an indicator that there is no segmentation at all, if this is the case for all criteria.

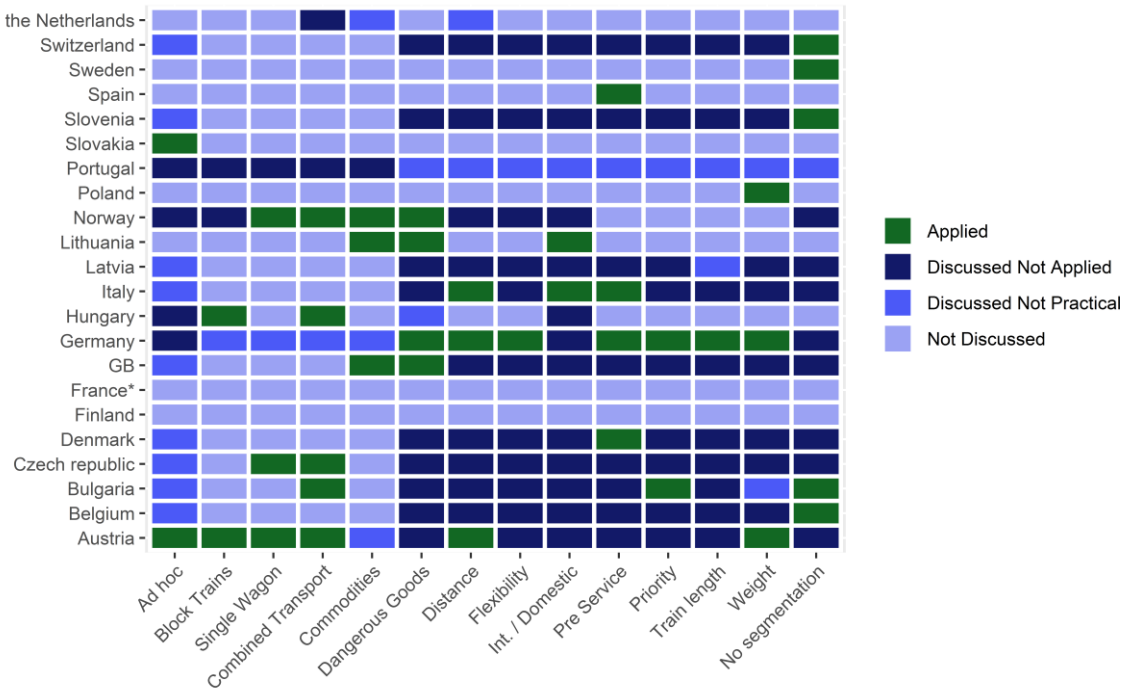
The analysis is split between freight and passenger services, even though some criteria are used in both services. When they are used in both services, the characteristics can be different for each service, e.g. weight as factor might be accounted for differently for freight services compared to passenger services. Sometimes a criterion is used to define an entire segment (e.g. weight for heavy trains), but sometimes several criteria are used to define one segment (e.g. distance and dangerous goods for a short distance dangerous good segment in Germany).

Using the previously discussed approach to classify the segmentation among countries, the following heatmaps summarize the responses of 17 countries. This allows a quick understanding of the used criteria in one country (horizontally) and a comparison of one criterion across countries (vertically). The specific criteria are discussed in the following (first for freight and then for passenger services) and some further examples and cases are presented if available.

- **Overviews of freight segmentation criteria**

The following graph presents the used criteria for the segmentation of freight across countries.

Figure 2: Heatmap of Segmentation Criteria in Freight



*France does not apply markups for freight.

Ad hoc

Demand may differ for scheduled services compared to un-scheduled or occasional train services and different charges could be applied because of the respective ability to bear mark-ups. In Germany this was considered, but not applied in practice because the IM argued that the markets of scheduled and unscheduled services are mostly homogenous with respect to cost, price, and market demand. A differentiation would set incentives to needlessly order scheduled services if prices for ad hoc services were higher or vice versa to order ad hoc services for actually scheduled services if prices for ad hoc service were lower. Nevertheless, the definition of "ad hoc" also matter. In Italy ad hoc means special (reduced) charges in case a new service is launched.

Block Trains

Block trains, also called unit trains, are trains that run as a unit from the loading point to the unloading point without intermediate stops. They are trains in which all wagons load the same commodity and have the same origin and destination, without being rearranged *en route*. This differentiates from wagonload trains (ie trains made of single wagon consignments of freight). In Germany, this is implicitly recognized in the "Standardtrain" segment for which block trains make up roughly 25%. According to the German RB, block trains have a higher ability to bear mark-ups than single wagon trains and combined traffic services[14].

Wagonload

In contrast to block trains, wagonload trains are rearranged *en route* and can carry different types of goods in different types of wagons. In Germany, this is implicitly recognized in the "Standardtrain" segment for which wagonload trains make up roughly 25%. Different studies[15] have shown that wagonload trains have a lower ability to bear mark-ups. In Austria, the single wagon load trains receive a subsidy for the first and the last mile and don't bear mark-ups. The articles 31 - 32 of the Directive 2012/34/EU are not properly transposed in to CZ legislation. The IM provides discounts for the Single Wagon and Combined Transport.

Combined Transport

Combined transport can be seen as sub category of wagonload traffic including a switch to another transport mode, usually for the "last mile", e.g. a container landing at a port then put on a train and finally shipped to its destination by road. Usually combined transport services have to compete

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14 https://www.bundesnetzagentur.de/SharedDocs/FAQs/DE/Sachgebiete/Eisenbahn/Unternehmen_Institutionen/Gutachten/Elastizitaet2018_FAQ.html

15 https://www.bundesnetzagentur.de/SharedDocs/FAQs/DE/Sachgebiete/Eisenbahn/Unternehmen_Institutionen/Gutachten/Elastizitaet2018_FAQ.html

more with other transport modes, because containers can be easily transported by whatever transport mode. Therefore, the ability to bear mark-ups is expected to be lower. The German IM claims that he cannot observe the transport mode changes and that it is not sufficient to observe if a train includes containers, because containers can also be part of a non-combined transport service. Hence, it is a discussed criterion which is not finally used for segmentation. However, roughly 50% of trains among the "Standard" train are assumed to be combined transport. Austria specifically has a segment that considers services that are "manipulated" more than once between starting the service and finishing it.

Commodities

Different goods have different demand elasticities or can be more or less easily transported with different transport modes. Hence, types of commodities could be used to differentiate segments. For instance, Great Britain uses different freight commodities for which different abilities to bear mark-ups are estimated based on an economic model. The model has indicated that only ESI coal, spent nuclear, biomass and iron ore have the ability to bear mark-ups, whereas the other commodities (such as construction materials and intermodal) are found to not be able to bear mark-ups. The German IM discusses commodities, but claims that it is not able to check what goods the RUs transport on their trains. That is why, it discards this criterion as not practical.

Dangerous goods

Dangerous goods can be seen as just another type of commodity, but are explicitly mentioned in Annex VI (1) b). Generally, services transporting dangerous goods are under pressure (legal and public) to use trains as safer mode of transport and hence might have a different ability to bear mark-ups. The German IM explicitly introduces a segment for dangerous goods in line with the national dangerous goods regulation (GGVSEB, Annex 1 § 35) and estimates that dangerous goods trains have a higher ability to bear mark-ups.

In GB, commodities are already considered as the main factor of segmentation. Nuclear transport could be seen as a dangerous good, so one could say that dangerous goods are subsumed into the "commodity" criterion in GB.

Distance

Train freight services become more viable the longer the distance, because average costs per km become much lower. Hence the ability to bear mark-ups for short distance services might be lower, due to stronger competition with other transport modes. The German IM introduces a general short distance segment and one for dangerous goods, for which the ability to bear mark-ups is estimated to be comparatively lower.

Flexibility

Some services are more flexible concerning their departure or arrival time for which the IM may grant a reduction of the charges. The German IM offers a discount for services if they accept a deviation to their requested time of +/- 120 minutes.

International vs. Domestic

Annex VI (1) of the Directive 2012/34/EU includes 'international vs. domestic' in the list of market pairs to be considered. Some IMs differentiate between domestic and international services, some others do not.

Pre Service

Locomotive runs and empty rides can be seen as intermediate input or a pre service for the real services of transporting goods. That is why, some system allows for lower mark-ups for these services. Germany only accounts for locomotive rides but not empty wagons. Spain has a specific segment for empty rides and also test rides. In accordance with the former Regulation, which despite not being in force is being used in this transitional period, Portugal has a specific segment for freight empty rides and locomotive runs. In Italy technical services are defined as the runs that are necessary to the provision of a commercial service and they are charged less.

Priority

This would indicate different disposition rules for services within a priority segment. The German IM has extra mark-up for all freight segments if they want to have priority in case of deviations from the planned schedule.

Train length

Trains would be segmented differently according to their length. This could be an attempt to differentiate between wagonload and block trains. The German IM only classifies trains with a length of less than 370m as short distance trains and charges a penalty if the RU violates this rule.

Weight

IMs may have two reasons to use weight as a criterion. On the one side weight can be used to identify different demand for very heavy goods that are prone to be transported by train and therefore the ability to bear mark-ups might be higher. On the other side, there may be higher marginal costs of wear and tear for track infrastructure. The German IM introduces a segment for heavy freight train (> 3000t) where the mark-up is set at a relatively higher level. Since 2019, the French IM has introduced the principle of a differentiated fee by tonnage class: applicants pay according to the class to which their tonnage belongs and not directly according to their intrinsic tonnages. SNCF Réseau has set 5 tonnage classes. In Poland mark-up is paid for trains weighing more than 660 tonnes, but intermodal trains are excluded.

No further segmentation

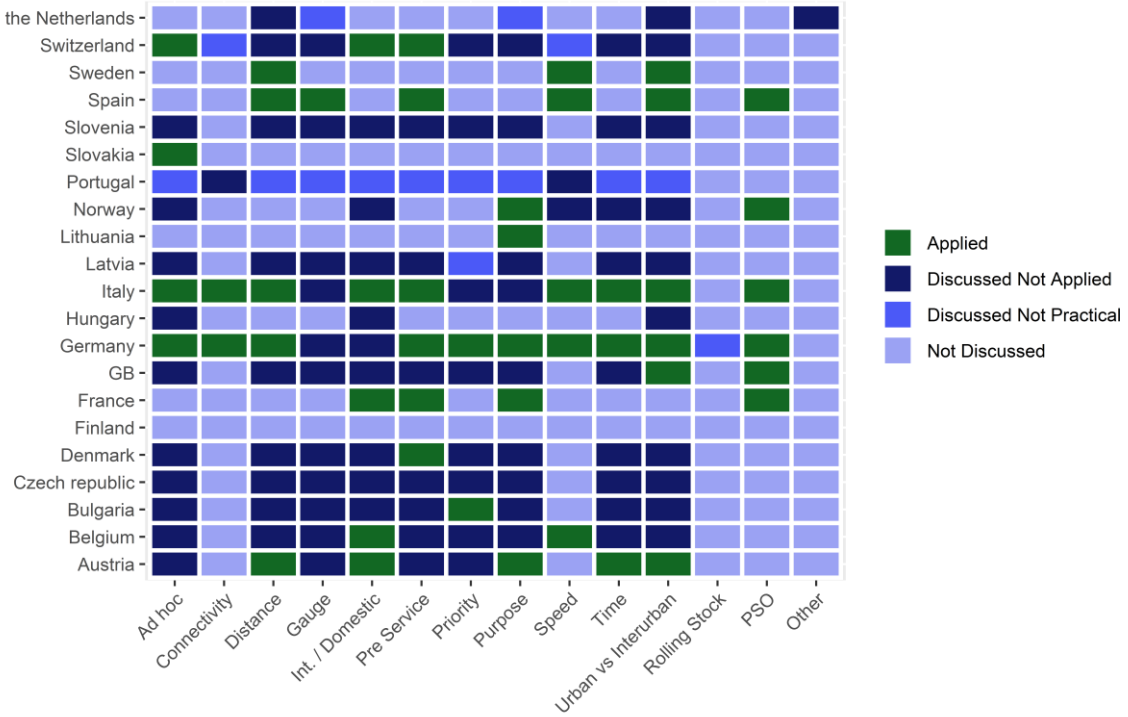
The heatmap shows that a number of countries do not use any criteria for the segmentation of freight services. This might be because it is more difficult to observe differences in demands in freight trains as they tend to carry combined loads and sometimes the differences are unknown to the IM. Also freight services only have a small share of the market (see figures before), so IMs maybe spend less of an effort to create further segments for freight services. In The Netherlands, the IM

has considered further segmentation, but came to the conclusion that further segmentation was not necessary, possible or appropriate.

- **Overviews of passenger segmentation criteria**

As for freight, the following heatmap offers a quick overview of the application of segmentation criteria in passenger services. Compared to freight, there are more countries using two or more criteria for their segmentation. In addition, the number of countries that have no segmentation at all (indicated by a grey row) is smaller (Slovenia and Finland). The specific criteria are discussed below.

Figure 3: Heatmap of Segmentation Criteria in Passenger Services



Ad hoc

As for freight services, demand may differ for scheduled compared to un-scheduled or occasional train services and different charges could be applied because of the respective ability to bear mark-ups. The German IM uses this criterion for its segmentation of charter and nostalgia services (e.g. historic steam engines or museum rides). Switzerland and Italy use this criterion for their segmentation. In Italy “ad hoc” refers to special (reduced) charges in the case a new service being launched.

Connectivity / Network

Large train networks derive value from their size and can allow customers to choose connections every hour or change trains easily at their convenience. This network effect provides an advantage

over services that only offer few connections or just point to point services, which may lead to a different ability to bear mark-ups. The German IM introduces a specific point to point segment with lower mark-ups. This segment only allows up to 4 connections per day, no direct links of connections, and RUs have to be more flexible when requesting tracks. Additionally, the average speed between metropolitan areas may not exceed 130 km/h.

The Italian IM, within the PSO regional services, considers the train service which serves a node having a higher traffic level than service which does not serve a node. Moreover, the Italian IM differentiates between hub and no hub node depending on connection with centre and presence of subway.

Distance

The distance of a service might warrant different mark-ups because long distance passenger services might attract different group of customers that are able to bear higher mark-ups. Competition might be higher for short distance services where customers would shift to cars or bus services if mark-ups were higher. The German IM implicitly uses distance to differentiate between PSO and Non-PSO services. It is assumed that customers of a PSO service do not on average travel more than 50km. In Spain there is one segment "VL3" for services that run more than 700 km (without Madrid) and one for less than 300 km excluding PSO, international or other long distance trains. This helps to identify services with different commercial features, which should be treated differently.

Gauge

Traditionally, some countries used different gauges to avoid interoperability and risks in times of war. New infrastructure usually uses the 1435 mm international gauge, but there are still some cases of different gauge and some IM designed specific segments for services running on these tracks. Spain historically used the Iberian gauge (1668 mm), but the new high speed infrastructure was built using the international gauge (1435 mm). There is also a third gauge in Spain, the metric gauge (1000 mm). Generally, the gauge is not an indicator for special purpose, because there are passenger and freight train in all different kind of gauges. Portugal uses the Iberian gauge (1668 mm) for the entire railway infrastructure, with the exception of Vouga and Tua lines, for which the gauge is 1000 mm.

International vs. Domestic services

Annex VI (1) of the Directive 2012/34/EU includes 'international vs. domestic' in the list of market pairs to be considered. Some countries differentiate between domestic and international services, some do not.

Pre Service

Locomotive runs and empty rides can be seen as intermediate input for the actual services of transporting passengers. That is why some systems allow for lower mark-ups for these services. Germany only accounts for locomotive rides but not empty carriages and also implicitly considers a higher share of empty rides for charter services. Portugal has a specific segment for empty trains in

accordance with the former Regulation, which despite not being in force, is being used in this transitional period. Spain has a specific segment for empty rides and also test rides.

Priority

End users might appreciate a guarantee that their train will be prioritized in case of any deviation within the system. So the IM might decide he will charge a premium for this. The German IM used to have an express segment for PSO traffic, which has been abolished within the new system introduced in 2018. The IM claims that there is no difference in demand for these services. Some non-PSO services can pay extra to be prioritized in case of traffic conflicts. In Bulgaria, some train categories are prioritized without affecting the charging.

Purpose

Some services are tied to a specific purpose or event. These services are usually more ad hoc and uncertain. Hence, their ability to bear mark-ups might be lower. The German IM defined specific segment for charter services (soccer trains) and old-timer / heritage services (museum runs / steam engines), which have to pay relatively lower mark-ups. This is also the case in France for historical and tourist trains, which don't pay mark up.

Speed

Trains become more competitive with increasing average speed. Hence their ability to bear mark-ups might increase. Generally, many countries have specific segments for high speed trains. The German IM uses speed to classify train service into a metropolitan segment for which the mark-ups increases with average speed. Speed is also a secondary criterion for point to point services that are not allowed to run faster than 130 km/h on average between metropolitan areas, because they would compete with other long distance services.

The Italian IM uses speed to differentiate segments for regional transport services; those with a speed of over than 75 km/h pay a higher charge. In Spain, the network comprises different types of lines that, depending on their technical features, allow for higher speed. Besides lines devoted to mainly "pure" HS services (AVE), other lines allow for trains circulating at up to 200 km/h, and as such, they constitute another type of service.

Time

Demand depends on time. There are peak and off peak periods of demand and studies can show demand curves differ over time. Based on a study on mobility in Germany, the Germany IM identified a peak / day (06:00 – 20:00) and of an off peak / night period (20:00 – 06:00) with more and respectively less demand for traffic. There is a specific segment for night traffic for which the ability to bear mark-ups is assumed to be lower. Austria allocates short distance services during peak time to a high demand segment. The Italian IM uses time to identify a segment for night traffic. This segment has charges lower than day trains; lower charges are applied also on Saturday (OA services) and Sunday/holidays (PSO services). The main Swedish IM charges a "passage fee" based on time of day. The charge is applied for train paths on certain tracks in the three largest cities in Sweden during weekday mornings and afternoons (6-9 and 15-18).

Urban vs. Interurban

Demand is usually focused on population or industry centres. Hence, these services might be able to bear higher mark-ups than services in less populated areas. The Austrian IM differentiates for demand centres and for short distance PSO traffic, because of different demand. In Spain there is a specific segment for trains that pass through Madrid which, as the capital, is the main demand centre in Spain. The German IM has identified a set of metropolitan stations with more than 50k passengers per day. Train services in between these stations are classified as metropolitan and have to pay relatively higher mark-ups.

PSO

In some cases, the characteristic of a service based on a PSO contract might be put it into a different segment. This is for instance the case in Norway and Germany. In Germany all PSO services belong to a specific segment and the prices are differentiated by region. Even though there is no specific segment for PSO in Spain, the IM justifies higher mark-ups for the urban/interurban trains on the ground that these services are used primarily by PSO trains. Therefore, although there is no segment, it is a criterion used for assessing mark-ups.

Rolling stock

The rolling stock of a train service might be used to identify its market segment as the rolling stock is an indicator of the demand structure. E.g., one could argue that night trains might be identified by their use of sleep wagons.

Other

Some countries also looked at other segments. In The Netherlands for instance, segmentation was considered depending on the part of the day: morning peak hours, off peak hours and evening peak hours. This segmentation was not applied, because the difference in end user's elasticities was too little to justify segmentation. Segmentation of train class was also considered. However, the use of train class is strongly correlated with travel purpose and therefore it was not considered appropriate to apply segmentation per train class.

From the previous heatmaps one can see that the application of segmentation criteria is very different. Each IM has some flexibility to use the criteria to define a final market segmentation depending on their ability to observe them, the criteria's practicality, or other member specific reasons related to the country specific situation. However, market segmentation used by the different IMs needs to be founded upon well-established economic theory and practice and be non-discriminatory. It seems that IMs usually use more criteria for the segmentation of passenger than freight services. There are only a few countries that use a more elaborate segmentation based on more than two criteria (Austria, Bulgaria, Germany, Italy and Lithuania). It should be noted again, that using one of the criterion is not equal to defining a market segment based on this criterion. Instead, IMs have some flexibility to combine and merge criteria to define market segments that fi their specific environment.

2.4.3 Total level of charges and costs

In addition to reviewing the specific charges for direct costs, the market segmentation, and mark-ups, some RBs specifically review the total level of charges and/or the cost base on which the charges are calculated. This can also include capital costs. This step can be very important as it sets the upper bound of the total charges. Once direct cost is identified, the remaining cost shall be recovered by the IM through subsidies, mark-ups or a combination of both. Therefore, the total level of charges, understood as the sum of charges and mark-ups, are directly influenced by the total amount of cost and the level of subsidies and public grants.

As opposed to direct cost, there is no definition of total cost in either the Directive 2012/34/EU or IR 2015/909. According to Article 3 (1) of IR 2015/909, direct cost is calculated as the difference between the cost for providing the services of the minimum access package and for the access to the infrastructure connecting service facility, and the non-eligible cost. Therefore, total cost can be described as all the cost borne by the IM that stem from the provision of the services comprised in the minimum access package.

Table 9: Ex-Ante Review Process of Total Charges by RBs

Country	Ex-Parte				Ex Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
France	✗	✗	✗	✗	✓	✓	Every 3 years	2 months	X-12 months	✗
GB	✓	✓	✗	✗	✓		Every 5 years	undetermined	X-4 years	
Germany	✓	✗	✓	✓	✓	✓	Annually	2 Months	X- 14 M	✓
Germany	✓	✗	✓	✓	✓	✓	Every 5 years	undetermined	X- 3-4 years	✓
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	4/5 months	X- 12/18 months	
Italy	✗	✗	✗	✗	✓	✓	Every 5 years	2/3 months	„Bridge year“ (i.e. one year before the implementation of the new charge system)	
Spain					✓	✓	Annually	3 months	X-7 months	✓
The Netherlands	✓	✗	✗	✗	✓	✓	When mark-up methodology is reviewed (at least every 5 years)	6 months	X-24 months	✓

Table 10: Ex-Post Review Process of Total Charges by RBs

Country	Ex-Parte				Ex-Officio	If Ex-Officio applies				
	IM	Other IM	RU	Other		Regularly	How often	How long	When	Extension
Belgium	✓	✗	✓	✗	✓		At need		At need	
France	✓	✓	✓	✓	✗					
Germany	✓	✗	✓	✓	✓	✗				✓
Hungary	✓	✓	✓	✓	✓	✗				
Italy	✓	✗	✓	✓	✓	✗				
Luxembourg	✓	✗	✓	✓	✓	✗				
Norway	✓	✓	✓	✓	✓	✗	Not specified			✓
Romania	✓	✗	✓	✗	✓	✗	The review is conducted by RBs own initiative when necessary		At need	
Slovenia			✓		✓	✗	At need, recommended 5 years	5 years	At need	
Spain	✓	✗	✓	✓	✓	✗		3 months		✓
The Netherlands	✗	✗	✓	✓	✓	✗				✗

We received information from 7 countries about the ex-ante review of total charges (Table 9) and 11 countries provided information about their ex-post review (Table 10). As for the market segmentation, one reason we might have received less information here is that the IMs in some countries only charge direct, so that there is no reason to review total charges. As for direct costs, Germany and Italy appear twice and the same explanation applies.

Also similar to direct costs and market segmentation, there is nothing particularly different for the ex-parte process of total charges. All countries except France that provided information conduct ex-officio reviews for both ex-ante and ex-post. However, they are only conducted regularly for ex-ante (all but Hungary) and usually not regularly for ex-post. When done regularly, this happens either annually or every three or five years.

For ex-ante reviews, some countries have a predefined time length ranging from two months to 6 months. The reviews take play around several month to almost two years before the beginning of the next timetable period. The countries that do bigger reviews (for instance GB and Germany) do not have a predefined time length and the reviews start several years before the affected timetable period. There are a few examples where the duration and the timing is predefined for ex-post reviews and where time extensions are possible.

2.5 Other elements of the charging system

2.5.1 Congestion and scarcity charges

The issue of scarcity and congestion is addressed in Article 31 (4) of Directive 2012/34/EU. It states that "*the infrastructure charge may include a charge which reflects the scarcity of capacity of the identifiable section of the infrastructure during periods of congestion.*"

In 2019, the WG Charges and WG Access collaborated on a report about congested infrastructure.[16] The report included a section on capacity-related charges. The study found that twelve countries have implemented capacity-related charges in some way. However, the charges tend not to be used in practice or only play a minor role in alleviating congestion. While there is both theoretical and legal potential of using the charging system to address issues related to scarce capacity, there appears to exist practical obstacles for using charges and a lack of successful cases to draw upon.

A table setting out whether national IMs include scarcity charges within their pricing schemes is included below.

[16] IRG-Rail (2019), A survey of congested infrastructure, priority criteria and capacity charges in Europe. IRG-Rail (19) 4.

2.5.2 Environmental charges

Directive 2012/34/EU states, under Article 31 (5), that "*[t]he infrastructure charge may be modified to take account of the cost of the environmental effects caused by the operation of the train.*" It also stresses that "*[s]uch a modification shall be differentiated according to the magnitude of the effect caused.*"

Some countries have decided to put more emphasis on environmental externalities and promote clean transport modes like rail. Germany uses an integrated system of bonus and malus for freight traffic: a malus for all not retrofitted wagons running on the network and a bonus for those wagons using retrofitted brake blocks, which will phase out in 2020 because all noisy wagons are in principle banned from the network by then. In Italy, following the Decision 96/2015, the IM is entitled to include in the access charges a component that boosts the reduction of noise effects. Thus far, it has decided not to apply it. In Sweden, the main infrastructure manager previously made extensive use of charging components that aimed to internalise externalities. These included the increased risk of accidents, and emissions from diesel-powered engines. These were included in the charges for direct cost. However, as Implementing Regulation 2015/909 clarified that such costs may not be counted as direct costs, these surcharges have been phased out.

Environmental charges are used to create a level-playing field across all modes of transport based on impacts on the environment. IRG-Rail considers that all modes should be charged in a way that prevents one mode from being at a disadvantage compared to others. However, the most frequent case are noise charges and not environmental pollution as in carbon emissions or something similar. That is why, a specific column for noise charges is included in Table 11.

2.5.3 Performance schemes

Directive 2012/34/EU states, under Article 35(1), that "[i]*nfrastructure charging schemes shall encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network through a performance scheme. This scheme 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 are in place in almost all countries analysed in this paper. The schemes vary in their design, but their target is typically delay-minutes.

Almost all countries have a performance regime included in their national legal framework. In Denmark, there is a performance regime based on the payment for the use of the state owned rail network and on the environmental subsidy to freight transport. In The Netherlands and Romania, there is a performance regime included in the Network Statement and it is agreed with railway undertakings in their access agreements. A performance regime can also be tailored to fit for a particular railway undertaking. The Portuguese legal framework also considers a performance regime. However, the performance regime currently in use in Portugal was implemented before the entry into force of the new legislation. A new performance regime is currently being developed by

the IM to meet the requirements established in the new legislation. The new performance scheme is expected to be approved in 2017 and to be implemented in the following year. In Belgium, the IM had implemented a performance regime in 2017 and 2018. However, after a complaint from some RUs contesting the fairness of the regime, the Belgian RB has discontinued this system. The Belgian IM is working on another system to be implemented as per 2020.

IRG Working Group Access produced a review of performance schemes in IRG Member States in 2017.[17] The review shows that the design of the performance regimes in place across countries are broadly similar, but also vary in many respects. All performance schemes include a threshold for delays, below which no delay payments are applied. Schemes differ in what this threshold is, e.g. varying between 3 and 240 minutes for long-distance passenger traffic. Schemes also differ as to how delays are measured. Some countries only penalize delays at the destination, while other also do so for delays at the origin and intermediate points along the route. Some schemes include follow-up or secondary delays, while some do not.

The review also found that all countries' performance schemes include penalties. Some countries also include compensations and bonuses as part of the schemes. This generally seems to be interpreted as compensations paid between RUs. In such cases, the funds flow through the IM, which acts as an intermediary. Some countries also use bonuses for RUs that perform better than planned, but the design of these is not elaborated in the paper. There seems to be a wide divergence in the methodology of calculating penalties. Most countries charge per delay minutes, but some set fixed charges (per train) or as a percentage of the access charges. Countries also vary in how charges are differentiated (segment, geographic areas, e.g.). In some countries, penalties, bonuses or compensations depend on a comparison between performance achieved and predetermined performance targets or thresholds/benchmarks.

The review also handles evaluations of the performance regime. Only a handful of countries are able to say that positive performance results can be attributed to their performance regimes. A larger group of countries responded that minimal or no clear effects can be seen, or that no formal evaluations have been made. However, the paper concludes that there is no common approach to evaluating the efficacy of performance regimes. The reduction of delay minutes is one indicator, but not a sufficient monitoring parameter for the effects of performance schemes.

[17] IRG-Rail Working Group Access (2017), Overview on European Performance Schemes. Report 17-4. https://www.irg-rail.eu/irg/documents/position-papers/221,2017.html

2.5.4 Reservation charge

Directive 2012/34/EU states, under Article 36 that "[i]*nfrastructure managers may levy an appropriate charge for capacity that is allocated but not used. That non-usage charge shall provide incentives for efficient use of capacity. The levy of such a charge on applicants that were allocated a train path shall be mandatory in the event of their regular failure to use allocated paths or part of them. For the imposition of this charge, the infrastructure managers shall publish in their network statement the criteria to determine such failure to use. The regulatory body referred to in Article 55 shall control such criteria in accordance with Article 56. Payments for this charge shall be made by either the applicant or the railway undertaking appointed in accordance with Article 41 (1). The infrastructure manager shall always be able to inform any interested party of the infrastructure capacity which has already been allocated to user railway undertakings".*

IRG Rail has published a "Review of Reservation Charges across IRG Rail Members" in 2019[18] that shows that the most common cases of reservation charges are cancellation charges. Some countries also charge for amendments. The review also concludes that there is a wide variety in the understanding of what constitutes a cancellation or an amendment. This makes the comparison of the scarcely available quantitative data infeasible. It is quite common that the charges are differentiated according to time, but they are not often differentiated between freight or passenger services. They usually become more expensive closer to the time of departure, to set an incentive for RUs to free up booked capacity. In many countries amendments are just treated as a cancelation which is followed by a new request. Only a few countries have done an evaluation of the effect reservation charges and further research will be interesting to see how these charges adapt over time and to analyse their impact.

A summary of how these various charges are applied by IMs across countries is given in the table below. The review of charging approaches highlights that countries apply different pricing components to address additional charging possibilities. This may be a consequence of different political preferences, structural differences, different traffic patterns as well as different approaches to regulating the broader transportation sector when collecting data for the purpose of this paper. At the time of writing the environmental charge is only applied in few countries (e.g. Denmark, Germany, and Switzerland).

[18] https://www.irg-rail.eu/download/5/650/ReviewofReservationCharges.pdf

Table 11: Overview on other elements of the charging system across countries

Country	Congestion / Scarcity	Performance	Environmental	Noise	Reservation or Cancellation charge
Austria	✓	✓	✗	✓	✓
Belgium	✗	✓	✗	✗	✓
Bulgaria	✗	✗	✗	✗	✓
Croatia	✗	✓	✗	✗	✓
Czech Republic	✗	✓	✗	✓	✓
Denmark	✗	✓		✓	✓
Estonia	✓	✗	✗	✗	✓
Finland	✗	✓	✗	✗	✗
France	✗	✓	✗	✗	✓
GB	✗	✓	✗	✗	✓
Germany	✗	✓	✓	✓	✓
Greece	✗	✓	✗	✗	✓
Hungary	✗	✓	✗	✗	✓
Italy	✗	✓	✗	✗	✓
Latvia	✗	✗	✗	✗	✓
Lithuania	✗	✓	✗	✗	✓
Luxembourg	✓	✓	✗	✗	✓
Norway	✓	✓	✗	✗	✓
Poland	✓	✗	✗	✗	✓
Portugal	✗	✓	✗	✗	✓
Romania	✗	✓	✗	✗	✗
Slovakia	✗	✓	✗	✗	✓
Slovenia	✓	✗	✗	✗	✓
Spain	✗	✓	✗	✗	✓
Sweden	✓	✓	✗	✗	✓
Switzerland	✓	✗		✓	✓
The Netherlands	✓	✓	✗	✓	✓

2.6 Charging unit

The table below provides information on the main charging units used by countries. It highlights that train.km is the most commonly used charging unit (few Members States currently use tonne.km).

Table 12: Overview of Charging Units across countries

Country	Train km	Gross tonne km	Other
Austria	✓	✓	
Belgium	✓	✗	
Bulgaria	✓	✓	
Croatia	✓	✗	
Czech Republic	✓	✗	
Denmark	✓	✗	DKK/train
Estonia	✓	✓	
Finland	✗	✓	
France	✓	✓	Path.km and €/year (lump sum)
GB	✓	✓	Vehicle mile, and billing period
Germany	✓	✗	
Greece	✓	✗	
Hungary	✓	✓	
Italy	✓	✗	
Latvia	✓	✓	
Lithuania	✓	✓	Net tonne km
Luxembourg	✓	✗	Path.km
Norway	✗	✓	NOK/train[19]
Poland	✓	✗	
Portugal	✓	✗	
Romania	✓	✓	
Slovakia	✓	✓	€/stop (train stations)
Slovenia	✓	✗	
Spain	✓	✗	Seats.train.km
Sweden	✓	✓	Passage
Switzerland	✓	✓	CHF/year, powered axle.km, % of traffic revenues
The Netherlands	✓	✗	Differentiated by weight

[19] Applies for capacity charges.

Some countries also use gross tonne km. There are some particular cases. Lithuania, for instance, has net tonne km charging unit for mark-ups in segments of the rail freight transport service market. The mark-ups shall be applied to each tonne of freight carried per freight segment in the rail freight market. Luxembourg, according to section 6 of the Luxembourg Railway Network Statement, uses a charging system (for the fees charged for minimum access services) based on formulas calculated from certain conditions, and these are associated with the access to the service infrastructures and with complementary services provided by the infrastructure manager. In this line, the charging unit used by Luxembourg is €/train path. In Spain, the indicator of seats.km only applies to mark-ups, and only for high-speed passenger services. It is stated by the law, but the IM has argued that it is an indicator of the ability of the market (the operator in this case) to bear a higher cost. Also, the Swedish IM levies a charge on passenger trains passing the cities of Stockholm, Gothenburg and Malmö during peak hours in the morning and afternoon on weekdays. RUs pay a fixed fee of SEK 433 (ca. EUR 40) per passage. The charge is levied as a mark-up.

2.7 Traffic forecasts

Only five regulators challenge the traffic forecasts made by the IM as part of the examination of charges. In The Netherlands, the charges are corrected by the IM *ex-ante* on the basis of capacity applied for and extrapolations of volumes in previous years. In Germany, traffic forecasts are also challenged during the *ex-ante* examination of charges. The forecast of passenger train km is based on an extrapolation of current train km considering additional or reduced service requirements or changes in train km due to construction works. Freight train km are projected with the help of an internal analysis on the basis of general economic figures. In Poland, the regulatory body examines the forecast for operational work of the IM for each category of lines and weight. In case of a significant difference with the charge of the last timetable, the regulatory body asks the IM to provide a justification. In Italy, traffic forecasts over the regulatory period (5 years) are estimated by the IM on the basis of a consultation of the railway undertakings and their consistency is evaluated by the regulatory body. In GB, traffic forecast is one element that is considered during a periodic review to inform both the business plans and calculation of charges. In Spain, the RB assesses the methodology applied by the IM and ex-ante analyses yearly forecasts.

3. Cost Modelling

One of the main purposes of economic regulation is to ensure that prices of regulated activities are oriented to efficient criteria. In this regard, Article 31 (3) of Directive 2012/34/EU establishes that *"…the charges for the minimum access package and for access to infrastructure connecting service facilities shall be set at the cost that is directly incurred as a result of operating the train*".

Mentioning the cost that is directly incurred as a result of operating the train, or direct cost, raises the issue of how to properly identify these costs and which competences RBs have in relation to them. In order to improve regulation tasks, the same article mentioned above foresaw the approval, by the European Commission, of an Implementing Regulation. Regulation 2015/909 developed the framework for direct cost calculation, elaborating on different modalities that shall be used to adequately identify the cost that is directly incurred as a result of operating the train service. This regulation introduces, in its recital (12), the idea of using the proxy of marginal cost for this purpose, since this price regulation ensures the optimum effective use of available infrastructure capacity.

Furthermore, some countries might opt to recover more cost than direct cost. Hence, they need to further investigate the total costs of the services, including capital costs and what part of the costs had been covered by subsidies.

3.1 Direct Cost

In most countries, the charging models for direct cost calculation are based (at least partly) on the principle of marginal cost pricing. Economic theory understands this principle as the increase in costs that occur due to a marginal increase of the usage of the train path or up to a ten percent increase. As stated before, marginal cost is the optimum price regulation for rail infrastructure from a welfare point of view. However, given that calculation for marginal cost for the use of infrastructure is rather complex and implies a deep knowledge of the IM's cost structure and operation, the EC passed the Implementing Regulation 2015/909, that approaches direct cost as the cost that is directly incurred by the operation of the train service. This regulation defines direct cost as the difference between the total cost borne by the IM for the provision of the MAP and a list of non-eligible costs. According to recital (8), direct cost shall comprise only those costs that the IM "*…can objectively and robustly demonstrate that they are triggered directly by the operation of the train service*". Therefore, non-eligible costs, which are listed in 4, are cost borne by the IM that do not vary with the increase of traffic. However, as stated by recital (12), IMs may decide to use other proxies of marginal cost for calculating direct cost. IRG Rail has also published a paper about Implementing Regulation 2015/909 in 2016.[20]

[20]https://www.irg-rail.eu/download/5/11/IRG-Rail168-GuidelinestothecalculationofdirectcostsinrespectofimplementingRegula.pdf

In the case of Finland charging systems are solely based on marginal costs. While some of the governments support IMs through a subsidy, others additionally require the IM to recover some of its fixed costs through the charging framework in the form of mark-ups, as in France, Germany, Italy, The Netherlands, Norway, Spain, Switzerland and GB.

In their review of charging principles, most regulatory bodies consider cost drivers. Most regulatory bodies interpret the cost directly incurred as a short-run marginal cost that should include operating costs (*e.g.* signalling), maintenance costs (*e.g. wear and tear costs*), and renewal costs. Essentially, they are not broken down into smaller market segments. In general, direct costs charges do not vary within other market segments of freight and passenger services.

However, this is not the case for every country, as some IMs use more developed cost models that allow for further differentiation. For instance, the cost model used by the Spanish IM, not only allows for calculating a different direct cost for high speed and conventional lines (as explained before), but also makes a more profound differentiation between types of passenger traffic, thus providing different direct cost for different segments. This cost model uses technical characteristics of the trains operating in each segment (mass, speed, number of axis and engines) as the drivers for allocating tracks maintenance, wear and tear and renewal costs.

Costs estimates based on econometric approaches are used by some IMs, as in Finland, France, Netherlands, Norway and Sweden. Bottom-up engineering methods are also used. An engineering method is implemented in Austria[21]. French, Dutch, Swiss, Belgian and GB IMs already resort to such engineering and modelling calculations. The ORR has developed top-down econometric models but these are not currently used to set charges. The GB mainline IM, Network Rail, has also developed bottom-up engineering models which are used to set variable usage charges[22]. In Sweden, Trafikverket does not have its own econometric model, but it relies on results from an independent government-run research institute. In Italy, a mixed approach was chosen. Once the full (efficient) cost of providing the service of access to the railway network has been the determined, the IM must exclude all non-eligible costs, as identified by Regulation 909/2015, in order to identify the total direct costs (following a top-down approach). The direct cost component of the charges is computed based on technical parameters such as mass, speed and contact wire that characterize the specific operator request (following a bottom-up methodology). In Portugal, the IM uses a cost model to compute direct costs. However, this cost model was developed under legal provisions that are not in force anymore. As stated before, the charging model is being revised by the IM and a new one is expected in the near future.

[21] Austria: The engineering cost model is mainly used for determined the part of the used caused depreciation and to allocate the direct costs to the different train categories.
[22] ORR uses top-down benchmarking to assess Network Rail's efficiency . However, since the 2013 periodic review(PR13) ORR does not use top-down benchmarking to set the level of charges to recover cost directly incurred.

Table 13: Overview of calculation of direct costs across countries

	Methodology to calculate direct costs (Article 31 (3))			Costs considered to calculate of direct costs (Article 31 (3))			Efficient costs[23] taken into account in calculation of direct costs (Article 31 (3))	Review of direct costs methodology (Article 31(3))
	Subtraction methodology[24]	Engineering	Econometric	Operation	Maintenance	Renewal		
Austria	✓	✓	✗	✓	✓	✓	✗	✓
Belgium	✗	✓	✗				✗	✓
Bulgaria	✗	✗	✗	✓	✓	✓	✗	✓
Croatia	✓			✓	✓	✗	✗	✓
Czech Republic	✓	✓	✗	✗	✓	✓	✗	✓
Denmark	✓	✗	✗	✓	✓	✓	✗	✓
Estonia	✗	✗	✓	✓	✓	✓	✗	✓
Finland	✓	✗	✓	✗	✓	✓	✗	✓
France	✗	✓	✓	✓	✓	✓	✗	✓
GB	✗	✓	✗	✓	✓	✓	✓	✓
Germany	✗	✓	✓	✓	✓	✓	✗	✓
Greece	✓	✗	✗	✓	✓	✗	✗	✓
Hungary	✗	✓	✓	✓	✓	✓	✗	✓
Latvia	✓	✗	✗	✓	✓	✓	✗	✓

[23] Efficient costs refer to direct costs calculated as described in Article 3 (2) of Commission Implementing Regulation n°2015/909.
[24] The difference methodology refers to the methodology presented in Commission Implementing Regulation n°2015/909.

	Methodology to calculate direct costs (Article 31 (3))			Costs considered to calculate of direct costs (Article 31 (3))			Efficient costs[23] taken into account in calculation of direct costs (Article 31 (3))	Review of direct costs methodology (Article 31(3))
	Subtraction methodology[24]	Engineering	Econometric	Operation	Maintenance	Renewal		
Lithuania	✓	✗	✗	✓	✓	✓	✗	✓
Norway[25]	✗	✗	✓	✗	✓	✓	✗	✓
Poland	✓	✗	✗	✓	✓	✓	✗	✓
Portugal	✗	✗	✗	✓	✓	✗	✗	✓
Romania	✗[26]	✗	✗	✓	✓	✗	✗	✓
Slovakia	✓	✗	✗	✓	✓	✓	✗	✓
Slovenia	✗	✗	✓	✓	✓	✓	✗	✓
Spain	✓	✓	✗	✓	✓	✓	✗	✓
Sweden	✗	✗	✓	✓	✓	✓	✗	✓
The Netherlands	✓	✓	✓	✓	✓	✓	✗	✓

[25] Commission Implementing Regulation n°2015/909 is currently awaiting to be made part of the EEA-agreement and has therefore not been transposed into Norwegian law. It is therefore not yet applicable in Norway.

[26] In Romania, the IM uses a cost model to compute direct costs, but this model was developed under the former legal provisions. At present, the charging model is being revised by the IM and a new one is expected in the near future.

Article 31 (3) of The Directive 2012/34/EU already anticipated the Implementing Regulation 2015/909 on the modalities for the calculation of the costs that is directly incurred as a result of operation the train service, which is defined as direct costs in Article 2 (1). The IR sets rules how direct costs should be calculated. Article 3 (4) states that the IM may include in the calculation of its direct costs in particular the following costs categories:

a. **Costs of staff:** Costs needed for keeping open a particular stretch of line if an applicant requests to run a specific train service scheduled outside the regular opening hours of this line;
b. **Costs of points infrastructure:** the part of the costs including switches and crossings, that is exposed to wear and tear by the train service;
c. **Cost for electrical equipment:** the part of the costs of renewing and maintaining the overhead wire or the electrified third rail or both and the supporting overhead line equipment directly incurred as a result of operating the train service;
d. **Scheduling costs:** the costs of staff needed for preparing the allocation of train paths and the timetable to the extent that they are directly incurred as a result of operating the train service

In particular Article 3 (4) c in combination with Article 4 (1) k indicates a separation of direct costs for electrical engines vs. non electrical engines. Therefore, an inclusion of the direct costs as specified in 3 (4) c leads to differentiation of direct costs and, thus, differentiation of charges between those traffic types.

The following table shows which of the above categories are included in the direct costs of the main IMs of each country. 16 countries provided information for this table. One can see that cost of points infrastructure is considered in all countries that provided information. All but two countries also consider the cost for electrical equipment. All but four countries consider cost of staff and scheduling costs.

Table 14: Overview of Direct Cost categories proposed by IR 2015/909 Article 3 (4)

	Direct costs categories proposed by IR 2015/909 Article 3 (4)			
	Cost of staff	Costs of points infrastructure	Cost for electrical equipment	Scheduling costs
Austria	✓	✓	✓	✓
Belgium	✓	✓	✓	✓
Czech Republic	✗	✓	✗	✓
Finland	✗	✓	✓	✗
France	✓	✓	✓	✗
GB	✓	✓	✓	✓
Germany	✓	✓	✗	✓
Hungary	✓	✓	✓	✓
Lithuania	✓	✓	✓	✓
Norway[27]	✗	✓	✓	✗
Poland	✓	✓	✓	✓
Romania	✓	✓	✓	✓
Slovakia	✓	✓	✓	✓
Spain	✓	✓	✓	✓
Sweden	✗	✓	✓	✗
The Netherlands	✓	✓	✓	✓

In The Netherlands, the direct costs for electrical engines and non-electrical engines are separated. The costs for electrical equipment are allocated to the MAP service 'tractive power supply'. The charge of this service consists of the transport cost of electricity and direct maintenance and renewal costs of the electric wire. The service only includes the use of the tractive power supply systems and not the supply of the electric power.

In Finland, the incremental costs that relate only to the electrical drive have been determined by using the subtraction methodology as described in Article 3 of the Implementing Regulation. According to this methodology, expert evaluation has been used to separate the costs directly incurred by traffic from the total network-wide incremental infrastructure costs that relate to electrical drive (electric distribution network). Finally, the costs have been divided by the gross tonne kilometres operated in rail traffic by electrical drive.

[27] Commission Implementing Regulation n°2015/909 is currently awaiting to be made part of the EEA-agreement and has therefore not been transposed into Norwegian law. It is therefore not yet applicable in Norway.

3.1.1 Subtraction Methodology

As mentioned before, the Implementing Regulation (IR) 2015/909 addresses direct cost primarily as the difference between total cost and non-eligible costs, therefore subtracting costs that do not vary with, or are directly triggered by the operation of the train, from the total cost of providing the services comprised in the MAP. According to art. 3 (1) of IR 2015/909, this methodology seems to be the main approach for direct cost calculation, since it contains an extensive regulation of non-eligible cost. Following recital 12 of IR 2015/909, "*It is a well-established economic principle that user charges based on marginal costs ensure the optimum effective use of available infrastructure capacity. Hence, the infrastructure manager may decide to use the proxy of marginal costs for calculating its cost directly incurred as a result of operating the train service.*" Article 6 of IR 2015/909 refers to econometric or engineering cost modeling As underlined in recital 14, these methods require, a higher degree of precision, a higher level of data quality and expertise than methods based on deducting from the full costs certain non-eligible cost categories. That is why, an IM may decide to not use any of the above mentioned methods.

The Polish main IMs for instance, may not have detailed information regarding particular parameters, for example real axle load assigned to railway line sections. Importantly, the main IM, PKP PLK, conducts a large-scale renovation process (implemented on the basis of the Multi-annual Program and the Multi-annual Agreement and modernization of the railway infrastructure (based on the National Railway Program) which significantly affects the stability of the data necessary for precise calculations. For econometric analyses, long time series of historical data are needed, which are an application of homogeneous methodology throughout the entire period of collecting these data. While, the ongoing implementation of the above-mentioned Programs excludes collecting infrastructure characteristics with the quality required by econometrics (that is, appropriately stable, long-term, related to the same research area). As a result of the above, PLK is not able to apply more sophisticated cost modelling. This is due to the fact that the data held by PLK does not meet the requirement of a higher degree of accuracy in cost calculation and they do not allow achieving a higher level of data quality and technical knowledge. That is why the main IM and other IMs use methods based on deducting from the full costs certain non-eligible cost categories.

3.1.2 Engineering

Engineering methodologies are based on engineering knowledge and techniques and sometimes are complemented by the information contained in cost accounting models. They blend bottom-up methods (to evaluate the physical relationship between the operation of train services and wear and tear of the infrastructure) and top-down cost allocation methods (to estimate future maintenance and renewal costs and allocate them to cost categories and reference objects). Operating costs other than maintenance may also be included in the calculation of direct costs provided that the infrastructure manager can transparently, robustly and objectively measure and demonstrate that these costs are directly incurred by the operation of the train service.

IR 2015/909 also foresees other methodologies for a higher degree of precision for the calculation of direct cost as a proxy for marginal cost. Indeed, Article 6 allows for modelling direct cost by means

of a robust econometric or engineering methodology. These other approaches can be used combined with the subtraction method in order to obtain a more precise estimation of direct cost. This is the case of Spain, that initially follows subtraction methodology, excluding non-eligible cost as defined by Article 4 from the total cost borne by the IM in the provision of its services, and then models some cost components (tracks' wear and tear) using a technical (engineering) approach.

The technical college of the University of Ohio made an interesting description of the engineering-bottom-up methodology which can be used for calculating the direct costs. Bottom-up costing relies on detailed engineering analysis and calculation to determine an estimate. Process based cost estimation is the way to estimate costs based on the idea that the costs of all the processes that produced the desired finished product has a cost that can be associated with them. In this case the desired finished product represents the output which makes a rail infrastructure available and can comprise the operation, the maintenance, the renewal, the upscaling of the rail infrastructure which is altered by rail traffic. The bottom-up portion of this type of estimation can be seen when each process is estimated separately, for each sub-component and then all of the results are combined to produce one total estimate.

Traditionally bottom-up method accounts for overheads in material and expenses as well as expenses based on labour. The greatest advantage of this method is that an accurate model is developed for each process. Because the accuracy of this model can be very good and every process is accounted for, this method can be very powerful.

The main drawback of process cost based estimation is that an expert in the sector must estimate the amount of raw material that must be used by each process model. Because this process is very tedious, it does not afford quick way to estimate cost. The design must be very detailed as well in order for the input data to be precise. Another issue might be that the bottom up approach relies on estimates that describe what should be instead of what actually happened. This has been pointed out by a report from the CERRE institute[28]. The reports also offers a comparison of the engineering and econometric estimates across some countries.

This is what has been observed in Belgium. The IM has decided to use this method. Infrabel appointed an expert to analyse all the processes related to the operations and the maintenance of the rail infrastructure and to identify the relevant cost centres to be incorporated totally or partially in the direct costs. This process of analysis and evaluation was quite long and rather cumbersome.

[28] https://www.cerre.eu/sites/cerre/files/180509_CERRE_TrackAccessCharges_OverallReport_final.pdf

3.1.3 Econometric

Econometrics is a proven method blending mathematics, statistics, and economics which has the advantage of solely relying on data to calculate the marginal cost of traffic. This methodology requires the infrastructure manager to collect extensive data on operational, maintenance and renewal costs, on traffic and on other characteristics (e.g. infrastructure, geographical or topological characteristics) at a sufficiently disaggregated level to allow satisfactory estimations. The econometric methodology enables to estimate the impact of traffic on costs, all other factors held equal (i.e. controlling for all other characteristics included in the estimation). Using the estimated impact of traffic on costs, it is then possible to deduct or calculate the marginal costs of traffic.

In Finland, econometric modelling is performed for the costs excluding the incremental costs that relate to the electrical drive (electric distribution network). A dataset for years 2013-2016 is prepared for calculating the basic infrastructure charge, which describes the railway network, rail traffic operations and rail infrastructure management of the Finnish Transport Infrastructure Agency (FTIA) with the following data:

- features of the railway network by track section,
- annual kilometres operated by track section and
- annual expenses of rail infrastructure management (maintenance and replacement investments) allocated to track sections.

As a result, the costs incurred by kilometres operated in rail traffic (cents/gross tkm) are obtained for train traffic operated by diesel traction.

In Germany, the main IM conducts a regression analysis for the costs of depreciation. In addition to the train km of freight, PSO and Non-PSO traffic, some other infrastructure parameters (for instance number of switches and what kind of material) are used to model the costs per train km for depreciation. The IM then uses a three year moving average to avoid fluctuations. The methodology is explained in more detail in the network statement.[29]

In France, SNCF Réseau has developed an econometric model to estimate marginal costs. The calculation makes it possible to explain observed (maintenance) or modelled (renewal) expenditure by the technical characteristics of the infrastructure and by traffic. Note that the IM is in the process of reworking its econometric methodology, which will enable to take into account observed (and not modelled) renewal costs. These analyses provide an estimate of cost functions, from which marginal costs are derived.

[29] https://fahrweg.dbnetze.com/resource/blob/3589412/c092f135a177d211b8545ca74f8df0b5/snb_2020_annex_6-1-data.pdf

In Norway, the IM, Bane NOR SF, has performed an econometric analysis on the basis of costs linked with corrective (remedying faults) and preventive maintenance of the infrastructure and traffic load measured in gross tonne-kilometres, as described in point 6.2.1.1.1 of Bane NOR's Network Statement for 2021. Bane NOR's econometric model aims to take into account that the lines used in the model have different technical designs in the form of the number of point switches, tunnels, speeds, etc. The model is logarithmic and operates with two products/services, passenger railway traffic and freight railway traffic. The estimation of the cost elasticities and thereby the marginal costs is carried out using the ordinary least squares method, often referred to as OLS in literature.

3.1.4 Criteria for Direct Cost Calculation and Modulation

Article 5 (1) of the IR 2015/909 states that the IM "*shall calculate average direct unit costs for the entire network*". Alternatively, the second paragraph of the same article allows IMs to calculate different direct cost for different parts of the networks if they can demonstrate to the RB that some parameters are significantly different for each part. In turn. Alternatively, Article 5 (2) authorizes the infrastructure managers to differentiate the direct cost based on different criteria and hence to differentiate direct cost charges across different train categories. This section analyses which criteria are used to calculate direct costs for direct train categories. Different criteria which can be attributed to four different cases (see also Section 2.4.2.2) and how they are dealt with by a national IM are listed below:.

- Applied
  The criterion is directly or at least partly used for the differentiation of direct costs. For instance, train mass can be used to adjust direct costs proportionally or to increase direct costs above a certain threshold.
- Discussed not applied
  The criterion is discussed in the network statement but the IM argued that it is not necessary or reasonable to use it. This might change in the future.
- Discussed not practical
  The criterion is discussed in the network statement but the IM argued that he cannot use it or observe it.
- Not discussed
  There is no discussion about this criterion in the network statement of the IM.

It is interesting to compare the criteria used by each main IM of a country for both the passenger services and for the freight services. The heatmap below allows the reader to directly compare all criteria across in one country (horizontally) and a comparison of one criterion across countries (vertically) for each main service (freight / passenger services). The first graph below is related to the freight services and the second one is related to the passenger services.

In general, some additional criteria are applied for passenger services than for freight services. The number of criteria used varies between countries. Slovenia is not discussing any criteria (for both segments), and criteria for passenger trains were not discussed in the Network Statement. Other countries, like Austria, apply a relatively large number of criteria.

Figure 4: Heatmap of Direct Cost Criteria in Freight Services

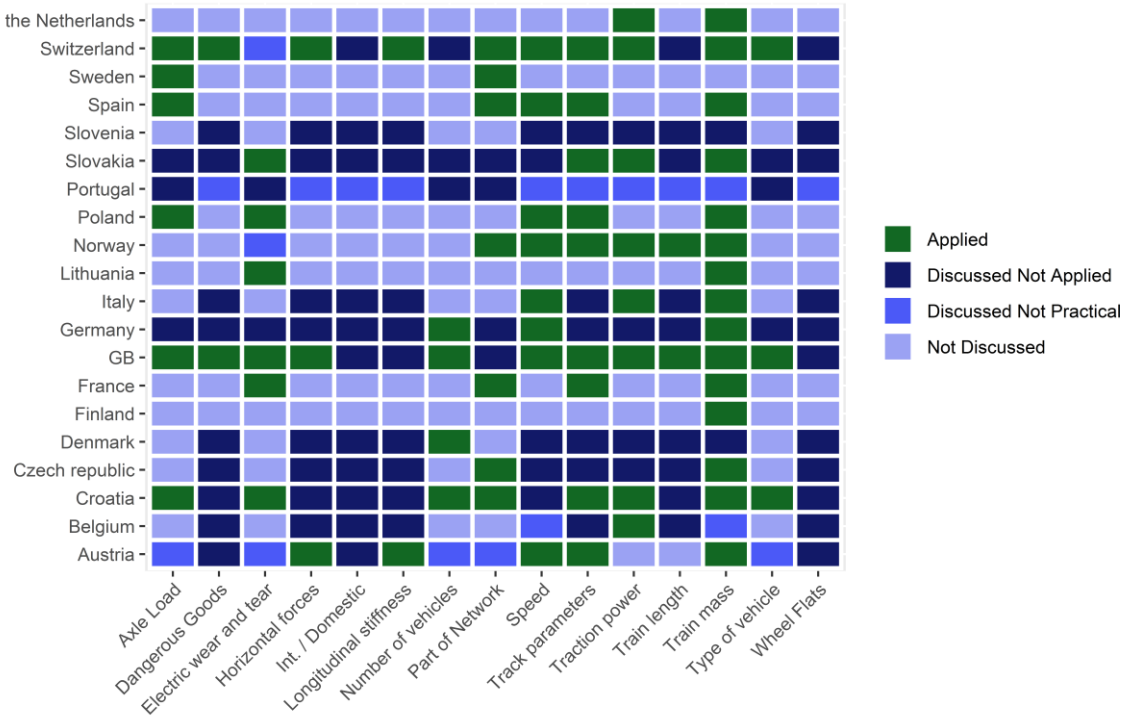
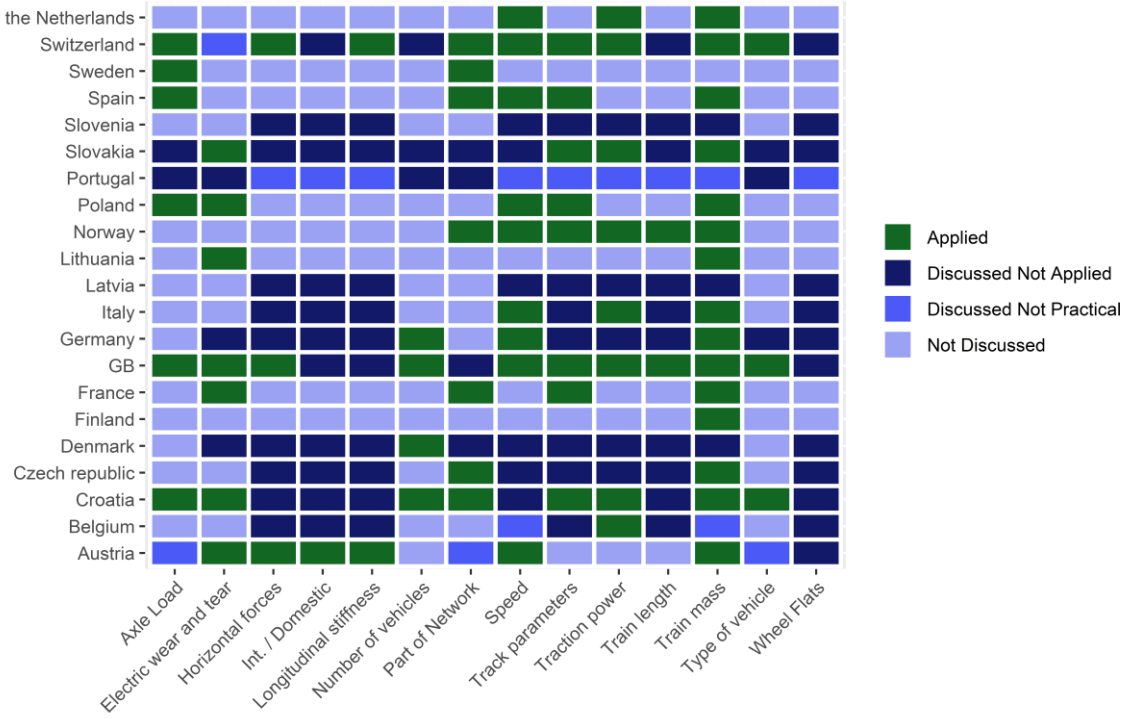


Figure 5: Heatmap of Direct Cost Criteria in Passenger Services



The following section briefly discusses how one could understand the different criteria and if available adds information how they have been interpreted in some countries. The discussion is not split by freight and passenger services, because the criteria for both overlap but for one category and mostly the application of the criteria does not differ between the two services. In hindsight, one could aggregate the two heatmaps, but to show the point, heatmaps for freight and passenger services have been created.

Axle Load
In some countries, the IM differentiates the direct costs according to the Axle load of the train wagons. The argument is that a higher axle load will strain the infrastructure more compared to lighter trains.

Dangerous Goods
One might argue that services with dangerous goods create higher direct costs, because they need more supervision. Currently this seems to be the case in GB and Switzerland, and is discussed in some countries to be applied in the future.

Electric wear and tear
According to Article 5.2i, IM may take into account consumed and measured electric power or the dynamics of pantographs or contact shoes as a parameter to charge for the wear and tear of the overhead wire or the electric rail. The German IM chose not to include these costs because the market segmentation, for which direct costs are calculated, does not differentiate according to the engine mode.

Horizontal forces
Horizontal forces refer to the forces of the vehicles to the rail, which interferes with the tracks. While they are usually smaller on straight lines, they occur in curves like tracks in the mountains and damage tracks.

International/ Domestic
Some IMs differentiate direct costs for domestic and international services based on the length and higher cost of services, some others do not.

Longitudinal stiffness
Longitudinal stiffness refers to the forces of the stiffness of vehicles on the tracks in curves, especially on mountain tracks with a narrow radius of tracks.

Number of vehicles
Article 5 (2a) of Implementing Regulation 2015/909 refers to “train length and/or number of vehicles in the train”. In the German TAC scheme, train km are used as a weighting factor for different clusters for which direct costs are calculated.

Part of Network
In Spain, the IM calculates separate direct costs for high speed and conventional networks as total costs and costs related to maintenance, renewals, etc., are significantly higher for high speed lines in terms of cost per train.km. Those lines also show differences in the type of trains, average speed and other parameters that justify its differentiation as a separate part of the network. The Czech IM uses 5 infrastructure categories with different coefficients for the calculation of direct costs.

In Sweden, the IM differentiates a direct cost charge based on the capacity utilisation of the lines. They motivate this by the fact that lines with higher capacity utilisation increases the cost for the IM to conduct maintenance of the infrastructure. However, this differentiation will be removed as of 2021.

Speed

Speed may play a role for the calculation of direct costs in two ways. Either by using the speed of the train or by using the track category (max speed) of network segments. The reasoning behind this criterion is that faster trains might produce a more intense wear and tear on the tracks compared to a slower train under similar conditions of mass and axel loads. This is done similarly in Germany. In Norway for instance, speed is included in the econometric model by using the track category (max speed).

Track parameters

Article 5(2) mentions track parameter, particularly radii, as a criterion to modulate direct costs. Other parameters might be related to speed, length, gauge, or interconnectivity of the track. Cost of wear and tear depends on the different tracks, like the radius of curves, type of track, maximum speed, and type of catenary. Therefore, direct costs may vary between the lines with varying parameters of the track.

The Austrian IM takes the different track parameters into account when calculating direct costs of the different train categories. In Norway the track parameters are technical data for the track in the econometric model used by our IM. These parameters are: Track length, bends, tunnels, point switches, speed and traction power.

Traction power

In Norway for instance, traction power is a technical input in the econometric model used by the IM.

Train length

In Norway train length plays a role for the calculation of direct cost indirectly through train mass, e.g longer trains have a higher train mass.

Train mass

The mass of the train can be one indicator that shows services that put more stress on the network. This is for instance the case in Germany, where trains which more than 3000 t are charged higher direct costs and train mass is used as a weighting factor to distribute costs across cost clusters. In Spain, direct cost related to tracks' maintenance and renewal are modulated between different segments according to technical criteria of the trains running the segments, being train mass on of the main parameter. In Finland, article 5 (2b) is not applied, but gross-ton kilometers are used, as according to article 5 (1). The Czech IM uses 22 weight categories with different coefficients to calculate direct costs.

Type of vehicle

Direct costs could depend on the type of vehicles that are used within a train. This could be different types of wagons or locomotives.

Wheel Flats
Wheel flats are flat spots on the rail wheel that could cause damage to the tracks and hence be considered for direct costs.

One can observe that the majority of the countries use the same criteria for passenger and freight services. Most of the countries use several criteria. Few countries (Portugal, Slovenia, Latvia and Czech Republic) do not use any criteria or are still in the process of discussing the criteria. Finally, a few countries only use one or two criteria (Denmark, Finland, Sweden, and Belgium). Speed, track parameters and train mass are most often used across countries.

3.2 Total Costs

As shown in Section 2.4.3 some RBs review the total level of charges and costs of the main IM. IRG-Rail has published a report comparing the total cost level of main IMs in selected European countries[30]. The report discusses in detail the definitions of the Minimum Access Package (MAP) and the main components of total costs, which is broadly defined as gross costs and net costs. To obtain net costs one needs to deduct those costs from gross costs that are covered by other sources, mostly grants and other revenues.

The differentiation between gross and net costs is particularly important in countries where the main IM charges mark-ups, because the mark-ups should only cover net costs to avoid double counting. The following sections discusses various aspects of the modelling of total costs.

As done in the above mentioned report, we focus on costs instead of expenditures. Therefore, all categories presented are focused on assets and projects that are already capitalized in the balance sheets and accounting system of an IM. The difference between expenditures or money granted to the IM and costs should be noted. Expenditures represent a flow of money while costs consider if the asset for which the expenditures were used are consumed within the observed time period. Expenditures and costs are equal when the asset is bought and consumed in the same time period.

3.2.1 Definition of total cost

To be able to compare as many countries as possible, the report uses a very broad definition of accounted gross cost, grants and other revenues on an annual basis.

- Gross costs: All cost related to the provision of the MAP services regardless of the funding sources
- Grants: Any form of funding sources that is not originally provided by the IM´s own funds and is consumed or capitalized within the given year. This also includes funds provided by

[30] "Benchmark on Financing of Main Railway Infrastructure Managers in Selected European Countries" (IRG Rail November 2019) https://www.irg-rail.eu/download/5/645/BenchmarkonFinancingofMainRailwayInfrastructureManagersinSelectedEuropeanCountri.pdf

contractual agreements referred to in Article 30 (2) and Annex V of Directive 2012/34/EU, as well as subsidies and any other sources of public funding.

- Other revenues: Other commercial revenues not directly linked to services provided within the MAP but based on assets used within the MAP. This could for instance be revenues from a sale of MAP assets, advertisement on MAP assets, or renting out parts of a MAP asset to other companies while still using them for the MAP (e.g. cables and network antennas on the track infrastructure)[31]
- Net costs: The residual of gross costs and grants & other revenues. This should be equal to the revenue cap of charges for countries applying mark-ups[32].

It is also interesting to discuss in more detail what costs should be included into the main IM´s cost. This can be addressed by looking at the definition of the minimum access package in national law and which services are to be provided by the main IM across countries. Directive 2012/34/EU states in Annex II (1) that the minimum access package shall comprise:

a. handling of requests for railway infrastructure capacity;
b. the right to utilise capacity which is granted;
c. use of the railway infrastructure, including track points and junctions;
d. train control including signalling, regulation, dispatching and the communication and provision of information on train movement;
e. use of electrical supply equipment for traction current, where available;
f. all other information required to implement or operate the service for which capacity has been granted.

The benchmark report contains further details. In addition, total costs can be separated into a more detailed split of the accounted MAP costs as foreseen in the International Accounting Standards (IAS)[33]:

"*An entity shall present an analysis of expenses recognized in profit or loss using a classification based on either their nature or their function within the entity, whichever provides information that is reliable and more relevant.*"

[31]Other examples comprise advertisement on train bridges, also selling old rails or other parts of the infrastructure, as well as selling wood from protected forest (protect railways from avalanches)

[32] With the exception that in some countries an incentive regulation applies that allows the revenue cap to be different than the actual cost of the respective year.

[33] International Accounting Standards (IAS): These standards were issued by the International Accounting Standards Council (IASC), and they set internationally recognized accounting standards.

For this, there are several ways to do so, starting with the nature of expense method.

"*The first form of analysis is the 'nature of expense' method. An entity aggregates expenses within profit or loss according to their nature (for example, depreciation, purchases of materials, transport costs, employee benefits and advertising costs), and does not reallocate them among functions within the entity. This method may be simple to apply because no allocations of expenses to functional classifications are necessary."*[34]

Usually one could subsume the following categories under this methodology:

- Material
  Material cost is the cost of materials used to manufacture a product or provide a service.
- Depreciation & Amortization
  Depreciation is an accounting method of allocating the cost of a tangible asset over its lifetime and is used to account for declines in value over time. Amortization applies to intangible assets. Usually defined by accounting standards (IFRS, local GAAP) and/or the law.
- Wages & Social charges
  All costs paid for labour.
- Other costs
  Costs not related to any of the above categories.

Another approach would be the functional cost view

"The second form of analysis is the 'function of expense' or 'cost of sales' method and classifies expenses according to their function as part of cost of sales or, for example, the costs of distribution or administrative activities. At a minimum, an entity discloses its cost of sales under this method separately from other expenses. This method can provide more relevant information to users than the classification of expenses by nature, but allocating costs to functions may require arbitrary allocations and involve considerable judgement."[35]

Usually one could subsume the following categories under this view:

- Operations
  Business activities that the IM engages in to enable the RUs to have access to and use the railway network.

[34] IAS 1, page 102

[35] IAS 1, page 103

- Maintenance
  The process of preserving the existing condition of an asset. Action of extending the life duration of an existing asset.
- Renewals
  An expenditure to replace an existing asset with a new asset.
- Enhancement
  An expenditure to improve the quality of an existing asset.
- Upscaling
  An expenditure to increase the capacity of an existing asset.
- New infrastructure
  An expenditure to build new capacity
- Other costs
  Costs not related to any of the above categories.

It is not always easy to exactly differentiate between these categories. The Implementing Regulation (EU) 2015/1100 for the rail market monitoring (RMMS), uses the category upgrades which subsumes both enhancement and upscaling. For certain investments, for instance into ETCS system, it would be difficult to say in which category they should fall as they both improve the quality and capacity of a network.

The following table summarizes which of the above categories are used in the costs accounting schemes of the main IMs of the respective countries. This does not imply that the RB has easily access to this data or that they are publically available.

Table 15: Cost components of the MAP used by the main IM

	Functional Costs View							Nature of Expense			
Country	Operations	Maintenance	Enhancement	Renewals	Upscaling	New infrastructure	Other costs	Material	Depreciation & Amortization	Wages	Other costs
Czech Republic											
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Austria	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓
Belgium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Finland	✗	✓	✗	✓	✗	✗	✗	✓	✗	✓	✓
France	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hungary	✓	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗
Italy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Poland	✓	✓					✓	✓	✓	✓	✓
Slovakia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Slovenia	✗	✓	✓	✗	✗	✗	✗	✗	✓	✗	✗
Spain	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
Sweden	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓
The Netherlands	✓	✓	✓	✓		✓	✓	✗	✗	✓	✓

3.2.2 Review of the IM's investment programmes

Only the five regulatory bodies of France, Portugal, Estonia, Bulgaria and GB have the task of formally reviewing the investments or investment programmes of the IMs with reference to Article 8 (3) of Directive 2012/34/EU. Some other regulatory bodies may however be consulted, as part of a more general consultation procedure, on medium to long-term investments plans. In Sweden, the regulator is consulted on the national transportation plan which is prepared by the IM and constitutes a national investment plan over a period of 10-12 years. The Spanish Railway Act, transposing Directive 2012/34/EU, also foresees a general consultation procedure, which would include the rail regulator, on the strategic plan of network development. Finally, some regulators may have access to information on investments, without being formally consulted. The Italian regulatory body must be informed of the content of the contractual arrangements between the State and the IM which fix the investments and the renewals over a five-year period[36] before the signature and it has the right to comment on the content. The German IM has to set up a business plan including investment- and financing programs. The regulatory body has the possibility to comment on the document.

In France, the regulatory body by law reviews maintenance, renewal or enhancement investment programmes for projects over 200 million euros. This review takes the form of a non-binding opinion and should assess the financial viability of the project for the infrastructure manager[37].

In GB, the regulatory body is involved at all stages of the investment lifecycle, on all capital expenditures of the IM, including maintenance, renewals and enhancements. Its role notably consists of determining the efficient price of the infrastructure investment at the beginning of the Control Period (five-year period), monitoring it throughout development and delivery and then determining the actual value of addition to the regulatory asset base. To do so, the GB rail regulator analyses a series of documents (e.g. Project Management Plan, Asset Management Plan, Estimate Report, benchmarking and unit rate analysis, Investment Paper, etc.). The IM is incentivised to deliver the project at the target price, which is set at the regulator's efficient determination of price[38]. Any change to the target price throughout the lifecycle of the project is monitored and approved by GB regulatory body.

In Portugal, the regulatory body (AMT) may be consulted on the investment plan which is part of the activity plan that is to be approved by the Ministry of Finance and the Ministry responsible for the rail sector. The Infrastructure Investment Plan is part of the National Reform Program, which follows the Plan prepared by the IP designated by "Ferrovias 2020", which is supported by PETI. At

[36] In November 2017 ART issued an advice on the contractual arrangement on investments taking place during the period 2017-21 between the Italian IM and the State (Advice n° 11/2017).

[37] Article 2111-10-1 of the French Transportation Code states that the regulator's opinion should notably focus on (1) the relevance of the revenue forecasts from the project and (2) on the adequacy between these revenue forecasts and projected investment costs.

[38] Note that target prices may be set for individual projects or efficient cost may be calculated for a portfolio of projects. In case of a portfolio, the infrastructure manager is able to overspend on one project, provided that there is no net change on the overall portfolio cost.

the time of the preparation of PETI, AMT did not exist. However, IMT, the former regulatory body, participated in review of the road, sea and rail sector. According to AMT´s bylaws, it is the responsibility of this entity to issue recommendations on the drafting and modification of any public service provision agreements.

3.2.3 Financing of the IM's investment programmes (replacement, expansion and maintenance investments)

The IMs are largely financed either by governments (subsidies), railway undertakings (infrastructure charges) or the European Union (European funds). Some IMs also receive other income as in GB for example, where Network Rail receives income from renting/leasing out its property. For all IRG-Rail members, the IMs receive subsidies to finance their investment programmes. In some countries, public grants represent a high percentage in terms of the costs that are covered. This percentage may vary depending on the type of investment (replacement, expansion and maintenance). For example, in Finland approximately 90% of the IM's expenses (including expansion investments) are funded by the State budget. In Greece, no less than 70% of the total costs are subsidised by the State. In Italy, the government provides funds for investments in the conventional network (fully covered) and high speed network (partially); renewals and maintenance are partially financed by the State.

Investment programmes can also be co-financed by European Union funds. This is the case for example in Denmark, Hungary, Greece, Croatia, Italy, Germany, Poland and Romania. In Hungary, for example, the major renewal and upgrading works are mainly financed by EU funds. The maintenance cost, on the other hand, is financed using the IMs' incomes. In Portugal, the IM (IP) benefits from a package of community funds - "Connecting Europe Facility (CEF)" (general component - contribution of 30% to 50% and cohesion component - 85% contribution) and Portugal 2020 Programme (85% contribution), plus the Juncker Plan and the contribution of *Infraestruturas de Portugal*.

In some countries, such as The Netherlands, Sweden and Poland new infrastructure projects (expansion investments) are generally financed by the State, whereas renewals, enhancements and upgrades of the existent infrastructure are financed by the IM. The IM also receives government subsidies to finance these expenses. In Sweden, the government essentially finances both development and maintenance of infrastructure. The principle has been that the government deducts track charges from the Swedish Transport Administration's appropriation needs and assigns the difference. In The Netherlands, for example, about 75-80% of the operation, maintenance, renewal and infrastructure expansion costs incurred by the IM are financed by subsidies. In Sweden, the share of government financing is around 80 to 85%.

In contrast with this subsidy allocation depending on the type of expense, GB IM receives a grant from the relevant governments, which is not allocated towards a particular category of expenditure. However, the different governments have specified what enhancements should be delivered within

the same five year period of time. In France, new investments are financed both by public subsidies and private funds (private funds are predominant in the case of concessions).

In Portugal, IM financing is guaranteed through share capital, State and European subsidies and loans. The majority of the loans are secured by the government, where the IM plays the role of "agent". The financing of the infrastructure manager is done through: i) government subsidies - compensatory allowances - established in the 5-year Framework Contract for the National Railway Network signed between the State and IP; ii) railway undertakings - the infrastructure charges; iii) loans contracted with the Portuguese State; iv) subsidies from different entities to finance IM investments programmes. The European Union funds contribute to co-finance some programmes, some of them are non-refundable subsidies; v) the profits and/or dividends of the companies in which it participates, such as IP Telecom and IP Patrimony and vi) the provision of services in service facilities, such as freight terminals.

3.2.4 The impact of public grants on charges

High level impact of public grants on charges

The railway networks regulated by IRG-Rail members are natural monopolies. As such, the issue of the recovery of costs and, in particular of fixed costs, is central. Directive 2012/34/EU mandates a charging system based on direct costs (Article 31 (3)) to which mark-ups that consider the competitiveness of the market segments may be added, in order to obtain full recovery of the costs incurred by the IM (Article 32 (1)). In addition to this charging system, Article 8 (2) allows EU countries to provide the IM with public grants. Given this framework, it can be argued that the level of public grants necessarily impacts the overall level of charges paid by railway undertakings. Indeed, the Recast does not impose on countries to levy mark-ups in accordance with Article 32 (1). Thus, depending on the level of public grants provided to the IM, charges may be set at the directly incurred costs or mark-ups may be introduced to cover a larger share of the full costs of the network.

The impact of public grants on direct costs and mark-ups

Concerning individual charges, the level of directly incurred costs in a given country must not be impacted by public grants as this charge should only reflect the additional costs incurred as a result of operating the train service. Nevertheless, according to Article 4 (1.b) of IR 2015/909, costs that do not relate to payments made by the IM cannot be considered eligible costs. In this regard, depreciation on the basis of wear and tear of assets that were subsidized, cannot be included as part of direct cost. In addition, operating costs can be subsidized as well, what also reduces direct cost. Therefore, differences with regard to level of subsidies among countries could affect the level of direct cost.

For countries that levy mark-ups, and in the context of full recovery of costs incurred by the IMs, two different approaches may be used to set the level of these charges. In countries such as Spain, Finland, Slovakia or Greece, the level of charges is calculated in a first step. Then, public grants, particularly government subsidies, are set to balance the accounts of the IMs. An opposite approach is taken in *e.g.* Italy, GB and Germany. In these countries, the level of public grants is set first and

the level of charges is then derived so as to cover the full efficient and relevant costs incurred by the IMs. Using one methodology instead of the other to calculate mark-ups is likely to impact their level. In Italy, the length of the regulatory period is set at 5 years that is also the duration of the contract between the State and the IM for the public subsidies for investments and maintenance.

The impact of public grants on amounts paid by RUs

Public grants may also be used to impact the amounts paid by railway undertakings (RUs), rather than the level of charges. This is for instance the case in Italy and France, where governments have chosen to support the railway freight sector. In France, the governmental support applies to all freight traffic, while in Italy it only concerns freight traffic towards or from the South of the country. In both States, the concerned freight services do not pay the full charges set by the IM. In Italy, the government subsidies, limited in time, cover the full amount of access charges to the railway undertakings operating in the freight sector that benefit from the incentive. Moreover, in most countries, indirect public contributions are also made to the IM to cover part of the track access charges of railway undertakings operating under public service contracts. In 2014, the German Federal Government provided regional transport authorities about 7.3 billion euros for the organization of regional passenger transport, of which 3.1 billion euros were used to cover part of the track access charges for these services. The overall level of contribution increased in 2015 and reached 8.2 billion euros in 2016, 8.3 billion euros in 2017 with approximately 3.3 billion euros spent for track access charges (for subsidized passenger services only). France has a similar organization in which the federal government pays for part of the track access charges of regional and national public services.

Recently, some countries (for instance Germany) have introduced schemes to cover parts of the freight charges for RU. In Germany, the transport ministry pays part of the charges in lieu of the RUs directly to IM to cover for the mark-up of the track access charges.

Breakdown of IM revenues between access charges and public grants

As underlined in the previous subsection, public grants represent a substantial part of the revenues of the IM in most countries. In Greece, around 70% of the revenues of the IM come from public compensation. In Slovakia, public subsidies amount to around 80% of the IMs' incomes, while in Finland they represent 90%. The rest is covered by access charges. The breakdown of income between charges and subsidies within a country may vary for different parts of the network.

Time periods for the determination of public grants

Depending on the country or the source of financing, the level of public grants may be set for different time periods. In Finland, public grants are decided on an annual basis. In Germany, Italy, Norway and GB, the bulk of public grants is set for multi-annual periods. In GB, the Department for Transport (for England and Wales) and Transport Scotland (for Scotland) pays a network grant to the IM for a five-year period. In Italy and in Germany, part of the public grants is included in the public contract between the State and the IM, for a period of five years. In Germany, some public grants such as infrastructure upgrading subsidies is set on an annual basis.

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Table 16 Overview Table for Investment and Subsidies[39]

	The RB reviews the investments or investment plans of the IM	Financing of the IM				Part of investment programmes (replacement, expansion, maintenance) financed by :			Some railway infrastructures financed by private funds
		Track access charges	EU subsidies	State subsidies	Regional subsidies	EU subsidies	State subsidies	Regional subsidies	
Austria	✗	✓	✗	✓	✗	✓	✓	✗	N/A
Belgium	✗	✓	✗	✓	✗	✗	✓	✗	
Bulgaria	✓	✓	✓	✓	✗	✓	✓	✗	
Croatia	✗	✓	✓	✓	✗	✓	✓	✗	✗
Czech Republic	✗	✓	✓	✓	✗	✓	✓	✗	✗
Denmark	✗	✓	✗	✓	✗	✗	✗	✗	✗
Estonia	✓	✓	✓	✓	✗	✓	✓	✗	
Finland	✗	✓	✗	✓	✗	✓	✓	✗	✗
France	✓	✓	✓	✓	✓	✓	✓	✓	✓
GB	✓	✓	✗	✓	✗	✗	✓	✗	✓
Germany	✗	✓	✓	✓	✓	✓	✓	✓	✓
Greece	✗	✓	✓	✓	✗	✓	✓	✗	
Hungary	✗	✓	✓	✓	✗	✓	✓	✗	
Italy	✗	✓	✓	✓	✓	✓	✓	✓	✗
Latvia	✗	✓	✗	✓	✗	✓	✓	✗	✗
Lithuania	✗	✓	✓	✓	✗	✓	✓	✗	✗
Luxembourg	✗	✓				✓	✓	✗	
Norway	✗	✓	✗	✓	✗	✗	✓	✗	✗

[39] This table refers to all IMs within the country

Poland	✗	✓	✓	✓	✗	✓	✓	✗	
Portugal	✓	✓	✓	✓	✗	✓	✓	✗	
Romania	✗	✓	✓	✓	✗	✓	✓	✗	✗
Slovakia	✗	✓	✓	✓	✗	✓	✓	✗	✗
Slovenia	✗	✓	✗	✓	✗	✓	✓	✗	✗
Spain	✗	✓	✗	✓	✗	✓	✓	✗	✗
Sweden	✗	✓	✗	✓	✗	✓	✓	✗	✓
The Netherlands	✗	✓	✗	✓	✗	✓	✓	✓	

3.2.5 The cost of capital

Generally, the cost of capital is understood as the return required by the sources of financing a company's investments. In this regards, economic theory defines cost of capital as the opportunity cost of making a specific investment instead of a different investment with equal risk. For IMs, as well as for any regular company, this cost arises from the return on the borrowed funds (debt) and the own funds (equity).

In most regulated sectors, cost of capital is the measure for the reasonable profit as stated by price regulation. However, whether a reasonable profit shall be included for regulated prices of the IM is a debatable issue. Indeed, the Directive 2012/34/EU does mention reasonable profit in Article 3, defining it as "…*a rate of return on own capital that takes account of the risk, including that to the revenue, or the absence of such risk, incurred by the operator of the service facility and is in line with the average rate for the sector concerned in recent years*". Therefore, a reasonable profit is only explicitly defined for operators of service facilities.

Another debate regarding the applicability of cost of capital (understood as the return on both equity and debt) to IMs total cost is the fact that, in general, IMs are often public companies whose investments have been funded mainly through public funds and sometimes respond to certain policy goals, such as industrial development or eliminating market failures (Christiansen, H. 2013[40]). In this scenario, the return on own capital might not be considered as a main goal of public policy.

On the other hand, IR 2015/909 includes financing cost as one of the non-eligible costs listed in Article 4. Therefore, although not a direct cost, the financing cost might be considered as part of IM's total cost. However, financing cost are usually interpreted as interests on debt, so the debate on whether return on equity shall be included within cost of capital still remains.

Only a few regulators review the cost of capital included in the pricing of the infrastructure. This is the case for Germany, Italy, and GB. The methodology that prevails when determining this cost of capital is a CAPM/WACC approach. In Italy, the regulatory body has identified criteria for the determination of the parameters used in the CAPM/WACC formula, and for some of them, the specific economic values to fill in the formula. In Germany, the cost of capital is considered as a fixed cost.

[40] Christiansen, H. (2013), "Balancing Commercial and Non- Commercial Priorities of State-Owned Enterprises", *OECD Corporate Governance Working Papers*, No. 6, OECD Publishing. http://dx.doi.org/10.1787/5k4dkhztkp9r-en

3.2.6 The regulatory asset base

The regulatory asset base is one of the main parameters of price regulation. According to the OECD[41], this regulatory asset base, also called "rate base", is used to calculate the rate of return on investment when applying this type of price regulation. This base includes all the assets that are taken into account for the purpose of determining the investment that will be remunerated, accounting for the accumulated depreciation of the assets. Therefore, this parameter is of great importance for RBs, given that the size of the eligible assets included in the base will determine the final rate of compensation for the regulated company. The role of the RB in a given regulated industry is to balance the benefits of rate-of-return regulation and the associated risk of over-investment. As stated before, increasing the regulatory asset base will have a direct impact on remuneration of the investment. Therefore, there is a risk for the operator to increase investment inefficiently, substituting labour for capital. To avoid such outcome, RBs can decide that certain investment should not be included in the asset base, thus capping the compensation.

As shown in Table 17, a regulatory asset base is determined for charging purposes in seven countries. This is the case in Croatia, Estonia, Latvia, Estonia, Germany, Italy and GB. In Germany, Italy and GB the calculation is based on both internal data (cost data) and external data (annual report). In fact, in Italy the regulatory asset base is determined on internal data but should be coherent with the external data published in the IM's annual report. In Croatia the estimation is only based on internal data.

3.2.7 Valuation of assets

Only a few regulators report having a national law or a practice for valuing assets for consideration within the calculation of charges. Bulgaria, Estonia, Latvia, and Romania do this based on the current value of the assets. Austria, Belgium, Bulgaria, Croatia, Czech Republic, Lithuania and Portugal use an historic value approach for the value of assets. GB uses another methodology which is based on an income approach using the regulatory asset base, which equates to the discounted future cash flows associated with the network.

In Italy, the net book value of the assets used in operating the train service, with the exclusion of the assets financed by public subsidies, is taken into account for the computation of the cost of capital; IAS and IFRS apply.

Regarding the assets, the Portuguese law says that the IM must prepare and keep up-to-date a register of its assets and assets under its responsibility, in order to assess the financing needed to

[41] Égert, B. (2009), "Infrastructure Investment in Network industries: The Role of Incentive Regulation and Regulatory Independence", *OECD Economics Department Working Papers*, No. 688, OECD Publishing, Paris, https://doi.org/10.1787/225261508320.

repair or replace, and the record should be accompanied by detailed information on the expenses with the renovation and modernization of the infrastructure. Besides what is defined in the Regulation 2015/909, the national law does not say anything more.

Table 17: Overview of practices for investments and subsidies

Country	The IM includes the cost of capital in its pricing scheme	The RB reviews the methodology to estimate the cost of capital	A regulatory asset base is determined to calculate the cost of capital	How are assets valued for their consideration within the calculation of charges?		
				Based on current costs	Based on historic costs	Other methodology
Austria	✗	✗	✗	✗	✓	✗
Belgium	✗	✗	✗	✗	✓	✗
Bulgaria	✗	✗	✗	✓	✓	✗
Croatia [42]	✓	✗	✓	✗	✓	✗
Czech Republic	✗	✗	✗	✗	✓	✗
Denmark	✗	✗	✗	✗	✗	✗
Estonia	✓	✓	✓	✓	✗	✗
Finland	✗	✗	✗	✗	✗	✗
France	N/A	N/A	N/A	N/A	N/A	N/A
GB	✗	✓	✓	✗	✗	✓
Germany	✓	✓	✓	✗	✓	✗
Greece	✗	✗	✗	✗	✗	✗
Hungary	✓	✗	✗	✗	✓	✗
Italy	✓	✓	✓	✗	✓	✗
Latvia	✓	✓	✓	✓	✗	✗
Lithuania	✗	✗	✗	✗	✓	✗
Luxembourg	✗	✗	✗	✗	✗	✗
Norway	✗	N/A	✗	N/A	N/A	N/A
Poland	✗	✗	✗	✗	✗	✗
Portugal	✗	✗	✗	✗	✓	✗
Romania	✗	✗	✗	✓	✓	✗
Slovakia	✗	✗	✗	✗	✗	✗
Slovenia	✗	✗	✗	✗	✓	✗
Spain	✗	✗	✗	✗	✓	✗
Sweden	✗	✗	✗	✗	✗	✗
The Netherlands	✗	✗	✗	✗	✓	✗

[42] Not for all.

3.3 Multi-annual contracts

In most countries, a multi-annual contract entered into force between IM and the government, determines, amongst other topics, the amount of public subsidy for maintaining and renewing the infrastructure and a range of defined quality standards. In GB, statutory arrangements play this role.

In Portugal, a 5-year Framework Contract for the National Railway Network was signed in 2016 between the Portuguese State and IP, the main IM. Under this contract, the State's main obligation is to finance the management of the infrastructures while IP is obliged to meet user-oriented performance targets, in the form of indicators and quality criteria covering elements such as train performance (line speed and reliability, and customer satisfaction), network capacity, asset management, activity volumes, safety levels, and environmental protection. The contract also sets financial efficiency objectives for IP in the form of revenue and expenditure indicators.

In France, a performance contract was signed in 2017 between the State and the IM for 10 years. It includes some obligations of productivity, quality and security, respecting financial trajectory. A revision clause was setting to evaluate the situation every 3 years. In Poland, a 5-year multiannual agreement was signed in December 2018. It defines rules for financing the IM's activity with public funds as well as obligations of quality. Evaluation of contract effects may happen every year. In Romania, a 5-year Framework Contract for the National Railway Network was signed in 2016 between the Romanian State and the IM. Under this contract, the State's main obligation is to finance the IM activity and the IM is obliged to meet user-oriented performance targets. In Germany, two 5-year Framework Contracts and one 10-year Framework Contract were signed between the German government and DB Netz AG (main IM), DB Station und Service AG (main station manager) and DB Energie GmbH (main energy infrastructure manager), the first from 2009 to 2014 (including a one-year extension), the second from 2015 to 2019 and the third from 2020 to 2029. Under these contracts, the German government's main obligation is to finance infrastructure renewals while the different DB enterprises are obliged to meet financial minimum targets for maintenance as well as annual performance targets.

3.4 Efficiency

Some regulatory bodies have been given the (national) competency to review the efficiency of the IM in accordance with Article 30 (1) of the Directive 2012/34/EU. The ORR reviews the regulatory accounts and produces an annual efficiency and finance assessment of Network Rail. The ORR's *final determination* sets the complete costs of Network Rail with respect to some efficiency assumptions on costs that allow reaching the outputs set by railway funders. Then, the assumptions ORR has made on the level of Network Rail's maintenance and renewals expenditure will be reflected in the level of charges that operators pay, given that charges are set to be cost reflective. Those assumptions are made *ex-ante* for the five-year control period.

The French and the Dutch IMs also include efficiency targets within the annual evolution of (some) charges. In Italy, after a process of consultation, a target of an annual rate of 2% of reduction in operating costs was adopted by the regulatory body for the first regulatory period (2016-2021).

In Germany, the level of total costs is defined every five years for the regulatory period. During the regulatory period, an annual ceiling of costs is determined, which considers inflation and productivity change rate as the ceiling for charges proposed by the IM.

The mechanism of the German incentive system is twofold: if the actual costs of the IM decrease during a regulatory period, the charges do not, but the profit increases. Therefore, an incentive to cost reductions is set. Only with the next regulatory period, cost changes are considered for the determination of the level of total costs. The second incentive is given by allowing the IM to keep profits from increased output, as the cost ceiling applies to product of demand at the beginning of the regulatory period multiplied by the prices of each year. An increase in demand does not results in lower prices for the regulatory period, but increases the profit of the IM. Therefore, the system sets an incentive to extend the amount of traffic on the rail network.

In Poland the multiannual agreement sets out mechanisms that are designed to motivate the IM to reduce the costs of infrastructure management, costs of operating the train service and the costs of maintenance and repair activities. Every year the Ministry may approve efficiency bonus for the IM, if the IM achieves expected indicators' levels in the following areas:

a. the share of the length of the operating railway lines that meet the standards in relation to the total length of the railway lines in operation
b. average train speed (commercial speed)
c. punctuality
d. employment efficiency
e. cost-effectiveness
f. safety levels
g. reliability
h. accessibility
i. infrastructure quality

4. Complaints on charging issues

In the following, some special cases are highlighted for the reader:

The Swedish regulator has received one complaint from an RU on the differentiation of the access charges. The main Swedish IM modulated the average direct unit cost by basing the modulation on the vehicle with the highest axle weight load in the train. The RU claimed that the modulation was not in line with Implementing Regulation 2015/909 since it does not reflect the actual wear and tear caused to the infrastructure and that it was discriminatory for RUs with wagon load traffic. The RU also claimed that the method of modulation in network statements 2017 and 2018 should be based on an average of the axle weight in the train. The Swedish RB found that the IM could not prove that the modulation reflected the cost directly incurred by the train service operation and it was therefore not in line with the Regulation and not in line with the Swedish Railway Act.

Furthermore, the Swedish RB has received several complaints during the past years regarding the delay attribution codes set by the IM. The attribution codes determine which party (IM, RU or neither) is liable to pay charges under the performance scheme. The complaints typically ask the RB to change the code set by the IM. In one interesting case from 2019, the RB determined that the IM was wrong in using a code corresponding to external factors for a delay caused by a bird short-circuiting electrical equipment, which led to a power-outage and delays. The code originally used by the IM implied that no party was held responsible for the delay and no charges are paid. However, the RB argued that the IM should have been able to prevent the delays, e.g. by installing bird rejectors near sensitive electrical equipment. The IM should therefore have used a code indicating that the delays were due to infrastructure failure.

In June 2019, the Finnish RB issued a decision (TRAFICOM/5620/03.06.00/2019) on the infrastructure charges for electrical drive levied by the Finnish Transport Infrastructure Agency (FTIA) in the timetable periods 2019 and 2020. The decision was issued, because VR Group (Finnish incumbent RU) complained about a revised decision on the calculation principles and level of the infrastructure charge levied for electrical drive by the FTIA. In its decision, the RB concluded that the charges do not fully meet the requirements laid down in the Finnish Rail Transport Act (1302/2018) and the more detailed provisions of EU legislation. Furthermore, by its decision, the RB reduced the 2019 and 2020 infrastructure charges for electrical drive by an average of 8 per cent. It also referred the determination of the infrastructure charge for 2021 back to the FTIA.

The Norwegian RB received a complaint from The Airport Express Train in December 2017 regarding infrastructure charges for 2017, 2018, and 2019. After investigating the complaint, the RB found that the mark-ups levied by Bane NOR SF (the Norwegian IM) from The Airport Express Train were not in accordance with the Norwegian national railway regulations. As a result, the RB made a

decision[43] in May 2019 obliging the Norwegian IM to pay back to The Airport Express Train mark-ups collected from the company in 2017, 2018 and 2019, and to stop further collection of mark-ups from the company in 2019. The IM was also obliged to assess the implications of the decision for other railway undertakings. The main conclusions in the RB's decision where that the IM had failed to conduct a market analysis on which the mark-ups in 2017 and 2018 could be based, and that the market analysis conducted for the year 2019 failed to comply with railway regulations. Hence, the applied mark-ups were found to be discriminatory. Furthermore, the RB found that the IM failed to comply with requirements in the regulations concerning necessary information about infrastructure charges in the Network Statement. Following the RB's decision, the IM decided to appeal the decision. On 21 July 2020, a district court in Oslo ruled mainly in favor of the RB. However, the IM decided to appeal the court's decision and the case is currently awaiting further legal proceedings and judicial review.

[43] The decision is available on the website of the Norwegian RB: https://sjt.no/globalassets/02_jernbane/pdf-jernbane/markedsovervaking/vedtak-i-klage-fra-flytoget-as-pa-bane-nor-sf-sin-innkreving-av-infrastrukturavgifter-i-2017-2018-og-2019.pdf