2020 PRIME Benchmarking report

KPI & Benchmarking Subgroup PRIME

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Foreword by PRIME co-chairs

The European Green Deal and the Sustainable and Smart Mobility Strategy put rail transport in the centre of political measures to make Europe the first climate-neutral continent by 2050. The European Year of Rail 2021 highlighted the important role of rail in reaching this goal successfully. Rail will have to take up a bigger share of the transport system. Rail infrastructure managers work to provide safe, reliable and efficient railway infrastructure for the transport of people and goods. Their contribution will be key in meeting additional capacity needs and creating optimal operating conditions for the provision of attractive rail services. The recent COVID pandemic has had a very heavy economic impact on the sector, which is already visible to some extent in this year's report. But the ongoing recovery also offers an opportunity to transform our transport systems and it is good to see that many Member States are making use of funding from the EU Recovery and Resilience Facility to invest in rail.

The KPI subgroup was set up in 2014 with two main objectives: to monitor common trends at the EU level; and to benchmark performance and by so doing to strive for better results. We are pleased that we can share with you the fifth benchmarking report prepared by the PRIME KPI subgroup, covering the years 2016-2020. For the infrastructure managers, benchmarking helps to understand where each organisation stands and where there is potential for improvement. For the European Commission, there is an invaluable opportunity to identify best practice and to monitor the progress with respect to EU policy priorities. For all stakeholders, it is an opportunity to observe trends as they evolve, and to identify strengths and weaknesses of the system.

Compared to the first four reports, this edition includes a more complete dataset, several new performance indicators and two new participants (in total 19). Four infrastructure managers are in the transitional phase to join. Similarly to last year's report, this report offers detailed explanations and contextual information to make the wealth of data more accessible.

We would like to thank the new PRIME KPI subgroup chairs Jude Carey from Irish Rail and Raymond Geurts van Kessel from ProRail as well as Rui Coutinho from IP Portugal who was leading the Subgroup for 4 years together with the members of this group from 24 organisations, the Commission, and the European Union Agency for Railways, for this outstanding achievement.

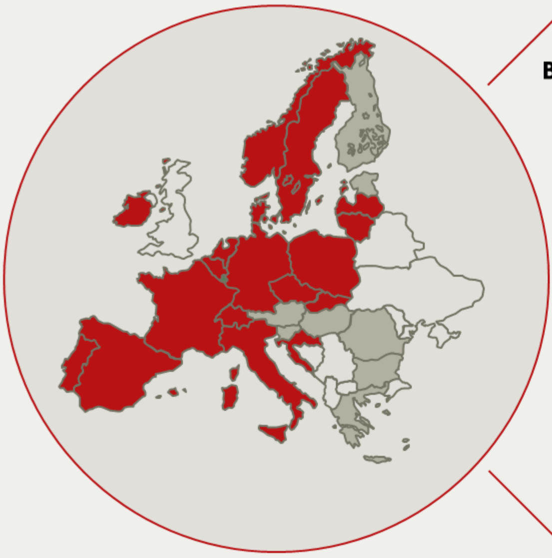
PRIME members have jointly agreed on the key performance indicators that are relevant for their business. The progress on common data definitions and KPIs is documented in the catalogue, which is continuously refined and publicly available on the PRIME website. We will continue to work on making PRIME KPIs more robust, comparable for benchmarking purposes and more complete by covering additional aspects.

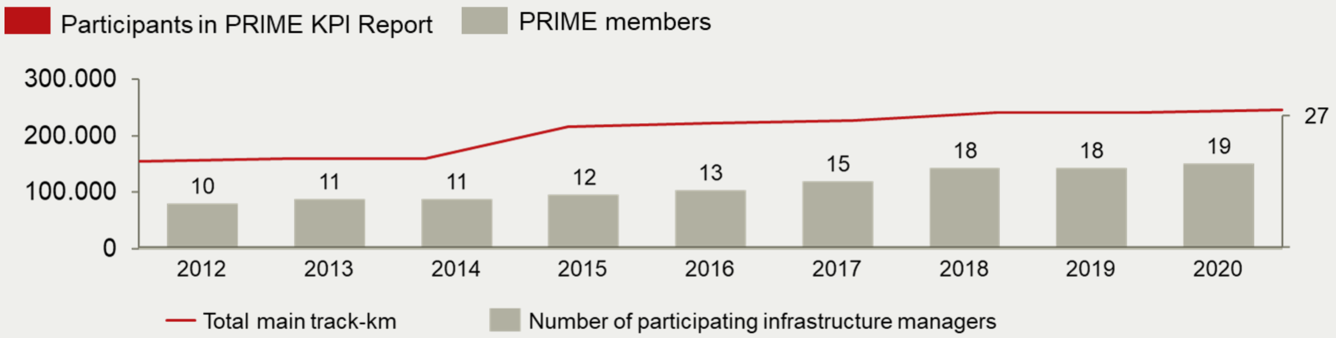
We believe that PRIME data and definitions can serve the needs of a large range of rail experts and policy makers. By measuring and sharing the results, we aim to demonstrate to the wider public that the rail sector is committed to improving its service provision.

PRIME co-chairs

Kristian Schmidt
European Commission, DG MOVE
Director of Land Transport

Alain Quinet
SNCF Réseau
Deputy Director General





Main track-kilometres

72% (+ 0.2%)
of main track-km are electrified

9% (+ 12%)
of main track-km are equipped with ERTMS

15.100 (+ 3%)
high-speed main track-km (≥ 200 km/h)

Passenger trains

27 (- 11%)
passenger trains per main track-km per day

94,6% (+ 2%)
of passenger trains on time

Freight trains

7 (- 7%)
freight trains per main track-km per day

62,8% (+ 1%)
of freight trains on time

Expenditures

109.900€ (+ 1%)
OPEX per main track-km

128.600€ (+ 3%)
CAPEX per main track-km

Energy supply

82% (+ 1%)
of train-kilometres are electricity-powered

Remarks

The red values refer to 2020. The percentage values show each KPI's evolution between 2019 and 2020.

To ensure a consistent data basis, every KPI includes only the infrastructure managers that have delivered data for the specific KPI both for 2019 and 2020.

Introduction

Rail is the backbone of European transportation. It is the safest, greenest mode of land transport and has also proven efficiency in the current Covid-19 pandemic, as being more resilient than other modes rail freight continued to run reliably throughout the pandemic, ensuring supply chains.

Emissions from transport, unlike other sectors, have risen steadily between 2013 and 2019 and now account for a quarter of total greenhouse gas emissions in the EU. During the Covid-19 pandemic there was a substantial drop of an estimated 12,7% in 2020, although this is expected to rebound after the pandemic.[1]

One of the main objectives of the European Green Deal is to reach a 90% reduction in transport emissions by 2050. Rail has an essential role in this transformation, which is why the Commission has set a number of ambitious rail related milestones to be reached by 2050, in the new Sustainable and Smart Mobility Strategy, such as to:

- **Double rail freight** traffic
- **Triple high-speed** rail traffic
- **Complete** the multimodal **Trans-European Transport Network (TEN-T)** equipped for sustainable and smart transport

In order to fulfil its role in the European Green Deal and meet the objectives of the Sustainable and Smart Mobility Strategy, rail has to be sustainable, safe, resilient, reliable, smart and affordable and able to adapt to the changing needs of passengers and industries. This depends on the performance of both rail operators and infrastructure managers (IM). The latter are responsible for developing, maintaining and managing the rail infrastructure. The PRIME KPI & Benchmarking Subgroup collects data to monitor their performances in these categories.

- **Safety** is a top priority. Although safety risks cannot be completely eliminated, safety levels can be significantly improved by good asset condition and the adoption of safety policies. Investing in state-of-the-art technology (e.g. ERTMS), rethinking networks, stations, level-crossings, and training of track workers and awareness-raising campaigns for the public, are available tools for infrastructure managers.

[1]European Environment Agency: Greenhouse gas emissions from transport in Europe. https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport

- **Ensuring the optimal use of rail infrastructure** based on the needs of customers is essential and can be promoted through adequate instruments such as economic incentives and/or charging and performance schemes, in line with EU law[2]. As capacity is limited, and new construction is very costly and time intensive, getting maximum capacity out of the existing infrastructure network is paramount. This depends on efficient capacity allocation and traffic management, as well as on systems like the European Rail Traffic Management System (ERTMS), which allows for shorter head times between trains.
- **Strong cooperation between all actors across borders** is vital to enabling smooth operation between countries, overcoming fragmented national structures and creating a truly open and interoperable railway market. It paves the way for major international projects and services linking European cities and citizens with each other. The Platform for Rail Infrastructure Managers in Europe (PRIME) is a central element of this cooperation. In 2021 the European Commission published the Action Plan to boost long-distance and cross-border passenger rail services, in order to make rail more attractive as a travel option.
- Efficient and far-sighted maintenance and renewals increase **reliability and availability**. Reducing the number of asset failures through proactive maintenance reduces delays and cancellations, thereby making rail more attractive to users. Conversely, tracks in bad condition, and therefore subject to permanent or temporary speed limitations or even closure, lead to longer travel times and in some cases lower utilisation, as the route becomes unattractive.
- Rail is already one of the most environmentally friendly and energy-efficient transport modes. But **environmental sustainability** is not only about more people using rail, but also about rail itself becoming greener. Rail is mostly electrified, with 4 out of 5 trains running on electricity, and represents only 0,4% of CO_2 emissions from all transport modes[3]. Rail has the potential to become completely carbon neutral well before the rest of the economy by 2050.
- **Providing good value for money** is important, as infrastructure managers are largely funded by the public and State budgets are constrained. Gov-

[2] Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area http://data.europa.eu/eli/dir/2012/34/oj

[3] Statistical Pocketbook 2020. https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2020_en. and CER launches the Future is Rail campaign - UIC Communications

ernments have a part to play here too. In accordance with EU law[4], Member States have to ensure that the accounts of infrastructure managers are balanced. Low levels of investment over an extended period of time can negatively impact operational costs, safety and overall performance.

2020 and 2021 were difficult years for the rail sector. **Transport was one of the sectors most severely affected by the Covid-19 pandemic.** While freight transport has shown a certain resilience in the crisis, there has been a huge drop in passenger mobility. During the peak of the crisis, ridership went down by more than 90% in several countries and many international connections were stopped. Rail infrastructure managers are impacted due to the reduction in traffic and the revenues it generates[5].

As this report **covers data up to 2020**, **it already reflects possible impacts of the pandemic**. Nevertheless, it would be a limited view to attribute individual developments exclusively to the pandemic. Rail transport is a complex system that depends on a variety of factors and actors. Furthermore, more time is needed to gather and analyse data in order to grasp the full impact of the current pandemic on the behaviour of passengers and transport users. But there are certainly lessons to be learnt, such as the resilience and increased punctuality of rail during the crisis and the growing appetite of customers for sustainability.

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[4] Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area. http://data.europa.eu/eli/dir/2012/34/oj

[5] Opinion of the European Economic and Social Committee (TEN/716-EESC-2020) for the Proposal for a Regulation of the European Parliament and of the Council establishing measures for a sustainable rail market in view of the COVID-19 pandemic [COM(2020) 260 final - 2020/0127 (COD)], Rapporteur-general: Alberto MAZZOLA, Plenary session: 553 - Jul 16, 2020 https://www.eesc.europa.eu/fr/our-work/opinions-information-reports/opinions/proposal-regulation-european-parliament-and-council-establishing-measures-sustainable-rail-market-view-covid-19-pandemic

1. PRIME KPI & benchmarking

Platform of Rail Infrastructure Managers in Europe (PRIME)

The Platform of Rail Infrastructure Managers in Europe (PRIME) was established between the European Commission's transport and mobility directorate general (DG MOVE), and rail infrastructure managers in 2013. Its main objective is to improve the cooperation between rail infrastructure managers across Europe. Furthermore, the platform supports and facilitates the implementation of European rail policy and develops performance benchmarking for the exchange of best practices.

Alongside the European Commission and the European Union Agency for Railways (ERA), PRIME now has 37 industry members including all main infrastructure managers of EU Member States and of the EFTA members Switzerland and Norway. Four industry associations of European rail infrastructure managers participate as observers[6].

KPI & Benchmarking Subgroup

A central idea behind PRIME is to give infrastructure managers, who are natural monopolies, an opportunity to learn from each other. The performance benchmarking currently covers several dimensions of rail infrastructure management: costs, safety, sustainable development, punctuality, resilience, and digitalisation. The core of the benchmarking is the catalogue, which contains a clear and concise documentation of the PRIME key performance indicators (KPIs).

The number of infrastructure managers participating in the subgroup has steadily increased. The first pilot benchmarking started in 2015 with 9 infrastructure managers collecting data predating to 2012. In this year's benchmarking, based on 2020 data, 20 infrastructure managers have contributed to the report, of which 19 are involved in the external report presented in the table below.

[6] PRIME members: https://webgate.ec.europa.eu/multisite/primeinfrastructure/about-prime/members_en

Infrastructure managers participating in the report

Infrastructure manager	Logo & abbreviation		Country	
Adif		Adif		Spain
Bane NOR		Bane NOR		Norway
Banedanmark		BDK		Denmark
DB Netz AG		DB		Germany
HŽ Infrastruktura d.o.o.		HŽI		Croatia
Iarnród Éireann – Irish Rail		IÉ		Ireland
Infrabel		Infrabel		Belgium
Infraestruturas de Portugal S.A.		IP		Portugal
Latvijas dzelzceļš		LDZ		Latvia
AB LTG Infra		LTGI		Lithuania
LISEA[7]		LISEA		France
PKP PLK		PKP PLK		Poland
ProRail		ProRail		Netherlands
RFI		RFI		Italy
SBB		SBB		Switzerland
SNCF RÉSEAU		SNCF R.		France
Správa železnic, s.o.		SŽCZ		Czechia
Trafikverket		TRV		Sweden
Železnice Slovenskej republiky		ŽSR		Slovakia

Table 1: Infrastructure managers participating in the report

Purpose and empirical methodological approach of the report

The purpose of this report is to illustrate the current performance of infrastructure managers, to identify areas for further analysis and to provide relevant data to the railway industry and related sectors, politicians, researchers, economists and other interested stakeholders. Above all, the general objective for the report is to deliver insight and inspiration for better decisions in developing a sus-

[7] LISEA (South Europe Atlantic High-Speed Rail Line) operates exclusively the high-speed line between Tours and Bordeaux.

tainable and competitive infrastructure management which can provide high quality services.

In this report the key indicators will each be shown in a benchmark graph and a time series graph, presenting a cross-comparison of infrastructure managers and key trends. Similarly to last year's report it includes data for the last five years: this year's report covering 2016-2020. **This allows more companies to be presented in the graphs and makes it easier for new members to reach the threshold for historical data.** To ensure clarity and comparability only complete time series are shown. The time series chart is complemented with the compound annual growth rate (CAGR) to increase the visibility of the overall development. The CAGR also shows only complete time series.

The benchmarking charts show 2020 data and the average of the years 2016-2020 for every individual infrastructure manager[8], plus the peer group's average weighted by denominator. The peer group's average weighted by denominator means for example that, if the KPI reflects cost per main track kilometre (denominator), organisations with large networks will have a correspondingly higher impact on the weighted average. Thus, the weighted average reflects the average of the combined total network of all participating infrastructure managers. Due to the specificity of 2020 and the potential impact of the Covid-19 pandemic, data were not substituted with the latest available values when no 2020 data were available, as was the case in previous reports. The accuracy of the data is indicated in each case and highlighted in a lighter colour in the charts for values that deviate from the standard. The reason for including deviating figures even if they are less comparable is to provide a more complete dataset and enable more infrastructure managers to contribute data. Fewer deviating figures are anticipated with each future report. The benchmarking charts always list the 19 infrastructure managers that took part in the report, regardless of whether they have delivered data for the specific KPI or not. This means that 0 can mean either 0 or no data.

It is important to note that railway as a system includes both railway undertakings (RU) and infrastructure managers (IMs). This report however represents only data from infrastructure managers, and not railway undertakings.

The quantitative results can only be interpreted meaningfully if the main influencing factors are taken into account. Without considering the different characteristics of the infrastructure managers and their structural peculiarities, meaningful comparisons cannot be achieved. LISEA for exam-

[8] Infrastructure managers are abbreviated as "IM" in the charts.

ple operates exclusively one high-speed line and has a regional network, whereas the other infrastructure managers are active nationwide. In order to facilitate the interpretation of the figures and the quantitative results, background information on the specific contexts of the infrastructure managers and rail infrastructure is provided for each indicator. More general information on influencing factors can be found in the Annex 5.1, and some macro level data on the infrastructure managers and the countries they are operating in can be found in Annex 5.2.

Selected indicators and report structure

The indicators presented in this report are selected from the data pool of the PRIME KPI & Benchmarking Subgroup. They aim to display a status quo alongside the European objectives, covering the fields of finance, safety, environment, performance, and delivery. Figure 1 shows these groups as well as the selected indicators that are analysed in the report. The numbers beside the KPI point to the chapter in which they are treated.

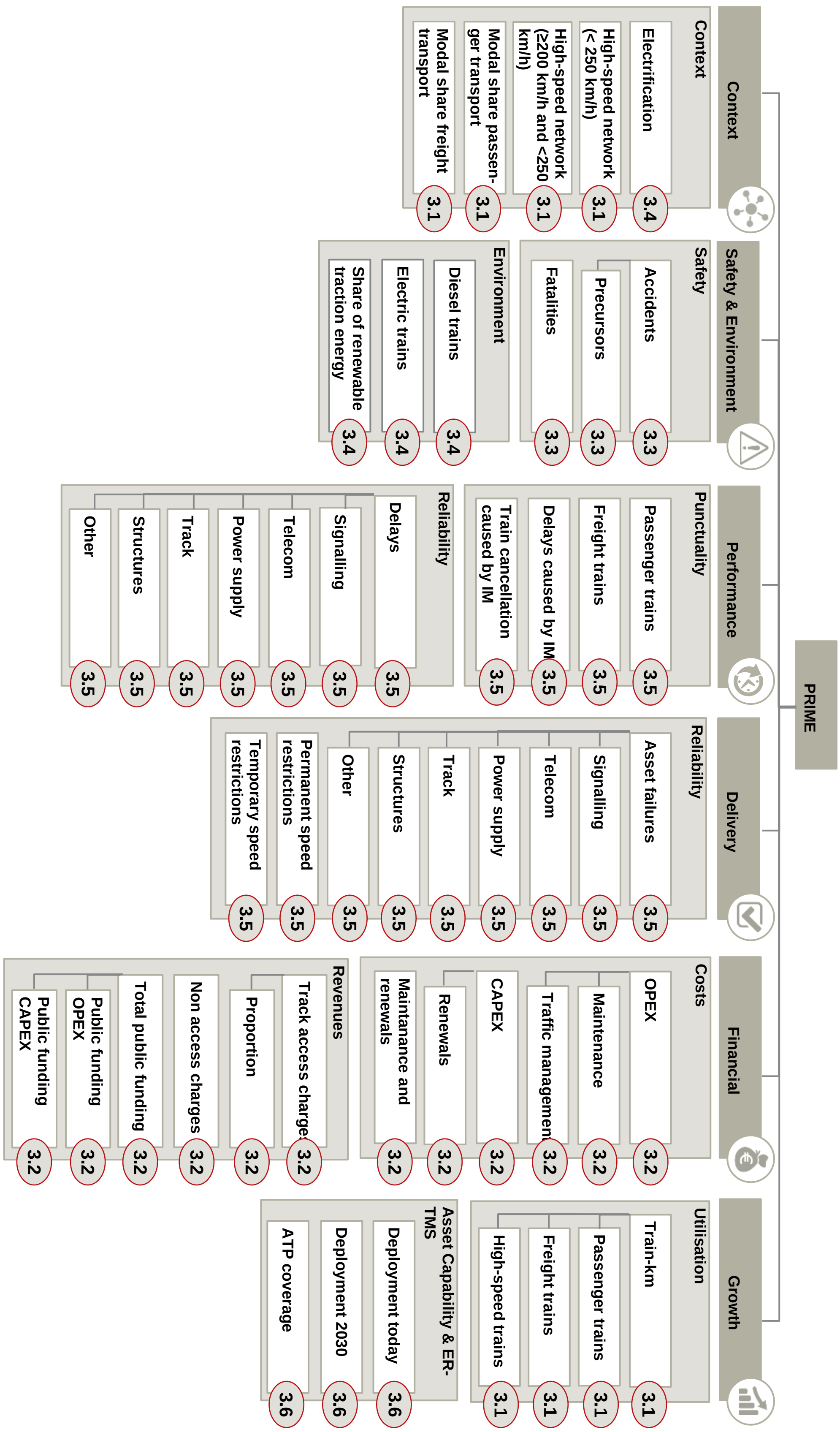

Figure 1: Selected indicators for the report and their chapters in the report

2. Outstanding developments in 2020

The evolution of some KPIs between 2019 and 2020 contrasts markedly with the evolution from 2016 to 2019, reflecting, at least partly, the profound impact of the Covid-19 pandemic.

2020 has seen an unprecedented decrease in network utilisation. Between 2019 and 2020, the entire peer group has seen network utilisation decrease, with half of the peer group reporting a double-digit rate of decline. This ends the trend of increasing network utilisation between 2016 and 2019, a period in which 70% of the peer group registered an increase in network utilisation. The decrease in network utilisation affects both passenger train and freight train utilisation, though freight train utilisation is less affected. While all infrastructure managers have registered a decrease in passenger train utilisation, two infrastructure managers have achieved an increase in freight network utilisation. Lower utilisation leads to lower TAC revenue per main track-km. TAC revenue per main track-km has sharply decreased in 2020, with rates of decrease ranging from 3 to 47%.

2020 has also seen an unprecedented improvement in train punctuality, both passenger and freight. The whole peer group registered an improvement in passenger train punctuality, with rates of increase ranging from 1% to 4%. This contrasts with the trend between 2016 and 2019, which saw punctuality improvement range from 0,11% to 1,31%. Nearly all infrastructure managers also improved freight train punctuality between 2019 and 2020, which growth rates ranging from 1% to 17%. This also contrasts with the trend between 2016 and 2019, which saw most infrastructure managers decrease freight train punctuality. Infrastructure managers account for only 20-30% of train unpunctuality. Between 2019 and 2020, the share of train cancellations caused by the infrastructure manager sharply declined for most infrastructure managers, with rates of decrease ranging from 4% to 100%. It is important to bear in mind, however, that train punctuality values are the result of the overall system of infrastructure and train operation and cannot be only explained by short-term effects such as decreasing utilisation.

Another outstanding development concerns asset failures. Between 2019 and 2020, 13 out of 15 infrastructure managers have decreased the number of asset failures in relation to network size, with rates of decrease ranging from 1 to 45%. This is mostly explained by a decrease in the number of signalling failures and in the number of track failures (both in relation to network size). Telecommunication failures, power supply failures, structure failures and other infrastructure failures have developed unevenly within the group between 2019 and

2020, with some infrastructure managers registering an increase and other a decrease.

Between 2019 and 2020, 11 out of 18 infrastructure managers reduced OPEX. This does not greatly contrast with the trend observed in the period between 2016 and 2019, where half of the IMs decreased OPEX while the other half increased OPEX. The development of maintenance and renewal has also proven stable in 2020, possibly reflecting a financial commitment to railway that has not been put into question during the pandemic. In some cases, the lower network utilisation has even been used to improve the network. SBB, for example, indicated that increased network availability due to cancellations was used for construction activities.

The number of main track-km equipped with ERTMS increased by 12% between 2019 and 2020. This overall increase in the peer group was mainly driven by PKP PLK and SŽCZ.

3. Trends and developments

This core chapter aims to give an overview of the development and status quo of the performance of the infrastructure managers, using finance, safety, environment, performance and delivery, and ERTMS deployment as the selected indicators.

Before analysing the more specific indicators, however, it is important to understand the major characteristics and trends of the rail industry in the participating Member States. For this reason, we will briefly outline the development of the modal share, network and utilisation in Chapter 3.1 and work through the different categories from Chapter 3.2 onwards.

3.1 Overview of main rail industry characteristics and trends

3.1.1 Summary of industry characteristics

EU-wide objectives

- Increasing the passenger volume in rail and shifting more freight transport from road to rail are key objectives of the European Green Deal and the Sustainable and Smart Mobility Strategy.
- Rail needs to be an attractive alternative to more polluting modes of transport, both for passengers and freight.
- The EU's Sustainable and Smart Mobility Strategy lays the foundation for making the EU transport system greener and supporting digital transformation. It sets out ambitious rail-related targets by 2050[9], such as to:
  - Double freight traffic
  - Triple high-speed traffic
  - Complete a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high-speed connectivity

Peer group's performance

[9] COM/2020/789 final: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0789&from

- The network size ranges between 670 and 55.400 main track-kilometres.
- The average density of the peer group's network is 58 main track-kilometres per 1.000 km^2.
- Eleven infrastructure managers operate high-speed lines with a speed of equal or above 200 km/h.
- The individual modal share of rail of the peer group has a range between 1% and 20% in passenger and 0,6% and 74% in freight transport.
- In passenger transport the modal share of rail showed a positive development in more than two thirds of the countries.
- In freight transport the modal share of rail decreased in 11 countries.
- The degree of utilisation ranges between 7 and 65 passenger trains and 0,4 and 18 freight trains per main track-kilometre per day.

3.1.2 Development and benchmark of industry characteristics

Rail infrastructure is developed over decades and determines the shape and the management of the network for a very long time. This chapter aims to give an overview of the status quo on the rail sector of the operating country and shows the infrastructure manager's main network characteristics on a macro level.

Rail characteristics indicators:

PRIME members are reporting twelve indicators on rail characteristics:

- National modal share of rail in passenger transport
- National modal share of rail in freight transport
- Total track-kilometres
- Total main track-kilometres
- Proportion of high-speed main track-kilometres (≥ 200 km/h and <250 km/h)
- Proportion of passenger high-speed main track-kilometres (≥ 250 km/h)
- Total main line-kilometres
- Total passenger high-speed main line-kilometres (≥ 200 km/h)
- Degree of network utilisation of passenger trains
- Degree of network utilisation of freight trains
- Degree of network utilisation of passenger high-speed trains (≥ 200 km/h)

› Degree of network utilisation of all trains

In order to increase comparability of these values across infrastructure managers, utilisation is measured in train-kilometres per main track-kilometre.

Modal share of rail transport

Modal share is an important indicator for the European Union in developing sustainable transport. For passenger inland transport the modal share compares the share of passenger cars, buses/coaches and railways. The modal share of rail in freight inland transport shows the national rail tonne-kilometres compared to total tonne-kilometres carried on road, inland waterways and rail freight. Figures 2 and 5 present the benchmark of the modal share of rail in inland passenger and freight transport in the Member States, based on data of the European Commission. Figures 3 and 6 show the national trends of rail in inland passenger and freight modal share development.

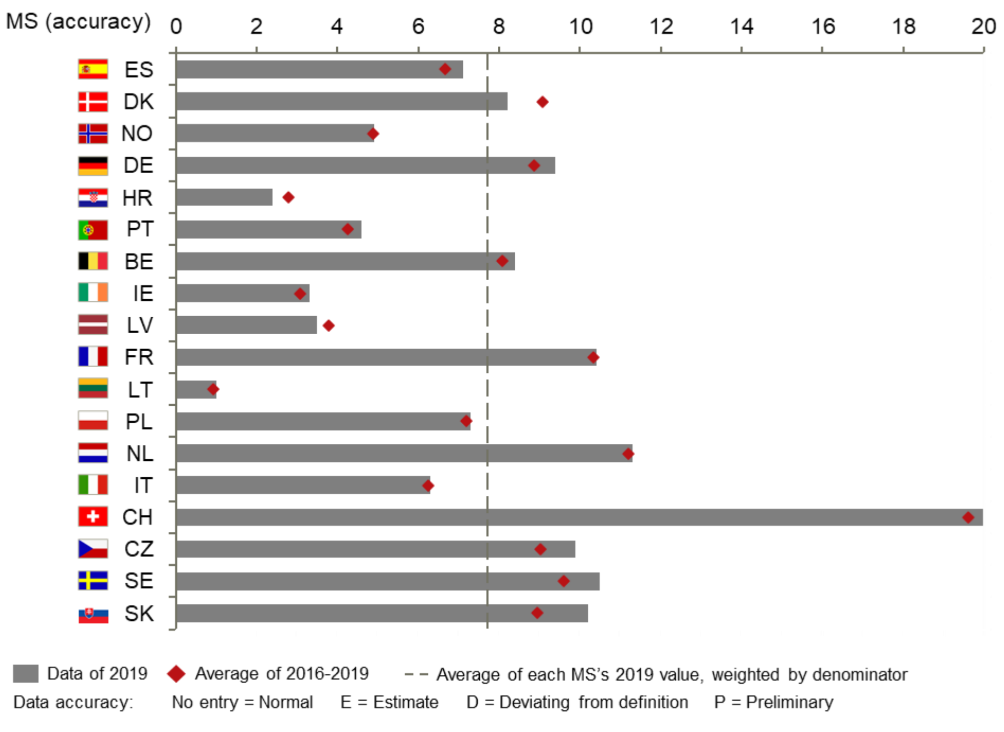

Figure 2: National modal share of rail in inland passenger transport (% of passenger-km)[10]

Figure 2 shows the cross-comparison of the participating Member States. The range of modal share of rail in inland passenger transport varies widely across

[10] Source: European Commission, Eurostat, 2019 data. MS = Member State

the peer group. The highest modal share can be found in Switzerland (20%), while it varies between 1% and 11% in the other countries.

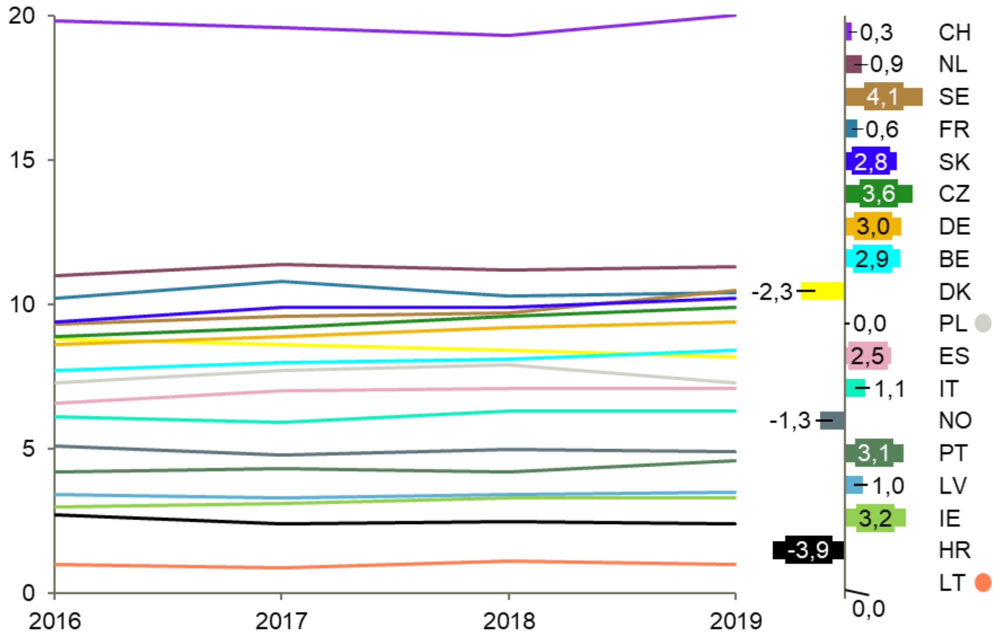

Figure 3: National modal share of rail in inland passenger transport (% of passenger-km) and CAGR (%) in 2016-2019[11]

Between 2016 and 2019 the peer group's modal share of passenger rail transport showed a slight average increase of 1,1%. In more than two thirds of the countries the development was positive. The greatest annual increase in this period was in Sweden, with an annual growth of 4,1%. Other countries showing growth above 3% were Czechia, Ireland, Portugal and Germany. The greatest decrease can be seen in Croatia (-3,9%).

The modal share in passenger transport in a country highly depends on a number of geographic and socio-demographic factors as well as the network size, density, and utilisation. The main parameters affecting the mobility choice are travel time, availability and reliability, supply of alternative transportation means, comfort and price factors. Switzerland is a good example for having relatively good conditions in most of these parameters. As the country has a relatively small territory, the travel distances are comparatively low. Due to the high rail network density and frequency, most of the cities can be reached in a relatively short time. Additionally, its performance in punctuality and reliability is high and the travel comfort and quality of rail services are among the best. Fur-

[11] Source: European Commission, Eurostat.

thermore, it is important to note that Switzerland also has a long-term vision in rail infrastructure development, accompanied by a substantial budget.

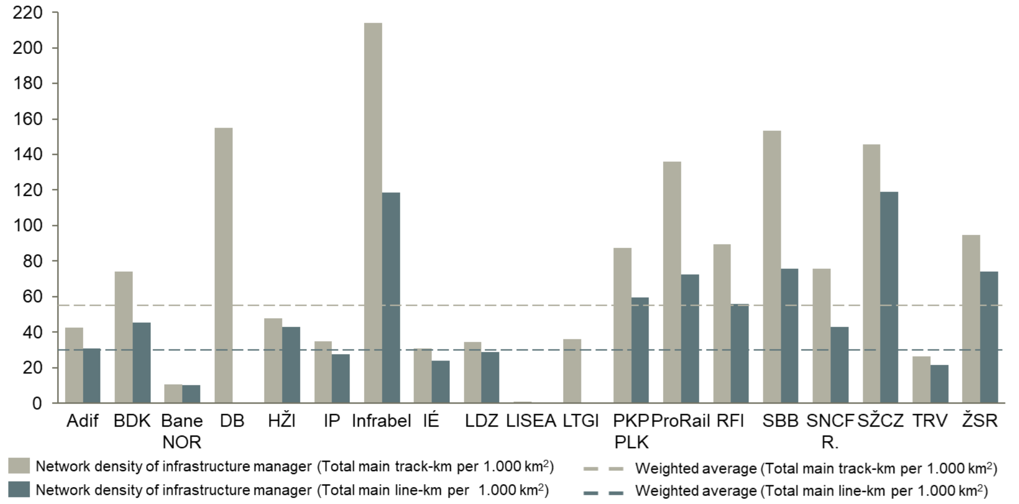

Figure 4: Network density of infrastructure manager (Total main track-km and total main line-km per 1.000 km^2)

Network density of the infrastructure managers is illustrated in figure 4 both measured in main line-kilometres and main track-kilometres. It is important to note, that the graph does not reflect the national railway density of the country, but the network of the infrastructure managers represented in this report. Network density measured in main line-kilometres per square kilometre describes the coverage of the area from an operational perspective, in other words how well the area can be supplied with trains in the first place. Main track-kilometres per square kilometre describes the network density from the infrastructure manager's perspective, how many assets are managed in the respective area. Infrabel has the highest network density with more than 200 main track-kilometres per 1.000 km^2, the lowest network density is in Norway and Sweden. LISEA is a special case as it operates exclusively the high-speed line between Tours and Bordeaux.

Socio-demographic factors such as mobility demand, age structure, income level, household size, car ownership and environmental awareness might also play a role in determining the modal share. With a growing share of elderly people in all European countries, modal share of rail could increase more in countries where a higher percentage of elderly people are still active and mobile. With reference to income levels, the effect on rail usage can point in both directions: an increase in income level might have an impact on car ownership and consequently reduce the number of people traveling by train or higher income might increase the number of people who can afford to travel by train.

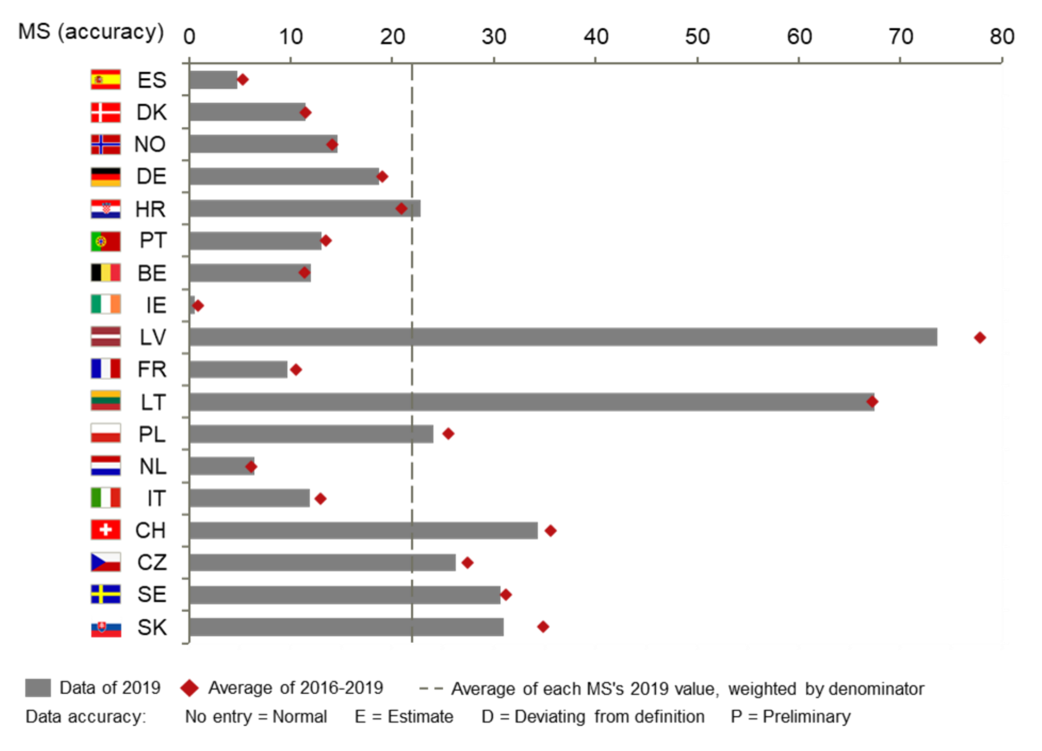

Figure 5: National modal share of rail in inland freight transport (% of tonne-km)[12]

The bandwidth of individual results for freight is more significant than the one of passenger transport. However, the pattern is clearer: the share of rail freight in the Baltic countries is significantly higher than in the rest of the EU. In Latvia rail accounts for 74% and in Lithuania for 68% of the total inland freight transport. This is followed by Switzerland with 34%, Sweden and Slovakia with 31%. The peer group's average is 22%, all figures rounded.[13]

[12] Source: European Commission, Eurostat, 2019 data. MS = Member State

[13] Reporting freight modal share in tonne-km means that the distance travelled is taken into account. When taking into account only the volume of tonnes transported, modal share values can significantly differ from modal share values in tonne-km.

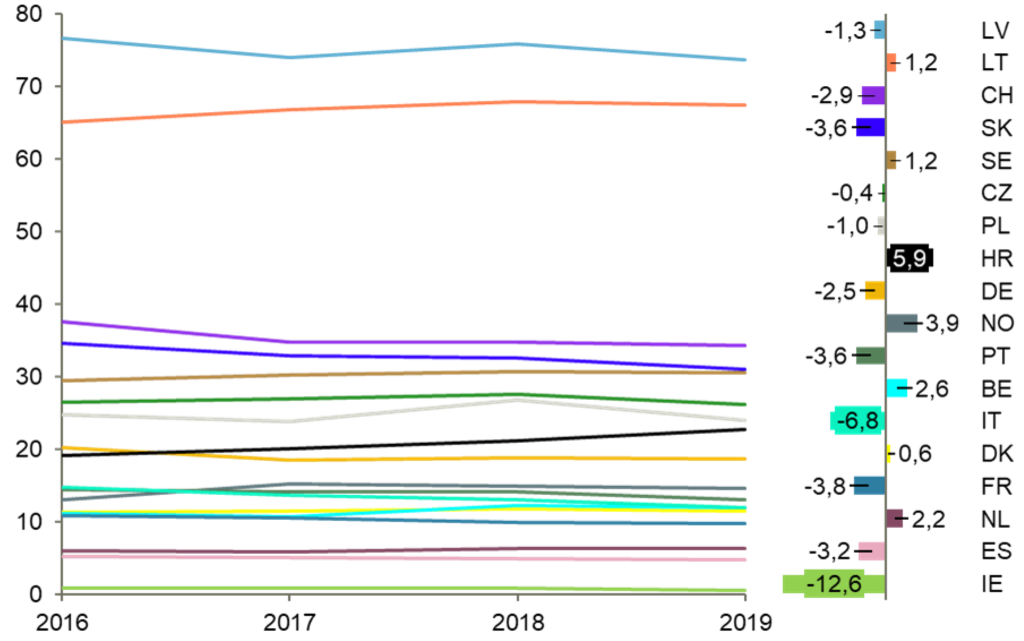

Figure 6: National modal share of rail in inland freight transport (% of tonne-km) and CAGR (%) in 2016-2019[14]

Figure 6 shows the development of the national modal share in rail freight transport. Compared to the slight increase in the modal share of passenger rail, freight transportation underwent a reduction in 11 countries. Considering the objective of doubling rail freight by 2050 set in the Sustainable and Smart Mobility Strategy, these trends are rather disappointing. It is interesting that while Croatia had the largest decrease in the modal share of passenger rail, it also had the highest increase in freight rail with an average of almost 6%.

As already highlighted, the Baltic countries show the highest share of rail in freight. These can be linked partly to the transit transport of Russian energy products but might also have its roots in the history of these countries[15]. In the post-war period the extension of freight rail transport became an important pillar of the industrialisation of Eastern European countries. Czechia and Poland also possess higher levels of freight activity. Switzerland, however, has almost no heavy industry but has a relatively high rail freight share. One explanation could be the Swiss ban on night-time trucking, its general rail-friendly transport policy and its strategic position in Europe.

Macro-economic aspects, such as trade relations and the organisation of the logistics sector of a country, also have an impact on the freight sector and

[14] Source: European Commission, Eurostat.

[15] DG MOVE (2015): Study on the Cost and Contribution of the Rail Sector.

therefore also on rail freight traffic. Network density and transport corridors between economic centres, as well as transhipment points such as ports and airports, are equally important. The growth of e-commerce and the associated change in the logistics sector is not reflected in the data of rail freight development. An increase in interconnected multimodal transport solutions can support a shift to rail. However, this development must be initiated by the rail freight operators. Given the EU's policy objectives, it is important to continue to monitor this development. Rail freight needs serious boosting through increased capacity, strengthened cross-border coordination and cooperation between rail infrastructure managers, better overall management of the rail network, and the deployment of new technologies such as digital coupling and automation[16].

Network size

This subchapter aims to give a better overview of the network size operated by the infrastructure managers and presents its network measured in total track-kilometres, in total main track-kilometres, and total main line-kilometres. It furthermore illustrates the high-speed network of relevant infrastructure managers. Figures 7 and 9 show the benchmark and figures 8 and 10 show the development of the network in main track-kilometres and high-speed main line-kilometres for selected infrastructure managers.

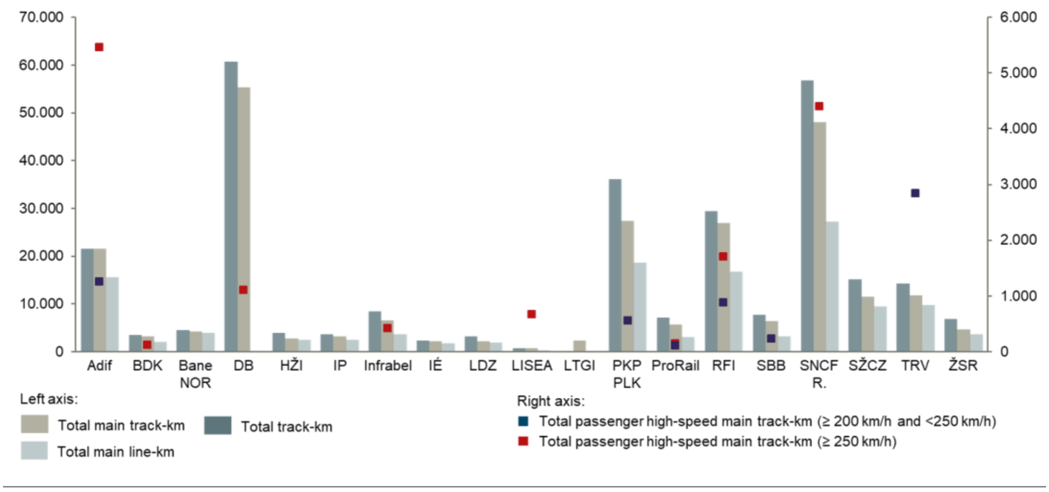

Figure 7: Total track-km, Total main track-km, Total main line-km, Total passenger high-speed main track-km (≥ 200 km/h), Total passenger high-speed main track-km (≥ 250

[16] COM/2020/789 final: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0789&from

km/h)[17]

Figure 7 shows the benchmark of the network in the different units of measurement. The left axis shows the network distinguished between total track, total main track and total main line, the right axis and the square symbols indicate the high-speed tracks of the infrastructure managers differentiated based on their speed limits. While total track-kilometres show the cumulative length of all tracks maintained by the infrastructure manager, total main track-kilometres exclude tracks at service facilities[18] which are not used for running trains. Total main line-kilometres indicate the cumulative length of railway lines operated and used for running trains by the end of reporting year. Regarding total track-kilometres SNCF R. and DB are managing the largest networks with around 60.000 kilometres of track. The smallest networks considering track size are operated by LISEA, IÉ and LDZ, however LISEA is not managing a countrywide network but operating a high-speed line alone (South Europe Atlantic High-Speed Rail Line). Furthermore, it is important to note that these figures do not represent the entire national railway network but only the part that is managed by the peer group's infrastructure manager.

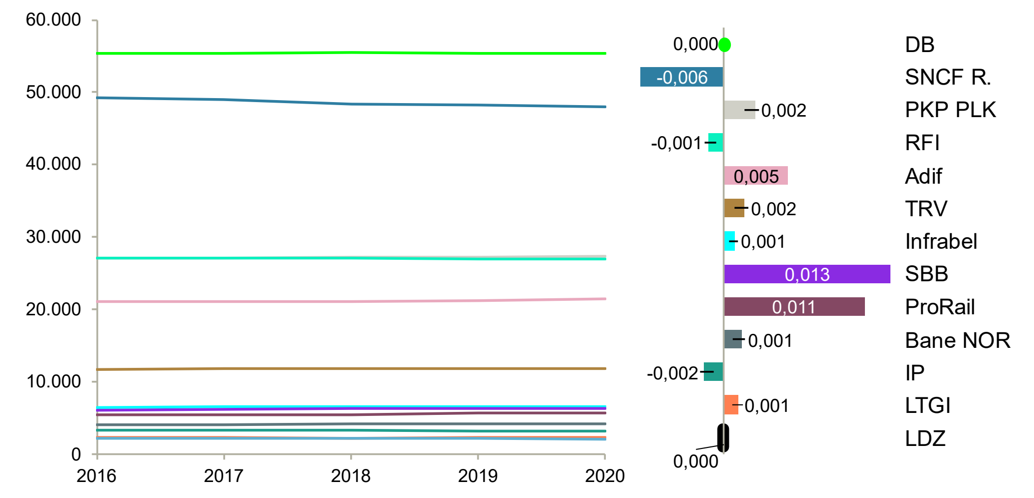

Figure 8: Total main track-km and CAGR (%) in 2016-2020

Rail infrastructure consists of long-lasting assets, with lifetimes often reaching several decades. Hence, the analysis over a period of five years can only be of limited value. However, SBB, ProRail, Adif and PKP PLK increased their net-

[17] LISEA has no countrywide network but is operating the South Europe Atlantic high-speed rail line.

[18] Service facilities are passenger stations, their buildings and other facilities; freight terminals; marshalling yards and train formation facilities, including shunting facilities; storage sidings; maintenance facilities; other technical facilities, including cleaning and washing facilities; maritime and inland port facilities which are linked to rail activities; relief facilities; refuelling facilities and supply of fuel in these facilities.

work by over 200 kilometres between 2016 and 2020. ProRail increased its network mainly due to its takeover of KeyRail.

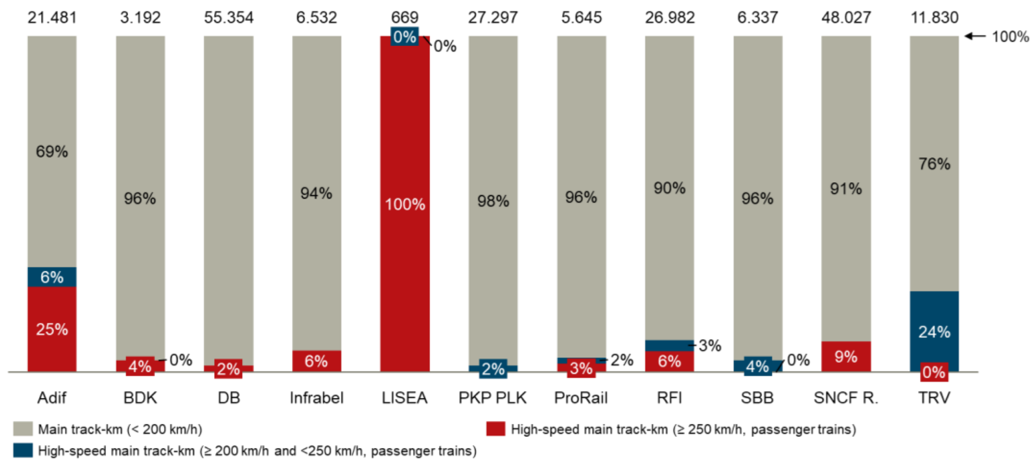

Figure 9: Share of high-speed main track-kilometres (in % of total main track-km)

Figure 9 shows selected infrastructure managers which also operate high-speed lines and their share of the network. The red colour indicates the share of total passenger high-speed main track-kilometres that allows a speed equal or above 250 km/h. Blue shows the lengths of high-speed tracks between a speed limit of equal or higher to 200 km/hm and lower than 250 km/h. The high-speed lines have furthermore following characteristics:

- specially built high-speed lines equipped for speeds generally equal to or greater than 250 km/h,
- specially upgraded high-speed lines equipped for speeds of the order of 200 km/h,
- specially upgraded high-speed lines which have special features as a result of topographical, relief or town-planning constraints, on which the speed must be adapted to each case.

The last category also includes interconnecting lines between the high-speed and conventional networks, lines through stations, accesses to terminals, depots, etc. travelled at conventional speed by 'high-speed' rolling stock.[19]

As shown in figure 9 nine infrastructure managers have high-speed main tracks equipped for speed above 250 km/h, ranging between 5460 kilometres for Adif and 112 kilometres for BDK. There is large variation in the proportion of high-

[19] Source: Glossary for Transport Statistics, A.I-04. Directive (EU) 2016/798 on the rail interoperability, Annex I, Article 1

speed tracks. While LISEA is a 100% high-speed line, only 2% of ProRail's network is high-speed.

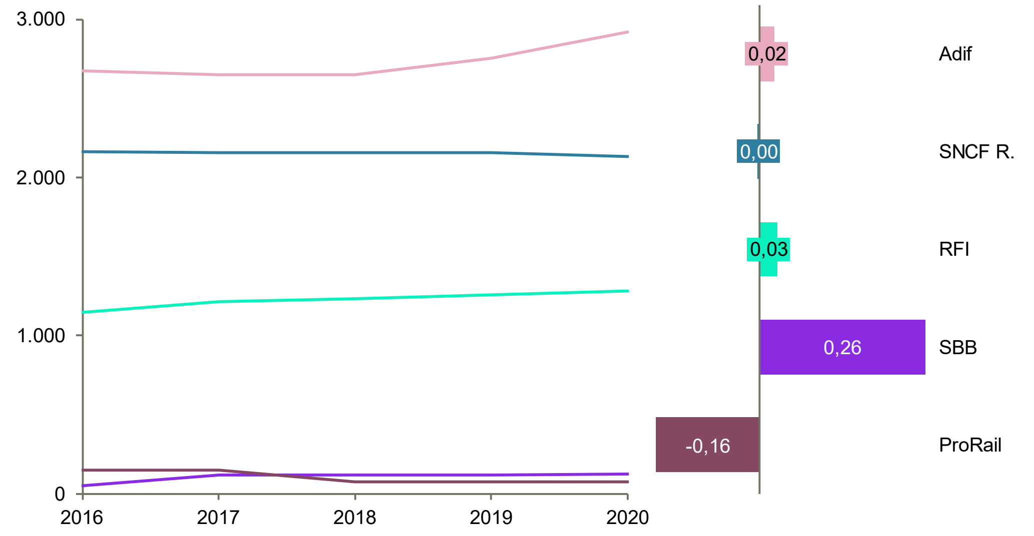

Figure 10: Total high-speed main line-kilometre (≥ 200 km/h) and CAGR (%) in 2016-2020

Figure 10[20] shows the development of high-speed network of the relevant infrastructure managers. Three infrastructure managers increased the length of their high-speed lines (≥ 200 km/h) between 2016 and 2020. SBB more than doubled its high-speed network compared to 2016 mainly with the opening of the Gotthard Base Tunnel in December 2016 and the Ceneri Base Tunnel in September 2020 through the Alps.

It is not surprising that the size of a network strongly correlates with the size of the country and its population. However, the distribution of the population is an important aspect too, as it might lead to a concentration of significant parts of the network in a few urban areas or along corridors.

As illustrated, rail networks mostly remained unchanged over the years, however more infrastructure managers focus now on extending their high-speed infrastructure. Increasing high speed traffic is among the transport priorities of the European Commission. Improving the offer of high-speed rail services would provide passengers with a true alternative to short-haul flights and cars.

Current network extension programs are highly dependent on the status of rail within the country, funding agreements and budgets available. These factors in turn are closely linked to a country's economic power. Eligibility for EU-funds is

[20] Please note that this figure, unlike the charts above, shows high-speed lines and not high-speed tracks.

another important factor, especially with regards to the extension of high-speed lines, as EU cohesion policy-related financing is one of the major sources of rail funding. Most of the network extensions in Eastern and Central European countries, in Portugal and Spain were co-financed to a significant extent by the EU.

Network utilisation

Utilisation is an essential measure of the performance of an infrastructure manager. One of the most important objectives is to use its infrastructure as effectively as possible. Figure 11 presents the aggregated benchmark of the degree of network utilisation by passenger and freight trains. Figures 12 to 13 show the development chart of these indicators.

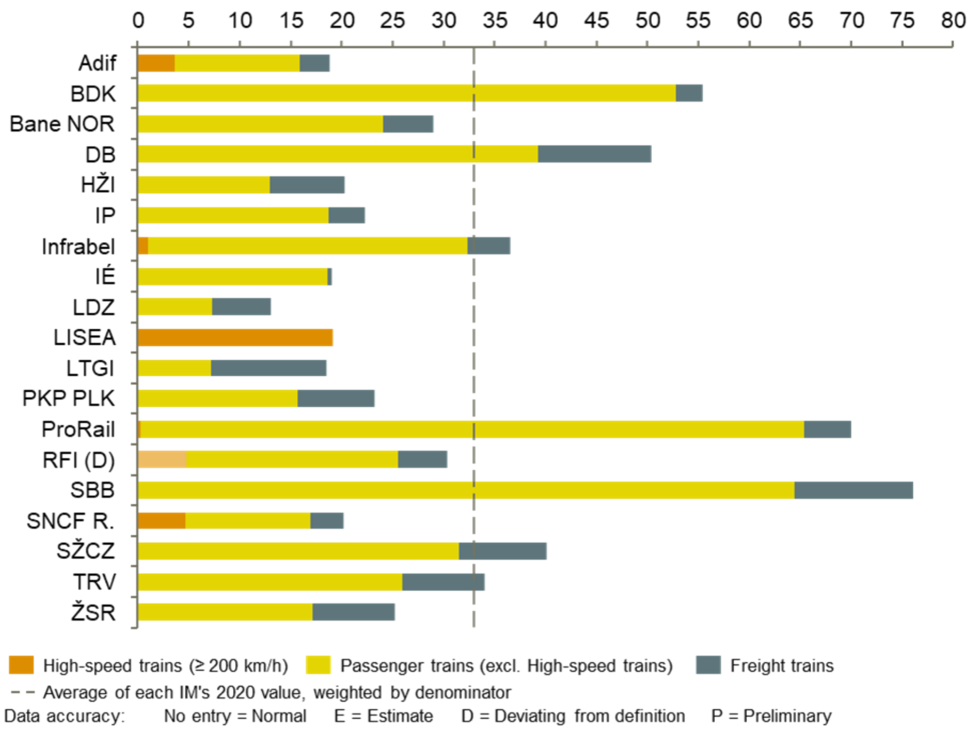

Figure 11: Degree of network utilisation – all trains (Daily train-km per main track-km)[21]

Figure 11 illustrates the network utilisation of passenger, freight and passenger high-speed trains (≥ 200 km/h). The intensity of network use of passenger trains is marked with yellow colour and ranges from 7 to 65 trains per day. ProRail's and SBB's networks are utilised more than twice the average. LTGI and LDZ are showing the lowest degrees of utilisation regarding passenger trains. The orange colour shows the train activity of passenger high-speed trains, with

[21] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

SNCF R., RFI and Adif showing similar levels. Utilisation of freight trains is given in grey. SBB, LTGI and DB have the highest intensity of use with more than 11 freight trains per day running on each kilometre of main track. LISEA is a special case, as its network is 100% high-speed, which does not allow freight trains.

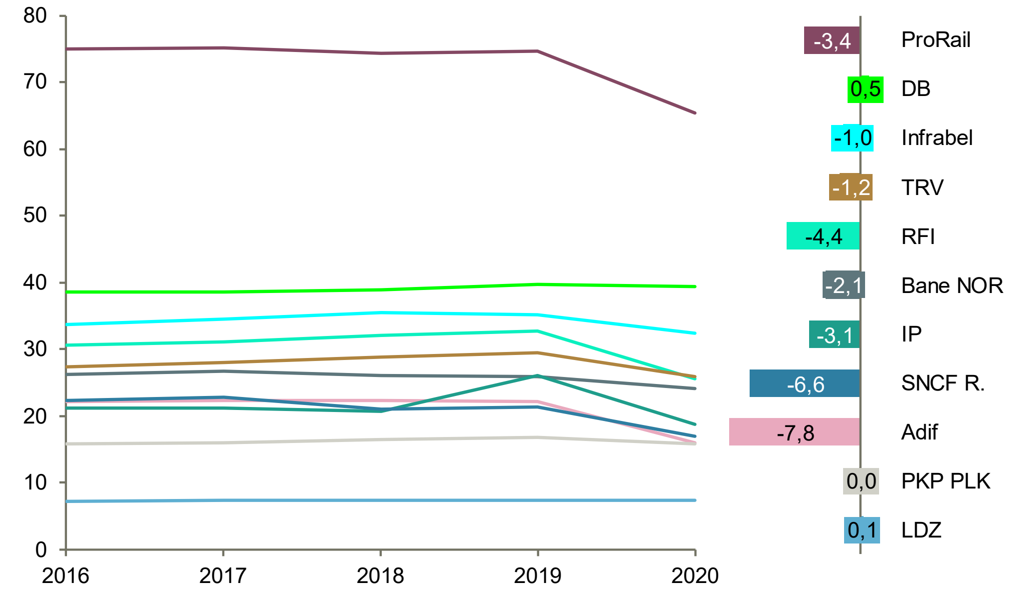

Figure 12: Degree of network utilisation – passenger trains (Daily passenger train-km per main track-km) and CAGR (%) in 2016-2020

Possible impacts of the Covid-19 pandemic are visible in the development charts, which show that the decline occurred almost exclusively from 2019 to 2020. Individual growth rates between 2016 and 2020 ranged from -7.8% to +0.5% per year, with only three IMs not experiencing a decline. The sharpest decline was recorded for Adif, SNCF R. and RFI with over 4% average decrease.

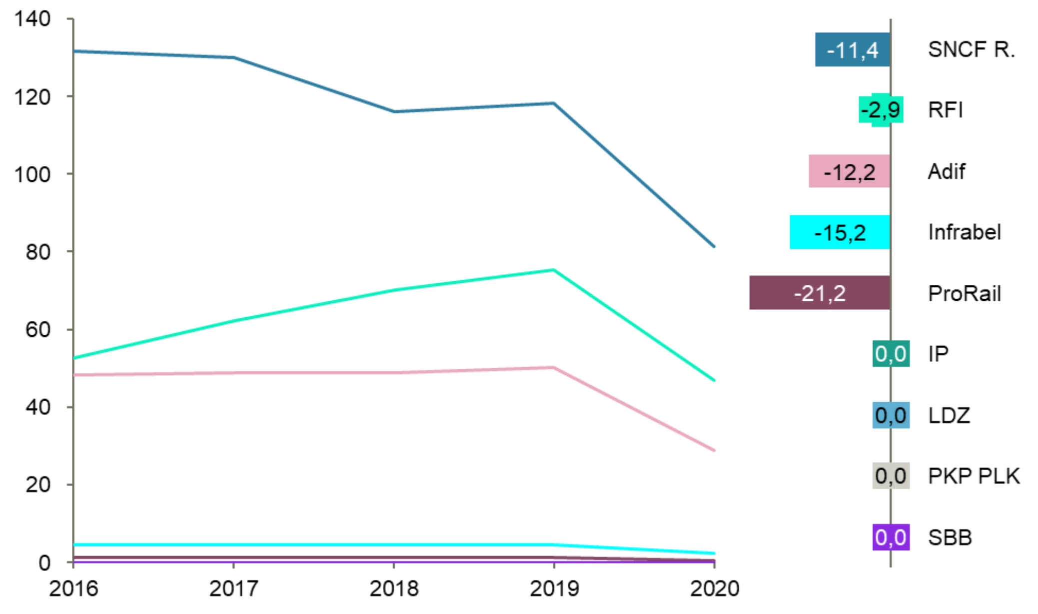

Figure 13: Total passenger high speed train-km (≥ 200 km/h) (Million train-km) and CAGR (%) in 2016-2020

The same development can be seen for passenger high-speed traffic with a speed of equal or above 200km/h. The sharp decline of more than 10% per year of ProRail, Infrabel, Adif and SNCF R. was largely due to the decline in 2020. However, SNCF R. has seen a declining trend in high-speed traffic from 2016, which would be interesting to investigate.

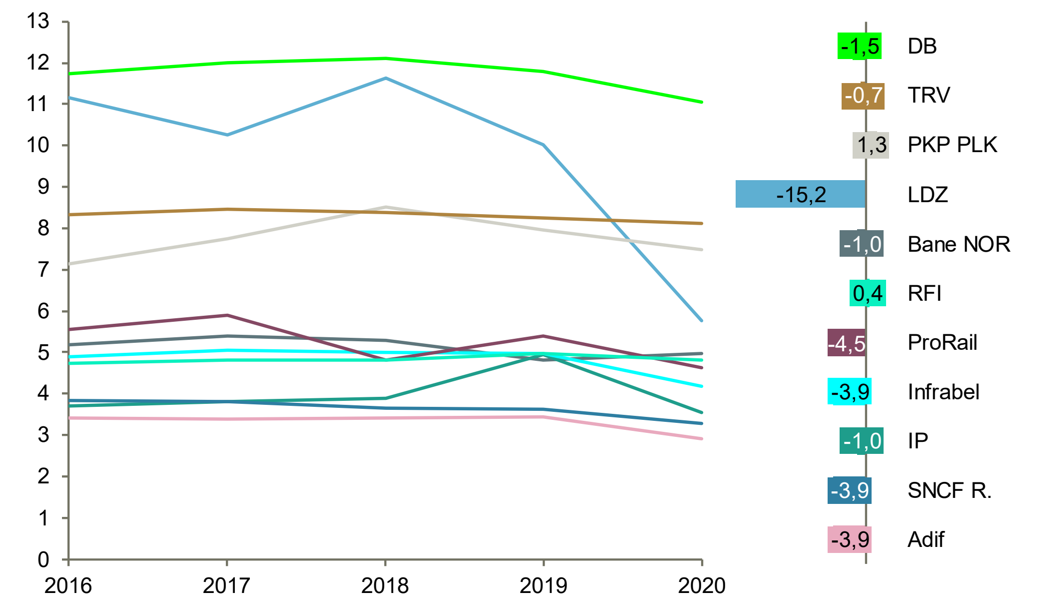

Figure 14: Degree of network utilisation – freight trains (Daily freight train-km per main track-km) and CAGR (%) in 2016-2020

As we can see in figure 14 the impact of the pandemic seems to be smaller in freight transport than in passenger transport. Freight train activity decreased for nine infrastructure managers, however to less extent than in passenger traffic. The most significant decrease, which also started in earlier years, is shown by LDZ. One of the reasons for these reduced cargo volumes can be related to the current political relationship with Russia and a limited cargo transportation through Latvia, improved Russian port infrastructure, and a lack of demand for coal in Europe. However, besides train kilometres, load factor is also a key to understanding reduced freight train activity, as more trains are not necessarily needed to carry more goods, and slot optimization can also have a huge impact.

Passenger train utilisation tends to be higher in smaller countries with high population density and a wider rail network, e.g. the Netherlands, Switzerland, and Denmark. Similar to the parameters influencing the share of passenger rail in a country's modal share, utilisation is driven by the prosperity of a country and its citizens, and the status of the rail sector in that country. It furthermore depends on public service obligations in rural areas with low population density and the existence of bottlenecks and congested nodes where all traffic has to pass. Utilisation is particularly important for infrastructure managers when it comes to finance. It is decisive both for revenues and expenditures as public funding decisions are largely based on train activity. On the other hand wear and tear is accelerated by more intensive use.

Similar to the modal share in freight transport, the degree of utilisation by freight trains highly depends on logistical circumstances, such as availability of suitable transhipments centres and smooth interconnections. The European Commission has set out in the Sustainable and Smart Mobility Strategy its intention to promote intermodal transport. Ultimately all transport modes for freight must come together via multimodal terminals and the European Commission will take initiatives to ensure that that EU funding, and other policies, including R&I support, be geared better towards addressing these issues[22]. Punctuality and plannability are decisive factors for freight clients. Improving performance in freight train punctuality might also increase the willingness of companies to shift their goods to rail.

[22] COM/2020/789 final: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0789&from

3.2 Financial

3.2.1 Summary of finance

EU-wide objectives

- Railway infrastructure requires substantial amounts of funding to cover capital and operating expenditures. Providing value for money is paramount as funding is constrained, and infrastructure managers are constantly improving their asset management activities to achieve this objective.
- The European infrastructure managers apply different financing and funding structures and rely on combinations of public funding, access charges and commercial revenues.
- EU legislation aims at increasing the transparency of funding arrangements and developing appropriate incentives to ensure the best available use of existing assets and capacity.
- Directive 2012/34/EU, establishing a single European railway area[23], requires
  - rail undertakings and infrastructure managers to maintain separate accounts
  - the expenditure (under normal business conditions and over a period not exceeding five years) and the infrastructure managers' income from different sources (including access charges and state funding) to be balanced.
- It also sets out a framework for determining charges, establishing the principle that the charges paid to operate a train service must cover the direct cost incurred as a result of such operation while allowing for additional mark-ups and charges to recover fixed costs and address externalities.

Peer group's performance

[23] Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area Text with EEA relevance. http://data.europa.eu/eli/dir/2012/34/oj

- The level of operational expenditures varies between € 60.000 – 225.000 per main track-kilometre per year and remained for most infrastructure managers relatively stable in 2016-2020.
- The average capital expenditures is € 127.000 per main track-kilometre per year with a standard deviation of € 70.000, and has seen increased fluctuation in 2016-2020
- TAC revenues vary between €0,3 – €40, showing an average of €4,5 per train-kilometre.

3.2.2 Development and benchmark of finance

Rail infrastructure requires a significant amount of funding which is dedicated to building new infrastructure, replacing existing assets as well as maintaining and operating the asset base. The financial chapter covers important elements related to expenditure and revenues of infrastructure managers.

Rail financing indicators

PRIME members report four indicators measuring costs and six indicators measuring revenues:

- Costs:
  - Operational expenditures
  - Capital expenditures
  - Maintenance expenditures
  - Renewal expenditures
- Revenues:
  - Proportion of TAC in total revenue
  - Total track access charges
  - Non-access charges
  - Total public funding
  - Public funding for operational expenditure
  - Public funding for capital expenditure

In order to increase comparability of these values among infrastructure managers, the expenditure-figures are related to main track-kilometres. The revenues from track access charges are related to main track-kilometres, train-kilometres and the monetary value. Non-access charges and public funding are related to main track-kilometres.

3.2.3 Costs

The costs category includes relevant costs incurred by the infrastructure manager, broken down into useful and comparable sub-categories. It includes all operating, capital and investment costs. For purposes of comparison, costs are adjusted to reflect local costs using purchasing power parities (PPPs). The costs incurred by an infrastructure manager are dependent on a number of factors: some lie within and some outside the responsibility of an infrastructure manager.

Figures 15 to 24 show the compositions of the operational and capital expenditures of the PRIME members in a latest benchmark and over the time period 2016-2020.

Operational expenditure

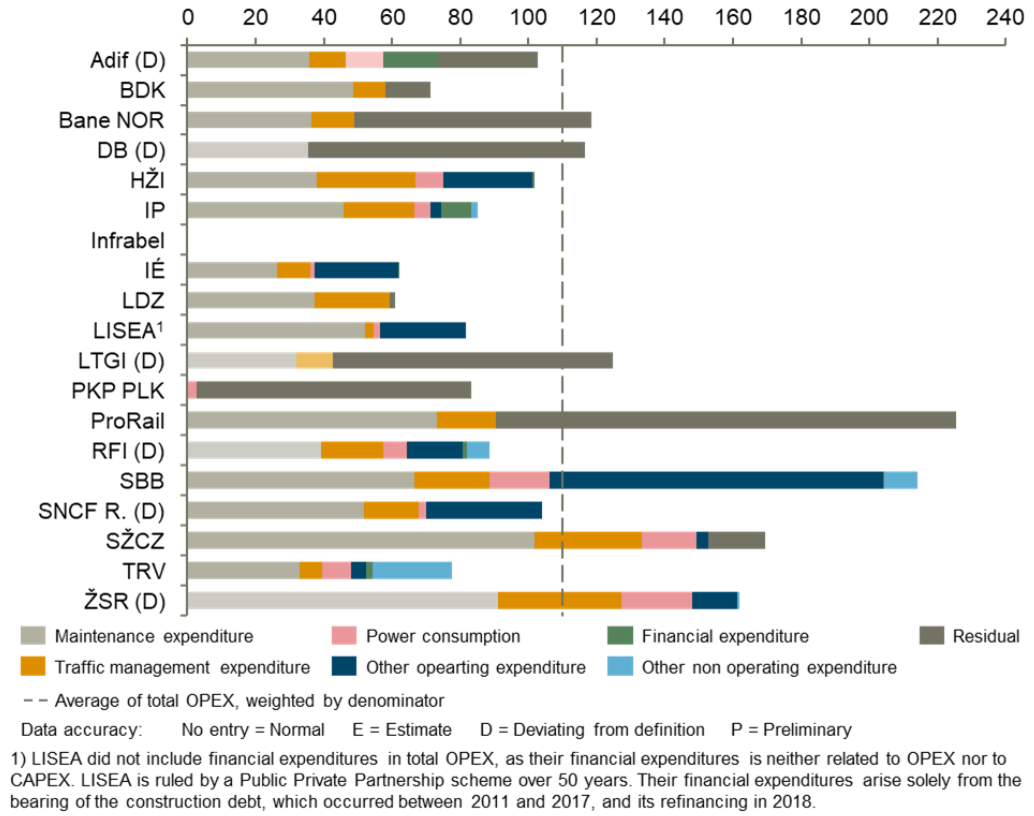

Figure 15: Detailed composition of operational expenditure in relation to network size (€1.000 per main track-km)[24]

Figure 15 shows the composition and the level of operational expenditures in 2020. Accounting systems vary widely between countries, so not all infrastructure managers were able to allocate these costs to the individual categories. Maintenance and traffic management expenditure are the largest categories, while costs related to finance and power consumption make up a smaller part. The residuals include the costs that remain after deduction of the various subcategories from the total operational expenditure. The level of total operational expenditures varies between €60.000 – €225.000 per main track-kilometre per year and shows an overall dispersion of values of €49.000. ProRail and SBB spent almost double the amount compared to the peer group average. SBB's costs assigned to "other operating expenditure" are generated by activities related to other income, i.e. shunting yard operations and traction power supply,

[24] Results are normalised for purchasing power parity. Lighter colours (Adif, DB, LTGI, RFI, ŽSR) indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.
"Other operating exenpenditures" were stated as such by the infrastructure managers, residuals were calculated from total opex (residuals = total opex - all other incicated categories).

and by project-related, non-depreciable activities (see figure 31 as counterpart: total revenues from non-access charges). On average, infrastructure managers' annual operational expenditures amount to €110.000 per main track-kilometre. The lighter colour of Adif, DB, LTGI, RFI, ŽSR indicate deviating data for individual components and are explained in the Annex 5.3.

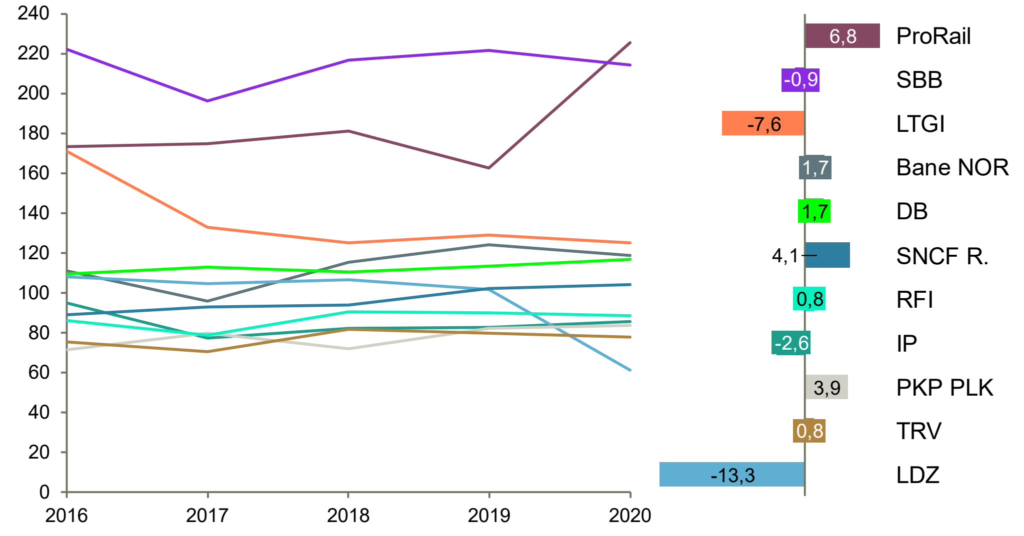

Figure 16: Operational expenditures in relation to network size (€1.000 per main track-km) and CAGR (%) in 2016-2020[25]

As can be seen in figure 16, total operational expenditure has remained relatively homogenous across the group. LDZ experienced a decrease of €40.000. ProRail's increase is due to the fact that labour expenditures were first included in 2020. Other infrastructure managers like SNCF R., Bane NOR, PKP PLK and DB recorded more or less constant annual increases. Operational costs are driven by a range of different factors. The size and complexity of the networks are just as relevant as train utilisation. For example, a network with a relatively large number of switches and a high degree of electrification and level crossings is more prone to failures and requires more interventions. Tunnels and bridges must not only be checked more regularly, but also entail more costly and sophisticated replacements and repairs. Busy tracks are subject to higher wear and tear. Condition and age of the assets are also relevant: investments that have been made in the past pay off and reduce operational costs later. Besides maintenance, operational expenditures also include functions of traffic management. The services provided by the infrastructure manager vary significantly, too. Different technologies and the amount of human resources needed determine the level of expenditures.

[25] Results are normalised for purchasing power parity.

Capital expenditures

According to the PRIME KPI & Benchmarking subgroup's definition, capital expenditures are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment. An expense is considered a capital expenditure when the asset is a newly purchased capital asset or an investment that improves the useful life of an existing capital asset. Hence, it comprises investments in new infrastructure as well as renewals and enhancements. As capital expenditures are often linked to major (re-)investment programs it is not surprising that expenditure levels fluctuate over time.

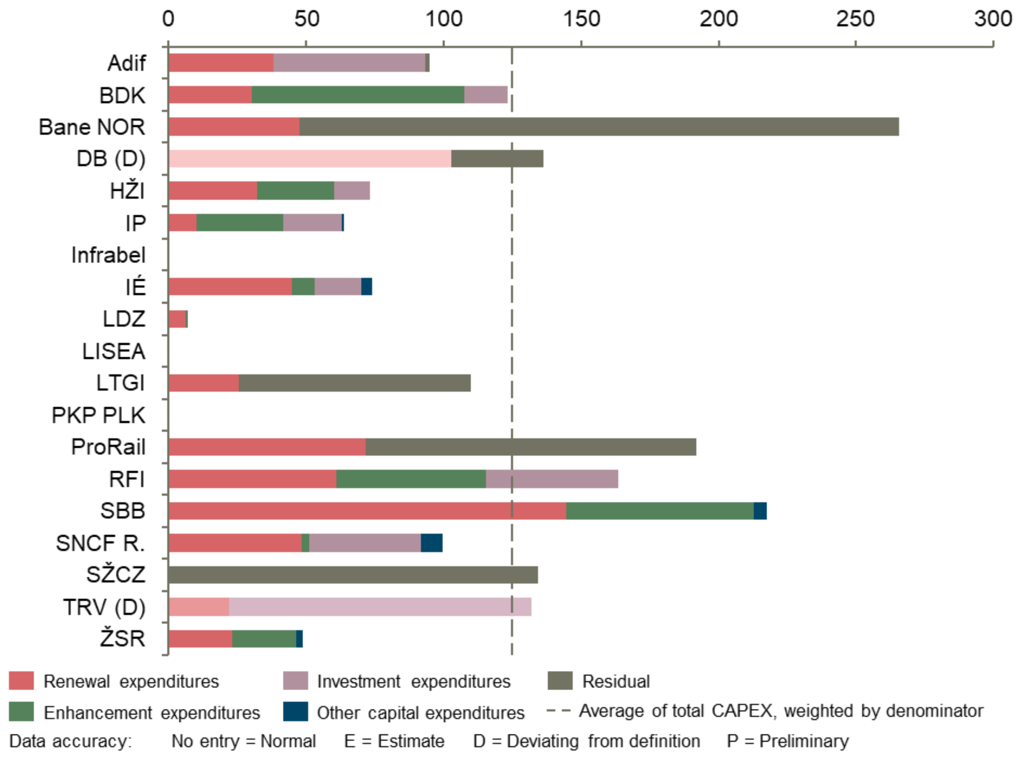

Figure 17: Composition of capital expenditures in relation to network size (€1.000 per main track-km)[26]

Figure 17 shows different components of capital expenditure in 2020. The largest share, almost 40%, is accounted for by expenditure on renewals. Investment expenditures are the highest for TRV, followed by Adif, SNCF R. and RFI. In total, the annual capital expenditure varies between €0-265.000 per main track-kilometre. On average €126.000 per main track-kilometre per year is spent on capital expenditure. The standard deviation in the peer group is €70.000, significantly higher than for OPEX, as would be expected. LISEA's

[26] Results are normalised for purchasing power parity. Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

capital expenditure is zero as its infrastructure is fairly new. The lighter colour of DB indicates deviating data for renewals, which is explained in the Annex 5.3. The residuals include the costs that remain after deduction of the various sub-categories from the total capital expenditures.

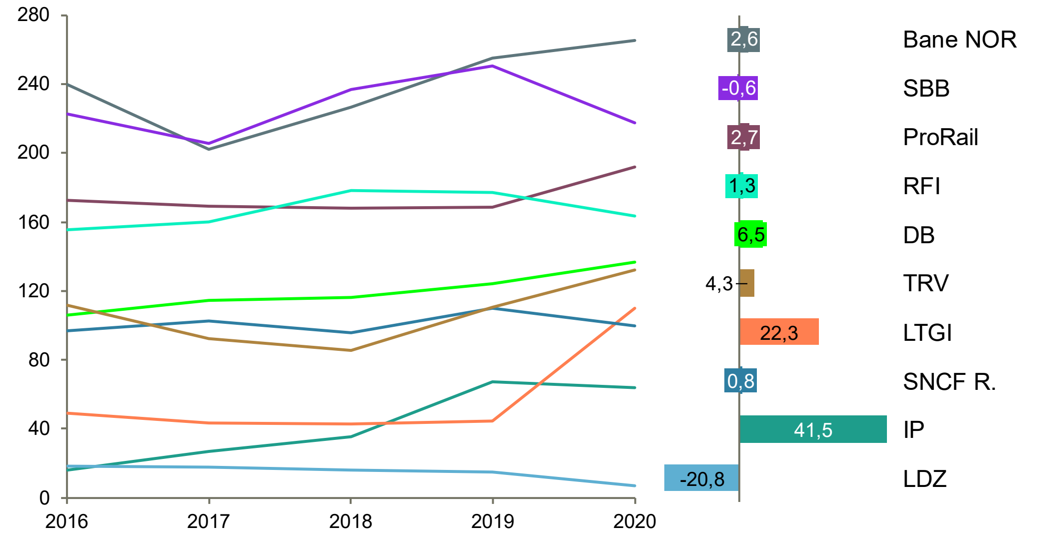

Figure 18: Capital expenditures in relation to network size (€1.000 per main track-km) and CAGR (%) in 2016-2020[27]

As capital expenditures are often linked to major (re-)investment programs it is not surprising that expenditure levels fluctuate over time. The individual annual growth rates of the infrastructure managers range from -20,8% to 41,5%. The highest increase in investment-related expenditure has been recorded at IP spending four times as much in 2020 as in 2016. IP is undertaking an important investment in the Portuguese railway network, building, enhancing and renewing infrastructure which will last until 2023.

Similar to operational costs, capital expenditures also increase with higher network complexity. High numbers of switches, signalling and telecommunication assets increase the cost of renewals. Network complexity, in turn, is in part determined by geographic conditions.

The level of capital expenditures is highly dependent on the budget and funding agreements between infrastructure managers and national governments. In particular renewals of rail infrastructure require long term planning, reflecting the long-lived nature of the assets and the need for a whole-life approach to asset management. Longer funding settlements provide more stability regarding finance issues and enable larger investments projects. In terms of public

[27] Results are normalised for purchasing power parity.

funding the eligibility for the EU Cohesion Fund is particularly important for Central and Eastern European countries, as EU cohesion policy-related financing is one of the major sources of funding, especially modernisation projects such as ERTMS, railway electrification etc. The condition and age of the asset also influences the need for renewals and asset improvement. The supplier market, prices and resources determine the level of activities achievable with the budgets provided.

Maintenance and renewals

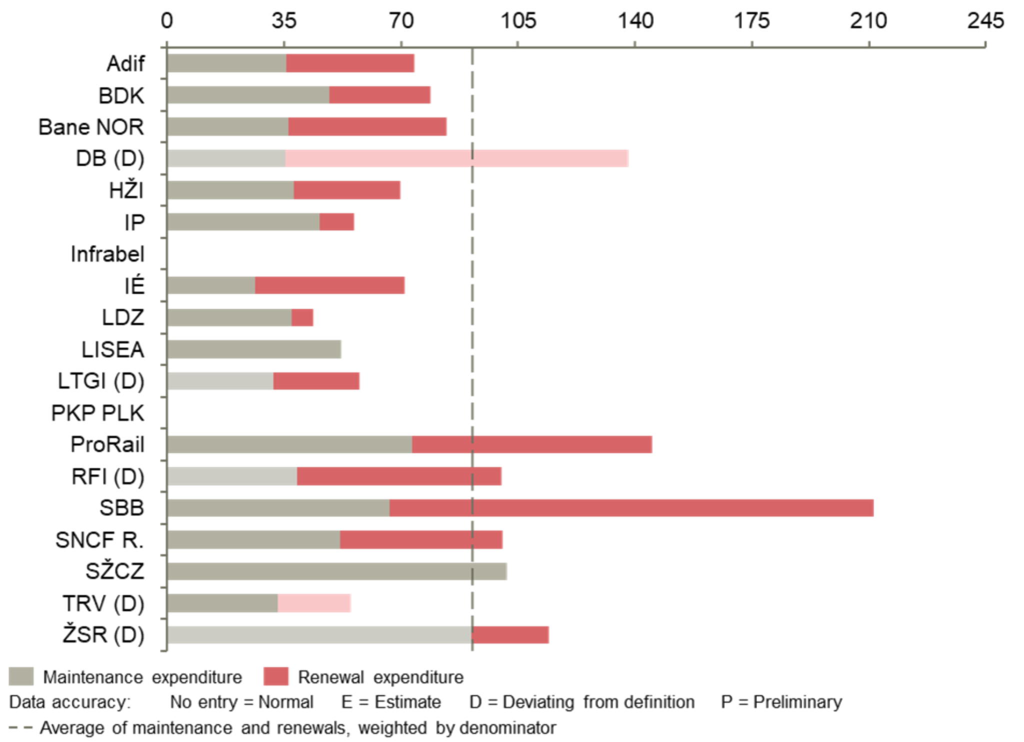

Figure 19: Maintenance (component of OPEX) and renewal expenditures (component of CAPEX) in relation to network size (€1.000 per main track-km)[28]

Figure 19 aims to provide a snapshot of current maintenance and renewal expenditures. Maintenance expenditures are dedicated to the infrastructure manager's activities needed to maintain the condition and capability of the existing infrastructure or to optimise asset lifetimes. Renewals represent capital expenditures needed to replace existing infrastructure with new assets of the same or similar type. On average infrastructure managers spend €94.000 per main track-kilometre per year on maintenance and renewal. Only three infrastructure managers are spending significantly more than average, namely SBB, ProRail

[28] Results are normalised for purchasing power parity. Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

and DB. The differential of spread of OPEX and CAPEX can also be seen here: while maintenance shows a standard deviation of €21.000, renewals have a spread in data distribution of €37.000.

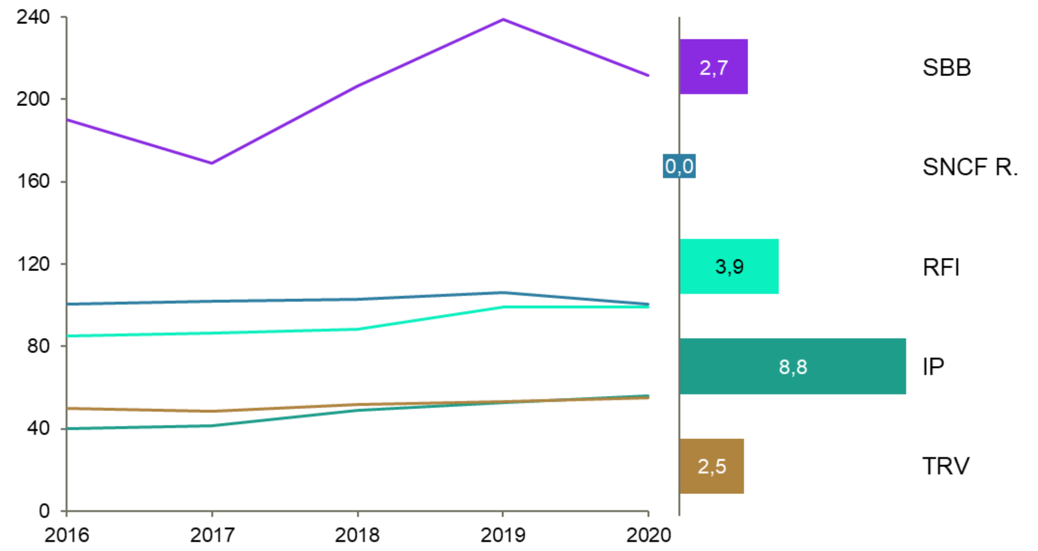

Figure 20: Maintenance (component of OPEX) and renewal expenditures (component of CAPEX) in relation to network size (1.000 Euro per main track-km) and CAGR (%) in 2016-2020 [29]

Similar to operational and capital expenditures, maintenance and renewal costs are driven by the following factors: network complexity/asset densities (e.g. switches, bridges, tunnels…), network utilisation and the condition of assets.

3.2.4 Revenues

This category provides an overview of track access charges (TAC) paid by railway undertakings using the railway network and its service facilities. TAC revenues are shown both in relation to network and to traffic volume, as operators are charged based on the usage of the network which is indicated by the traffic volume. The TAC relation to the network illustrates the TAC revenue in relation to a major cost driver. Furthermore, it measures and compares non-track access related revenues 'earned' by an infrastructure manager, excluding subsidies and property development.

To achieve meaningful comparability, the indicators for charging have been simplified, and PRIME is using fundamental KPIs that all infrastructure managers find common and easy to collect. Together with cost related indicators, they

[29] Results are normalised for purchasing power parity.

provide an indication to what extent infrastructure managers are capable of covering their costs, respectively to what extent they rely on subsidies.

This year, for the first time, we are also showing data on public funding of infrastructure managers. It covers the annual income from public funding from the European Union, the government, states and municipalities and distinguishes between funding dedicated to operational and capital expenditure.

Figures 21, 23 and 24 show the latest benchmark of the revenue indicators of the infrastructure managers. The development over the time period 2016-2020 is presented in figures 22, 25 and 26.

TAC - Track access charges

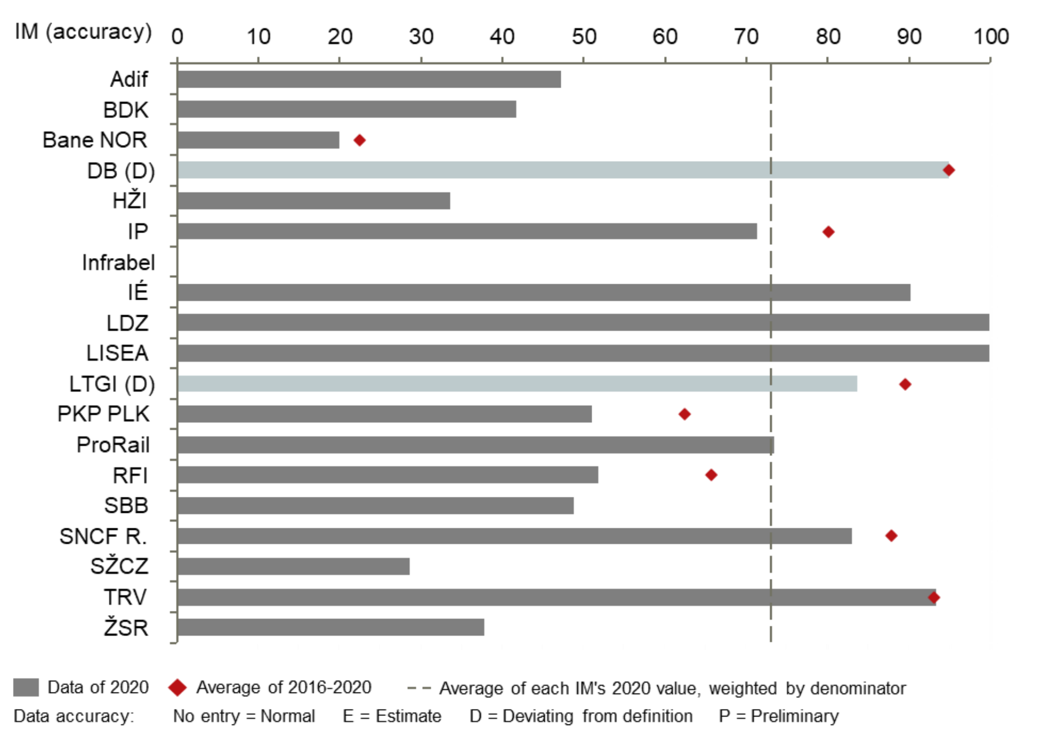

Figure 21: Proportion of TAC in revenue (% of monetary value)[30]

Figure 21 shows the proportion of TAC revenues of total revenues. For six infrastructure managers the share of track access charges of total revenues is above 80%. LISEA and LDZ generate all their revenues from track access

[30] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

charges. The peer group's average is 73%, however for Bane NOR, SŽCZ, HŽI and ŽSR the relevant share is below 40%.

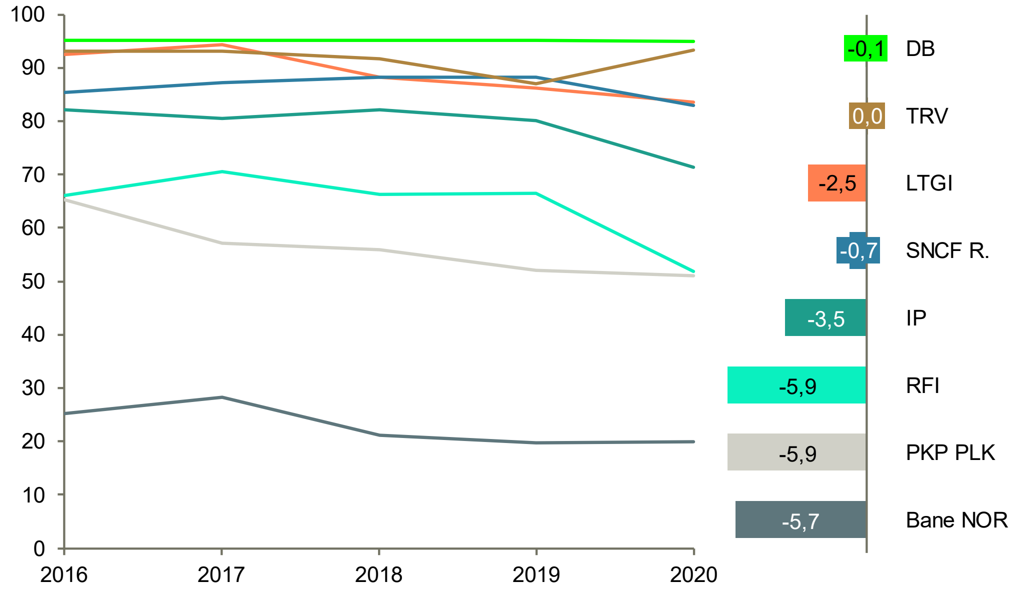

Figure 22: Proportion of TAC in revenue (% of monetary value) and CAGR (%) in 2016-2020

The proportion of revenues from track access charges remained relatively stable across the peer group between 2016 and 2019 but decreased for more infrastructure managers to a relevant extent in 2020. TRV was the only company that increased the proportion of TAC revenues in 2020 in comparison to last year.

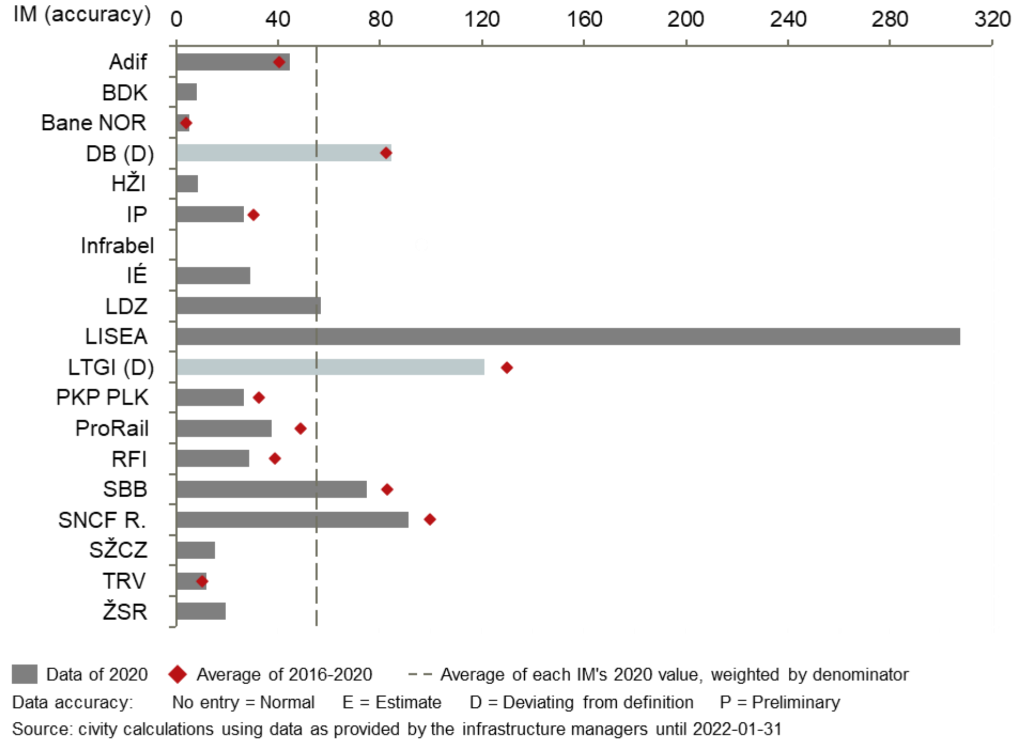

Figure 23: TAC revenue in relation to network size (€1.000 per main track-km) [31]

[31] Results are normalised for purchasing power parity. Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

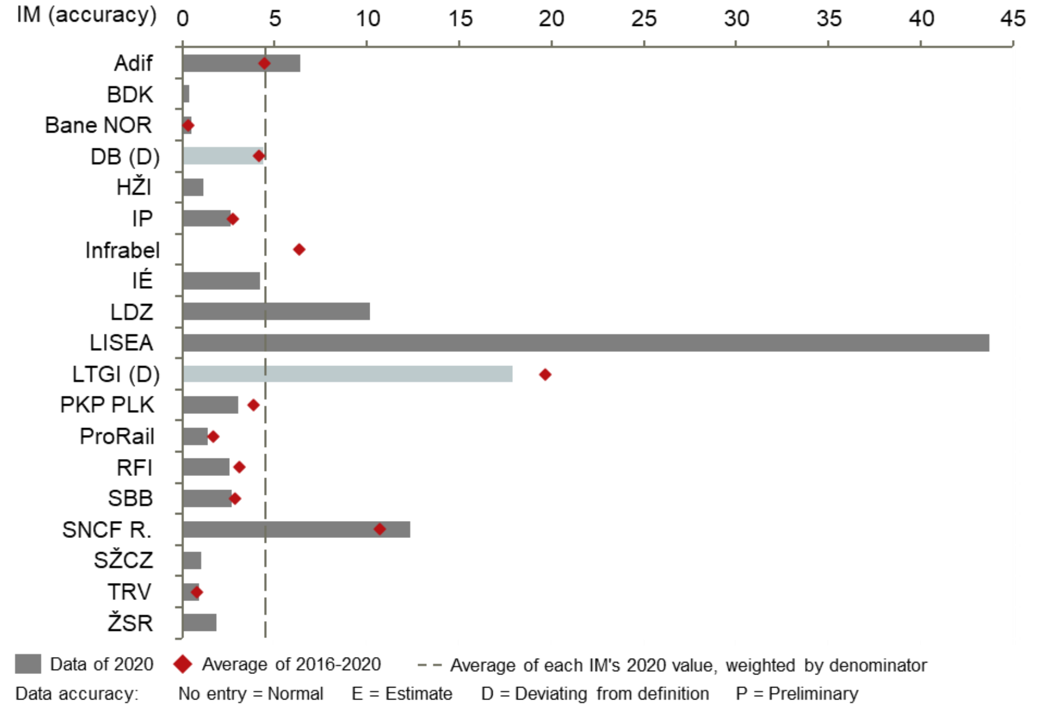

Figure 24: TAC revenue in relation to traffic volume (€ per total train-km) [32]

Figure 23 illustrates the revenues per track-kilometre and figure 24 the revenues per train-kilometre as a benchmark. The comparison shows the differences in the extent to which infrastructure managers can generate TAC revenues per train-kilometre on the one hand, and how many TAC revenues per track they have available in relation to their network costs on the other. SBB's TAC revenues, for example, are above average in relation to network size, but remain below average when related to traffic volumes. The range of TAC revenues in relation to network size varies between €5.000 - €307.000 per main track-kilometre per year and has a peer group average of €56.000 and a standard deviation of €71.000. In relation to traffic volume TAC revenues varies between €0,4 - €44, showing an average of €4,5. LISEA's level of income is significantly higher than that of other infrastructure managers because it comes exclusively from the LGV line (high-speed line) while remaining comparable to the charges levels of other LGVs on the French national network.

[32] Results are normalised for purchasing power parity. Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

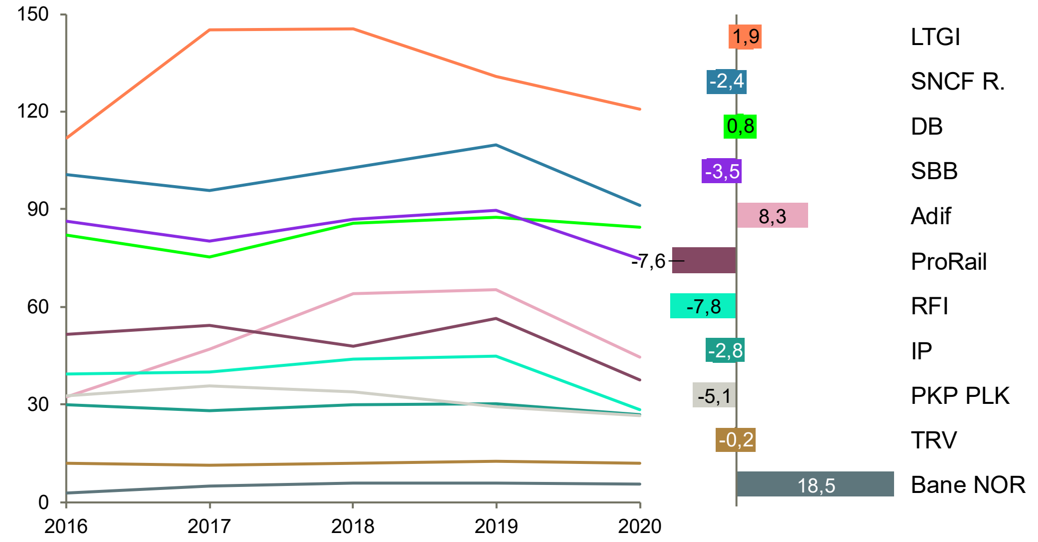

Figure 25: TAC revenue in relation to network size (€1.000 per main track-km) and CAGR (%) in 2016-2020[33]

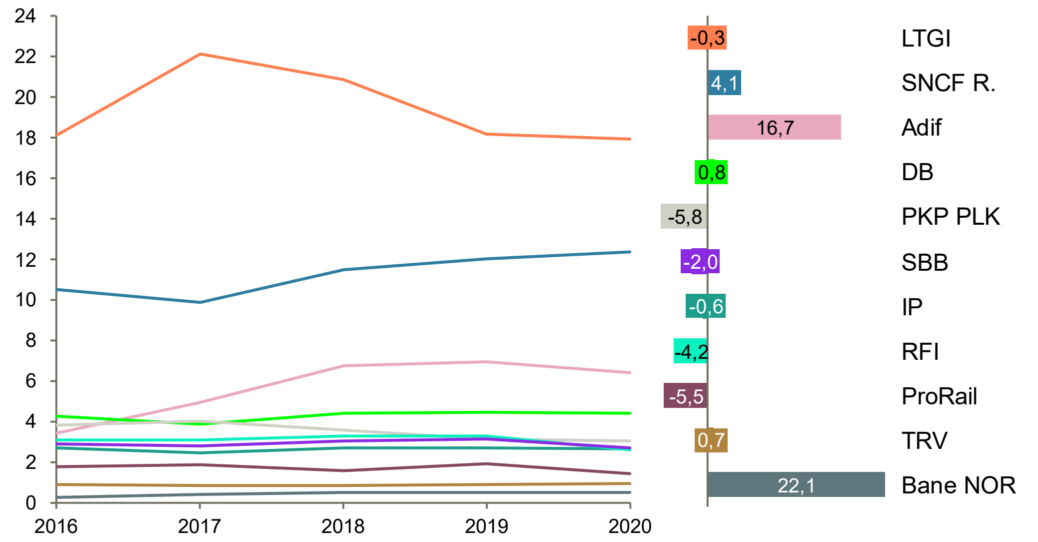

Figure 26: TAC revenue in relation to traffic volume (Euro total train-km) and CAGR (%) in 2016-2020[34]

Figures 25 and 26 illustrate the development of revenues per track-kilometre and train-kilometre generated by infrastructure managers to cover the cost of the network. By showing the potential impacts of the Covid-19 pandemic, it indicates why it is important to relate TAC revenues not only to the network but also to train activity. While TAC revenues in relation to network size decreased

[33] Results are normalised for purchasing power parity.
[34] Results are normalised for purchasing power parity.

significantly for most of the infrastructure managers from 2019 to 2020, TAC revenues in relation to traffic volume remained on a similar level as train activity also decreased during the pandemic. A high increase – in relation to traffic volume – can be seen at Adif (16,7%), however this development is partly the result of a change of the TAC system in 2017[35].

Non-access charges

Revenues from non-access charges may include revenues from service facilities and other services for operators, commercial letting, advertising, and telecommunication services, but exclude grants and subsidies. The growing importance of third-party financing in the transportation sector is also reflected by the development of the PRIME members.

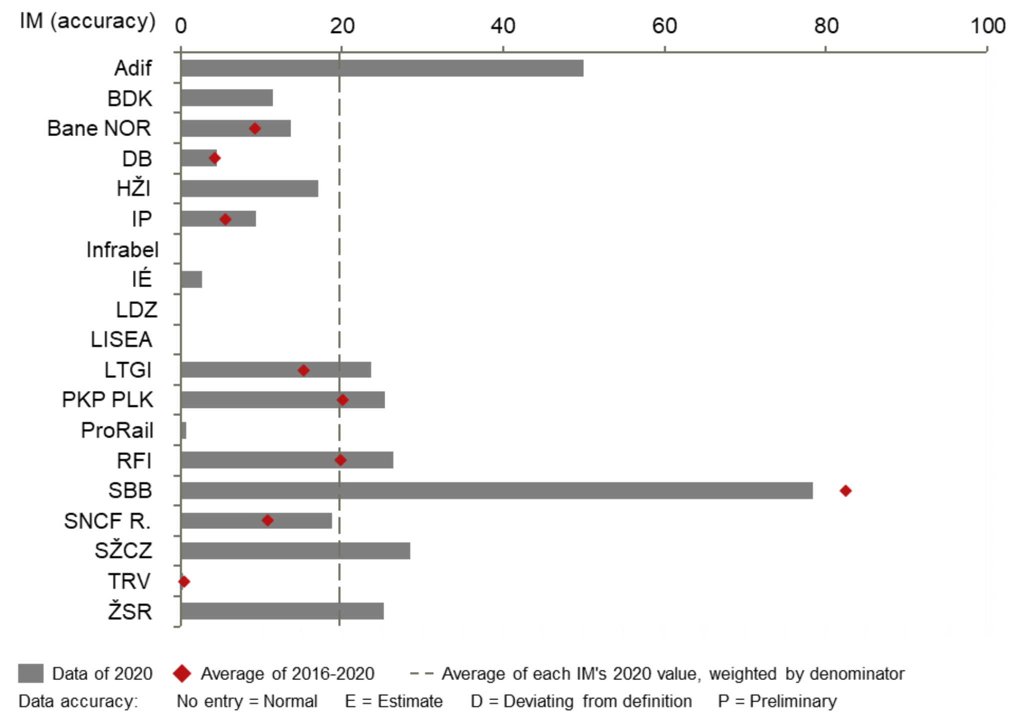

Figure 27: Total revenues from non-access charges in relation to network size (€1.000 per main track-km) [36]

The annual peer group's average of revenues from non-access charges is €20.000 per main track-kilometre. Six infrastructure managers have revenues of less than €10.000 per main track kilometre, among which LISEA has zero non-access charges revenues. The €80.000 generated by SBB is far above the

[35] Data estimated from the official P&L and balance sheet of Adif and Adif AV (two different infra managers and legal entities).

[36] Results are normalised for purchasing power parity.

average and stems from providing goods (e.g. traction current, switches) and services (e.g. use of IT tools, project management) to other infrastructure managers in Switzerland.

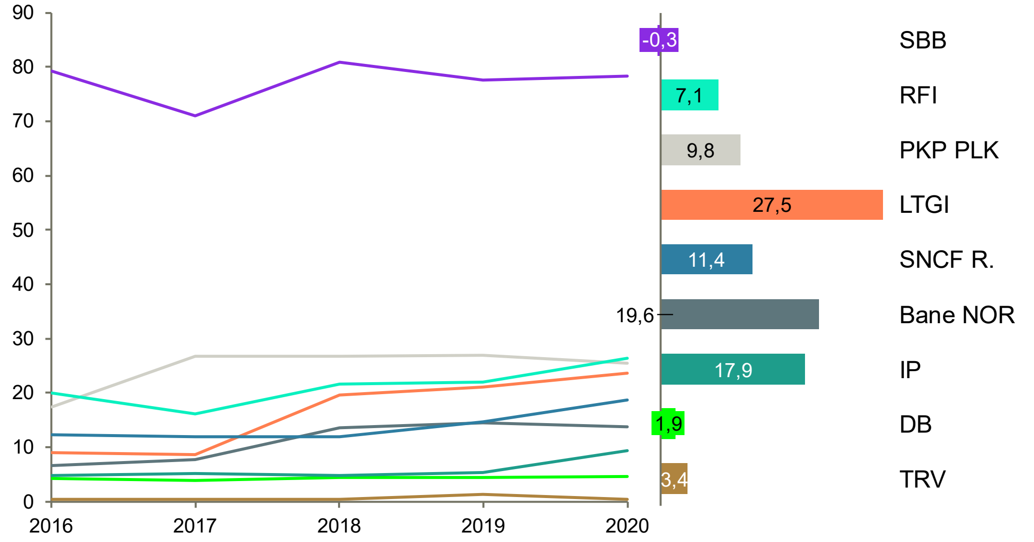

Figure 28: Total revenues from non-access charges in relation to network size (€1.000 per main track-km) and CAGR (%) in 2016-2020 [37]

The growing importance of third-party financing in the transportation sector is also reflected by the development of the PRIME members. Except for SBB all infrastructure managers exhibit an upwards trend, and LTGI, Bane NOR, IP and SNCF R. realised annual growth rates of over 10%.

The figures above demonstrate the different levels of revenues generated by infrastructure managers based on track access-related and non-track access-related sources. One of the main reasons for this variety is the range of possibilities ways of combining public funding, access charging and commercial funding. The precise combination in a given country typically reflects historical precedent, the intensity with which the rail network is used, the legacy of asset management (which determines the extent to which maintenance and renewal costs can be forecast with confidence), the need for new capacity (which can prompt a search for alternative forms of funding) and the willingness of users to pay.

[37] Results are normalised for purchasing power parity.

Public funding

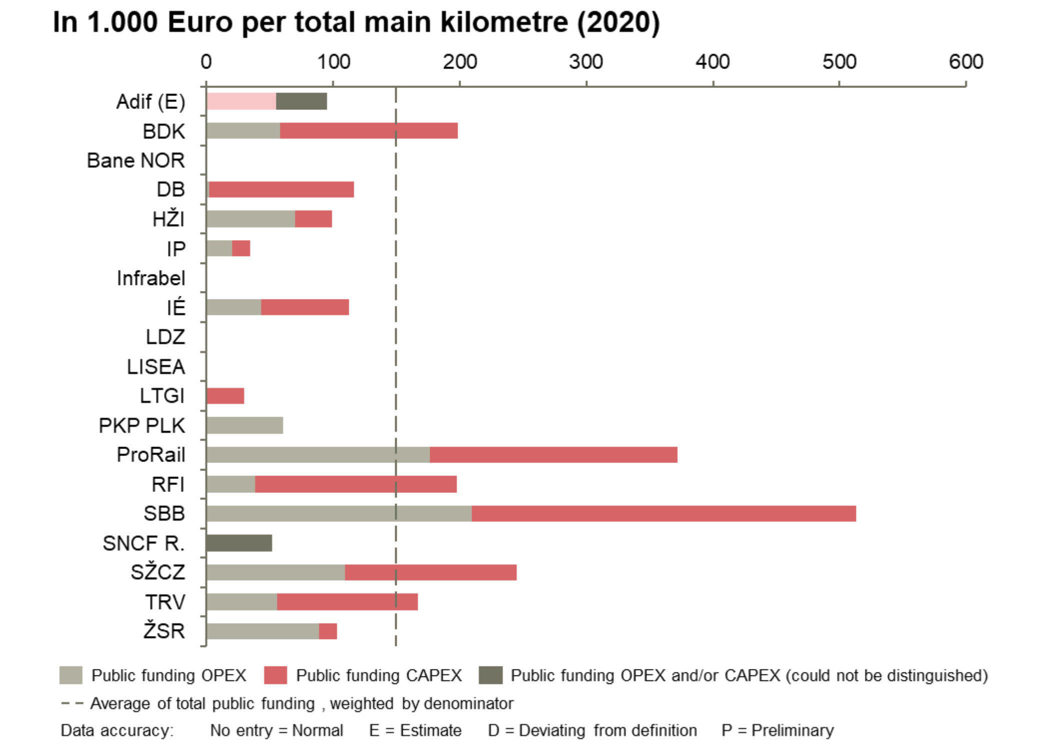

Figure 29: Public funding for OPEX and public funding for CAPEX in relation to network size (€1.000 per main track-km) [38]

Figure 29 shows infrastructure managers' public funding dedicated to operational and capital expenditure. The residual amounts comprise the funds that remain after deducting the two subcategories from the total public funds. As can be seen, the proportions in terms of the categories for which the funds are used are highly diverse. SBB receives the highest public funding with more than €500.000 related to its network size, while LTGI has less than €30.000. Regarding SBB's public funding for capital expenditure, all investments in the SBB rail network are paid for by SBB Infrastructure. Due to the acquisition of the Ceneri Base Tunnel, CAPEX 2020 is therefore disproportionately high. LISEA has no public funding at all due to its special case.

[38] Results are normalised for purchasing power parity. Lighter colour indictes estimated value.

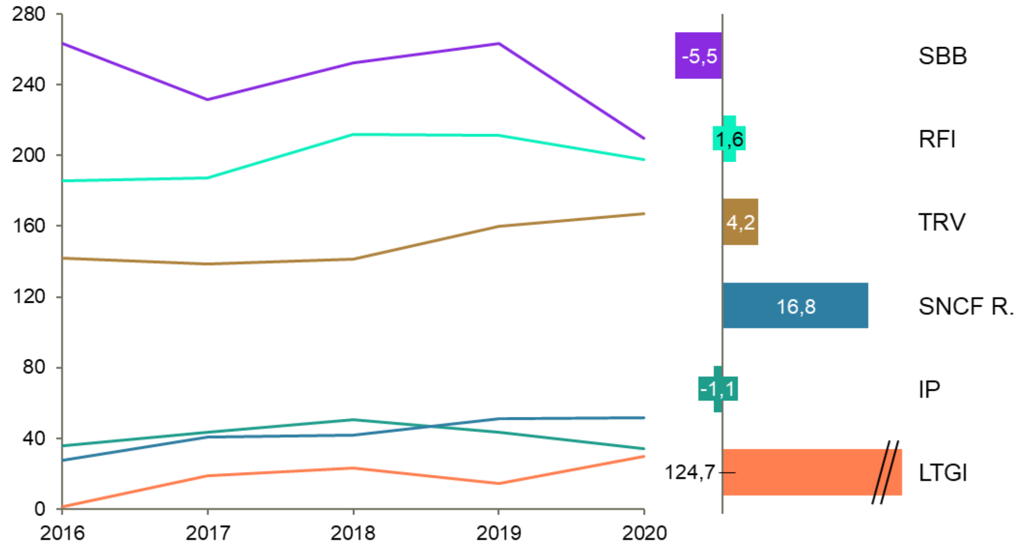

Figure 30: Total public funding in relation to network size (€1.000 per main track-km) and CAGR (%) in 2016-2020 [39]

While LTGI has had the lowest value for public funding in the entire group, its development since 2016 has been the greatest in relative terms. While in 2016 it was still €1.200 per main track kilometre, in 2020 it reached almost €30.000, an annual increase of more than 100%. SNCF R., TRV and RFI show a stable positive trend.

3.3 Safety

3.3.1 Summary of safety

EU-wide objectives

- All infrastructure managers aim at providing safe railway transport.
- In order to maintain and continuously improve railway safety EU-wide, the European Union has developed a legal framework for a harmonized approach to rail safety.
- The objective of the EU is to maintain and further develop the high standards of rail safety.
- In accordance with the Sustainable and Smart Mobility Strategy, by 2050 the number of fatalities should be close to zero for all modes.

Peer group's performance

[39] Results are normalised for purchasing power parity.

EU-wide objectives
› On average there have been 0,3 significant accidents and 0,3 people seriously injured and killed per million train-kilometres each year. › Safety performance increased in more than half of the companies. › Infrastructure manager related precursors also show a declining trend.

3.3.2 Development and benchmark of safety

For infrastructure managers safety is of outstanding importance and mandatory in any framework of key performance indicators. It is the most important element in the performance of an infrastructure manager, and affects customers, stakeholders, the reputation of the infrastructure manager, the railway and society at large. Infrastructure managers constantly invest in their assets and new technology to provide good safety levels, and they develop their safety policies to achieve maximum awareness. This chapter presents the safety performance of the infrastructure managers.

Rail safety indicators

PRIME members report three indicators measuring railway safety performance:

- Significant accidents
- Persons seriously injured and killed
- Infrastructure manager related precursors to accidents

In order to increase comparability of these values among infrastructure managers, these values are related to million train-kilometres.

Development and benchmark

Figures 31 to 36 show the safety performance of the PRIME members as a benchmark, and over the time-period 2016-2020.

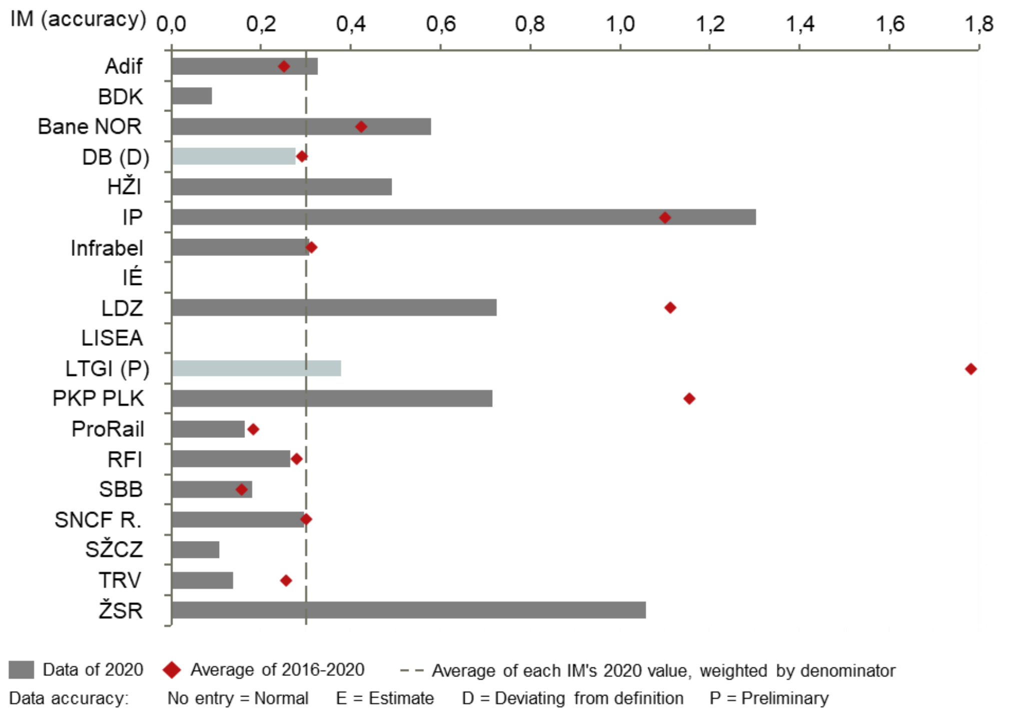

Figure 31: Significant accidents (Number per million train-km)[40]

The KPI values vary notably between the infrastructure managers, however they all remain below 1,4 significant accidents per million train-kilometres. LISEA and IÉ counted zero accidents in 2020. A relative increase can be seen at IP. However, IP is aware of global safety KPI results and several perspectives that contribute to the current trend. On the one hand, IP's network has a relatively low traffic density which influences KPIs negatively, on the other hand, 90% of significant accidents and its consequences result from infringement of rules by people external to railway system, intrusion into the rail premises and failure to comply signalling at level crossings. The lighter grey of DB indicates deviating data, which is explained in the Annex 5.3. LTGI's data is preliminary.

[40] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

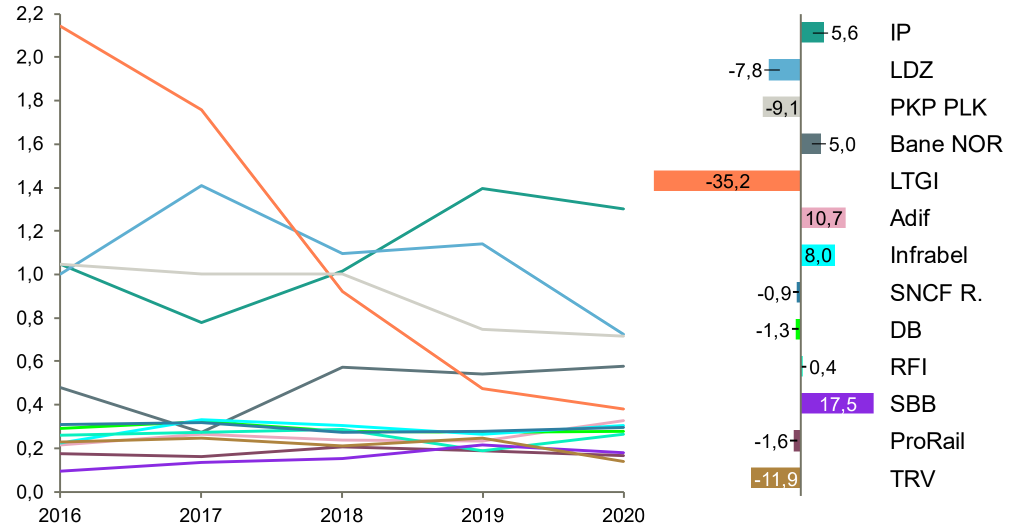

Figure 32: Significant accidents on infrastructure manager's network (Number per million train-km) and CAGR (%) in 2016-2020

The overall trend in safety performance between 2016 and 2020 shows a mixed picture. Seven infrastructure managers improved their safety level from 2016 to 2020 with reducing their relative accident numbers. The highest decrease in the number of significant accidents related to train activity can be seen at LTGI and PKP PLK with a reduction of 35% and 9%. This is the result of direct safety measures and modernisation, and replacement of traffic control equipment. PKP PLK for example is running a social campaign called "Bezpieczny przejazd" (*safe crossing*), to raise awareness of risks resulting from failures to observe special precautions on railway grade crossings and railway areas and offers targeted trainings for rail traffic controllers and people responsible for safety. Six infrastructure managers had an increase in their relative accident numbers, however SBB's, Adif's and Infrabel's numbers are still low. SBB's increase is mainly due to a different counting method according to the PRIME definition from 2017 (fires on rolling stocks are included from 2017 onwards); its accidents rate is still among the lowest in the peer group.

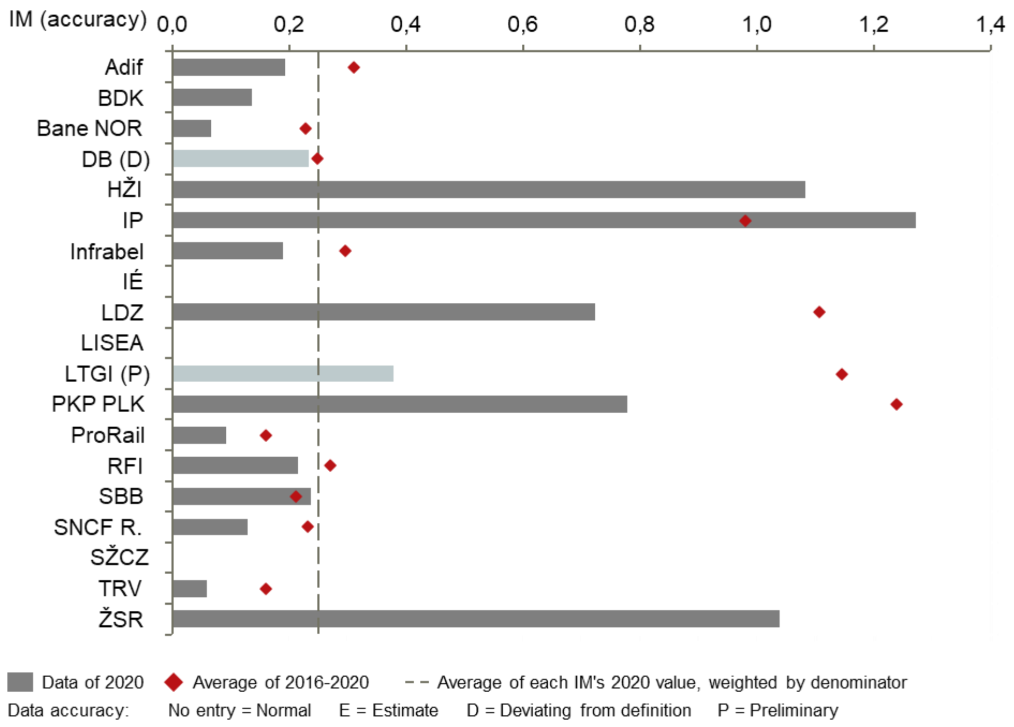

Figure 33: Persons seriously injured or killed (Number per million train-km) [41]

The number of persons seriously injured or killed strongly correlates with the lower number of significant accidents and has an average of 0,3 per million train-kilometres. However, while the majority of infrastructure managers have below-average casualty rates, some networks are well above the weighted average. The standard deviation for this indicator is 0,4.

It should be noted that this PRIME indicator differs from ERA's "Fatalities and weighted serious injuries" indicator. While ERA statistically considers 1 serious injury equivalent to 0,1 fatalities, the PRIME indicator adds up two absolute numbers.

[41] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

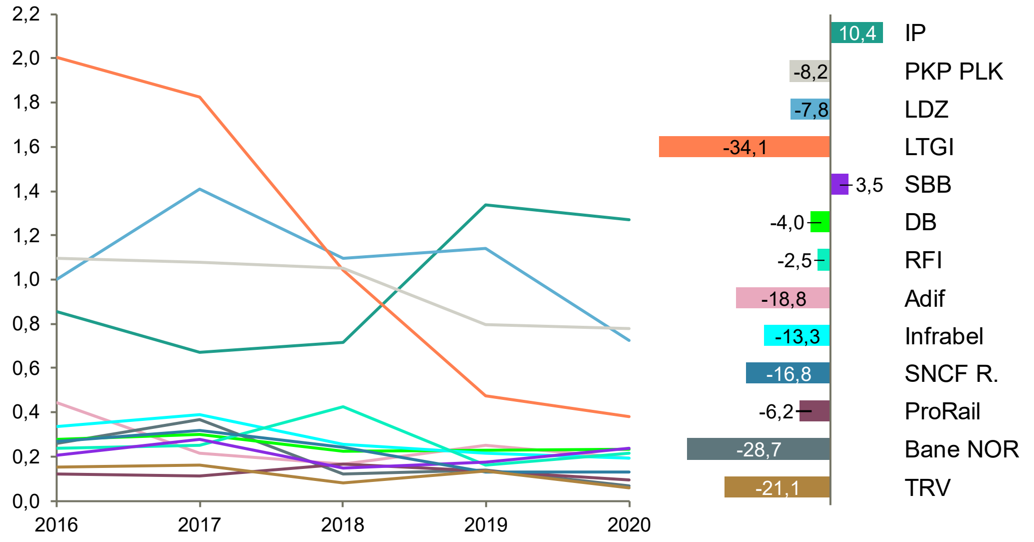

Figure 34: Persons seriously injured and killed (Number per million train-km) and CAGR (%) in 2016-2020

The development in the number of persons seriously injured and killed shows a very positive downward trend, as does the development of serious accidents shown above (figure 32). Eleven out of thirteen infrastructure managers show a decline in the number of people seriously injured and killed relative to million train-km.

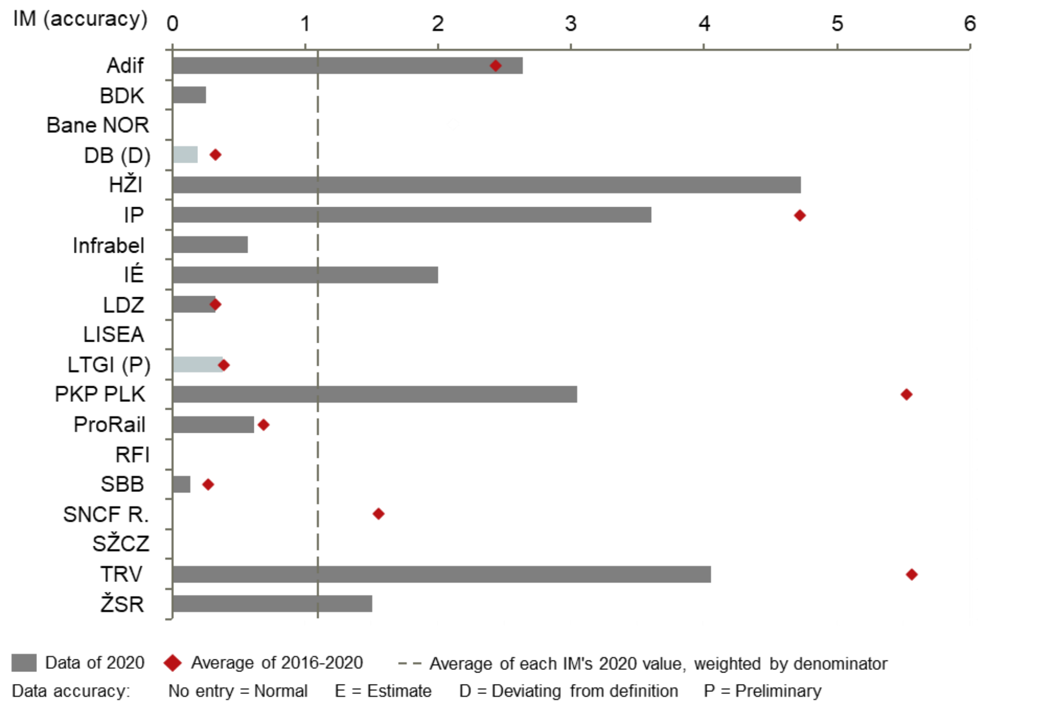

Figure 35: Infrastructure manager related precursors (Number per million train-km)[42]

Precursors are a good indicator to understand and mitigate root causes for significant accidents and include broken rails, track buckle and track misalignment, as well as wrong-side signalling failures.

The number of precursors of the peer group varies widely, some showing levels well below the peer group's weighted average of 1,1, while others have significantly higher values. However, it is interesting to see that two Baltic infrastructure managers show a relatively high number of accidents, while the infrastructure related precursors to accidents are among the lowest in the peer group.

[42] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

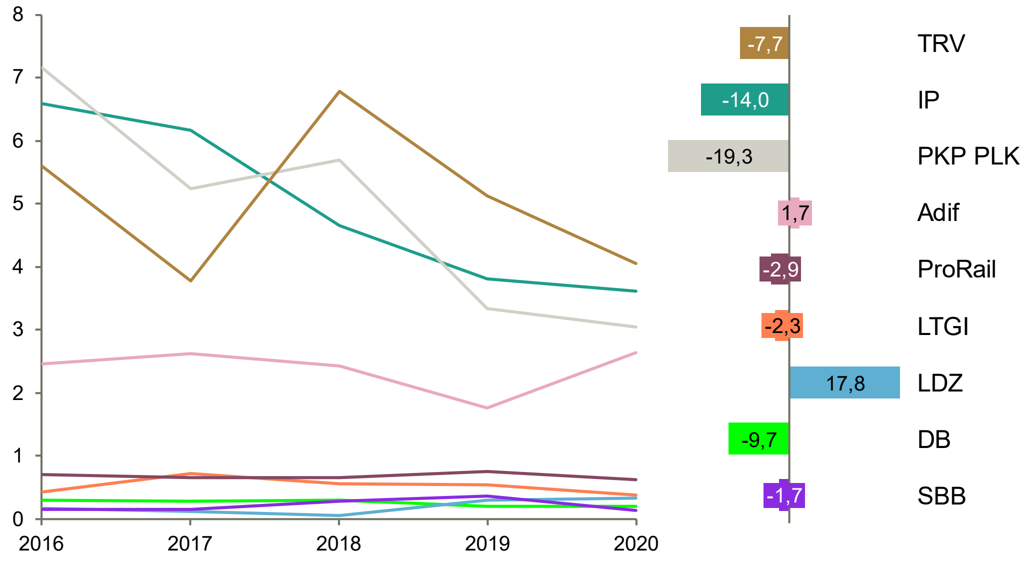

Figure 36: Infrastructure manager related precursors (Number per million train-km) and CAGR (%) in 2016-2020

Figure 36 corresponds to the diagrams above. Here, too, the trend between 2016 and 2020 shows a decline in infrastructure manager related precursors. The highest decrease can be seen at PKP PLK, as with the other indicators. The second highest annual average decrease, IP, is particularly interesting when considering the opposite trend for accidents and serious injuries and fatalities. This supports the information described above that many of the accidents occur independently of the infrastructure manager's area of responsibility.

Rail safety is influenced by a wide array of factors. Safety policies should be preventive and reactive at the same time. Providing assets in good condition by ensuring appropriate activity levels of maintenance and renewal is a precondition for reliable and safe operations. Safety figures are also influenced by unauthorised persons entering the rails, whereby these incidents can only be influenced by the infrastructure manager to a limited extent. Many infrastructure managers have launched campaigns to reduce the number of level crossings and to introduce modern signalling and communication systems. Increased awareness among employees and track workers, as well as the public, is another main pillar of rail safety. An organisation's safety culture is therefore essential, playing a major role by employing direct preventive measures, and through raising awareness of safety, which reduces the influence of the human factor. Regarding casualties, response time in emergency services and different reporting and hospital procedures in the Member States might also have an impact on the statistics.

As infrastructure managers in the EU are working under different circumstances it is very important to put the data in context. The infrastructure managers from newer EU countries in Eastern Europe are still in a phase of modernizing and upgrading their railway networks. The initial conditions were different not only regarding asset conditions and technical safety equipment, but also safety policies. In addition, it is important to note that in order to identify infrastructure manager related precursors to accidents, an organisation must have sufficient capacity and implemented systems to capture them.

3.4 Environment

3.4.1 Summary of environment

EU-wide objectives

- The European Green Deal aims to make Europe climate-neutral by 2050.
- In accordance with the EU's Sustainable and Smart Mobility Strategy:
  - All transport modes need to become more sustainable
  - Sustainable transport alternatives should be widely available
  - Scheduled collective travel of under 500 km should be carbon-neutral by 2030 within the EU
- Rail needs to continue with further electrification of the track or using greener alternatives to diesel where electrification is not possible. The TEN-T core network is to be electrified by 2030, the comprehensive network by 2050.

Peer group's performance

- The network of the peer group is mostly electrified with an average of 72% and remained relatively stable in 2016-2020.
- The share of electricity-powered trains in relation to train-kilometres across the peer groups is around 82%.
- While the degree of electrification strongly correlates with the share of electricity-powered trains, the electrified networks are not 100% exploited by all infrastructure managers.
- The share of diesel-powered trains in relation to train-kilometres across

Peer group's performance
the peer group is around 17%.

3.4.2 Development and benchmark of environment

While rail is the most environmentally friendly transport mode it is still important that it continues to become greener. The biggest overall impact will come from electrification and the use of greener alternatives to diesel where electrification is not possible. Another possibility is to increase the share of renewable energies in traction energy, for which data is available since this year. The indicators related to the electrification process and energy consumption are presented in this chapter.

Rail environment indicators

PRIME members are reporting three indicators measuring railway environmental performance:

- Degree of electrification
- Share of electricity-powered trains
- Share of diesel-powered trains
- Share of renewable traction energy

In order to increase comparability of these values among infrastructure managers, these values are related to main track-kilometres and to train-kilometres.

Development and benchmark

Figures 37 to 44 show the relevant environmental indicators as a latest benchmark between the infrastructure managers and their development over the time-period 2016-2020.

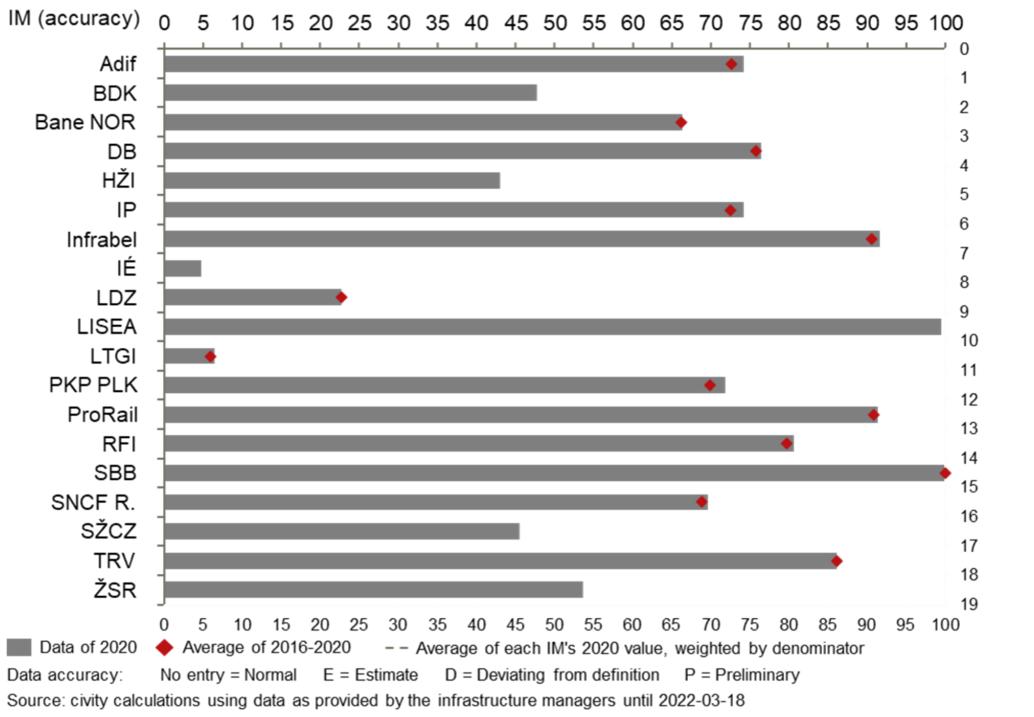

Figure 37: Degree of electrification of total main track (% of main track-km)

In the EU railway networks are mostly electrified. The peer group's average is 72%, however, the degree of electrification varies widely from 5% to 100%. While SBB, LISEA, and Infrabel have the highest degree of electrification, reaching over 90%, IÉ, LTGI and LDZ have electrified below 25% of their network.

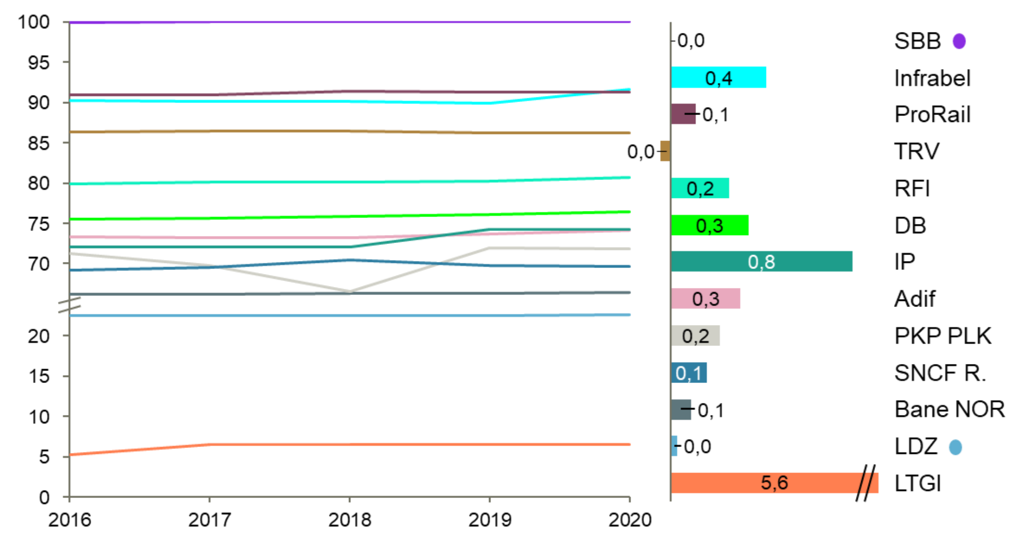

Figure 38: Degree of electrification of total main track (% of main track-km) and CAGR (%) in 2016-2020

The degree of electrification remained relatively constant over the period. LTGI had the highest annual growth rate with an absolute amount of an additional 30 kilometres of electrified main tracks in 2020. The rest of the peer group increased its network by below 1% or did not change.

Network utilisation and density appear to be a driver for electrification in several cases. As the transfer to electrified lines requires high investments, electrification makes economically most sense on busy lines. On low-density lines the cost-efficiency is not proven, which is one reason why some infrastructure managers, such as IÉ, LDZ and LTGI, are showing rather low degrees of electrification. Economic conditions can also impact the ability of a rail member to invest. Infrastructure managers and operators managing and running on low-density networks are discussing other approaches to develop greener railways. Battery powered trains and hybrid-diesel electric locomotives are two possible approaches. Making rail transport more sustainable cannot only be achieved by a fully electrified network, but also by incentivising and investing in other alternative energy sources.

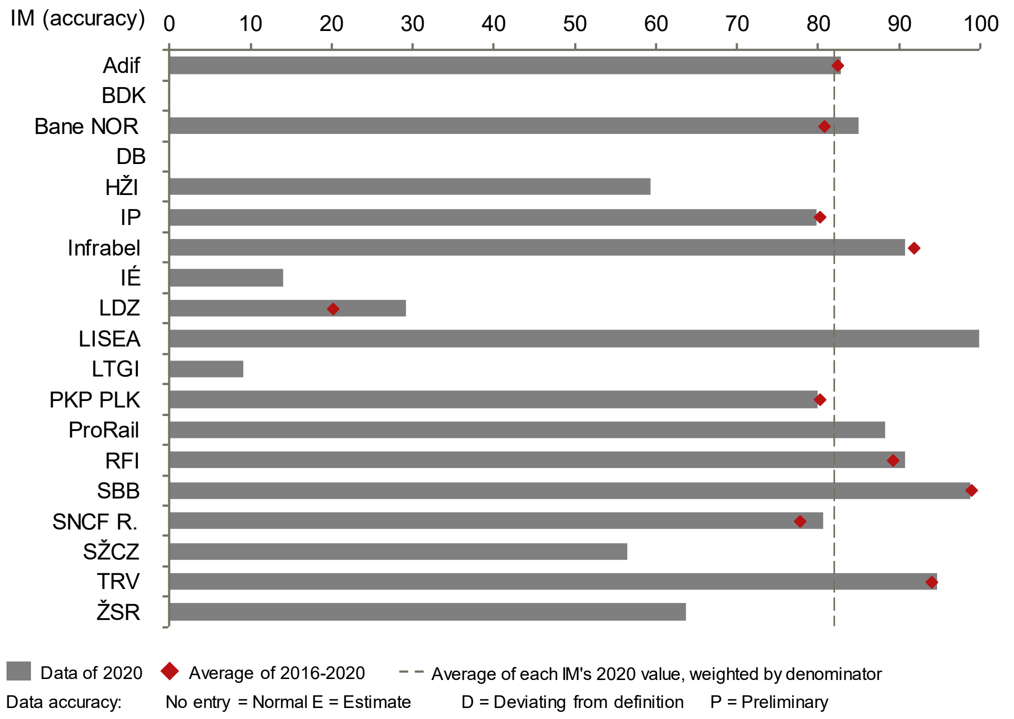

Figure 39: Share of electricity-powered trains (% of total train-km)

The share of electricity-powered trains corresponds to the electrification of the network. Over 80% of the peer group's traffic is powered by electricity. On LISEA's network all trains run with electricity-power. SBB, TRV, Infrabel and RFI have above 90% of electricity-powered trains running on their network.

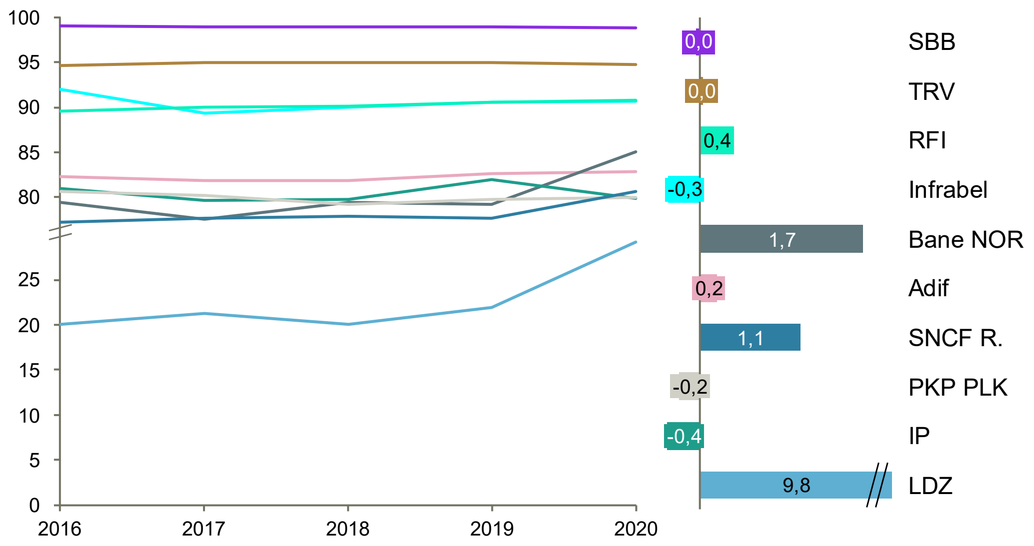

Figure 40: Share of electricity-powered trains (% of total train-km) and CAGR (%) in 2016-2020

Figure 40 shows the development of electricity-powered trains between 2016 and 2020. Parallel to the development of the electrification of the main tracks the trend is relatively stable, showing only a slight increase. Only LDZ saw an annual growth of almost 10%, and increased its share of electricity-powered trains from 20% in 2016 to 29% in 2020.

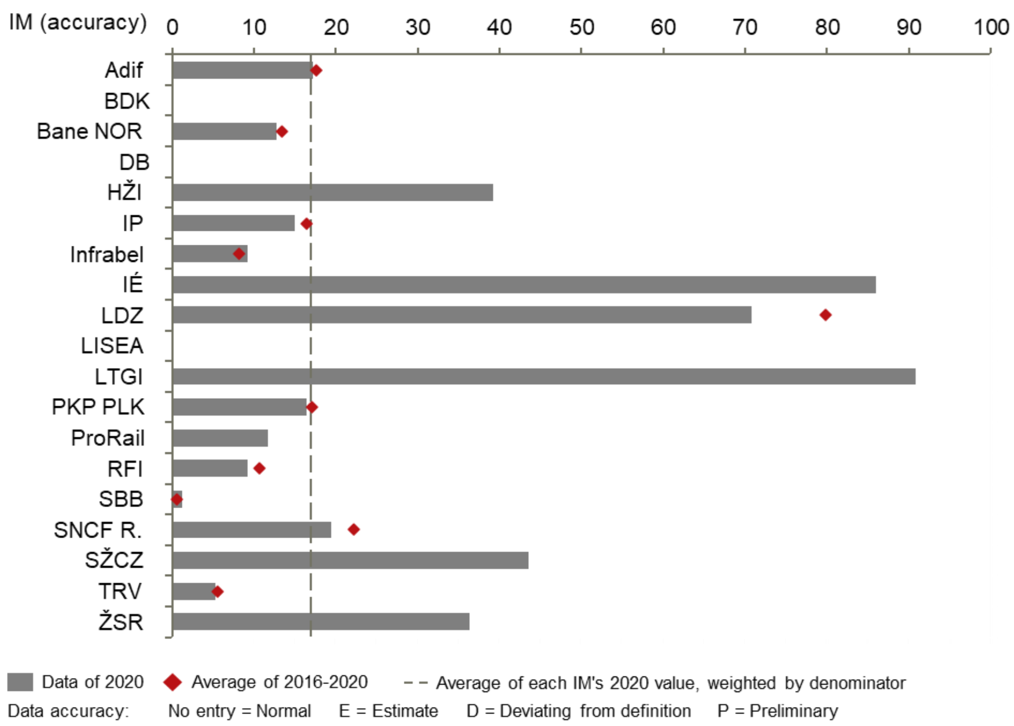

Figure 41: Share of diesel-powered trains (% of total train-km)

Figure 41 is the counterpart to figure 43 and shows the share of diesel-powered trains in relation to total traffic volume of the infrastructure managers. Corresponding to the low electrification level of their network, the Baltic countries and Ireland show higher rates of diesel-powered trains than the rest of the group. 90% of LTGI's, 86% of IÉ's and 70% of LDZ's traffic volume is produced by diesel-powered trains while the peer group's average stays below 20%.

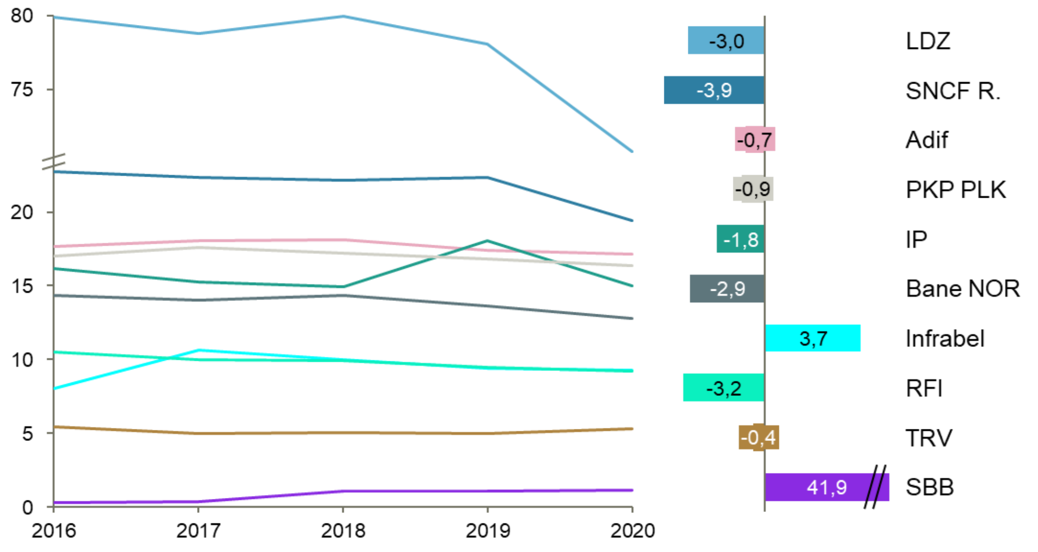

Figure 42: Share of diesel-powered trains (% of total train-km) and CAGR (%) in 2016-2020

Figure 42 shows the development of the share of diesel-powered trains between 2016 and 2020. Considering the European Commission's objective of reducing the share of diesel-powered trains, the declining trend across the peer group is promising. The sharpest decline occurred between 2019 and 2020, which makes it particularly interesting to see whether this is an exceptional result related to the pandemic or whether it will be the beginning of a trend. The highest annual growth can be seen at SBB, as there has been an increase in diesel powered work trains. However it still remains far below the average with a share of diesel-powered trains of 0,3% in 2016 and 1,2% in 2020.

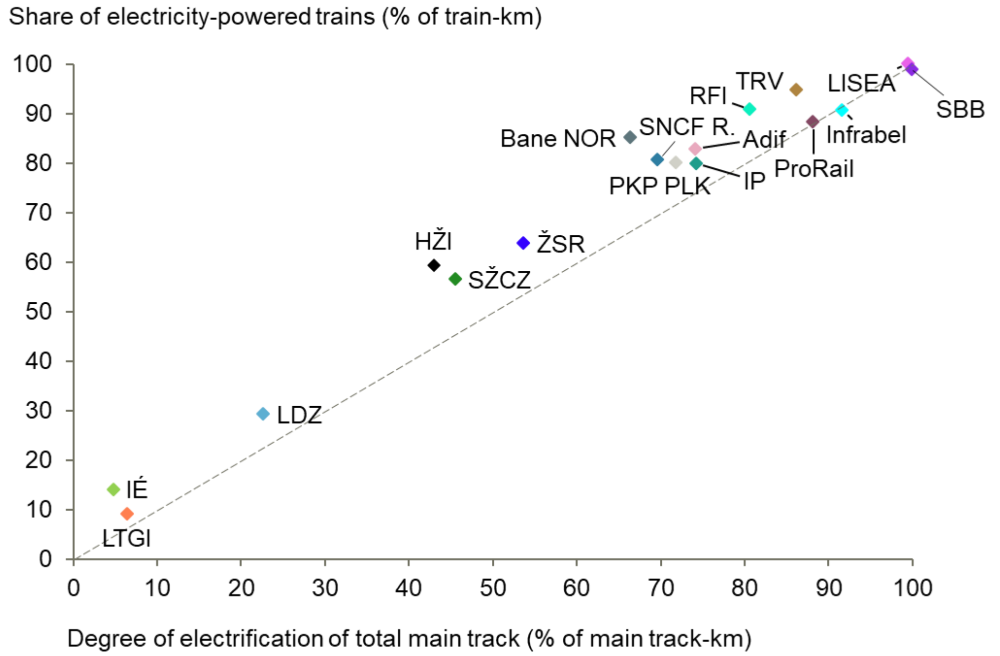

Figure 43: Share of electricity-powered trains (% of train-km) / Degree of electrification (% of main track-km)

Figure 43 shows an unsurprising correlation between the degree of electrification of the network and the share of electric trains. However, it is noticeable that similar degrees of electrification do not automatically lead to similar shares of electrically produced train services. The decision to operate electricity-powered trains lies mainly with the operator, which may decide to run diesel-powered trains or alternative engines on electrified lines. Historic trains or trains that also run on non-electrified lines are two examples.

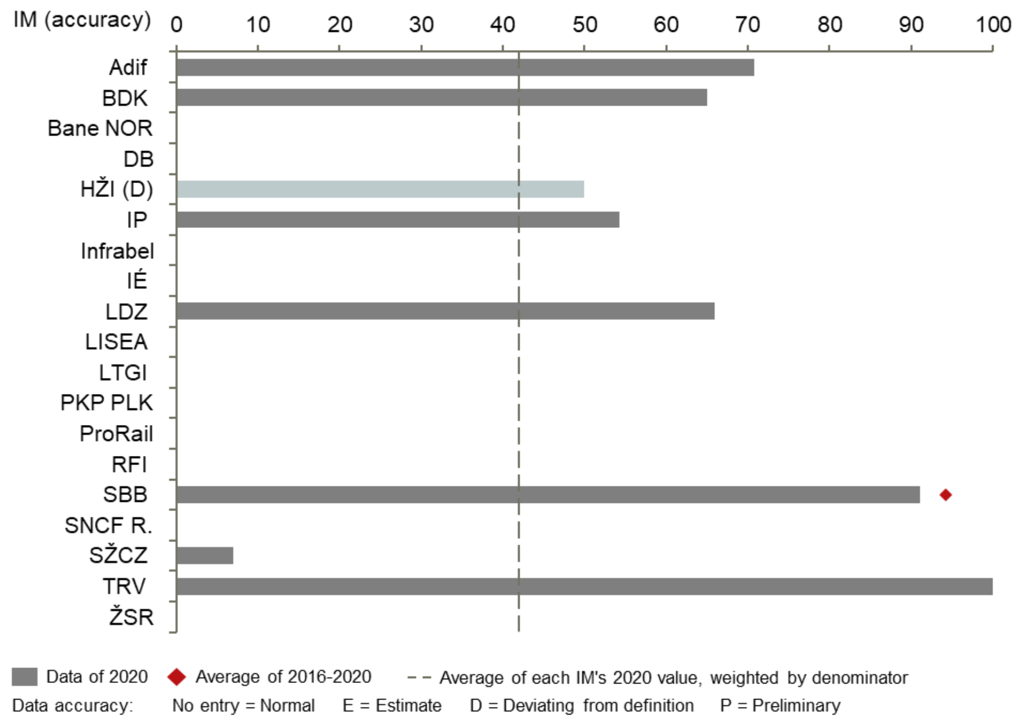

Figure 44: Share of renewable traction energy (% of kWh) [43]

Rails also aim to become greener in terms of energy consumption. Figure 44 shows the proportion of renewable traction energy in relation total traction energy in kWh. As we can see TRV obtains 100% of the energy needed to run electric trains from renewable energy sources, SBB has a share of over 90% mostly produced by its own hydropower plants. The peer group's average is 42% with a standard deviation of 38%. For ProRail no information about the source of traction power is delivered because in the Netherlands the RU's are responsible for buying traction energy.

3.5 Performance and delivery

3.5.1 Summary of performance and delivery

EU-wide objectives

- Improving performance and increasing punctuality of passenger and freight rail services is an objective of every infrastructure manager.

[43] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

EU-wide objectives

- Infrastructure managers establish targets and monitor them closely to develop appropriate activities and measure their effectiveness.
- EU legislation has established basic principles to minimise disruptions. Infrastructure charging schemes should encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network through a performance scheme.

Peer group's performance

- PRIME has developed common definitions to increase the comparability of performance measures:
  - Passenger trains punctuality is measured with a threshold of 5:29 minutes
  - Freight trains punctuality is measured with a threshold of 15:29 minutes
- Passenger and freight train punctuality have increased between 2016 and 2020.
- On average infrastructure managers caused 5 delay minutes per thousand train-kilometres.
- On average 700 asset failures per thousand main track-kilometres per year causing an average delay of 69 minutes per failure.

3.5.2 Development and benchmark of performance and delivery

Performance and delivery is a category in which increased customer demands are particularly visible. More frequent and more complex journeys require coordinated schedules and punctual trains. Current trends in logistics, such as just-in-time manufacturing and customized deliveries, call for more plannability, traceability and speed in transportation. Infrastructure managers are constantly working on improving their performance by increasing their punctuality and minimising the effect of failures in order to provide a reliable and available network.

Rail performance and delivery indicators

PRIME members are reporting three indicators measuring railway punctuality, two indicators measuring reliability and two indicators measuring availability:

- Punctuality:
  - Passenger trains' punctuality
  - Freight trains' punctuality

- Delay minutes caused by the infrastructure manager
- Reliability:
  - Asset failures in relation to network size
  - Average delay in minutes per asset failure
- Availability:
  - Tracks with permanent speed restrictions
  - Tracks with temporary speed restrictions

In order to increase comparability of these values among infrastructure managers, the train punctuality indicators are illustrated as a percentage of all trains scheduled, the delay minutes are related to train-kilometres and the number of asset failures and the speed restrictions are related to main track-kilometres.

3.5.3 Punctuality

Other than safety, train punctuality is the primary measure of overall railway performance and a key measure of quality of service, driven not only by the infrastructure manager but also operators, customers, and other external parties. It is a complex output that needs to be understood as the result of a system where many internal and external factors, different technologies, a large number of actors and stakeholders come together and interact to produce a good service for passenger and freight customers.

Punctuality is measured and managed in very different ways, as performance schemes are not yet sufficiently coordinated between infrastructure managers. Different measurement concepts concern mainly the thresholds of punctuality and approaches regarding measurement points. Within the peer group the individual span of thresholds set to classify a train as delayed may differ by more than 10 minutes for passenger trains and more than 50 minutes for freight trains. The collection of the individual company standards that are used for national and company internal monitoring can be found in the Annex 5.5.

In order to promote good quality benchmarking, PRIME has established a common definition including an agreed threshold for each passenger and freight services. For passenger trains, punctuality indicators represent the percentage of actually operating national and international passenger trains which arrive at each strategic measuring point with a delay of less than or equal to 5:29 minutes. For freight trains the threshold has been set to 15:29 minutes. Several but not all infrastructure managers report their punctuality figures according to this definition. However, for some infrastructure managers this threshold is less favourable and difficult to align with internal company targets.

As already indicated, the other important component of measurement concepts is the approach regarding measuring points. The density of measurement points in networks can be as low as measuring at the final destination only, or as high as measuring at arrivals, destinations and additional points. The following table shows the different concepts with regards to measurement points in each infrastructure manager's network. The counting method and definition of strategic measuring points lays in the responsibility of the infrastructure managers and is not further harmonised by PRIME.

Infrastructure manager	Measurement points in the network
Adif	For statistical purposes at final destination only. For traffic regulation and management also at every station, in blocks and at some other strategic points like switches.
BDK	Passenger trains (commuter): 86 strategic measurement points Passenger trains (regional and long distance): 48 strategic measurement points Freight trains: 14 strategic measurement points
Bane NOR	PRIME punctuality performance measures are measured at final destination and at Oslo Central Station for both passenger and freight trains.
DB	For statistical purposes: Punctuality of passenger trains is measured taking into account all stations. Punctuality of freight trains is measured at the final station (arrival) within Germany.
HŽI	For all trains, time is measured only at the destination (final relation station, or transfer to neighbouring infrastructure managers)
IÉ	Measured at final destination
Infrabel	Official punctuality is measured at final destination and, for passenger trains, at the first station of the Brussel North

Infrastructure manager	Measurement points in the network
	South connection. For internal analyses many more measuring points exist but these are not used in the calculation of the official performance measures.
IP	Exclusively at the destination (all systems are prepared for the measurement to be performed on more stations. To this end, the stations to be selected will be all those that enhance commercial service or have technical characteristics for services requested by the operator).
LDZ	Strategic measurement points.
LISEA	Stations and strategic measurement points across the network.
LTGI	Measured at strategic points.
PKP PLK	For statistical purposes, time measured at the destination (final relation station, or transfer to neighbouring infrastructure manager). The possibility of measurement exists at any point where the arrival / departure time of the train is described.
ProRail	Strategic measurement points.
RFI	Final destination for punctuality purpose.
SBB	Passenger trains: 53 strategic measurement points (large stations). Freight trains: 52 strategic measurement points (specific freight operating points).
SNCF R.	Measurements of punctuality are drawn from strategic and near-stations points.
SŽCZ	For statistical purposes: › Origin point of a train or arriving border station in case of cross-border train (transfer from other infrastructure manager) › Final destination point or departing border station in case of cross-border train (transfer to other infrastructure manager)

Infrastructure manager	Measurement points in the network
TRV	Official performance measures measured at final destination only. Many more measuring points exist, but are not calculated in the performance measures.
ŽSR	For passenger trains, the measurement points are at every station, but fulfilment of timetable is calculated based on measuring on arrival and sometimes departure, if needed. Same measurement points are applicable for freight trains, but the fulfilment of timetabling is not calculated unless demanded by an entity/authority

Table 2: Infrastructure manager's measurement points in the network

Passenger total train punctuality (5:29 minutes)

Figures 45 and 46 show the punctuality of passenger trains for operators using the network of PRIME members as a benchmark and over the time-period 2016-2020. It is important to note that punctuality figures presented here are not solely the result of the infrastructure manager's performance but also include delays caused by operators and other parties as well as external causes, hence representing full system-punctuality.

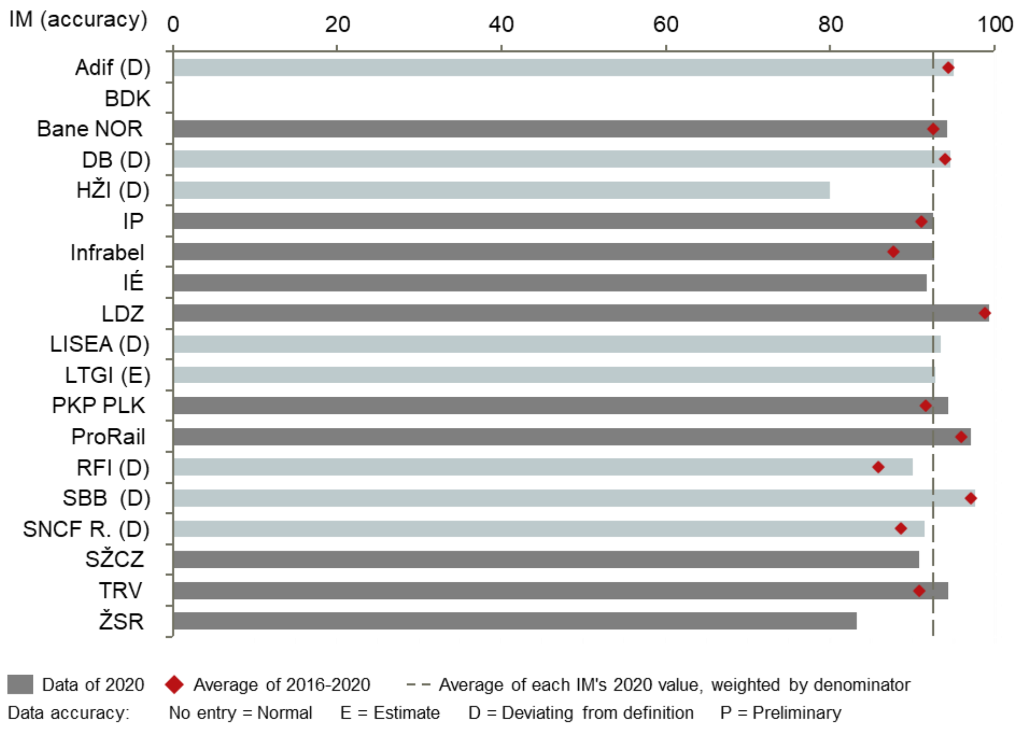

Figure 45: Passenger trains total punctuality (5:29 minutes) (% of trains) [44]

Figure 45 shows the passenger train punctuality data of the latest available year. The figures vary between 80% and 99%, which is again partly a result of different measuring methodologies. The punctuality of passenger trains has a weighted average of 95% and a standard deviation of 4,7%. The lighter grey colour highlights the infrastructure managers which deviate from the PRIME definition. In total, eight infrastructure managers are deviating from definition. Comments explaining in what sense the individual data points are deviating are collected in the Annex 5.3.

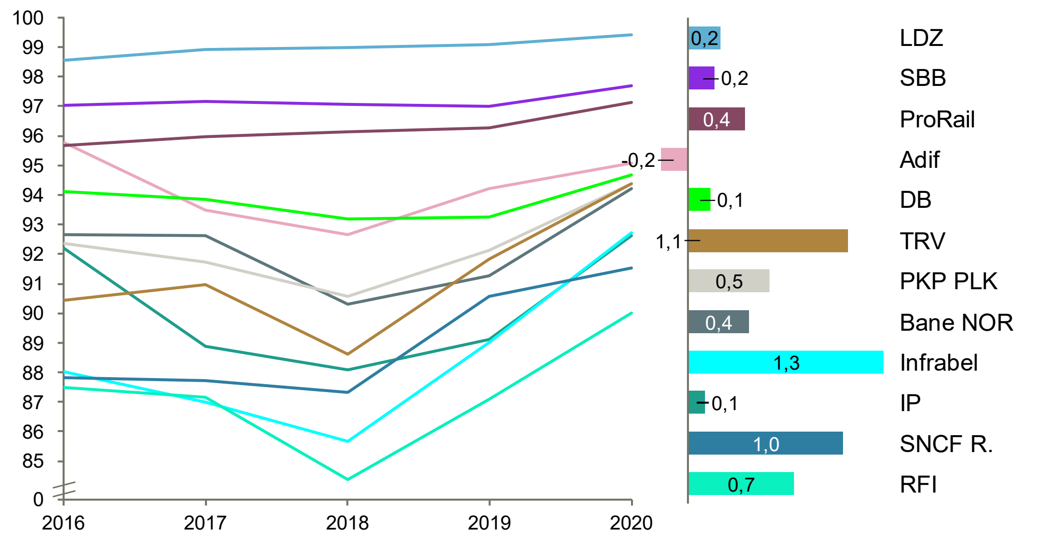

Figure 46: Passenger trains total punctuality (5:29 minutes) (% of trains) and CAGR (%) in 2016-2020

Figure 46 shows the development of passenger train punctuality between 2016 and 2020. While punctuality remained relatively stable between 2016 and 2019, almost all infrastructure managers have increased their punctuality in 2020 compared to the previous years. The covid-19 pandemic had a large impact on this development, as fewer passengers and fewer trains led to fewer delays. Infrabel showed the highest increase in punctuality with an annual average increase of 1,3%.

Besides different measuring concepts, there are other factors impacting punctuality. Some of them are outside the infrastructure manager's control. The complexity of a network and its utilisation are among the most important factors. The risk of delays due to failures increases with higher complexity. For example, a network with a high density of assets such as switches and level

[44] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

crossings is more prone to failures and requires more interventions, such as maintenance and renewal activities. Construction works can have an impact on punctuality as they can reduce the performance of the lines in the short term during the construction phase. The same principle applies with respect to the degree of utilisation. A network with a high degree of utilisation (expressed as train-kilometres per track-kilometre) experiences more wear and tear, operational conflicts, and train-affecting perturbations. Knock-on effects on punctuality increase with the level of utilisation. On the other side, higher utilisation implies that less error is accepted, and punctuality must be better. This means that the quality of the timetabling and of the infrastructure needs to be better. As shown in figure 15 this implies higher operational costs for infrastructure managers like SBB and ProRail. The need for more CAPEX is less clear as there are many other needs with high priority (e.g. renewal and safety requirements).

One should bear in mind that punctuality, however, results from a complex and long-term set of parameters; a meaningful analysis cannot be limited to one year.

Poor asset condition might also lead to a higher number of failures and increased repair time. Response times to failures and time needed to repair determine the infrastructure managers' capability to recover the assets availability and return to normal traffic operation. Condition of the rolling stock, which is a responsibility of the operator, as well as weather conditions, are factors that are perfectly independent from the infrastructure manager, but still do influence punctuality to a significant degree.

Freight total train punctuality (15:29 minutes)

Figures 47 and 48 show the punctuality of freight trains of PRIME members in a latest benchmark and over the time period 2016-2020.

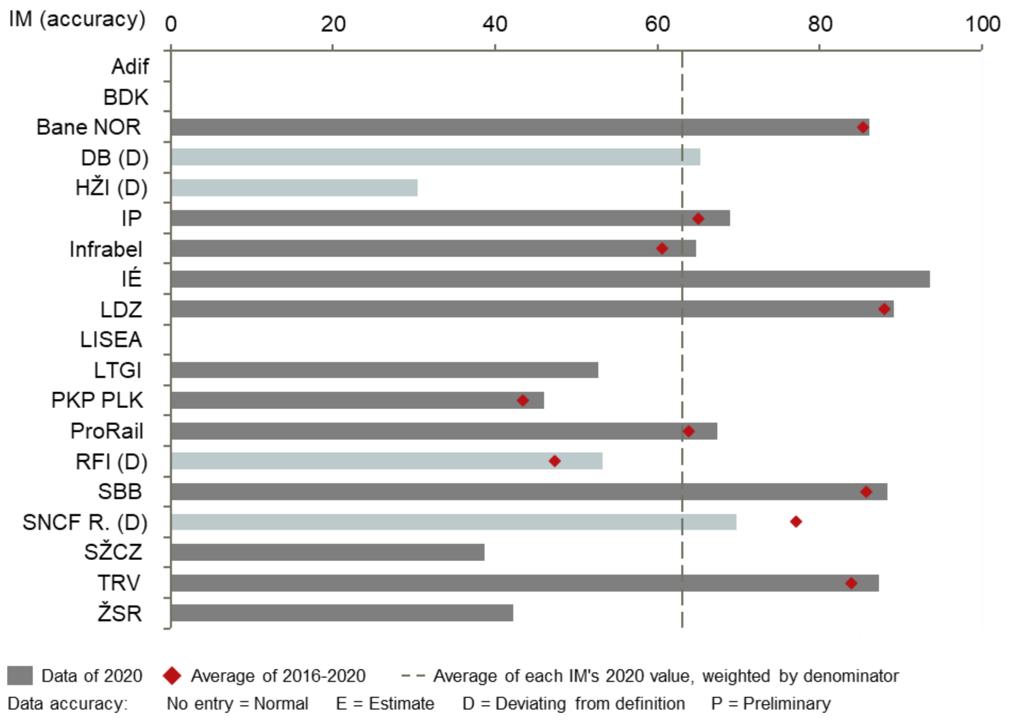

Figure 47: Freight trains total punctuality (15:29 minutes) (% of trains)[45]

In total four infrastructure managers deviate from the definition: these are marked in a lighter grey in the graph and the deviation are explained in the Annex 5.3. Compared to passenger train services, the percentage of freight trains on time is lower and ranges between 30% and 94%. The average punctuality for freight trains is 63% with a standard deviation of 25%. Especially with regard to the European Union's objective to boost freight transportation, these numbers are rather sobering. In order to become a true alternative for logistic companies, rail has to improve punctuality, reliability and flexibility.

[45] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

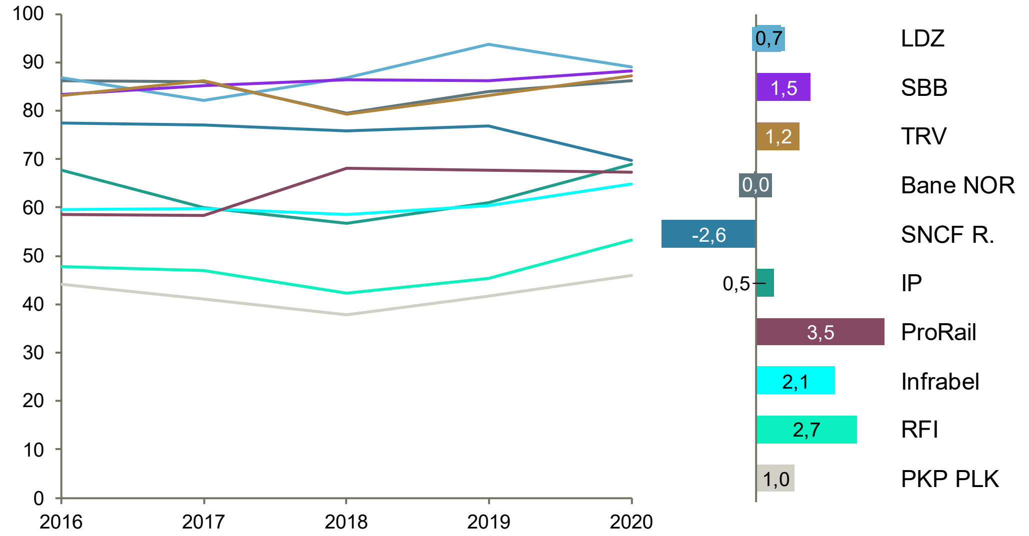

Figure 48: Freight trains total punctuality (15:29 minutes) (% of trains) and CAGR (%) in 2016-2020

Similarly to passenger train punctuality, freight train punctuality also increased in 2020. Seven out of ten infrastructure managers improved their punctuality rates from 2019. Apart from SNCF R. this is also true for the annual growth rates between 2016 and 2020.

Factors influencing punctuality of freight trains are similar to the ones described for passenger train services. In addition, freight train services run for a large part on international routes and over long distances, which makes them more vulnerable to disturbances. Another impact on punctuality in freight transport is caused by the fact that freight trains run mainly at night. Maintenance and minor renewal works are mainly carried out at night so as to not, or only slightly, affect passenger traffic, which is often prioritized. Due to this, freight trains may be affected more frequently, especially by short-term repair and maintenance work, with a negative impact on punctuality.

Delays caused by infrastructure managers

As illustrated before, punctuality depends on a wide array of different factors and has to be interpreted as a systemic result. Hence, the number of delay minutes accrued should be distinguished between those caused by the infrastructure managers and others. In general, only 20-30% of unpunctuality is caused by infrastructure managers.

Delay minutes caused by infrastructure manager

According to the PRIME KPI & Benchmarking subgroup delays caused by infrastructure managers can be allocated to one of these four categories: operational planning, infrastructure installations, civil engineering causes, causes of other infrastructure managers.

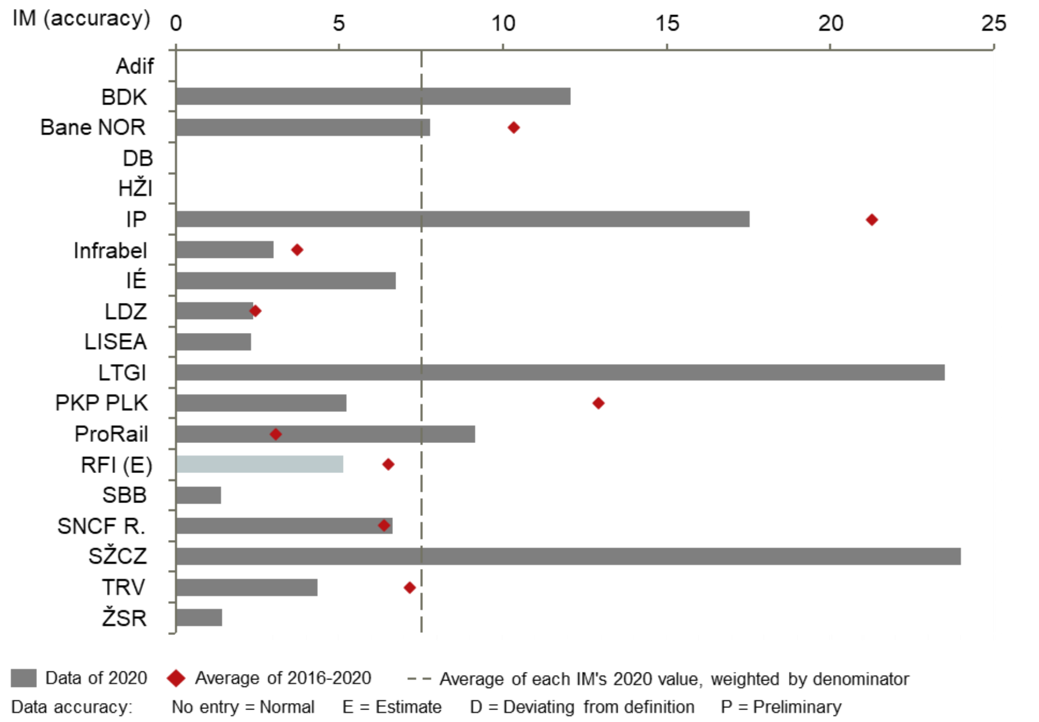

Figure 49: Delay minutes per train-km caused by the infrastructure manager (Minutes per thousand train-km) [46]

On average infrastructure managers caused 7 delay minutes per thousand train-kilometres, and their results vary between 1 and 24 minutes per thousand train-kilometres. Corresponding to their overall high passenger train punctuality shown in figure 45, SBB and LISEA have a significantly lower level of delay minutes caused by the infrastructure managers. IP's relatively high value can partly be explained by the restrictive cancellation policy of the Portuguese Rail system, and the way cancellations are treated in performance statistics according to which it is more acceptable to continue to delay a train rather than to cancel it. Furthermore, the current investment program in the Portuguese railway network in building, enhancing and renewing infrastructure will last until 2023, leading to further delays.

[46] Lighter colours indicate accuracy level deviating from normal (here estimated). Comments concerning the deviations can be found in the Annex 5.3.

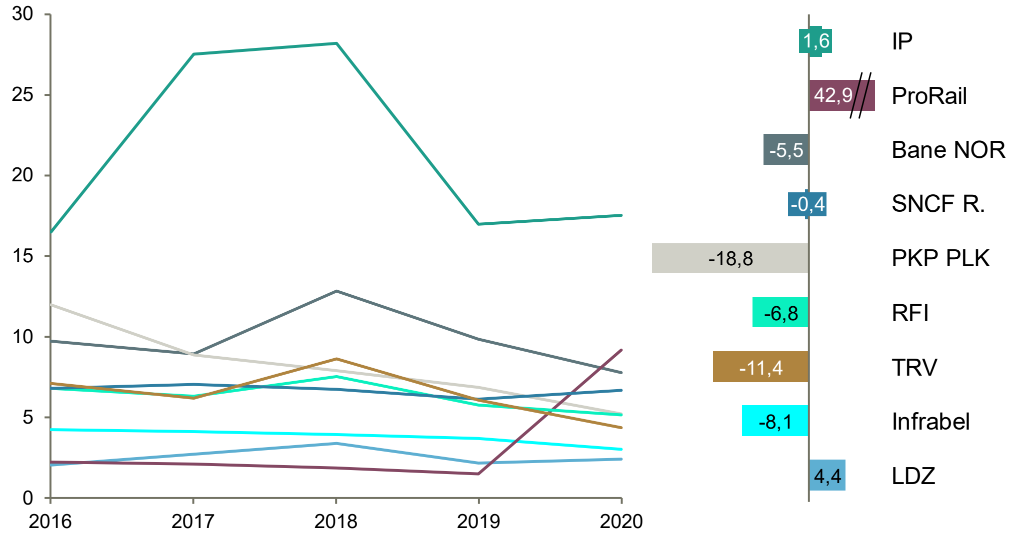

Figure 50: Delay minutes per train-km caused by the infrastructure manager (Minutes per thousand train-km) and CAGR (%) in 2016-2020

Regarding the delay minutes caused by infrastructure managers, the development is positive. The number of delay minutes per train-kilometre caused by the infrastructure manager underwent a decrease in almost all companies. PKP PLK has seen an average annual decrease in delay minutes of 19% over the period 2016-2020, from 12 in 2016 to 5 in 2020. This significant reduction is mainly the result of multi-billion euro investments in modernising railway infrastructure, for example replacing old CCS (Control-Command and Signalling) devices with new and more reliable ones, implementing and completing programs of replacement of turnouts like collision-free rail-road crossings, and construction of viaducts.

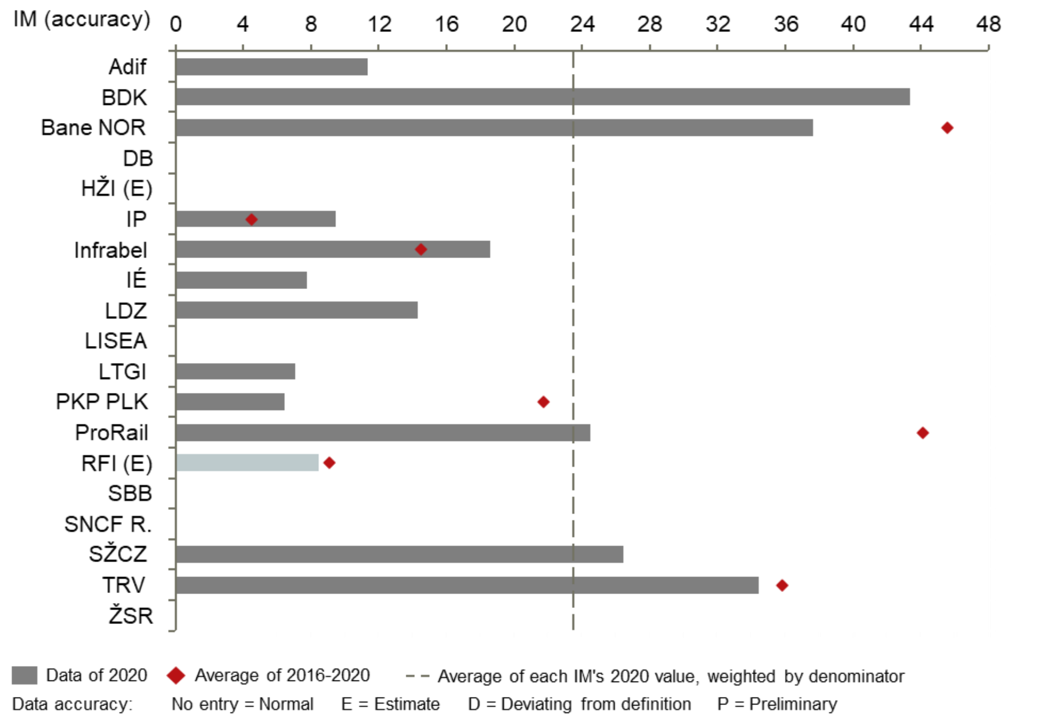

Figure 51: Passenger train cancellations caused by the infrastructure manager (% of scheduled and cancelled passenger trains) [47]

As illustrated in figure 51 the percentage of train cancellations caused by infrastructure managers varies widely, some showing levels well below the weighted average while others have significantly higher values. On average 23% of train cancellations were the infrastructure managers' responsibility; the standard deviation is 14%.

Besides different measuring concepts, cancellation policies vary between the infrastructure managers. Infrastructure managers apply different practices with regards to the number of trains cancelled and the way they are treated in performance statistics. Some infrastructure managers consider long delays above a fixed threshold as a cancellation while others do not have a fixed threshold and cancel trains according to the timetable reprogramming. Following a restrictive cancellation policy could make it more difficult to achieve punctuality goals.

[47] Lighter colours indicate accuracy level deviating from normal (here estimated). Comments concerning the deviations can be found in the Annex 5.3.

3.5.4 Reliability

Reliability reflects the probability that railway systems or components will perform a required function for a given time when used under stated operating conditions. It is measured by counting failures which are actually affecting train operations. Many elements of the infrastructure manager's asset management system are geared to improve asset reliability, including regular condition monitoring of assets, renewal programmes, as well as predictive and preventive maintenance concepts.

Development and benchmark

Figures 52 to 55 show the latest benchmark of the number of train-affecting asset failures between the infrastructure managers and its development over the time period of 2016-2020.

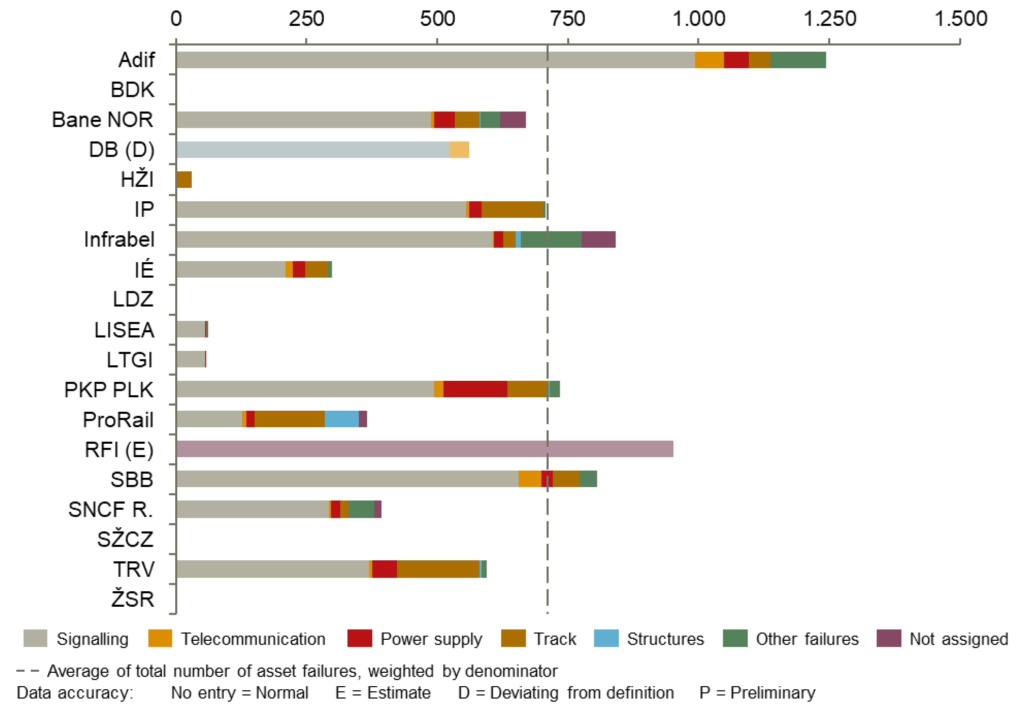

Figure 52: Asset failures in relation to network size (Number per thousand main track km)[48]

Figure 52 shows the level and the composition of asset failures that caused delays. On average 700 assets fail per thousand main track-kilometres per year. The failure frequency in the peer group varies between 58 and 1.240 fail-

[48] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

ures per thousand main track-kilometres. Signalling accounts for the majority of all asset failures. SBB's high level of signalling errors stems at least partially from a high block and therefore signal density and the pioneering use of ETCS. The track system is the second highest failing asset group. Failures of power supply and telecommunication assets are less common and, considering the overall number, the frequency of structural failures is negligible in most of the countries. The lighter grey colour of DB indicates deviating figures for signalling failures, the lighter yellow of DB for telecommunication failures, the lighter purple of RFI indicates estimated figures for asset failures and is not distinguished between the categories. In what sense these data are deviating is explained in Annex 5.3.

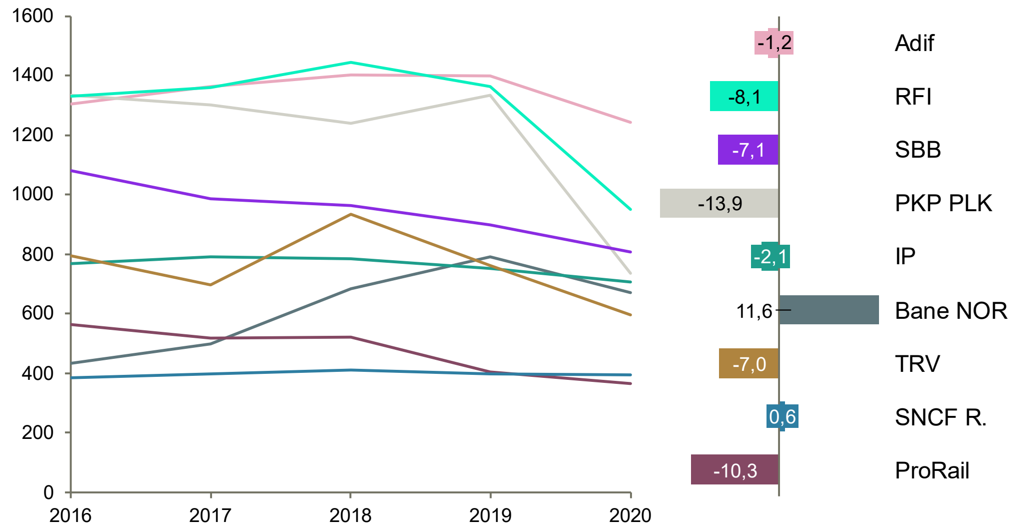

Figure 53: Asset failures in relation to network size (Number per thousand main track-km) and CAGR (%) in 2016-2020

The development of the number of failures per main track-kilometre is rather different in the peer group. Some infrastructure managers show a stable performance, while others are facing a higher fluctuation. In Bane NOR the relative number of asset failures increased from 430 in 2016 to 670 in 2020. This is mainly due to an increased registering of the number of signalling failures in 2018. However, as shown in figure 56, the impact of signalling failures on delays is comparatively low, which can party be the reason for the declining trend of Bane NOR's average delay minutes caused by asset failures shown in the next two figures. The declining trend of SBB is partly a success of the implementation of a so-called network status report (Netzzustandsberichte) of the Federal Office of Transport in 2015, which aims to provide comprehensive overview of the condition of the railway infrastructure in Switzerland and to monitor its development[49].

While asset failures have an impact on almost all performance indicators, such as finance, safety, punctuality and reliability, there are several factors which determine the frequency and dimension of asset failures. Complexity (electrification, switch density and signalling) naturally increases the chances of failures, and high utilisation accelerates wear and tear. The condition, age and renewal rate of assets is also decisive. However, asset failure also depends on a number of factors such as stage of development, historic elements and the budget of the infrastructure manager and the Member State concerned. Prevention policies, good maintenance/renewal management, and failure recording technologies might help to identify failing assets at an early stage and allow effective measures to be taken before consequences grow.

Geographical risks such as earthquakes, floods and landslides might cause severe damage, and extreme weather conditions such as extreme heat can cause rail buckling and broken rails. Infrastructure managers have to be prepared as extreme weather events, such as storms, rainfall and extreme temperature fluctuations are becoming increasingly common.

The magnitude of the impact of asset failures on delays and their development over the period is shown in figures 54 and 55.

[49] Bundesamt für Verkehr BAV Netzzustandsberichte (admin.ch)

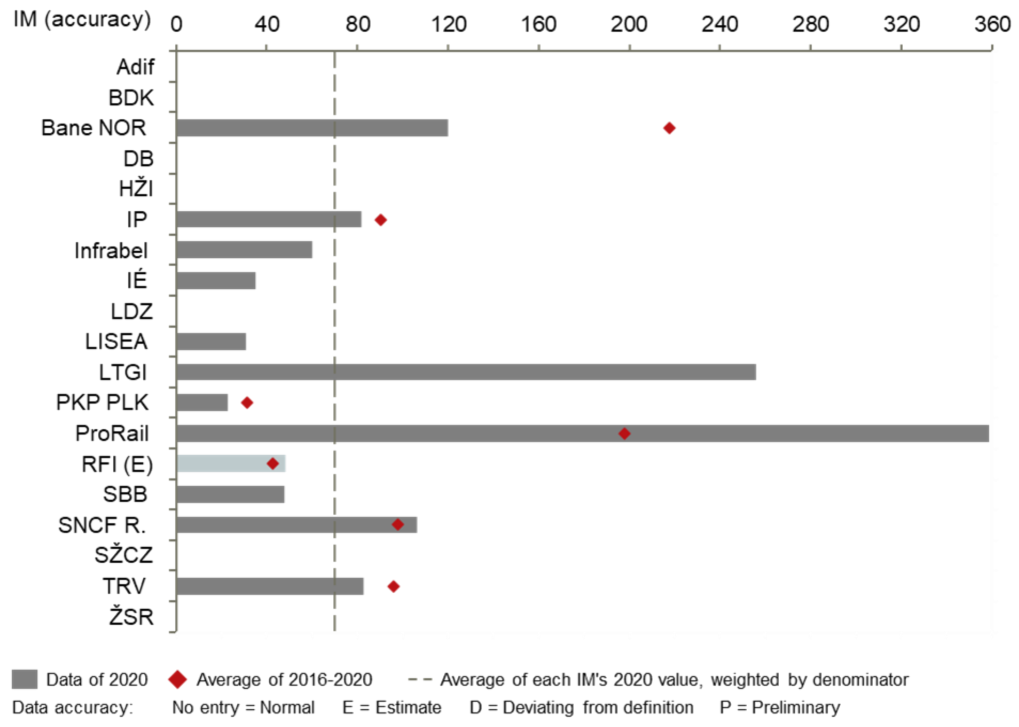

Figure 54: Average delay minutes per asset failure (Minutes per failure)[50]

On average asset failures cause a delay of 68 minutes and vary widely between 22 and 360 minutes per asset failure. The lowest level of delay minutes caused by asset failures are found at PKP PLK, LISEA and IÉ, where one asset failure causes on average a delay of below 40 minutes.

[50] Lighter colours indicate accuracy level deviating from normal. Comments concerning the deviations can be found in the Annex 5.3.

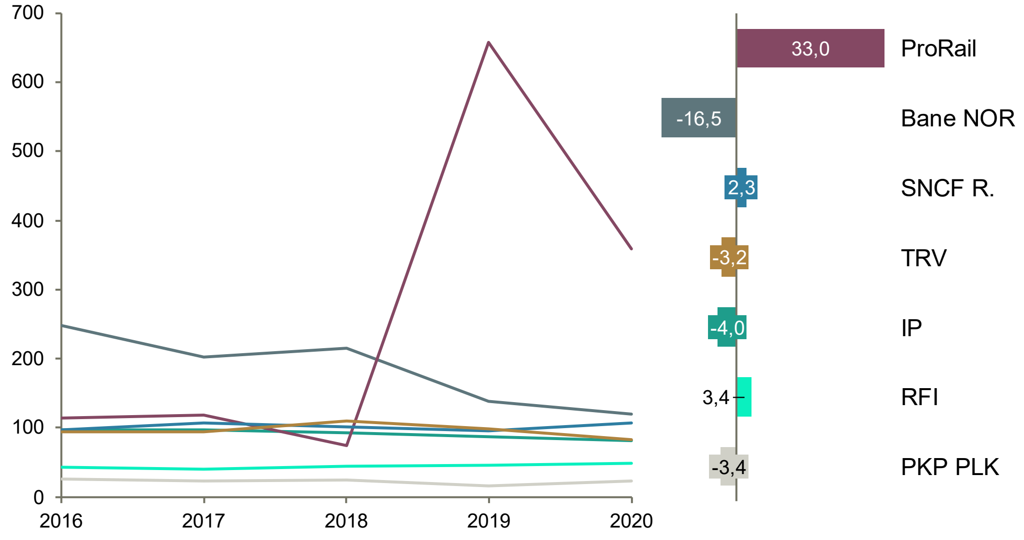

Figure 55: Average delay minutes per asset failure (Minutes per failure) and CAGR (%) in 2016-2020

Apart from ProRail's outliers in 2019 and 2020 and Bane NOR's constant decrease, the impact of asset failures on delay minutes remained relatively stable over the year. It is interesting to see that Bane NOR had the most significant decrease in delay minutes within the group, however it showed the highest increase in the frequency of asset failures (figure 53). This underlines the fact that the type of equipment failure plays a role, as well as the frequency of the failures and the infrastructure manager's response time to the problem.

The magnitude of delays caused by asset failures highly depends on the type of asset involved. By relating the frequency of individual asset failures to the delay minutes caused, the impact on punctuality becomes visible. Figure 61 shows this relationship.

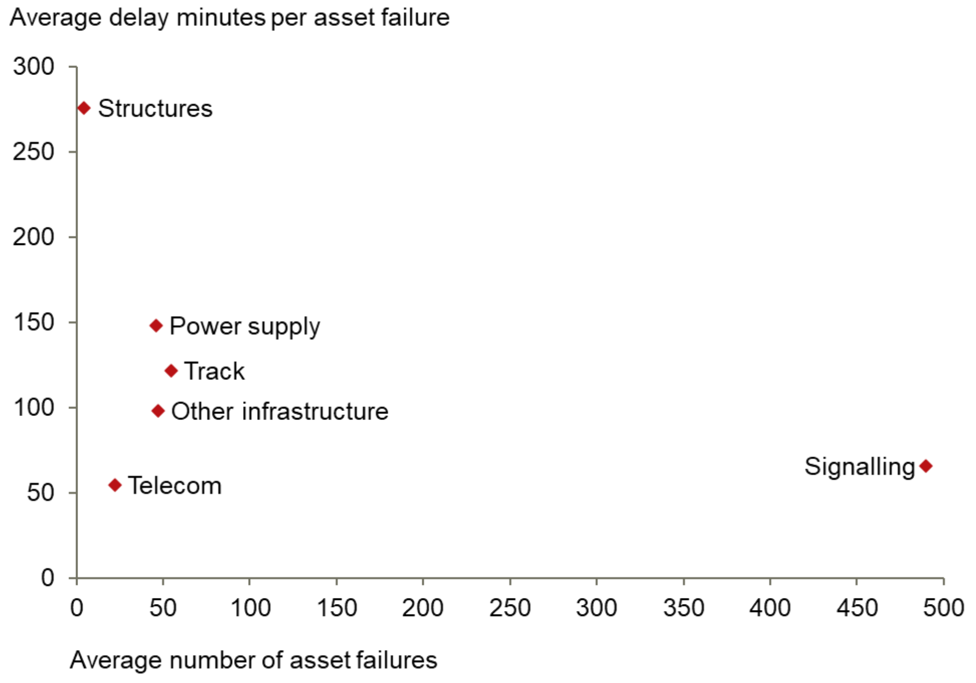

Figure 56: Delay per asset failure (Minutes per failure) / Asset failures (Number per thousand main track-km)[51]

In 2020 structure assets such as bridges and tunnels caused the highest number of delay minutes with more than 250 minutes per failure. Power supply failures were responsible for an average delay of 150 minutes per failure. Track failures and telecommunication failures caused on average 121 and 54 delay minutes respectively. The most frequent type of asset failures was related to signalling, with an average of almost 500 failures per thousand main track-kilometre, however they had a comparably low impact of 65 delay minutes per failure on average.

However, the type of asset failures is not the only driving factor. High utilisation increases knock-on effects. Particularly on very busy routes, one single disruption can cause several knock-on delays. The knock-on might affect the traffic on the route where the disruption happened, plus on any connecting tracks, resulting in secondary delays.

Having well-organised maintenance planning and good response times are important when it comes to managing failures. Efficient contingency plans, good communication with operators, and the ability to quickly alter timetables are essential for minimizing delays.

[51] Average indicates the weighted average within the peer group.

3.5.5 Availability

Availability of the infrastructure reflects the state of an asset and its usability for its intended purpose. As well as managing its assets in such a way as to minimise the effect of failures on the railway, availability indicators also measure the effectiveness and timeliness of the infrastructure manager in responding to these failures, and returning the network to normal function.

Temporary and permanent speed restrictions have an overall impact on the availability of railway infrastructure, and can lead to delays, breakdowns and longer travel times. Speed restrictions are imposed on the railway to ensure safe use of the infrastructure and are applied when track renewals or regular maintenance work are carried out. However, it is often important to relieve the infrastructure by reducing speed limits even before maintenance work is started.

Development and benchmark

Figures 57 to 58 show to what degree a network was affected by permanent or temporary speed restrictions. Due to incomplete time series, no trend line can be shown for these two indicators.

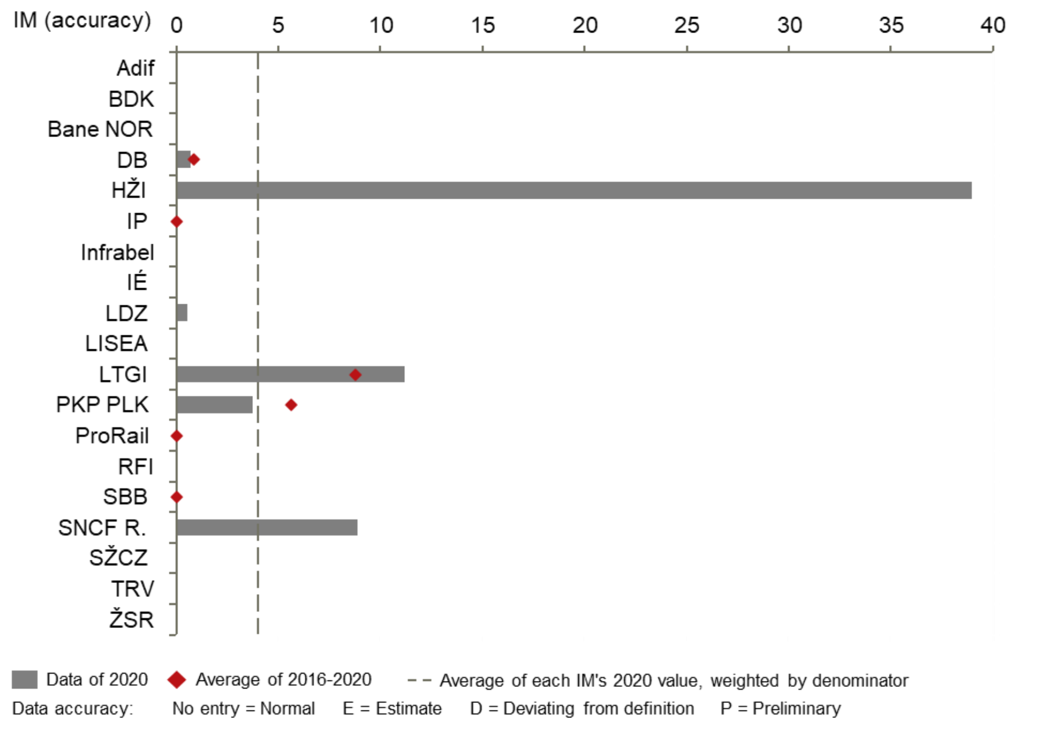

Figure 57: Tracks with permanent speed restrictions (% of main track-km)

Based on the definition, restrictions are defined as permanent if they are incorporated within the yearly timetable. The majority of infrastructure managers show a share of track with permanent speed restrictions below 1%, while others have 3% to 40% of their network under permanent speed restriction. On average 4% of the peer groups network faces a permanent speed restriction with a spread of 11%. For HŽI permanent speed restrictions are a consequence of the poor condition of local and regional lines. Some infrastructure managers do not count permanent speed restrictions at all, as they are included in the working timetable.

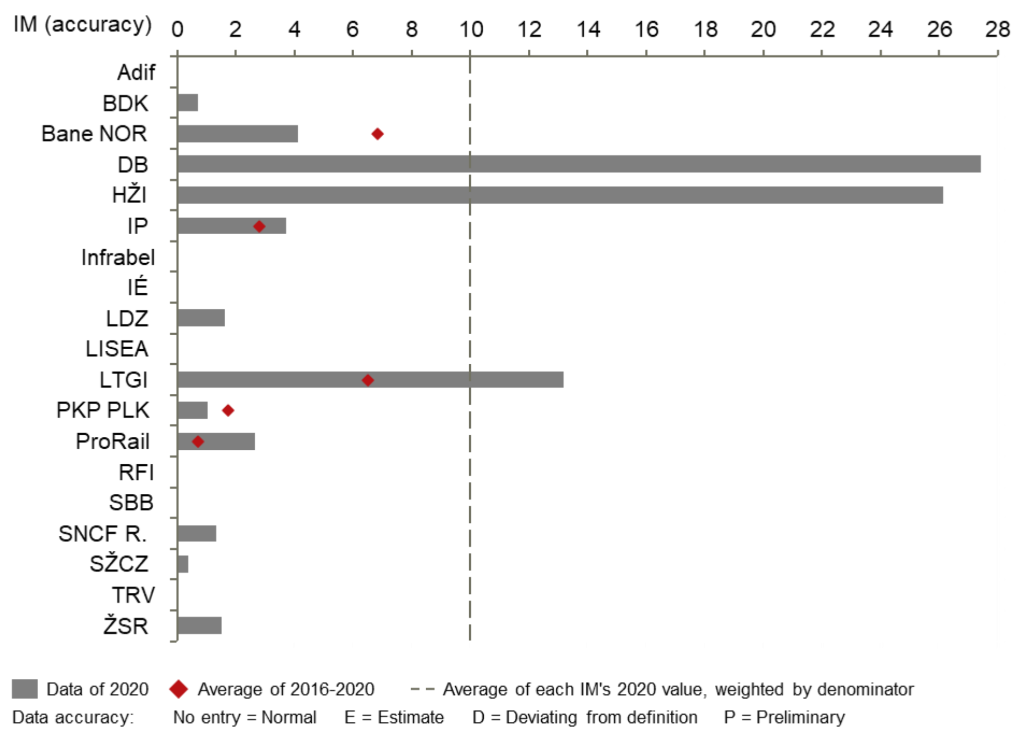

Figure 58: Tracks with temporary speed restrictions (% of main track-km)

Other than permanent speed restrictions, restrictions that occur during the year and are not included in the annual timetable are considered temporary. On average, 10% of the main track is unavailable due to temporary speed restrictions, which are typically caused by deteriorating conditions or necessary track works. While some infrastructure managers have hardly any temporary speed restrictions, DB and HŽI restrict speed on more than 25% of their networks. This causes a standard deviation of 9%. IP's temporary speed restrictions are mainly due to an investment program in the Portuguese railway network, building, enhancing and renewing infrastructure, which will last until 2023. The increase for ProRail is caused by the fact that small temporary restrictions caused by trespassers are also included.

Speed restrictions are usually set by the infrastructure manager in consultation with train operators. For how long speed restrictions last and whether the temporary ones become permanent depends on the funding agreements and budget of the infrastructure managers for maintenance and investments. It is also relevant how utilised the effected routes are, and whether there are branch lines that can be used during the maintenance works. Reducing speed in order to extend service life is sometimes the better option than interrupting a very active route for a longer period of time.

3.6 ERTMS deployment

3.6.1 Summary of ERTMS deployment

EU-wide objectives

- Digitalisation is one of the key pillars of the European Commission's Sustainable and Smart Mobility Strategy. It is an indispensable driver for the modernisation of the entire system, making it seamless and more efficient. In the rail sector ERTMS deployment plays a major role in this digital transformation.
- The main objectives of ERTMS are to increase safety, capacity and interoperability, harmonise automatic train control and communication systems throughout the European rail network, and act as the building block for the digitalisation of the rail network.
- The technical details of ERTMS are laid down in the CCS TSI (Control-Command and Signalling Technical Specification for Interoperability). The European Union Agency for Railways (ERA) is the ERTMS System Authority responsible for ensuring interoperable deployment as defined in the Fourth Railway Package.
- Based on the revised TEN-T Regulation from December 2021, the TENT-T network shall be gradually completed in three steps: 2030 for the core network, 2040 for the extended core network and 2050 for the comprehensive network. The core and extended core network together form the European Transport Corridors which are the most strategic part of the network with highest EU added value.

Peer group's performance

- ERTMS deployment is highly heterogonous in the peer group.
- ERTMS is deployed on about 9% of all tracks of the peer group's railway network

EU-wide objectives
› Across the peer group ERTMS is expected to be implemented in about 38% of the railway network by 2030.   › ATP coverage is included as a new indicator for the first time and has an average of 52%

3.6.2 Development and benchmark of ERTMS and ATP

In the rail sector ERTMS deployment plays a major role in this digital transformation. ERTMS deployment is a significant investment but is crucial for infrastructure managers, as expected benefits of ERTMS deployment are significant, including increased safety, capacity, availability, and interoperability.

ERTMS and ATP indicators

PRIME members are reporting two indicators measuring ERTMS deployment:

- ERTMS track-side deployment
- Planned extent of ERTMS deployment by 2030
- ATP coverage

In order to increase comparability of these values among infrastructure managers, these values are related to main track-kilometres.

Development and benchmark

Figures 59 and 60 show the level of ERTMS track-side deployment and the planned extent of ERTMS deployment by 2030.

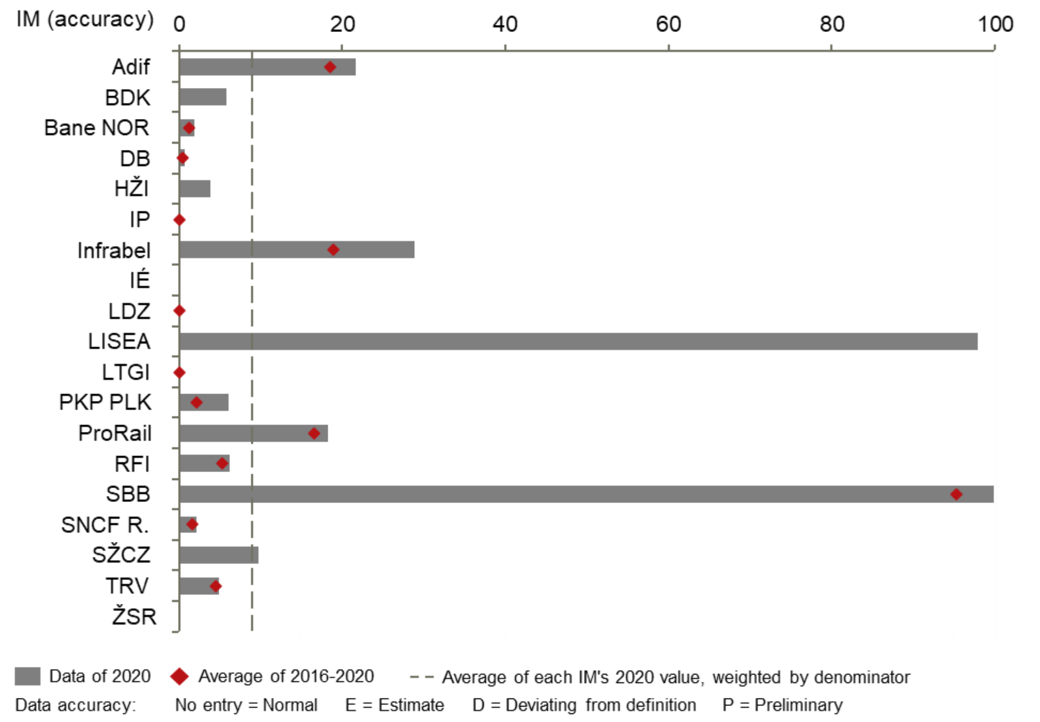

Figure 59: ERTMS track-side deployment (% of main track-km)

ERTMS is deployed on about 9% of all tracks of the peer group's railway network. The infrastructure managers' implementation strategies are heterogeneous, which is reflected by there being no ERTMS deployment in some countries vs. a high share in others of more than 90%. Some infrastructure managers have different traffic management systems, for example LTGI's isolated network which does not require ERTMS deployment. Ireland, too, does not have to implement ERTMS as it does not have a border with another EU-country, however it has started to deploy a new management control system which is a combination of other systems.

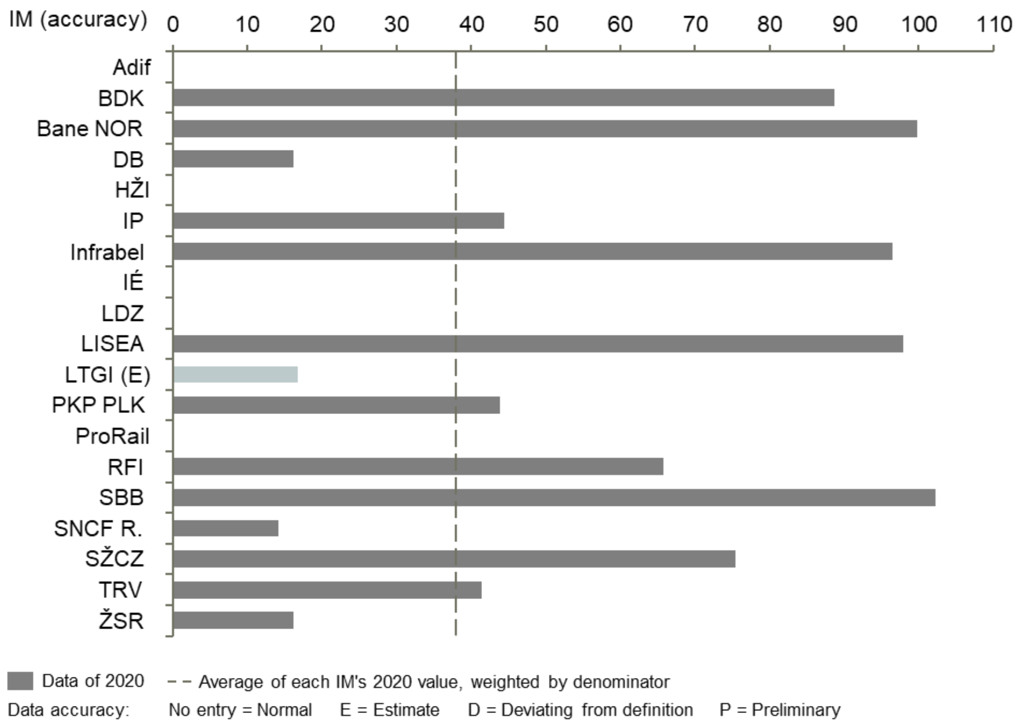

Figure 60: Planned extent of ERTMS deployment by 2030 (% of current main track-km)[52]

By 2030, ERTMS is expected to cover about 35% of the peer group's railway network. For SBB the value is higher than 100%, as the future network will be larger than the current network and both are and will be entirely equipped with ERTMS. For BDK the value is not quite 100% since the Copenhagen S-bane will be equipped with a similar system called CBTC instead of ERTMS. It is important to note that considering the EU objective on ERTMS deployment, this indicator does not show the full picture, as it refers to the ERTMS deployment of the total main network and not only the TEN-T lines. It is also important to note that the numerator of this KPI (planned ERTMS deployment by 2030) refers to 2030 while the denominator (total main-track km) refers to 2020. If the whole network is planned to be equipped with ECTS by 2030, but will shrink between 2020 and 2030, the KPI is less than 100% even though ERTMS will be deployed on the whole network.

[52] Lighter colours indicate estimated data.

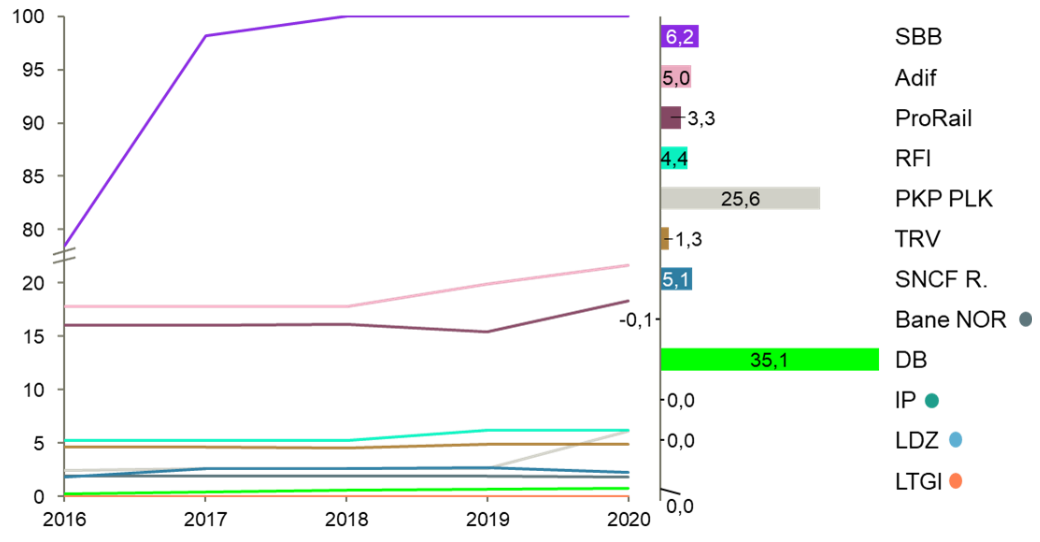

Figure 61: ERTMS track-side deployment (% of main track-km) and CAGR (%) in 2016-2020

The development of ERTMS deployment is visualised in figure 61. The most significant increase can be seen in DB and PKP PLK, which more than doubled their ERTMS-equipped main lines between 2016 and 2020. Adif increased the level of ERTMS equipped lines from 18% in 2016 to almost 22% in 2020. PKP PLK's increase was mainly due to the ETCS Level 2 system on the Warszawa - Gdynia section of the E 65 route being put into operation in 2020.

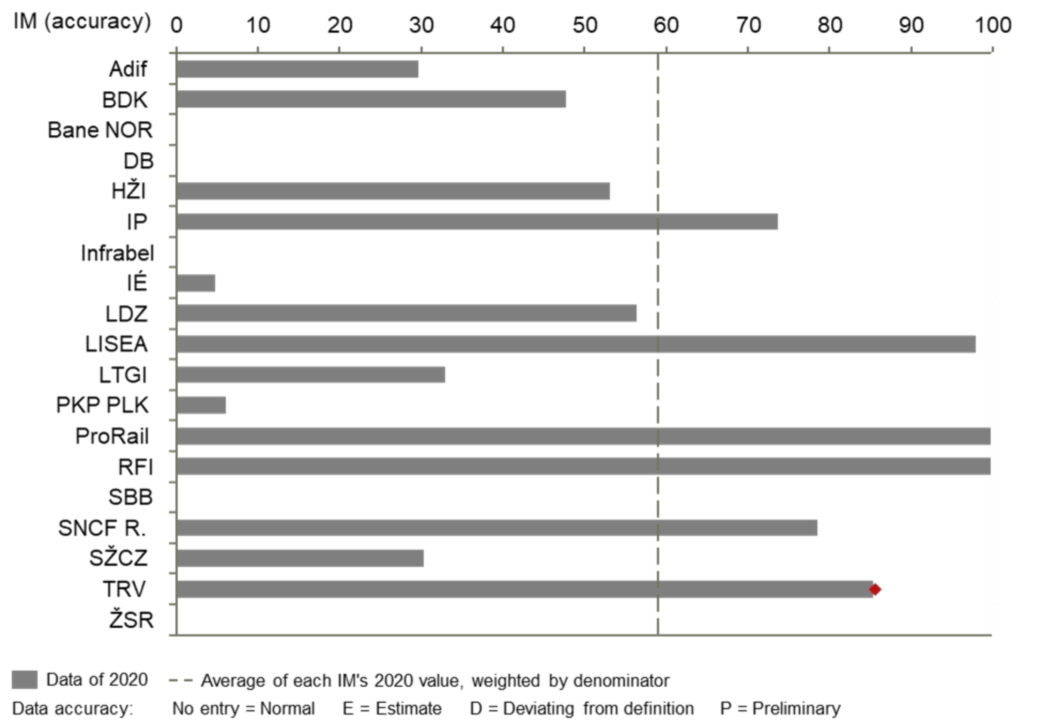

Figure 62: ATP coverage (% of main track-km)

ATP coverage is a new indicator in the benchmarking report. The train protection scheme aims to support infrastructure managers in achieving the vision zero approach to eliminating transport-related fatalities in the European Union and includes ETCS, ATB, LZB, CBTC and similar systems. ATP coverage is highly diverse within the peer group. ProRail has 100% of its network equipped with ATP, while coverage in IÉ and PKP PLK remains below 10%. The peer group average is 59% and has a standard deviation of 34%.

Despite the fact that the European vision of the deployment of ERTMS is clearly formulated, the speed and commitment of uptake depend on a variety of factors, including the stage of a railway's development, past and present priorities, funding agreements and the level of the budget for investment. Network size and complexity (number of stations and hubs), adaptability to the existing infrastructure, technical equipment and asset condition are other aspects that might influence the timeline for deployment of ERTMS. Difficulties in coordinating with operators, who have to equip their fleet with ERTMS on-board systems, increase the burden of deployment.

4. Outlook

The outbreak of Covid-19 has created an unprecedented situation that has profoundly impacted the railway sector. While the pandemic has seen governments reaffirming that rail is an essential service, leading most countries to maintain a minimum service level, measures such as lockdowns and the closing of borders have significantly reduced people movement in 2020.

This PRIME report is the first report that presents data generated during the pandemic. This report features data from 2016 onwards, giving us the possibility to assess 2020 against the backdrop of long-term trends. Several developments that were registered in 2020 stand out from the trends of previous years. The most notable one is the sharp decline in train utilisation, both passenger and freight train.

This development markedly contrasts with the ambitions that were set forth in the European Green Deal and in the EU Smart and Sustainable Mobility Strategy. While 2020 saw railway traffic decline, the tremendous importance of railways in making the European Union the first carbon neutral region in the world by 2050 was reaffirmed. Railways are called on to become the backbone of the mobility strategy in the green deal. How Covid-19 interferes in this goal and how railways will overcome the short- and long-term adverse effects of the pandemic remains yet to be fully understood.

Both climate change and the Covid-19 pandemic are global crises calling for global responses. With its 24 benchmarking members, the KPI and benchmarking PRIME subgroup creates a space for European infrastructure managers to come together, to cooperate and to benefit from each other's knowledge and experience.

Never have so many infrastructure managers taken part in the public PRIME report, and the PRIME KPI and benchmarking subgroup is still growing. ÖBB and CFL joined the working group in 2020 and are currently in transition. ŽSR completed the transition phase and joined the public report for the first time this year. We hope that further members will complete the transition phase and become regular members taking part in this public benchmarking report next year.

5. Annex

5.1 Key influencing factors of participating infrastructure managers

Operating context

Infrastructure managers are operating in different countries under different geographic and political circumstances. Understanding the influencing factors and contextualising the indicators with them is essential for the correct interpretation of the values.

Influencing factors can be grouped in the following seven categories, which are illustrated below. The impacts of these factors on the performance of infrastructure managers are very different: some lead to increasing costs, some have an impact on punctuality or safety.

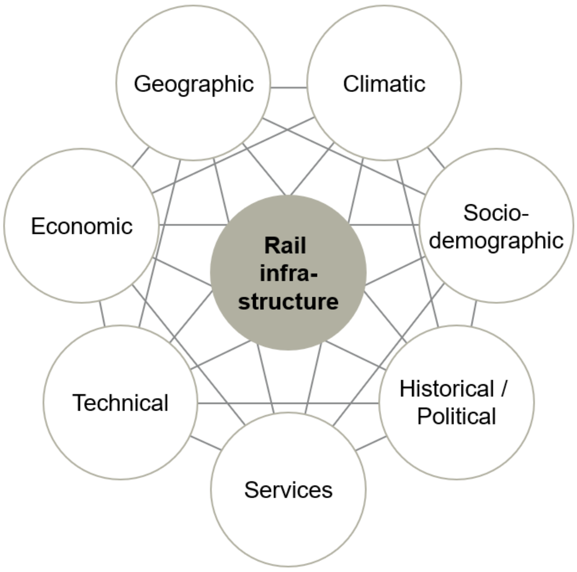

Figure 63: Factors influencing the outcome of rail infrastructure

Geographic

The geography and topography of a country determines its rail network from the moment of its construction, to its maintenance and renewals. The size of the country, its population density and distribution, and the locations of its economic and cultural centres are all influencing factors, above all for the length of the network. The range of sizes of the countries included in this report lies between 41,000 and 633,000 km² for Switzerland and France respectively (overseas territories included). The topography determines the shape and complexity of the network: mountainous regions hinder long, straight lines and generally require more sophisticated rail structures such as bridges and tunnels. The expansion of the network is technically more complex and therefore entails higher investment costs. Furthermore, maintenance costs are higher in mountainous regions as wear and tear is more frequent and repairs are carried out under more difficult conditions. Rail infrastructure in regions of seismic activity is highly exposed to damage caused by earthquakes and seismic waves. Countries with highly complex topographical conditions include Switzerland, Spain, Norway, and Italy.

Climatic

Conditions of climate are also important and have an impact on asset failures, reliability and punctuality that can increase maintenance and renewal costs. In countries with very hard winters such as Scandinavia and the Baltic, very low temperatures might cause broken rails, switch malfunctions, and snowdrifts. Besides normal latitude-related climate conditions, the increasing number of extreme weather events due to climate change has additional impacts. Heavy storms damage tall infrastructure (mileposts, signals), and overturned trees cause delays, failures and speed restrictions[53]. Increased global temperature is leading to hotter and drier summers, which favour buckling in railway tracks and increase the risk of forest fires.

Socio-demographic

Population size, population density and population distribution within a country shape rail infrastructure. In small countries with a high population density, rail utilisation is higher, allowing for higher economies of scale than in sparsely populated areas. This is visible in the Netherlands with its highly utilised and polycentric urban network. In other countries, for example in Spain and the Scandinavian states, population density varies between densely populated metropolitan areas and the sparsely populated countryside. Age distribution, mobility patterns and environmental awareness of citizens are additional parameters that are influencing the share of rail in the modal split – with possible consequences on funding and extension plans. Beyond national circumstances, international links are also a decisive driver: In transit countries such as Belgium, the Netherlands, Germany and Switzerland, transit also accounts for a consid-

[53] UIC, 2017: Rail Adapt - Adapting the railway for the future.

erable proportion of network usage. Six of the eleven Rail Freight Corridors run through Germany. In Switzerland, transit traffic has been a major support factor for a railway-friendly policy among the population and politicians.

Political and historical

Even though infrastructure managers are independent entities, output parameters of rail infrastructure, like rail transport volumes, are partly politically influenced and investment decisions heavily depend on the availability and regularity of state funding. The status of rail in a country and the commitment of politicians is therefore very relevant, and also historically shaped.

Traditional heavy industry, with heavy and bulky transport goods such as coal, sand, steel and wood partly explain the high share of rail freight in today's Eastern European EU Member States.

Services

The main services offered by railway undertakings on the infrastructure manager's networks are conventional passenger trains over different distances, freight trains and high-speed connections. The different rail services also have an impact on the infrastructure: a high share of freight transport causes higher wear and tear due to the weight of the freight and requires higher maintenance costs. The nature of high-speed train services is not uniform among infrastructure managers. In Germany, for example, high speed connections mostly run on the same routes as lower speed passenger transport and even freight traffic. If a manager's network consists exclusively of high-speed lines between metropolitan areas, it naturally has other OPEX and CAPEX values and other punctuality and reliability values than a mixed transport network.

Technological

The technical and technological level and state of development of railway network infrastructures varies considerably throughout the EU. When comparing modernisation and roll-out of technological innovations, different starting points and investment cycles have to be considered. The new EU member states mainly started with technological modernisation from the 1990s, getting a bigger boost with the entitlement to EU-funding after their accession. Modern technology helps railways to achieve higher safety performance, minimize their impact on the environment and also become more cost efficient. It is therefore in the interest of every infrastructure manager to be equipped with state-of-the-art rail technologies. EU rail policy promotes the incorporation of such technologies to contribute to the achievement of EU rail policy objectives, including facilitating cross-border transport. The introduction of ERTMS is a prominent example.

Economic

Economic circumstances within a country influence the operation of infrastructure managers both directly and indirectly. A country's GDP, its economic power and connectivity all have a positive impact on passenger and freight transport demand[54]. Market structure and the combination of public funding, track access charges and commercial infrastructure funding determines the financing pool available to infrastructure managers.

The amount and continuity of available revenues determines the infrastructure manager's investment possibilities and maintenance performance. In Switzerland for example rail projects are decided for several decades and are independent of politically influenced budgets of a current government. Furthermore, growing state funds and eligibility of European funds (e. g. cohesion fund) are important factors. Czechia for example receives an investment of over €160 million for 2021 from the EU's Cohesion Fund to modernise its rail transport.[55]

[54] Passenger and freight transport demand in the EU: https://www.eea.europa.eu/data-and-maps/indicators/passenger-and-freight-transport-demand/assessment-1

[55] EC: EU Cohesion policy: €160 million to modernise the rail transport in Czechia. https://ec.europa.eu/regional_policy/en/newsroom/news/2021/01/01-11-2021-eu-cohesion-policy-eur160-million-to-modernise-the-rail-transport-in-czechia

5.2 Fact sheets of the infrastructure managers

adif

Other characteristics[3]

- Large areas are sparsely populated
- Complex orography (2nd most mountainous country in Europe)
- High quality road network

		Bandwidth of sample		
		Low	Medium	High
Area	k km²			506
Border countries	number		5	
Population	millions		47	
GDP per capita	%, EU 28=100	86		
Active licenses[1]	number	40		
National modal share passenger rail[4]	%		7	
National modal share rail freight[4]	%	5		
International passenger-km[1]	%	2		
International tonne-km[1]	%	15		
Length of national main lines	km		15.893	
National passenger stations	number	1.502		
Share of national network managed[2]	%			100
Length of high-speed lines	km			2.923
Length of main track	km		21.481	
Full time employees	fte	10.968		
Passenger train-kilometres	m train-km	125		
Freight train-kilometres	m train-km	23		
Total gross tonne-kilometres	bn gtkm		58	
Grants total	bn EUR		2	

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 64: Fact sheet Adif

BANE NOR

Other characteristics[3]

- Greatest length of any European country with many fjords
- Two-thirds of Norway is mountainous
- Warm summers and cold, snowy winters

		Bandwidth of sample		
		Low	Medium	High
Area[4]	k km²		385	
Border countries	number	3		
Population	millions	5		
GDP per capita	%, EU 28=100		142	
Active licenses[1]	number	7		
National modal share passenger rail[5]	%	5		
National modal share rail freight[5]	%	15		
International passenger-km[1]	%	1		
International tonne-km[1]	%	32		
Length of national main lines	km	4.134		
National passenger stations	number	334		
Share of national network managed[2]	%			100
Length of high-speed lines	km	0		
Length of main track	km	4.147		
Full time employees	fte	3.426		
Passenger train-kilometres	m train-km	36		
Freight train-kilometres	m train-km	8		
Total gross tonne-kilometres	bn gtkm	17		
Grants total	bn EUR	1		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) Overseas territories included
5) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 65: Fact sheet: Bane NOR[56]

[56] Grants total are normalised for purchasing power parity

BANEDANMARK

Other characteristics[3]

- Area and population excludes: Faroe Islands & Greenland
- BDK as an IM is separated from RUs

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	43		
Border countries	number	1		
Population	millions	6		
GDP per capita	%, EU 28=100		136	
Active licenses[1]	number	8		
National modal share passenger rail[4]	%		8	
National modal share rail freight[4]	%	12		
International passenger-km[1]	%	7		
International tonne-km[1]	%			94
Length of national main lines	km	2.519		
National passenger stations	number	452		
Share of national network managed[2]	%		78	
Length of high-speed lines	km	57		
Length of main track	km	3.192		
Full time employees	fte	2.367		
Passenger train-kilometres	m train-km	61		
Freight train-kilometres	m train-km	3		
Total gross tonne-kilometres	bn gtkm	17		
Grants total	bn EUR	1		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 66: Fact sheet: Banedanmark[57]

DB NETZE

Other characteristics[3]

- Rail network large & No. of RUs very high
- Capacity has reached its limits
- Transit: six out of nine Rail Freight Corridors
- Rail noise - public issue

		Bandwidth of sample		
		Low	Medium	High
Area	k km²		357	
Border countries	number			9
Population	millions			83
GDP per capita	%, EU 28=100	121		
Active licenses[1]	number			434
National modal share passenger rail[4]	%		9	
National modal share rail freight[4]	%	19		
International passenger-km[1]	%	6		
International tonne-km[1]	%		42	
Length of national main lines	km			39.299
National passenger stations	number			7.033
Share of national network managed[2]	%		85	
Length of high-speed lines	km			2.663
Length of main track	km			55.354
Full time employees	fte			50.330
Passenger train-kilometres	m train-km			794
Freight train-kilometres	m train-km			223
Total gross tonne-kilometres	bn gtkm			
Grants total	bn EUR			6

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 67: Fact sheet: DB Netz AG[58]

57 Grants total are normalised for purchasing power parity
58 Grants total are normalised for purchasing power parity

HŽ INFRASTRUKTURA

Other characteristics[3)]

- High quality of motorway network
- High amount of single tracks
- 25 kV AC overhead line
- Normal track gauge

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	◆ 57		
Border countries	number		◆ 5	
Population	millions	◆ 4		
GDP per capita	%, EU 28=100	◆ 64		
Active licenses[1)]	number	◆ 9		
National modal share passenger rail[4)]	%	◆ 2		
National modal share rail freight[4)]	%	◆ 23		
International passenger-km[1)]	%	◆ 4		
International tonne-km[1)]	%			◆ 68
Length of national main lines	km	◆ 2.605		
National passenger stations	number	◆ 546		
Share of national network managed[2)]	%			100 ◆
Length of high-speed lines	km	◆ 0		
Length of main track	km	◆ 2.709		
Full time employees	fte	◆ 4.888		
Passenger train-kilometres	m train-km	◆ 13		
Freight train-kilometres	m train-km	◆ 7		
Total gross tonne-kilometres	bn gtkm	◆ 8		
Grants total	bn EUR	◆ 0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 68: Fact sheet: HŽ Infrastruktura d.o.o. [59]

Iarnród Éireann Irish Rail

Other characteristics[3)]

- 1.600 mm broad gauge Railway.
- Rail Freight market limited by the size of the country and the relatively short distances travelled.

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	◆ 70		
Border countries	number	◆ 1		
Population	millions	◆ 5		
GDP per capita	%, EU 28=100			◆ 211
Active licenses[1)]	number	◆ 2		
National modal share passenger rail[4)]	%	◆ 3		
National modal share rail freight[4)]	%	◆ 1		
International passenger-km[1)]	%	◆ 4		
International tonne-km[1)]	%	◆ 0		
Length of national main lines	km	◆ 2.045		
National passenger stations	number	◆ 145		
Share of national network managed[2)]	%			100 ◆
Length of high-speed lines	km	◆ 0		
Length of main track	km	◆ 2.165		
Full time employees	fte	◆ 1.738		
Passenger train-kilometres	m train-km	◆ 15		
Freight train-kilometres	m train-km	◆ 0		
Total gross tonne-kilometres	bn gtkm	◆ 5		
Grants total	bn EUR	◆ 0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 69: Fact sheet: Iarnród Éireann – Irish Rail[60]

59 Grants total are normalised for purchasing power parity
60 Grants total are normalised for purchasing power parity

Infraestruturas de Portugal

Other characteristics[3)]

- IP manages the Portuguese rail and road infrastructure
- Iberian gauge, 25kV AC overhead line
- Pop.(mainland) 9,7m
- Area (mainland) 89 k

		Bandwidth of sample: Low	Medium	High
Area	k km²	92		
Border countries	number	1		
Population	millions	10		
GDP per capita	%, EU 28=100	77		
Active licenses[1)]	number	10		
National modal share passenger rail[4)]	%	5		
National modal share rail freight[4)]	%	13		
International passenger-km[1)]	%	3		
International tonne-km[1)]	%	24		
Length of national main lines	km	2.526		
National passenger stations	number	430		
Share of national network managed[2)]	%			100
Length of high-speed lines	km	0		
Length of main track	km	3.224		
Full time employees	fte	3.563		
Passenger train-kilometres	m train-km	22		
Freight train-kilometres	m train-km	4		
Total gross tonne-kilometres	bn gtkm	7		
Grants total	bn EUR	0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 70: Fact sheet: Infraestruturas de Portugal S.A. [61]

INFRABEL Right On Track

Other characteristics[3)]

- High population density
- High speed lines to surrounding European countries
- High degree of electrification

		Bandwidth of sample: Low	Medium	High
Area	k km²	31		
Border countries	number		4	
Population	millions	12		
GDP per capita	%, EU 28=100	117		
Active licenses[1)]	number	10		
National modal share passenger rail[4)]	%		8	
National modal share rail freight[4)]	%	12		
International passenger-km[1)]	%		16	
International tonne-km[1)]	%		41	
Length of national main lines	km	3.602		
National passenger stations	number	554		
Share of national network managed[2)]	%			100
Length of high-speed lines	km	211		
Length of main track	km	6.532		
Full time employees	fte	9.955		
Passenger train-kilometres	m train-km	77		
Freight train-kilometres	m train-km	10		
Total gross tonne-kilometres	bn gtkm			
Grants total	bn EUR	1		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 71: Fact sheet: Infrabel

61 Grants total are normalised for purchasing power parity

Other characteristics[3]

- By regional passenger trains to sandy beach, seaside pine forest, national park
- Narrow-gauge railway for tourists

		Low	Medium	High
Area	k km²	65		
Border countries	number		4	
Population	millions	2		
GDP per capita	%, EU 28=100	72		
Active licenses[1]	number	6		
National modal share passenger rail[4]	%	4		
National modal share rail freight[4]	%			74
International passenger-km[1]	%	6		
International tonne-km[1]	%			98
Length of national main lines	km	1.860		
National passenger stations	number	143		
Share of national network managed[2]	%			100
Length of high-speed lines	km	0		
Length of main track	km	2.216		
Full time employees	fte	3.650		
Passenger train-kilometres	m train-km	6		
Freight train-kilometres	m train-km	5		
Total gross tonne-kilometres	bn gtkm	16		
Grants total	bn EUR	0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 72: Fact sheet: Latvijas dzelzceļš[62]

Other characteristics[3]

- Connection between 1435 and 1520 tracks
- Connection with Klaipėda seaport
- High amount of single tracks

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	65		
Border countries	number		4	
Population	millions	3		
GDP per capita	%, EU 28=100	87		
Active licenses[1]	number	11		
National modal share passenger rail[4]	%	1		
National modal share rail freight[4]	%			67
International passenger-km[1]	%			28
International tonne-km[1]	%			78
Length of national main lines	km	1.911		
National passenger stations	number	136		
Share of national network managed[2]	%			100
Length of high-speed lines	km	0		
Length of main track	km	2.346		
Full time employees	fte	3.178		
Passenger train-kilometres	m train-km	6		
Freight train-kilometres	m train-km	10		
Total gross tonne-kilometres	bn gtkm	30		
Grants total	bn EUR	0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 73: Fact sheet: AB LTG Infra[63]

62 Grants total are normalised for purchasing power parity
63 Former Lietuvos geležinkeliai and grants are normalised for purchasing power parity

Indicator	Unit	Bandwidth of sample: Low	Medium	High
Area[4]	k km²			633
Border countries	number			8
Population	millions			67
GDP per capita	%, EU 28=100	103		
Active licenses[1]	number	27		
National modal share passenger rail[5]	%		10	
National modal share rail freight[5]	%	10		
International passenger-km[1]	%		10	
International tonne-km[1]	%		37	
Length of national main lines	km			27.594
National passenger stations	number		2.966	
Share of national network managed[2]	%			
Length of high-speed lines	km	669		
Length of main track	km	669		
Full time employees	fte	31		
Passenger train-kilometres	m train-km	5		
Freight train-kilometres	m train-km	0		
Total gross tonne-kilometres	bn gtkm	3		
Grants total	bn EUR	0		

Other characteristics[3]
- Only HSL
- PPP contract
- Touristic destination

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) Overseas territories included
5) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 74: Fact sheet: LISEA[64]

Indicator	Unit	Bandwidth of sample: Low	Medium	High
Area	k km²		313	
Border countries	number			7
Population	millions		38	
GDP per capita	%, EU 28=100	76		
Active licenses[1]	number	113		
National modal share passenger rail[4]	%	7		
National modal share rail freight[4]	%	24		
International passenger-km[1]	%	4		
International tonne-km[1]	%		39	
Length of national main lines	km		18.536	
National passenger stations	number		2.774	
Share of national network managed[2]	%			96
Length of high-speed lines	km	248		
Length of main track	km		27.297	
Full time employees	fte			38.834
Passenger train-kilometres	m train-km	157		
Freight train-kilometres	m train-km	75		
Total gross tonne-kilometres	bn gtkm			142
Grants total	bn EUR			

Other characteristics[3]
- 3rd largest railway network in the EU
- Standard rail gauge
- 6th in the EU in terms of country coverage and population
- 3kV traction voltage

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 75: Fact sheet: PKP PLK [65]

64 Grants total are normalised for purchasing power parity
65 Grants total are normalised for purchasing power parity

ProRail

Other characteristics[3]

- Large increase in passenger demand now and next 10 years to come
- Polycentric urban network with traffic evenly in both directions

Indicator	Unit	Bandwidth of sample: Low	Medium	High
Area	k km²	42		
Border countries	number	2		
Population	millions	17		
GDP per capita	%, EU 28=100		133	
Active licenses[1]	number	42		
National modal share passenger rail[4]	%		11	
National modal share rail freight[4]	%	6		
International passenger-km[1]	%	2		
International tonne-km[1]	%			84
Length of national main lines	km	3.220		
National passenger stations	number	399		
Share of national network managed[2]	%			100
Length of high-speed lines	km	72		
Length of main track	km	5.645		
Full time employees	fte	4.518		
Passenger train-kilometres	m train-km	135		
Freight train-kilometres	m train-km	10		
Total gross tonne-kilometres	bn gtkm		51	
Grants total	bn EUR	2		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 76: Fact sheet: ProRail[66]

RFI

Other characteristics[3]

- Complex orography, seismic territory (40%); hydrogeological risk
- Dichotomy North/South
- 100% ATP; 80% CCS

Indicator	Unit	Bandwidth of sample: Low	Medium	High
Area	k km²		301	
Border countries	number		6	
Population	millions			60
GDP per capita	%, EU 28=100	94		
Active licenses[1]	number	26		
National modal share passenger rail[4]	%	6		
National modal share rail freight[4]	%	12		
International passenger-km[1]	%	1		
International tonne-km[1]	%		53	
Length of national main lines	km		16.781	
National passenger stations	number		2.395	
Share of national network managed[2]	%			91
Length of high-speed lines	km		1.286	
Length of main track	km		26.982	
Full time employees	fte		26.293	
Passenger train-kilometres	m train-km	251		
Freight train-kilometres	m train-km	47		
Total gross tonne-kilometres	bn gtkm			137
Grants total	bn EUR			5

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 77: Fact sheet: RFI[67]

[66] Grants total are normalised for purchasing power parity
[67] Grants total are normalised for purchasing power parity

SBB CFF FFS

Other characteristics[3)]

- Federal state, strong position of regions
- High purchasing power; almost no heavy industries
- Night driving ban for lorries, no national bus system

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	41		
Border countries	number		5	
Population	millions	9		
GDP per capita	%, EU 28=100		160	
Active licenses[1)]	number	54		
National modal share passenger rail[5)]	%			20
National modal share rail freight[5)]	%		34	
International passenger-km[1)]	%		11	
International tonne-km[1)]	%			76
Length of national main lines	km	5.215		
National passenger stations[4)]	number	1.735		
Share of national network managed[2)]	%	61		
Length of high-speed lines	km	120		
Length of main track	km	6.337		
Full time employees	fte	9.978		
Passenger train-kilometres	m train-km	149		
Freight train-kilometres	m train-km	27		
Total gross tonne-kilometres	bn gtkm		71	
Grants total	bn EUR	2		

1) SBB, BFS, su-d-11-TP-ZR / T7_1/2,
2) IRG Rail 2019 data
3) As characterised by the IM
4) SBB, su-d-11-TP-ZR / T2
5) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 78: Fact sheet: SBB[68]

SNCF RÉSEAU

Other characteristics[3)]

- Area (mainland): 543 k km²
- Pop (mainland): 64,7
- Heterogeneous climate
- Urban polarisation
- Highly regulated

		Bandwidth of sample		
		Low	Medium	High
Area[4]	k km²			633
Border countries	number			8
Population	millions			67
GDP per capita	%, EU 28=100	103		
Active licenses[1)]	number	27		
National modal share passenger rail[5)]	%		10	
National modal share rail freight[5)]	%	10		
International passenger-km[1)]	%		10	
International tonne-km[1)]	%		37	
Length of national main lines	km			27.594
National passenger stations	number		2.966	
Share of national network managed[2)]	%			98
Length of high-speed lines	km			2.137
Length of main track	km			48.027
Full time employees	fte			52.748
Passenger train-kilometres	m train-km		297	
Freight train-kilometres	m train-km	57		
Total gross tonne-kilometres	bn gtkm			
Grants total	bn EUR		2	

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) Overseas territories included
5) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 79: Fact sheet: SNCF Réseau[69]

[68] Grants total are normalised for purchasing power parity
[69] Grants total are normalised for purchasing power parity

Other characteristics[3]

- Top density of lines per km² within the EU
- High density of stops, stations and level crossings
- Two gauges
- Four systems of electricity

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

		Bandwidth of sample: Low	Medium	High
Area	k km²	79		
Border countries	number		4	
Population	millions	11		
GDP per capita	%, EU 28=100	94		
Active licenses[1]	number	88		
National modal share passenger rail[4]	%		10	
National modal share rail freight[4]	%		26	
International passenger-km[1]	%		17	
International tonne-km[1]	%			64
Length of national main lines	km	9.406		
National passenger stations	number		2.579	
Share of national network managed[2]	%			98
Length of high-speed lines	km	0		
Length of main track	km	11.481		
Full time employees	fte		17.128	
Passenger train-kilometres	m train-km	132		
Freight train-kilometres	m train-km	36		
Total gross tonne-kilometres	bn gtkm		57	
Grants total	bn EUR		3	

Figure 80: Správa železnic, státní organizace[70]

TRAFIKVERKET SWEDISH TRANSPORT ADMINISTRATION

Other characteristics[3]

- Open market, many railway undertakings
- All tracks open for both passenger and freight traffic
- Large areas are sparsely populated

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

		Bandwidth of sample: Low	Medium	High
Area	k km²			450
Border countries	number	2		
Population	millions	10		
GDP per capita	%, EU 28=100	123		
Active licenses[1]	number	53		
National modal share passenger rail[4]	%		11	
National modal share rail freight[4]	%		31	
International passenger-km[1]	%	4		
International tonne-km[1]	%		39	
Length of national main lines	km	10.906		
National passenger stations	number	673		
Share of national network managed[2]	%			89
Length of high-speed lines	km	0		
Length of main track	km	11.830		
Full time employees	fte	8.739		
Passenger train-kilometres	m train-km	112		
Freight train-kilometres	m train-km	35		
Total gross tonne-kilometres	bn gtkm		69	
Grants total	bn EUR	2		

Figure 81: Fact sheet: Trafikverket[71]

70 Grants total are normalised for purchasing power parity
71 Grants total are normalised for purchasing power parity

Other characteristics[3]

- Mostly standard, but also some broad gauge tracks
- Increasing number of private RUs

		Bandwidth of sample		
		Low	Medium	High
Area	k km²	49		
Border countries	number		5	
Population	millions	5		
GDP per capita	%, EU 28=100	71		
Active licenses[1]	number	24		
National modal share passenger rail[4]	%		10	
National modal share rail freight[4]	%		31	
International passenger-km[1]	%	8		
International tonne-km[1]	%			89
Length of national main lines	km	3.627		
National passenger stations	number	703		
Share of national network managed[2]	%			100
Length of high-speed lines	km	0		
Length of main track	km	4.643		
Full time employees	fte	13.704		
Passenger train-kilometres	m train-km	29		
Freight train-kilometres	m train-km	14		
Total gross tonne-kilometres	bn gtkm	0		
Grants total	bn EUR	0		

1) EC RMMS 2018 data
2) IRG Rail 2019 data
3) As characterised by the IM
4) EC Eurostat 2019 data
— Under the line, IM specific data

Figure 82: Fact sheet: Železnice Slovenskej republiky[72]

[72] Grants total are normalised for purchasing power parity

5.3 Comments on deviations

Page	Indicator name	Input data name[73]	IM[74]	Comment by the IM for 2020
28	Total passenger high speed train-km	Total passenger high speed train-km (≥ 200 km/h) (N)	RFI	The data include train km covered by high speed trains. Some of these train km are operated on lines with speed <200 km/h
35	OPEX – operational expenditures in relation to network size	Total OPEX - operating expenditures (N)	DB	without stations
35	OPEX – operational expenditures in relation to network size	Total OPEX - operating expenditures (N)	SNCF R.	According to SNCF R. financial statement under the IFRS standard, financial expenditure is excluded from Operational expenditures.
35	Traffic management expenditures in relation to network size	Total traffic management expenditures (N)	LTGI	Traffic management + RFS without depreciation and electricity cost
37	CAPEX – capital expenditures in relation to network size	Total CAPEX - capital expenditures (N)	DB	without stations
37	Renewal expenditures in relation to network size	Total renewal expenditures (N)	DB	without stations
37	Renewal expenditures in relation to network size	Total renewal expenditures (N)	TRV	Our enhancements can not be separated from investments/renewals and are included in them.
37	Investment expenditures in relation to network size	Total investment expenditure (N)	TRV	Our enhancements can not be separated from investments/renewals and are included in them.
39	Maintenance expenditures in relation to network size	Total maintenance expenditures (N)	DB	without stations
39	Maintenance expenditures in relation to network size	Total maintenance expenditures (N)	LTGI	Depreciation, traffic management, electricity costs are not included
39	Maintenance expenditures in relation to network size	Total maintenance expenditures (N)	RFI	The data refers only to minimum access package
39	Maintenance expenditures in relation to network size	Total maintenance expenditures (N)	ŽSR	ŽSR does not conduct maintenance expenditures data as it; the figure stands for management and maintenance expenditures of network
44	TAC revenue in relation to network size	Revenues from TAC (N)	LTGI	MAP + RSF
44	TAC revenue in relation to network size	Revenues from TAC (N)	DB	withour stations
52	Significant accidents	Number of significant accidents (N)	DB	Number refers to all IMs in Germany
54	Persons seriously injured and killed	Number of persons seriously injured and killed (N)	DB	Number refers to all IMs in Germany

[73] The letters “D” and “N” mark the denominator (D) and nominator (N) of the indicator.
[74] IM = Infrastructure manager

Page	Indicator name	Input data name[73]	IM[74]	Comment by the IM for 2020
56	IM related precursors to accidents	Number of precursors to accidents (N)	DB	Number refers to all IMs in Germany
66	Share of renewable traction energy	Share of renewable traction energy (N)	HŽI	Share of energy from renewable sources in Croatia in 2019
71	Passenger trains punctuality	Number of all trains scheduled to be operated (D)	RFI	This data includes all type of trains
71	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	Adif	Only HS and Medium range trains. Commuter and regional trains threshold is 3' and 10' in Spain
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	DB	Definition: Passenger trains: 0,00 to max. 5,59 minutes
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	HŽI	5 minutes for passenger trains
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	LISEA	Less than 05:59
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	RFI	The measuring point is the arrival time of the train
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	SBB	Limit used is 4'59
72	Passenger trains punctuality	Passenger trains arrived at strategic measuring points with a delay of less than or equal to 5:29 minutes (N)	SNCF R.	Two reasons : 1/ we measure punctuality at the last observation point (which can be some kilometers away from the last stop of the train) 2/ We do not use UIC's rounding rule #2, our system only allows the use of following rule: 5'59 for passengers transport 15'59 for freight transport
75	Freight trains punctuality	Number of scheduled passenger trains that operated (D)	DB	Definition: Passenger trains: 0,00 to max. 5,59 minutes
75	Freight trains punctuality	Freight trains arrived at strategic measuring points with a delay of less than or equal to 15:29 minutes (N)	DB	Definition: Freight trains: 0,00 to max. 15,59 minutes
75	Freight trains punctuality	Freight trains arrived at strategic measuring points with a delay of less than or equal to 15:29 minutes (N)	HŽI	60 minutes for freight trains
75	Freight trains punctuality	Freight trains arrived at strategic measuring points with a delay of less than or equal to 15:29 minutes (N)	RFI	The measuring point is the arrival time of the train
75	Freight trains punctuality	Freight trains arrived at strategic measuring points with a delay of less than or equal to 15:29 minutes (N)	SNCF R.	Two reasons : 1/ we measure punctuality at the last observation point (which can be some kilometers away from the last stop of the train) 2/ We do not use UIC's rounding rule #2, our system only allows the use of following rule: 5'59 for passengers transport 15'59 for freight transport

Page	Indicator name	Input data name[73]	IM[74]	Comment by the IM for 2020
75	Freight trains punctuality	Number of scheduled freight trains that operated (D)	DB	Definition: Freight trains: 0,00 to max. 15,59 minutes
79	Assets failures in relation to network size	Total number of asset failures (N)	DB	KPI according internal measurement system
80	Assets failures in relation to network size	Total number of signalling failures (N)	DB	KPI according internal measurement system
80	Assets failures in relation to network size	Total number of telecommunication failures (N)	DB	KPI according internal measurement system
91	ERTMS track-side deployment	Total main track-km with ERTMS (N)	ŽSR	195 km ETCS, 368,5 km GMS-R

5.4 PRIME KPI-definitions

More detailed explanation on the definitions of input data and the indicators can be found in the catalogue available on the PRIME website.

Overview of main rail industry characteristics and trends

KPI name	KPI Definition	KPI unit
National modal share of rail in passenger transport	Proportion of national rail passenger-km compared to total passenger-km of passenger cars, buses/coaches and railways. (Source: European Commission, Eurostat)	% of passenger-km
National modal share of rail in freight transport	Proportion of national rail tonne-km compared to total tonne-km of road, inland waterways and rail freight. (Source: European Commission, Eurostat)	% of tonne-km
Total track-km	Total track-km	km
Total main track-km	A track providing end-to-end line continuity designed for trains between stations or places indicated in tariffs as independent points of departure or arrival for the conveyance of passengers or goods, maintained and operated by the infrastructure manager.	km

KPI name	KPI Definition	KPI unit
	Tracks at service facilities not used for running trains are excluded. The boundary of the service facility is the point at which the railway vehicle leaving the service facility cannot pass without having an authorization to access the mainline or other similar line. This point is usually identified by a signal. Service facilities are passenger stations, their buildings and other facilities; freight terminals; marshalling yards and train formation facilities, including shunting facilities; storage sidings; maintenance facilities; other technical facilities, including cleaning and washing facilities; maritime and inland port facilities which are linked to rail activities; relief facilities; refuelling facilities and supply of fuel in these facilities.	
Total main line-km	Cumulative length of railway lines operated and used for running trains by the end of reporting year. Lines solely used for operating touristic trains and heritage trains are excluded, as are railways constructed solely to serve mines, forests or other industrial or agricultural installations and which are not open to public traffic. Metro, Tram and Light rail urban lines (with non-standard – narrow - gauge) should be excluded. Private lines closed to public traffic and functionally separated (i.e. stand-alone) networks should be excluded. Private lines used for own freight transport activities or for non-commercial passenger services and light rail lines occasionally used by heavy rail vehicles for connectivity or transit purposes are excluded.	km

KPI name	KPI Definition	KPI unit
High Speed main line	High Speed main line-km.	km
Proportion of high-speed main track-km ≥ 250 km/h)	Percentage of high-speed main track kilo-metres (≥ 250 km/h) of total main track kil-ometres.	% of main track-km
Proportion of high-speed main track-km (≥ 200 km/h and <250 km/h)	Percentage of high-speed main track kilo-metres (≥ 200 km/h and <250 km/h) of total main track kilometres.	% of main track-km
Degree of net-work utilisation – passenger trains	Average daily passenger train-km on main track (revenue service only, no shunting, no work trains) related to main track-km.	Daily passen-ger train–km per main track-km
Degree of net-work utilisation – freight trains	Average daily freight train-km on main track (revenue service only, no shunting, no work trains) related to main track-km.	Daily freight train–km per main track-km

Finance

KPI name	KPI Definition	KPI unit
OPEX – opera-tional expendi-tures in relation to network size	Total infrastructure managers annual opera-tional expenditures per main track-km.	Euro per main track-km
CAPEX – capi-tal expendi-tures in relation to net-work size	Total infrastructure managers annual capital expenditures per main track-km.	Euro per main track-km
Maintenance expenditures in relation to net-work size	Total infrastructure managers annual maintenance expenditures per main track-km.	Euro per main track-km

KPI name	KPI Definition	KPI unit
Renewal expenditures in relation to network size	Total infrastructure managers annual renewal expenditures per main track-km.	Euro per main track-km
TAC revenue in relation to network size	Total infrastructure manager's annual TAC revenues (including freight, passenger and touristic trains) per total main track-km.	Euro per main track-km
TAC revenue in relation to traffic volume	Total infrastructure manager's annual TAC revenues (including freight, passenger and touristic trains) per train-km.	Euro per total train-km
Total revenues from non-access charges in relation to network size	Total infrastructure managers annual revenues from non-access charges (e.g. commercial letting, advertising, telecoms, but excluding grants or subsidies) related to total main track-km.	Euro per main track-km
Proportion of TAC in total revenue	Percentage of infrastructure managers annual TAC revenues (including freight, passenger and touristic trains) compared to total revenues.	% of monetary value
Maintenance and renewal	Total IMs annual renewal and maintenance expenditures (sum of total IMs annual renewal expenditures and total IMs annual maintenance expenditures) in relation to network size.	Euro per main track-km
Total public funding	Total public funding related to network size.	Euro per main track-km
Public funding for OPEX	Total public funding for OPEX related to network size.	Euro per main track-km
Public funding for CAPEX	Total public funding for CAPEX related to network size.	Euro per main track-km

Safety

KPI name	KPI Definition	KPI unit
Significant ac-	Relative number of significant accidents	Number per

KPI name	KPI Definition	KPI unit
cidents	including sidings, excluding accidents in workshops, warehouses and depots, based on the following types of accidents (primary accidents): › Collision of train with rail vehicle, › Collision of train with obstacle within the clearance gauge, › Derailment of train, › Level crossing accident, including accident involving pedestrians at level crossing, › Accident to persons involving rolling stock in motion, with the exception of suicides and attempted suicides, › Fire on rolling stock, › Other accidents The boundary is the point at which the railway vehicle leaving the workshop / warehouse / depot / sidings cannot pass without having an authorization to access the mainline or other similar line. This point is usually identified by a signal. For further guidance, please see ERA Implementation Guidance on CSIs.	mil-lion train-km
Persons seriously injured and killed	Relative number of persons seriously injured (i.e. hospitalised for more than 24 hours, excluding any attempted suicide) and killed (i.e. killed immediately or dying within 30 days, excluding any suicide) by accidents based upon following categories: › Passenger, › Employee or contractor, › Level crossing user, › Trespasser,	In number per million train-km

KPI name	KPI Definition	KPI unit
	› Other person at a platform, › Other person not at a platform[75]	
Infrastructure manager related precursor to accidents	Relative number of the following types of precursors: › broken rail, › track buckle and track misalignment, › wrong-side signalling failure	In number per million train-km

Environment

KPI name	KPI Definition	KPI unit
Degree of electrification of total main track	Percentage of main track-km which are electrified.	% of main track-km
Share of electricity-powered trains	Train-kilometres of electricity-powered trains compared to total train-kilometres (both for passenger and freight trains).	% of train-km
Share of diesel-powered trains	Train-kilometres of diesel-powered trains compared to total train-kilometres (both for passenger and freight trains).	% of train-km
Share of renewable traction energy	Share of renewable electric traction energy of total traction energy in % of kWh. Renewable energy is an energy that is derived from natural processes that are replenished constantly, such as energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, solid biomass, biogas and liquid biofuels. Only electric energy is included.	% of kWh

[75] Please note that unlike the methodology applied by ERA, the number of persons seriously injured is not weighted for the PRIME indicator. In this report, the number of persons killed and the number of persons seriously injured is simply added up.

Performance and delivery

KPI name	KPI Definition	KPI unit
Passenger trains punctuality	Percentage of actually operating (i.e. not cancelled) national and international passenger trains (excluding work trains) which arrive at each strategic measuring point with a delay of less than or equal to 5:29 minutes.	% of trains
Freight trains punctuality	Percentage of actually operating (i.e. not cancelled) national and international freight trains (excluding work trains) which arrive at each strategic measuring point with a delay of less than or equal to 15:29 minutes.	% of trains
Delay minutes per train-km caused by the infrastructure manager	Delay minutes caused by incidents that are regarded as infrastructure managers responsibility divided by total train-km operated (revenue service + shunting operations to and from depots + infrastructure manager's work traffic). Delay minutes according to UIC leaflet 450-2. Delay minutes will be measured at all available measuring points. Of those measured delay minutes that exceed a threshold of 5:29 minutes for passenger services and 15:29 minutes for freight services the maximum number is counted. No delay minutes are counted if these thresholds are not exceeded at any measuring point.	Minutes per train-km
Assets failures in relation to network size	Average number of all asset failures on main track according to UIC leaflet 450-2. An asset failure is counted one time and one time only if any train is affected by it. A train is affected if the asset failure causes the train to exceed a delay minutes threshold of 5:29 minutes for passenger services or 15:29 minutes for freight services at any available measuring point. An asset failure is not counted if these thresholds are not exceeded for any train at any available	Number per thousand main track-km

KPI name	KPI Definition	KPI unit
	measuring point (i.e. if no train is affected).	
Average delay minutes per asset failure	Average delay minutes per asset failure caused by all asset failures on main track according to UIC leaflet 450-2. An asset failure is counted one time and one time only if any train is affected by it. A train is affected if the asset failure causes the train to exceed a delay minutes threshold of 5:29 minutes for passenger services or 15:29 minutes for freight services at any available measuring point. Delay minutes will be measured at all available measuring points. Of those measured delay minutes the maximum number is counted. No delay minutes are counted if these thresholds are not exceeded at any measuring point. An asset failure is not counted if these thresholds are not exceeded for any train at any available measuring point (i.e. if no train is affected).	Minutes per failure

Availability

KPI name	KPI Definition	KPI unit
Tracks with permanent speed restrictions	Percentage of tracks with permanent speed restriction due to deteriorating asset condition weighted by the time the restrictions are in place (included in the yearly timetable) related to total main track-km; restrictions are counted whenever criterion is met regardless of whether infrastructure manager reports permanent speed restrictions as such or if they are included in the timetable.	% of main track-km
Tracks with temporary speed restrictions	Percentage of tracks with temporary speed restriction due to deteriorating asset condition weighted by the time the restrictions are in place (not included in the yearly timetable) related to total main track-km.	% of main track-km

ERMTS deployment

KPI name	KPI Definition	KPI unit
ERTMS track-side deploy-ment	Main tracks with ERTMS in operation in proportion to total main tracks (measured in track-km).	% of main track-km
Planned extent of ERTMS de-ployment by 2030	In 2030, the percentage of main track-km planned to have been deployed with ERTMS, i.e. main tracks equipped with both - ETCS (European train control system; any baseline or level) and GSM-R (Global Sys-tem for Mobile Communications); and where ETCS and GSM-R are used in service.	% of current main track-km
ATP coverage	Share of main track-km equipped with ATP. ATP is a train protection system providing warning and automatic stop, and continuous supervision of speed, protection of danger points and continuous supervision of the speed limits of the line, where "continuous supervision of speed" means continuous indication and enforcement of the maximal allowed target speed on all sections of the line. Including e.g. ETCS, ATB, LZB, CBTC and similar systems.	% of main track-km

5.5 Individual thresholds of punctuality for national measures

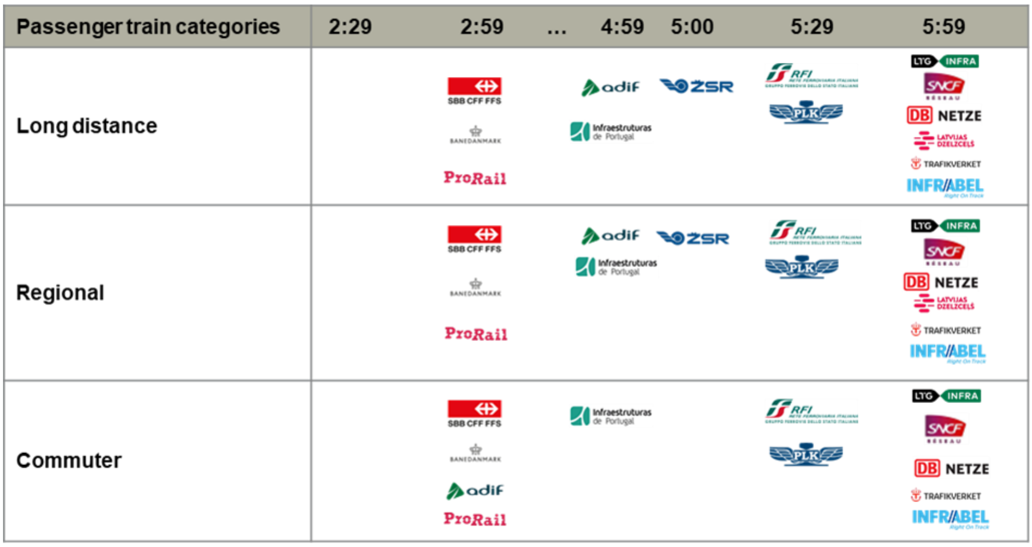

Figure 83: National delay measurement thresholds (in minutes:seconds)[76]

Figure 84: National delay measurement thresholds (in minutes:seconds)

76 RFI: Some Long distance trains have a threshold of 10:29

5.6 Financial data

	Purchasing power parity (LCU/EUR)				
Country	2016	2017	2018	2019	2020
Belgium	1,09	1,12	1,11	1,10	1,12
Croatia	4,72	4,70	4,80	4,80	4,80
Czechia	17,61	16,43	17,82	18,19	18,95
Denmark	9,94	10,34	9,83	9,75	9,88
France	1,10	1,07	1,09	1,07	1,09
Germany	1,06	1,04	1,07	1,08	1,12
Ireland	1,11	1,29	1,13	1,16	1,17
Italy	0,99	1,02	0,99	0,98	0,99
Latvia	0,68	0,68	0,71	0,72	0,72
Lithuania	0,62	0,60	0,65	0,66	0,68
Netherlands	1,11	1,15	1,13	1,15	1,16
Norway	14,05	14,67	14,32	14,52	15,01
Poland	2,42	2,28	2,51	2,56	2,67
Portugal	0,80	0,84	0,84	0,83	0,85
Slovakia	0,70	0,65	0,69	0,74	0,79
Spain	0,90	0,94	0,91	0,92	0,92
Sweden	11,78	12,96	12,60	12,79	13,12
Switzerland	1,64	1,86	1,68	1,68	1,71

Figure 85: Purchasing power parity (Index, EU-28=1)

	Average annual exchange rate (Local currency unit/Euro)				
Country	2016	2017	2018	2019	2020
Belgium	1,00	1,00	1,00	1,00	1,00
Croatia	7,53	7,46	7,42	7,42	7,54
Czechia	27,03	26,33	25,65	25,67	26,46
Denmark	7,45	7,44	7,45	7,47	7,45
France	1,00	1,00	1,00	1,00	1,00
Germany	1,00	1,00	1,00	1,00	1,00
Ireland	1,00	1,00	1,00	1,00	1,00
Italy	1,00	1,00	1,00	1,00	1,00
Latvia	1,00	1,00	1,00	1,00	1,00
Lithuania	1,00	1,00	1,00	1,00	1,00
Netherlands	1,00	1,00	1,00	1,00	1,00
Norway	9,29	9,33	9,60	9,85	10,72
Poland	4,36	4,26	4,26	4,30	4,44
Portugal	1,00	1,00	1,00	1,00	1,00
Slovakia	1,00	1,00	1,00	1,00	1,00
Spain	1,00	1,00	1,00	1,00	1,00
Sweden	9,47	9,64	10,26	10,59	10,48
Switzerland	1,09	1,11	1,16	1,11	1,07

Figure 86: Average annual exchange rate (Local currency unit/Euro)

6. Glossary

Name	Description	Source
Affected train (by an asset failure)	A train is affected if the asset failure causes the train to exceed a delay minutes threshold of 5:29 minutes for passenger services or 15:29 minutes for freight services at any available measuring point.	
Ancillary services	Ancillary services may comprise: (a) access to telecommunication networks; (b) provision of supplementary information; (c) technical inspection of rolling stock; (d) ticketing services in passenger stations; (e) heavy maintenance services supplied in maintenance facilities dedicated to high-speed trains or to other types of rolling stock requiring specific facilities.	Directive 2012/34/EU Annex II)
Asset Capability	Asset capability is a quality or function as a property or natural part of an asset. A capability is a characteristic of an asset enabling achievement of its desired function.	
Asset failure	An asset failure is counted one time and one time only if any train is affected by it. A train is affected if the asset failure causes the train to exceed a delay minutes threshold of 5:29 minutes for passenger services or 15:29 minutes for freight services at any available measuring point. An asset failure is not counted if these thresholds are not exceeded for any train at any available measuring point (i.e. if no train is affected).	
Asset Management	Coordinated activity of an organisation to realise value from assets.	ISO 55000:2014
Assets	LICB defines the Railway Infrastructures as consisting of the following items, assuming they form part the permanent way, including sidings, but excluding lines situated within railway repair workshops, depots or locomotive sheds and private branch lines or sidings: Ground area Track and track bed etc. Engineering structures: Bridges culverts and other overpasses, tunnels etc. Level crossings, including appliances to ensure safety of road traffic; Superstructure, in particular: rails, grooved rails; sleepers, small fittings for the permanent way, ballast, points, crossings. Access way for passengers and goods, including access by road; Safety, signalling and telecommunications installations on the open track, in stations and in marshalling yards etc. Lightning installations for traffic and safety purposes Plant for transforming and carrying electric power for train haulage: substations, Supply cables between sub-stations and contact wires, catenaries.	EC Directives, European Commission 5th Framework Programme Improve rail, Deliverable D3, “Benchmarking exercise in railway infrastructure management” as referred in the UIC Lasting Infrastructure Cost Benchmarking (LICB) project.
ATP (Automatic train protection)	A system that enforces obedience to signals and speed restrictions by speed supervision, including automatic stop at signals.	Recommendations to revise Annex 1 to Directive 2004/49
Bottleneck	A physical, technical or functional barrier which leads to a system break affecting the continuity of long-distance or cross-border flows and which can be surmounted by creating new infrastructure or substantially upgrading existing infrastructure that could bring significant improvements which will solve the bottleneck constraints.	Regulation (EU) No 1315/2013 (TEN-T), Article (3)(q)
Broken rail	Any rail which is separated in two or more pieces, or any rail from which a piece of metal becomes detached, causing a gap of more than 50 mm in length and more than 10 mm in depth on the running surface.	Directive (EU) 2016/798 on railway safety, Annex I, Appendix 4.1
Cancelled train	If a planned service is not running (i.e. train cancelled in the operations phase). The codes described in UIC CODE, 450 – 2, OR, 5th edition, June 2009, Appendix A page 9 should be used to describe the cause of cancellation on the whole or just a part of the route. Cancelled trains can be split into four types. These are: •full cancellation (cancelled at origin) •part cancellation en route •part cancellation changed origin •part cancellation diverted (any train that diverts and does not stop at all of its scheduled locations will be classed as a part cancellation even if it reaches its end destination).	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 6 – Cancelled services, combined with adopting the types of cancellations described by Network Rail.

Name	Description	Source
Capacity (infrastructure)	Capacity means the potential to schedule train paths requested for an element of infrastructure for a certain period.	2012/34/EU (SERA), Article 3 (24)
CAPEX, Capital expenditures	Capital expenditure are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment. An expense is considered to be a capital expenditure when the asset is a newly purchased capital asset or an investment that improves the useful life of an existing capital asset. Hence, it comprises investments in new infrastructure as well as renewals and enhancements.	PRIME KPI subgroup
Charges for service facilities	Revenues generated by providing access to service facilities. Services facilities include: (a) passenger stations, their buildings and other facilities, including travel information display and suitable location for ticketing services; (b) freight terminals; (c) marshalling yards and train formation facilities, including shunting facilities; (d) storage sidings; (e) maintenance facilities, with the exception of heavy maintenance facilities dedicated to high-speed trains or to other types of rolling stock requiring specific facilities; (f) other technical facilities, including cleaning and washing facilities; (g) maritime and inland port facilities which are linked to rail activities; (h) relief facilities; (i) refuelling facilities and supply of fuel in these facilities, charges for which shall be shown on the invoices separately	Directive 2012/32/EU, Annex II
Conventional train	Train, composed of vehicles designed to operate at speeds below 250 km/h.	Decision No. 1692/96/EC (TEN-T), Art.10(1)
Delay	The time difference between the time the train was scheduled to arrive in accordance with the published timetable and the time of its actual arrival.	Adapted from ERA, Glossary of railway terminology
Delay minutes	Delay minutes will be measured at all available measuring points. Of those measured delay minutes that exceed a threshold of 5:29 minutes for passenger services and 15:29 minutes for freight services the maximum number is counted. No delay minutes are counted if these thresholds are not exceeded at any measuring point.	
Deployment	The deployment of a mechanical device, electrical system, computer program, etc., is its assembly or transformation from a packaged form to an operational working state. Deployment implies moving a product from a temporary or development state to a permanent or desired state.	
Derailment of train	Any case in which at least one wheel of a train leaves the rails.	Glossary for Transport Statistics, A.VI-14 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.7
Direct Cost in the meaning of Regulation (EU)2015/909	Direct cost in this context means “the cost that is directly incurred as a result of operating the train service” and which is used for setting charges for the minimum access package and for access to infrastructure connecting service facilities. The modalities for the calculation of the cost that is directly incurred as a result of operating the train are set out in Commission Implementing Regulation (EU) 2015/909 and can in principle be established on the basis of: (a) a network-wide approach as the difference between, on the one hand, the costs for providing the services of the minimum access package and for the access to the infrastructure connecting service facilities and, on the other hand, the non-eligible costs referred to in Article 4 of this regulation, or (b) econometric or engineering cost modelling.	PRIME KPI subgroup on the basis of Implementing Regulation (EU) 2015/909

Name	Description	Source
Expenditure on enhancements of existing infrastructure	Enhancements (or 'upgrades') means capital expenditure on a major modification work of the existing infrastructure which improves its overall performance. Enhancements can be triggered by changed functional requirements (and not triggered by lifetime) or "forced" investments when acting on regulations. The purpose of enhancements is to change the functional requirements such as electrification of a non-electrified line, building a second track parallel to a single tracked line, increase of line speed or capacity. Enhancements include planning (incl. portfolio prioritization, i.e. which enhancements projects are realized when and where), tendering dismantling (disposal of old equipment), construction, testing and commissioning (when track is opened to full-speed operation). Enhancements are generally looked on at the level of annual spending from a cash-flow perspective, i.e. no depreciation or other imputed costs are taken into account. It includes its proportion of overhead (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material, (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and contractors (entrepreneurial production) as well as investment subsidies.	PRIME KPI subgroup on the basis of Regulation (EU) 2015/1100 (RMMS), Article 2
ERA	European Union Agency for Railways	Regulation (EU) 2016/796 (ERA)
ERTMS	'European Rail Traffic Management System' (ERTMS) means the system defined in Commission Decision 2006/679/EC and Commission Decision 2006/860/EC European Rail Traffic Management System (ERTMS) is the European signalling system consisting the European Train Control System (ETCS), a standard for in-cab train control, and GSM-R, the GSM mobile communications standard for railway operations. ERTMS in operations refers to main tracks equipped with both - ETCS (European train control system; any baseline or level) and GSM-R (Global System for Mobile Communications); and where ETCS and GSM-R are used in service.	Commission Decision 2006/679/EC Commission Decision 2006/860/EC
Failure	Termination of an item to perform a given service. Also see -> Asset failure	SIS-EN 13306:2010
Financial expenditures	Financial expenditures are the ones accounted for in the annual profit and loss statement. It includes interests and similar charges which correspond to the remuneration of certain financial assets (deposits, bills, bonds and credits).	PRIME KPI subgroup on the basis of Eurostat concepts and definitions on financial surplus
Freight train	Freight (good) train: train for the carriage of goods composed of one or more wagons and, possibly, vans moving either empty or under load.	Glossary for Transport Statistics, A.IV-06
Freight train-km	Unit of measurement representing the movement of all freight trains over one kilometre. From an infrastructure manager's point of view it is important to include all freight train movements as they all influence the deterioration of the rail infrastructure assets. Empty freight train movements are therefore included in the number of freight train movements.	Glossary for Transport Statistics, A.IV-07 LICB Web Glossary, p.19
Funding	An amount of money used for a specific purpose, in our case to finance the infrastructure manager expenditures.	Longman, Dictionary of contemporary English
Grant	A direct financial contribution given by the federal, state or local government or provided from EU funds to an eligible grantee. Grants are not expected to be repaid and do not include financial assistance, such as a loan or loan guarantee, an interest rate subsidy, direct appropriation, or revenue sharing.	PRIME KPI subgroup
Gross tonne km	Unit of measure representing the movement over a distance of one kilometre of one tonne of rail vehicle including the weight of tractive vehicle.	Glossary for Transport Statistics, A.IV-14
High speed train	Train, composed of vehicles designed to operate: - either at speeds of at least 250 km/h on lines specially built for high speeds, while enabling operation at speeds exceeding 300 km/h in appropriate circumstances, - or at speeds of the order of 200 km/h on the lines, where compatible with the performance levels of these lines.	Glossary for Transport Statistics, A.I-02 Directive (EU) 2016/797 on the rail interoperability, Annex I, Article 1

Name	Description	Source
High speed track	Track (line) whole or part of line, approved for V_{max} ≥ 250 km/h — specially built high-speed lines equipped for speeds generally equal to or greater than 250 km/h, *— specially upgraded high-speed lines equipped for speeds of the order of 200 km/h,* *— specially upgraded high-speed lines which have special features as a result of topographical, relief or town-planning constraints, on which the speed must be adapted to each case* *The last category also includes interconnecting lines between the high-speed and conventional networks, lines through stations, accesses to terminals, depots, etc. travelled at conventional speed by 'high-speed' rolling stock.* PRIME data collection is conducted separately for high-speed track ≥ 250 & high-speed track ≥ 200 and <250	Glossary for Transport Statistics, A.I-04 Directive (EU) 2016/797 on the rail interoperability, Annex I, Article 1
Infrastructure Manager (IM)	Any firm or body responsible, in particular, for establishing, managing and maintaining railway infrastructure, including traffic management and control-command and signalling. An infrastructure manager can delegate to another enterprise the following tasks: maintaining railway infrastructure and operating the control and safety system. 'Infrastructure manager' means any body or firm responsible in particular for establishing, managing and maintaining railway infrastructure, including traffic management and control-command and signalling; the functions of the infrastructure manager on a network or part of a network may be allocated to different bodies or firms.	Glossary for Transport Statistics. A.III-03 Directive 2012/34/EU (SERA), Article 3(2)
Infrastructure Manager's responsibility for delay minutes	Table, column 1-, 2-, 3- (Operational and planning management, Infrastructure installations, Civil Engineering causes). Plus: Delay minutes caused by weather incidents that have affected the railway infrastructure. The relevant causes are described in Appendix 2.	UIC CODE, 450 – 2, OR, 5th edition, June 2009, Appendix A
Interoperability	The ability of a rail system to allow the safe and uninterrupted movement of trains which accomplish the required levels of performance.	Directive (EU) 2016/797 on the rail interoperability, Article 2(2)
Investments in new infrastructure	Investment in new infrastructure means capital expenditure on the projects for construction of new infrastructure installations for new lines. It includes planning (incl. portfolio prioritization, i.e. which investment projects are realized when and where), tendering dismantling (disposal of old equipment), construction, testing and commissioning (when track is opened to full-speed operation). Investments are generally looked on at the level of annual spending from a cash-flow perspective, i.e. no depreciation or other imputed costs are taken into account. It also includes its proportion of overheads (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material, (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and contractors (entrepreneurial production) as well as investment subsidies.	PRIME KPI subgroup on the basis of Regulation (EU) 2015/1100 (RMMS), Article 2
Killed (Death (killed person))	Any person killed immediately or dying within 30 days as a result of an accident, excluding any suicide.	Glossary for Transport Statistics, A.VI-09 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.18
Level crossing	Any level intersection between a road or passage and a railway, as recognised by the infrastructure manager and open to public or private users. Passages between platforms within stations are excluded, as well as passages over tracks for the sole use of employees.	Glossary for Transport Statistics, A. I-14 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 6.3

Name	Description	Source
Level crossing accident	Any accident at level crossings involving at least one railway vehicle and one or more crossing vehicles, other crossing users such as pedestrians or other objects temporarily present on or near the track if lost by a crossing vehicle or user.	Glossary for Transport Statistics, A. I-15 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.8
Line km	A cumulative length of all lines maintained by infrastructure managers.	PRIME KPI subgroup based on Glossary for transport statistics
Main Lines (Principle railway lines)	Railway lines maintained and operated for running trains.	Glossary for transport statistics, A.I-02.1
Main lines (Principle railway lines), length of	Cumulative length of railway lines operated and used for running trains by the end of reporting year. Excluded are: - Lines solely used for operating touristic trains and heritage trains; - Lines constructed solely to serve mines, forests or other industrial or agricultural installations and which are not open to public traffic; - Private lines closed to public traffic and functionally separated (i.e. stand-alone) networks; - Private lines used for own freight transport activities or for non-commercial passenger services and light rail tracks occasionally used by heavy rail vehicles for connectivity or transit purposes.	Glossary for transport statistics, A.I-02.1 and A.I-01
Maintenance cost	Costs of function: Maintenance means non-capital expenditure that the infrastructure manager carries out in order to maintain the condition and capability of the existing infrastructure or to optimise asset lifetimes. Preventive maintenance activities cover inspections, measuring or failure prevention. Corrective maintenance activities are repairs (but not replacement), routine over-hauls or small-scale replacement work excluded from the definitions of renewals. It forms part of annual operating costs. Maintenance expenditure relates to activities that counter the wear, degradation or ageing of the existing infrastructure so that the required standard of performance is achieved. Types of costs: Maintenance cost include planning, its proportion of overhead (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material, (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and contractors (entrepreneurial production).	PRIME KPI subgroup on the basis of LICB and Regulation (EU) 2015/1100 (RMMS), Article 2
Main track	A track providing end-to-end line continuity designed for running trains between stations or places indicated in timetables, network statements, rosters or other indications/publications as independent points of departure or arrival for the conveyance of passengers or goods.	Glossary for Transport Statistics, A.I-01.1
Main track (main track km), length of	A cumulative length of all running/main tracks Excluded are: - Lines solely used for operating touristic trains and heritage trains; - Lines constructed solely to serve mines, forests or other industrial or agricultural installations and which are not open to public traffic; - Private lines closed to public traffic and functionally separated (i.e. stand-alone) networks; - Private lines used for own freight transport activities or for non-commercial passenger services and light rail tracks occasionally used by heavy rail vehicles for connectivity or transit purposes	Glossary for Transport Statistics, A.I-02.1 and A.I.01
Main track, electrified	Main running tracks provided with an overhead catenary or with conductor rail (3rd rail) to permit electric traction.	Glossary for transport statistics, A.I-01.1 and A.I.15 LICB Web Glossary, p.16

Name	Description	Source
Minimum access package charges	Revenues generated by charging railway undertakings for enabling them to provide their services. The minimum access package comprises: (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.	Directive 2012/32/EU, Annex II
Multimodal rail freight terminals	Multimodal Freight Terminals (IFT) or transfer points are places equipped for the transhipment and storage of Intermodal Transport Units (ITU). They connect at least two transport modes, where at least one of the modes of transport is rail. The other is usually road, although waterborne (sea and inland waterways) and air transport can also be integrated.	PRIME KPI subgroup on the basis of Regulation (EU) 2015/1100 (RMMS), Article 2
Multimodal transport	The carriage of passengers or freight, or both, using two or more modes of transport.	Regulation (EU) No 1315/2013 (TEN-T), Art.3(n)
Network	Principal railway lines managed by the infrastructure manager.	Glossary for Transport Statistics, A.I-02.1
Operations	Operations excluding maintenance. SS-EN 13306:2010 defines operation as: Combination of all technical, administrative and managerial actions, other than maintenance actions that results in the item being in use. Total annual expenditures for the infrastructure manager on operations includes operations proportion of the infrastructure manager overhead (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and if some parts are handled by contractors, this is also included. (Central or holding overheads are to be allocated proportionally.)	
OPEX, operating expenditures	An operating expense is an expense a business incurs through its normal business operations. Operating expenses include inter alia maintenance cost, rent, equipment, inventory costs, payroll, insurance and funds allocated toward research and development.	PRIME KPI subgroup
Other accident	Any accident other than a collision of train with rail vehicle, collision of train with obstacle within the clearance gauge, derailment of train, level crossing accident, an accident to person involving rolling stock in motion or a fire in rolling stock. Example: Accidents caused by rocks, landslides, trees, lost parts of railway vehicles, lost or displaced loads, vehicles and machines or equipment for track maintenance	Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.11
Other track	All other tracks than main/running ones: - tracks maintained, but not operated by the infrastructure manager; - tracks at service facilities not used for running trains. Tracks at service facilities not used for running trains are excluded. The boundary of the service facility is the point at which the railway vehicle leaving the service facility cannot pass without having an authorization to access the mainline or other similar line. This point is usually identified by a signal. Service facilities are passenger stations, their buildings and other facilities; freight terminals; marshalling yards and train formation facilities, including shunting facilities; storage sidings; maintenance facilities; other technical facilities, including cleaning and washing facilities; maritime and inland port facilities which are linked to rail activities; relief facilities; refuelling facilities and supply of fuel in these facilities.	Glossary for Transport Statistics A.I-01.2
Passenger	Any person, excluding a member of the train crew, who makes a trip by rail, including a passenger trying to embark onto or disembark from a moving train for accident statistics only	Glossary for Transport Statistics, A.VI-18 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.12

Name	Description	Source
Passenger-km	Unit of measurement representing the transport of one passenger by rail over a distance of one kilometre. The distance to be taken into consideration should be the distance actually travelled by the passenger on the network. To avoid double counting each country should count only the pkm performed on its territory. If this is not available, then the distance charged or estimated should be used.	Glossary for Transport Statistics, A.V-06
Passenger train-km	Unit of measurement representing the movement of all passenger trains over a distance of one kilometre. From an infrastructure manager's point of view it is important to include all passenger train movements as they all influence the deterioration of the rail infrastructure assets. Empty passenger train movements are therefore included in the number of passenger train movements.	Glossary for Transport Statistics, A.IV-07 LICB Web Glossary, p.18
Passenger trains	Train for the carriage of passengers composed of one or more passenger railway vehicles and, possibly, vans moving either empty or under load.	Glossary for Transport Statistics, A.IV-06 and A.IV-05
Permanent restrictions	Restrictions are defined as permanent if they are incorporated within the yearly timetable.	PRIME KPI subgroup
Punctuality	"Punctuality of a train is measured on the basis of comparisons between the time planned in the timetable of a train identified by its train number and the actual running time at certain measuring point. A measuring point is a specific location on route where the trains running data are captured. One can choose to measure the departure, arrival or run through time". "Punctuality is measured by setting up a threshold up to which trains are considered as punctual and building a percentage." When measuring punctuality the following are to be included all in service trains: freight and passenger, but excluding Empty Coaching Stock movements and engineering trains.	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 4, Measurement of punctuality
Railway line	Line of transportation made up by rail exclusively for the use of railway vehicles and maintained for running trains. A line is made up of one or more tracks and the corresponding exclusion criteria.	Glossary for Transport Statistics, A.I-02
Recycling	Reprocessing by means of a manufacturing process, of a used product material into a product, a component incorporated into a product, or a secondary (recycled) raw material; excluding energy recovery and the use of the product as a fuel. Recycling of waste is any activity that includes the collection and processing of used or unused items that would otherwise be considered waste. Recycling involves sorting and processing the recyclable products into raw material and then using the recycled raw materials to make new products.	ISO 18604:2013, 3.3
Renewal expenditure	Renewals mean capital expenditure on a major substitution work on the existing infrastructure which does not change its overall original performance. Renewals are projects where existing infrastructure is replaced with new assets of the same or similar type. Usually it is a replacement of complete systems or a systematic replacement of components at the end of their lifetimes. The borderline to maintenance differs among the railways. Usually it depends on minimum cost levels or minimum scope (e.g. km). It is capitalised at the time it is carried out, and then depreciated. Renewals include planning (incl. portfolio prioritisation, i.e. which renewal projects are realised when and where), tendering, dismantling/disposal of old equipment, construction, testing and commissioning (when track is opened to full-speed operation). Renewals are generally looked at on the level of annual spending from a cash-flow perspective, i.e. no depreciation or other imputed costs are taken into account. Excluded from the definition are construction of new lines (new systems) or measures to raise the standard of existing infrastructure triggered by changed functional requirements (and not triggered by lifetime!) or "forced" investments when acting on regulations. It includes its proportion of overheads (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material, (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and contractors (entrepreneurial production) as well as investment subsidies.	PRIME KPI subgroup on the basis of Regulation (EU) 2015/1100 (RMMS), Article 2
Serious injury (seriously injured person)	Any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding any attempted suicide.	Glossary for Transport Statistics, A. VII-10 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.19

Name	Description	Source
Significant accident	Any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.	Glossary for Transport Statistics, A.VII-04 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.1
Significant damage	Damage that is equivalent to EUR 150 000 or more.	Glossary for Transport Statistics, A.VI-04 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 1.2
TAC Total	Includes charges for minimum Track Access Charges for the passenger, freight and service train path. Mark-ups. No other charging components are included.	
Temporary restrictions	Restrictions that occur during the year that are not included in the yearly timetable.	
TEN-T requirements	Infrastructure requirements as set in Article 39 of the Regulation (EU) No 1315/2013 on Union guidelines for the development of the trans-European transport network. http://publications.europa.eu/resource/cellar/f277232a-699e-11e3-8e4e-01aa75ed71a1.0006.01/DOC_1	Regulation (EU) No 1315/2013 (TEN-T)
Track	A pair of rails over which rail-borne vehicles can run maintained by an infrastructure manager. Metro, Tram and Light rail urban lines are excluded. Excluded are: - Lines solely used for operating touristic trains and heritage trains; - Lines constructed solely to serve mines, forests or other industrial or agricultural installations and which are not open to public traffic; - Private lines closed to public traffic and functionally separated (i.e. stand-alone) networks; - Private lines used for own freight transport activities or for non-commercial passenger services and light rail tracks occasionally used by heavy rail vehicles for connectivity or transit purposes.	Glossary for Transport Statistics, A.I-01
Track buckle or other track misalignment	Any fault related to the continuum and the geometry of track, requiring track to be placed out of service or have immediate restriction of permitted speed imposed.	Directive (EU) 2016/798 on railway safety, Annex I, Appendix 4.2
Track km	A cumulative length of all tracks maintained by the infrastructure manager; each track of a multiple-track railway line is to be counted.	PRIME subgroup, based on Glossary for Transport Statistics
Trackside	Area adjacent to a railway track such as embankments, level crossings, platforms, shunting yards. Workshops, warehouses and depots are excluded.	PRIME KPI subgroup
Train	One or more railway vehicles hauled by one or more locomotives or railcars, or one railcar travelling alone, running under a given number or specific designation from an initial fixed point to a terminal fixed point, including a light engine, i.e. a locomotive travelling on its own. In this document we define trains as the sum of passenger trains and freight trains.	Glossary for Transport Statistics, A.IV-05 and A.IV-06
Train-km	The unit of measurement representing the movement of a train over one kilometre. The distance used is the distance actually run, if available, otherwise the standard network distance between the origin and destination shall be used. Only the distance on the national territory of the reporting country shall be taken into account.	Glossary for Transport Statistics, A.IV-05 Directive (EU) 2016/798 on railway safety, Annex I, Appendix 7.1

Name	Description	Source
Traffic Management Cost	Costs of functions: Traffic management comprises the control of signal installations and traffic, planning as well as path allocation. Types of costs: Traffic management includes planning, its proportion of overheads (such as financials, controlling, IT, human resources, purchasing, legal and planning), labour (operative, personnel), material, (used/consumed goods), internal services (machinery, tools, equipment including transport and logistics) and contractors (entrepreneurial production).	PRIME KPI subgroup on the basis of UIC studies (CENOS and OMC)
Working timetable	The data defining all planned train and rolling-stock movements which will take place on the relevant infrastructure during the period for which it is in force	Directive 2012/34/EU (SERA), Article .3(28)