Good practice benchmarking of the rail infrastructure managers

PRIME 2017 data Benchmarking Report – Executive Summary

Report developed under cooperation between PRIME KPI & Benchmarking Subgroup and European Commission Directorate for Mobility and Transport

Hamburg, 03 May 2019

European Commission

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Foreword by PRIME Co-Chairs

The goal of PRIME members is to provide safe, reliable and efficient railway infrastructure for transporting people and goods. The KPI subgroup was set up with the goal to monitor and benchmark performance and by doing so to strive for better results.

We are pleased that we can share with you the second benchmarking report prepared by the PRIME KPI subgroup, covering the years 2012-2017.

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 receive feedback and to monitor the progress with respect to EU policy priorities. The KPI subgroup has also set up a database and IT tool which can be used for analysing the trends and support management decisions on a daily basis.

The PRIME benchmarking framework is:

• comprehensive – including a selection of indicators covering a broad range of topics and

• has been developed by the industry itself and focussing on what is useful from the infrastructure managers' business perspective.

We believe that these two elements have been key features to ensure its wide support. We promised last year that each next report would be an improvement. And we are proud to confirm that compared to the first report, this edition includes a number of new indicators, more complete dataset, three new participants (in total 15) and is enriched by new analysis. Five infrastructure managers are in the transitional phase to join. We would like to thank the PRIME KPI subgroup chair Rui Coutinho from IP Portugal - as well as the members of this group from 20 organisations and EC for this outstanding achievement.

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

Finally, we invite remaining PRIME members to join the benchmarking framework so that our database and report will gradually become the most renowned source of complete and reliable data!

PRIME co-chairs

Elisabeth Werner
European Commission, DG MOVE
Director of Land Transport

Alain Quinet
SNCF Réseau
Deputy Director General

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The overall objective of the PRIME KPI exercise is business improvement – this report provides a starting point

Introduction

- Exchange of best practices and performance benchmarking are the formal tasks of PRIME (Platform of Rail Infrastructure Managers in Europe) who has undertaken the **role of the European Network of Infrastructure Managers** as foreseen in the 4th Railway Package
- The PRIME group has identified a number of **objectives and potential benefits** from this incl.
  - Mutual learning between IMs to improve performance and business development
  - Understand the drivers for each KPI and their manageability
  - Identify relative performance of IMs in different dimensions to each other and understand existing differences and reasons for them
  - Undertake root cause analysis and explore best practices
  - Inform decision makers about choices to achieve performance improvements
- This **second benchmarking report** to the PRIME KPI subgroup presents a further step towards achieving the objectives and benefits of the PRIME benchmarking exercise
- It is focused on presenting **comparative KPI results** and an overview of the **completeness and robustness of the data** collected to date
- The purpose of this report was not to forego future analysis and interpretation but to illustrate how KPIs and data may be analysed and combined to derive **questions for further analyses**
- It is expected that the PRIME KPI framework will continue to be developed over the coming years, with the KPIs refined and the quality of the input data and hence output metrics improved

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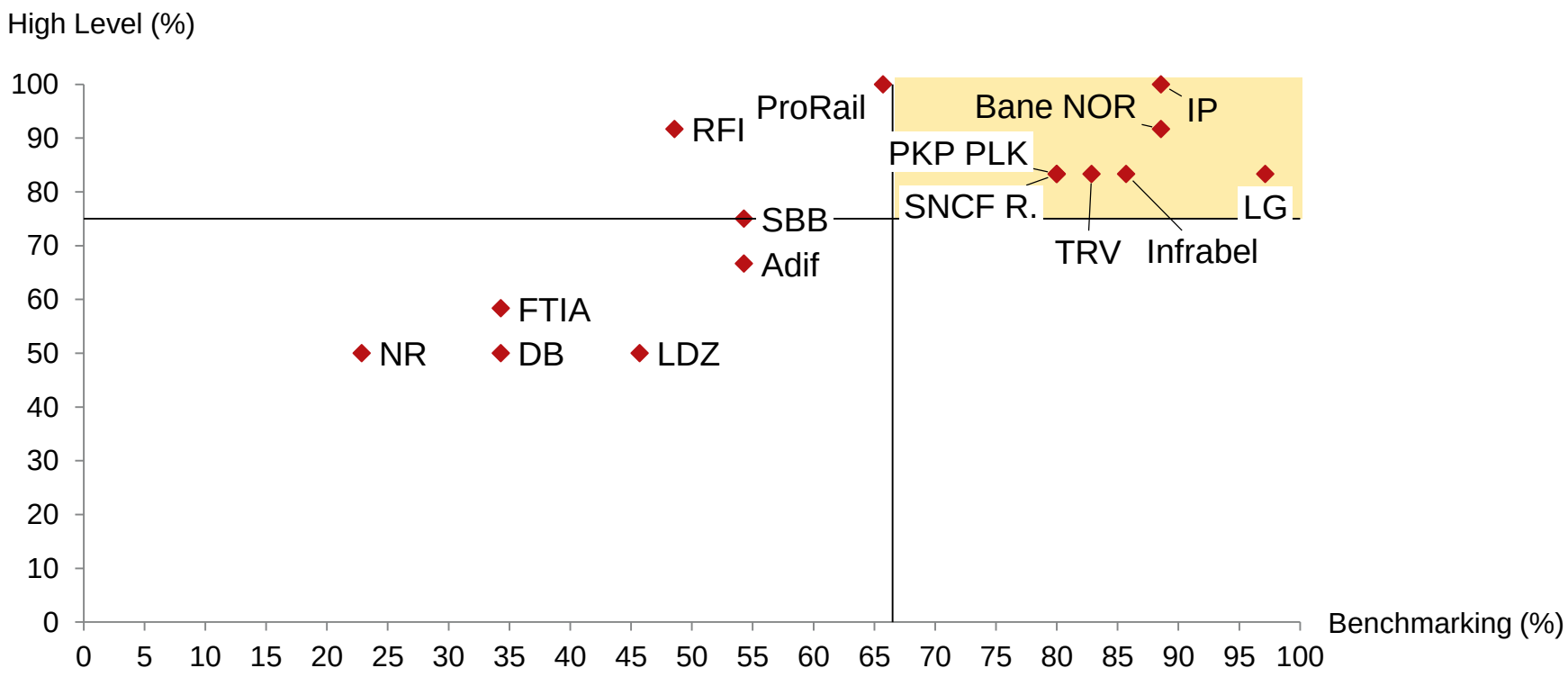
Compared to previous years there is a remarkable increase in data provision for high level and benchmarking KPIs

Completeness of KPIs

Percent

2017



Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

'Benchmarking Zone'

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The ‘High Level Industry’ KPIs are used for consistent and ongoing comparisons between the IMs

High Level Industry KPIs

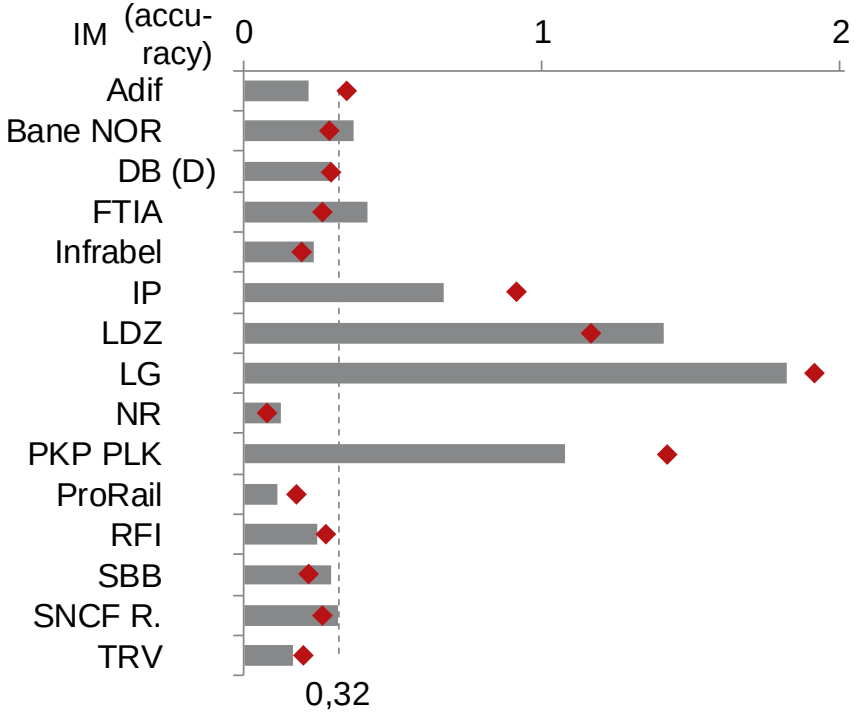
- The **KPI framework** developed for the PRIME IMs is a consistent and integrated set of indicators
- It supports the overall objective of the PRIME benchmarking exercise to enhance the performance and business development of each IM by addressing a large number of **relevant aspects of an IM’s business**
- The framework provides each IM with a structured, **wider set of indicators** which allows to understand its business and its performance in relation to the other IMs and in the context of external framework conditions
- It is recognized that each of the IMs has its own priorities and strategic objectives and the importance of different performance indicators will vary within the group
- Meanwhile a common and focused set of **12 ‘High Level Industry’ KPIs** has been defined which are of common interest and value to all IMs and cover the most important aspects from each of the PRIME KPI dimensions
- This does not suggest that these high level KPIs represent the main strategic priorities of each IM. Instead these cover the **common high level interests of the IM industry** and are meant to be used consistently and on an ongoing basis for prioritised, robust comparisons between the IMs
- The following presents comparative results for the 12 high level KPIs and summarises first questions for further investigation and analysis; one KPI is critical in terms of completeness and/or data robustness. Definitions can be found in the PRIME Catalogue

The number of persons seriously injured and killed during the reporting period varies widely

Persons seriously injured and killed

KPI 8

Number per million train-km (2017)



- The weighted average of safety related injuries and fatalities in the peer group's railway network is 0,3 per million train-kilometres
- They are lowest at ProRail in 2017 at 0,11; NR maintains the lowest average over time
- The casualty rate on some networks are well above the weighted average
- As safety is the most crucial aspect in delivering railway services it is worth to understand how best practice can be achieved
- Hence further analysis could consider :
  - Which were types of accidents and their underlying causes?
  - What technical measures, regulation or other measures are taken to further increase safety levels?

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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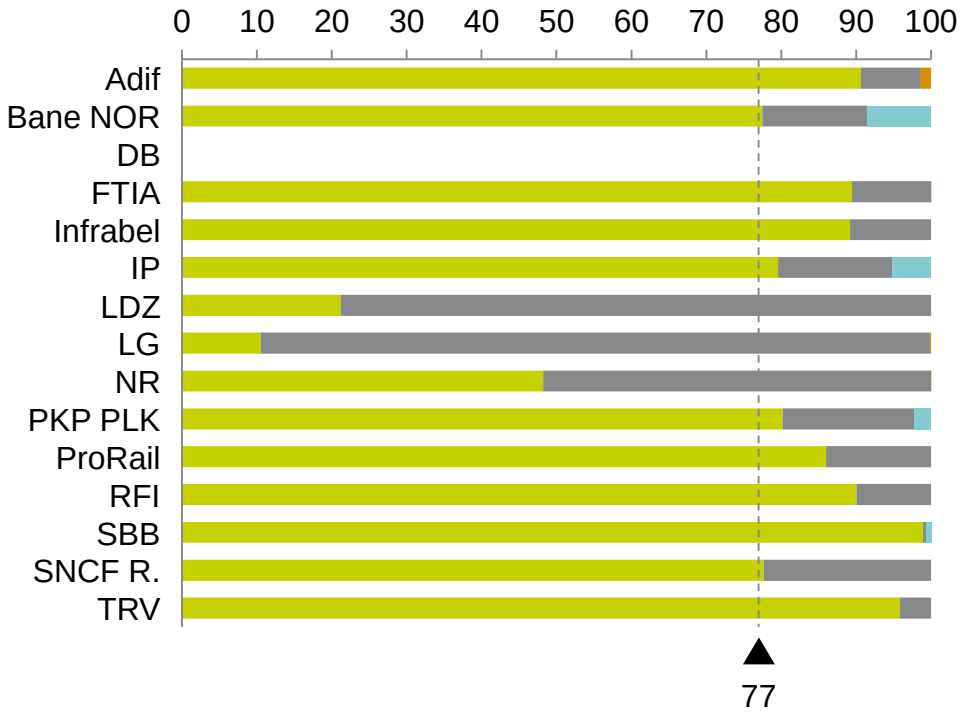
The majority of train-kilometres in the peer group results from electricity-powered trains

Share of train types[1)]

KPI 18+19

% of total train-km (2017)



- Overall the share of electrically produced train-kilometres in the peer group is quite high, reaching 77% of the total
- This reflects the degree of electrification of the network which for most organisations reaches 70% or more (KPI 1)

- The weighted average of the peer group is drawn down particularly by NR's high reliance on Diesel engines
- Unknown share for Adif, FTIA and NR are likely to refer to work trains

Share of electricity-powered trains | Share of diesel-powered trains | Work trains | Unknown

--- Total weighted average of electricity-powered trains

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) For the purpose of this report "Share of train types" (combination of KPI 18 & 19) is considered as a high level KPI

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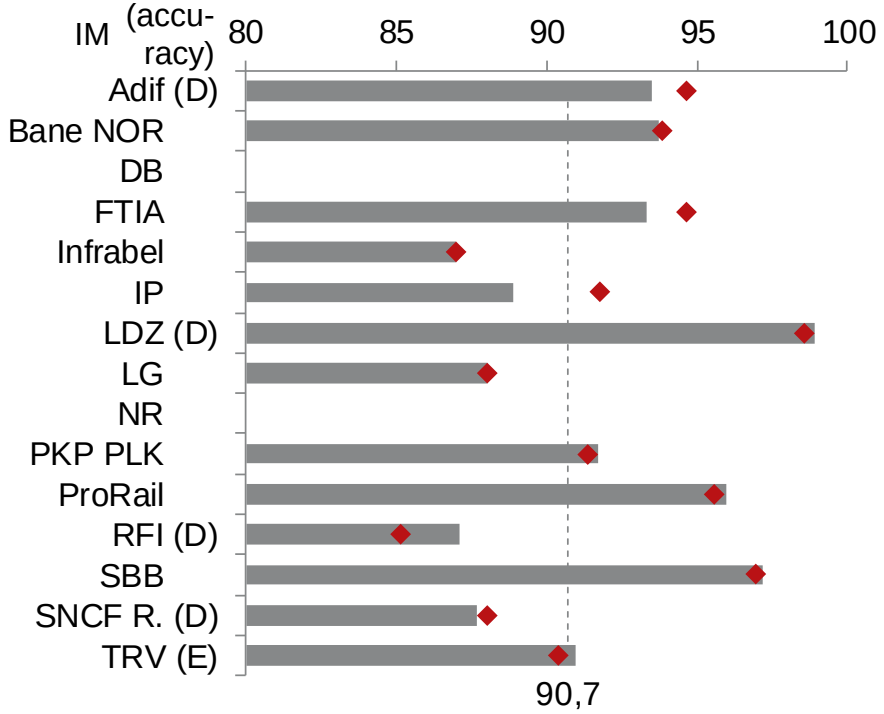
On average 91% of passenger trains are on time

Passenger trains punctuality

KPI 28

% of trains (2017)



- Further work is undertaken by IMs to collect punctuality data according to the PRIME definition, in order to make this measure more comparable across the peer group
- Among IMs with normal data SBB and ProRail show highest levels of punctuality. FTIA and IP have more delays compared to last years' average
- It would be interesting to analyse:
  - reasons behind the good and improving performances of individual IMs
  - external drivers of performance differences such as utilisation or network complexity

Some IMs use differing observation points and rounding rules for measuring punctuality

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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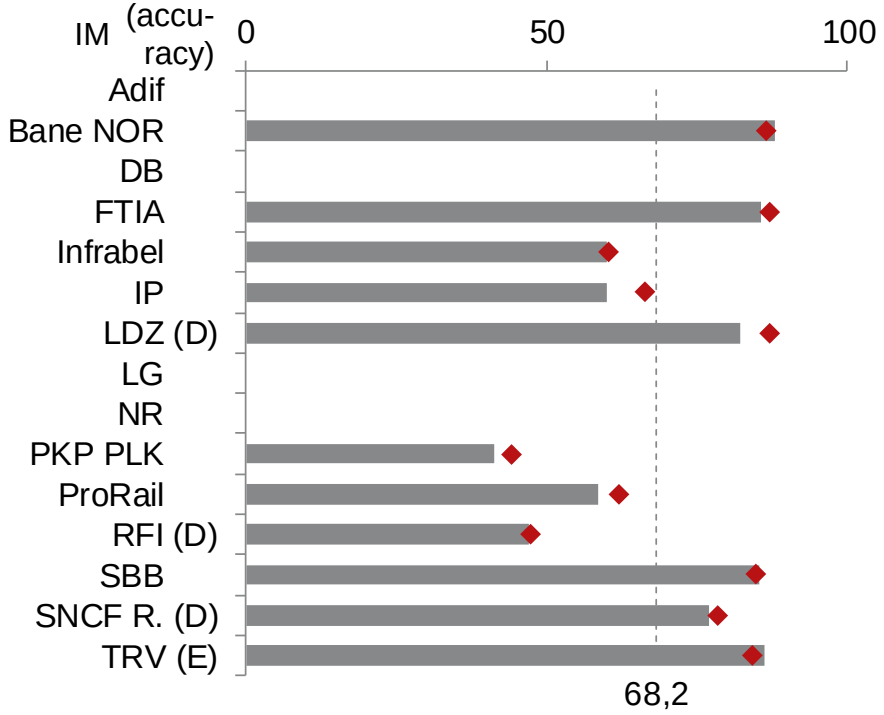
On average 68% of freight trains are on time

Freight trains punctuality

% of trains (2017)

KPI 29



- Further work is required by IMs to collect punctuality data according to the PRIME definition, in order to make this measure more comparable across the peer group
- Among the IMs with normal data, freight punctuality is highest for Bane NOR, FTIA and SBB. Freight punctuality varies by a factor of 2 and is considerably lower than for passenger traffic, despite its higher delay threshold
- It would be interesting to understand
  - why there is such a wide variation in freight train punctuality
  - the reasons behind the good performances

Some IMs use differing observation points and rounding rules for measuring punctuality

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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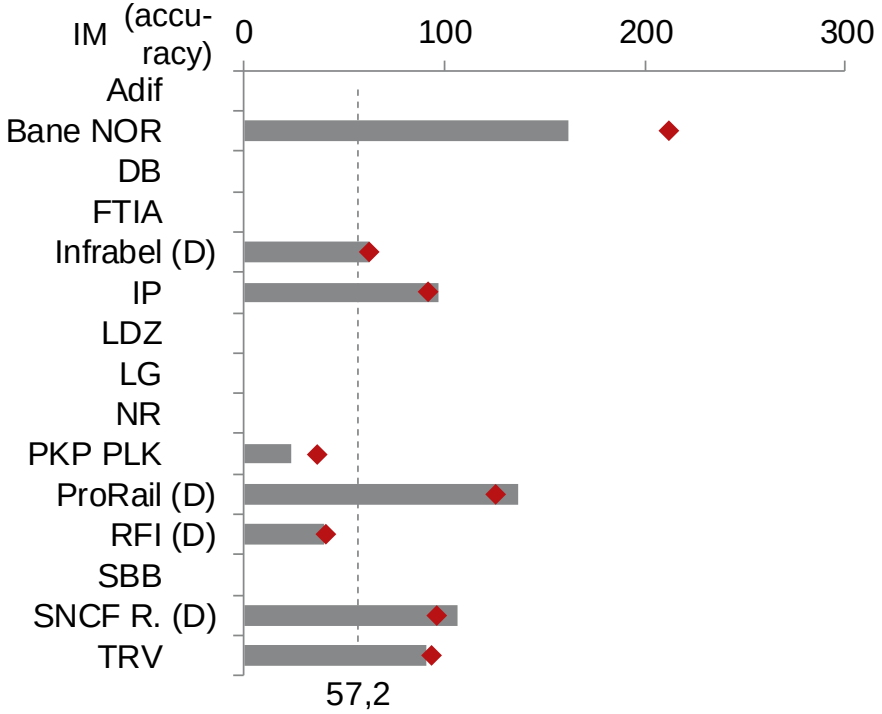
On average asset failures cause a delay of 57 minutes

Average delay minutes per asset failure

KPI 35

Minutes per failure (2017)



- The average delay minutes per asset failure varies widely
- Further work is required by IMs to collect data according to the PRIME definition, in order to make this analysis meaningful.

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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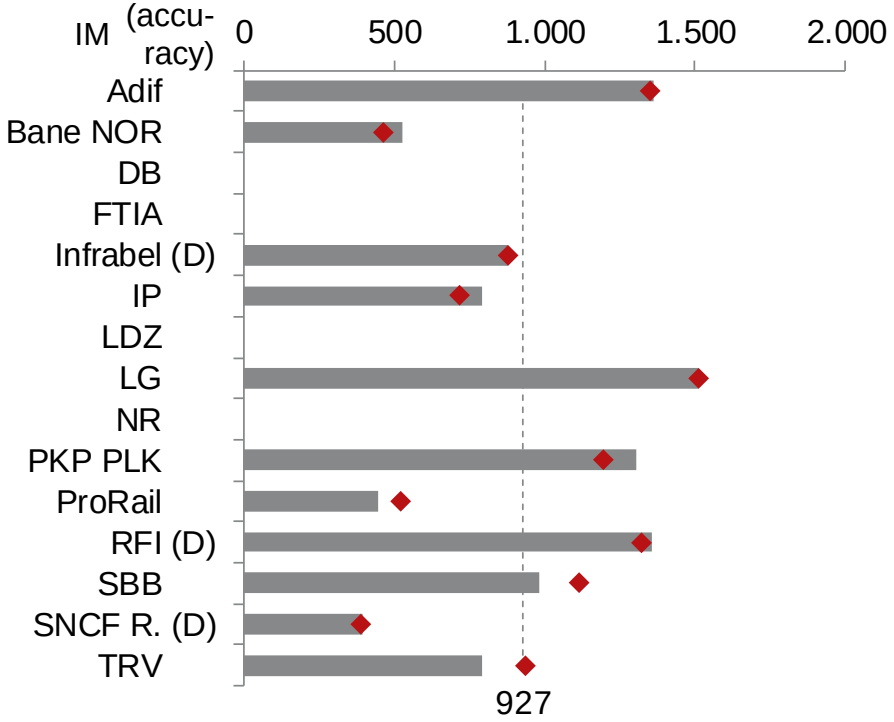
On average 900 assets are failing per thousand main track-kilometres and year

Asset failures in relation to network size

KPI 51

Number per thousand main track-km (2017)



- Asset failure frequency in the peer groups' railway networks varies between 400 and 1.500 failures per thousand main track-kilometres and year
- Three IMs (BaneNOR, ProRail and SNCF-Réseau) achieve a failure rate well below the weighted average
- All failure rates appear to be relatively constant over time
- Balance between preventive and corrective maintenance regimes need to be taken into account
- Extent of use of different failure registration tools might have an impact on this comparative analysis

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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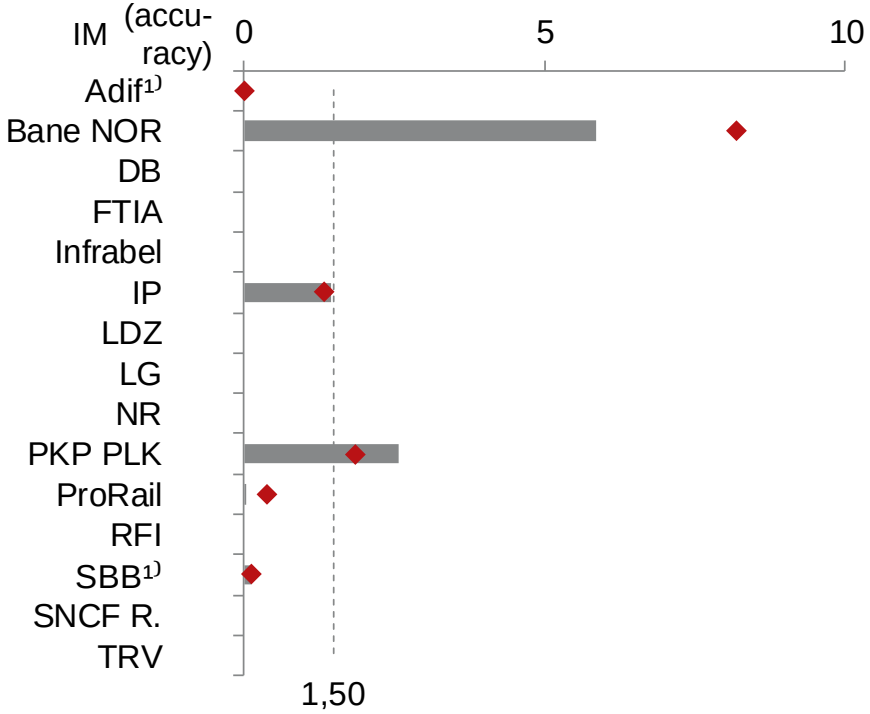
On average, about 1,5% of the main track has temporary speed restrictions due to deteriorating condition

Tracks with temporary speed restrictions

KPI 59

% of main track-km (2017)



- While some IMs have hardly any TSRs, others temporarily restrict speed on 6% of their network
- An in-depth analysis could identify
  - The statistical distribution of length and duration of TSRs
  - The reasons for temporary speed restrictions (e.g. bad track geometry …)
- It would be also interesting to understand the impact of TSRs on train operations

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) Data of 2016

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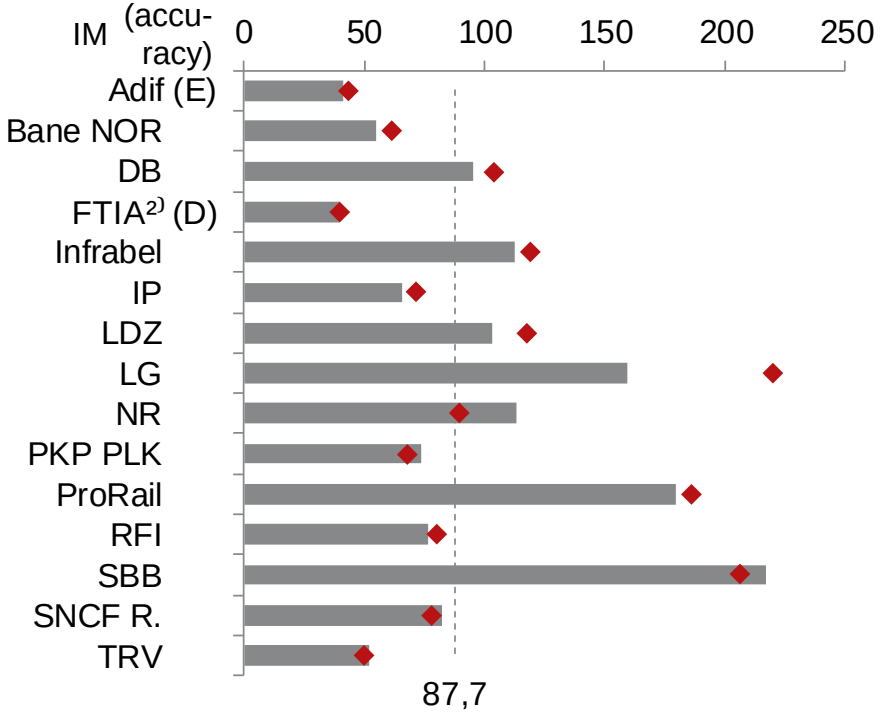
Average annual operational expenditures are 88 thousand Euros per main track-kilometre

OPEX – operational expenditures in relation to network size[1)]

KPI 60

1.000 Euro per main track-km (2017)



- Operational expenditures vary between 41 and 217 thousand Euros per main track-kilometres and year
- OPEX appear to be relatively constant over time except for LG, showing a decrease in 2017 compared to the average of 2012-2017
- This comparison provides an overview about annual expenditure levels independent of different operational conditions, representing major cost drivers
- For a meaningful gap analysis, these cost drivers should be taken into account, e.g.
  - Network characteristics (i.e. asset densities)
  - Network utilisation (i.e. train frequencies, gross tonnage)
  - Traffic management technologies and degree of centralisation

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

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Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) Results are normalised for purchasing power parity

2) Data of 2015

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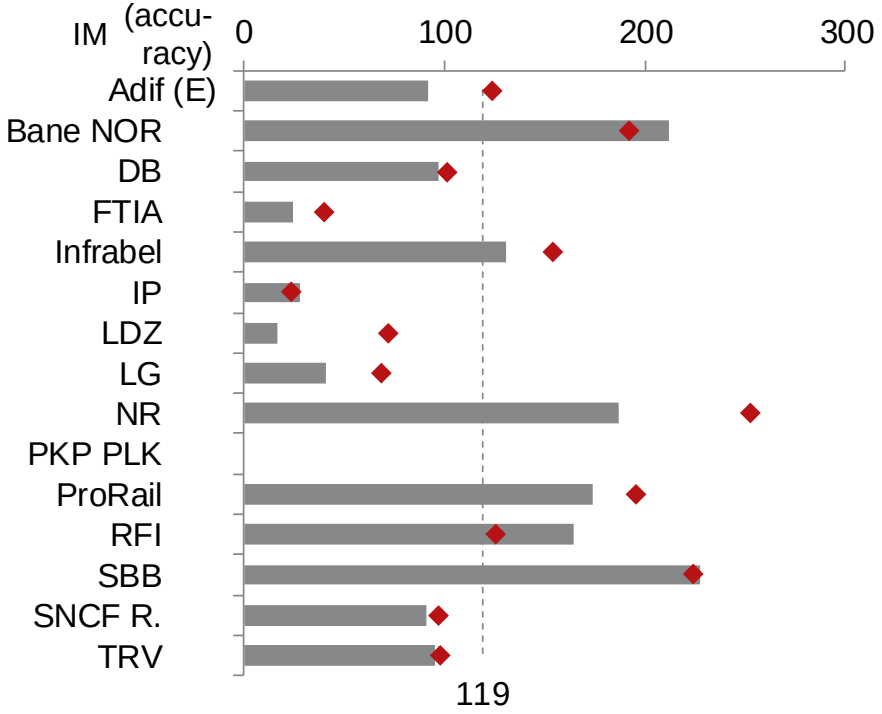
On average 119 thousand Euros per main track-kilometre and year are spent on capital expenditures

CAPEX – capital expenditures in relation to network size[1)]

KPI 66

1.000 Euro per main track-km (2017)



- The range of annual capital expenditures varies between 17 and 227 thousand Euros per main track-kilometres and year
- In many cases, capital expenditures are linked to major (re-) investment programs
- Thus it is not surprising that some IMs show high fluctuations in expenditure levels over time
- For an in-depth analysis, major cost drivers should be taken into account such as
  - Age and condition of the infrastructure assets
  - Technological migration strategies (such as ERTMS)
  - Available budgets and funding agreements
  - Supplier market, prices and resources

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) Results are normalised for purchasing power parity

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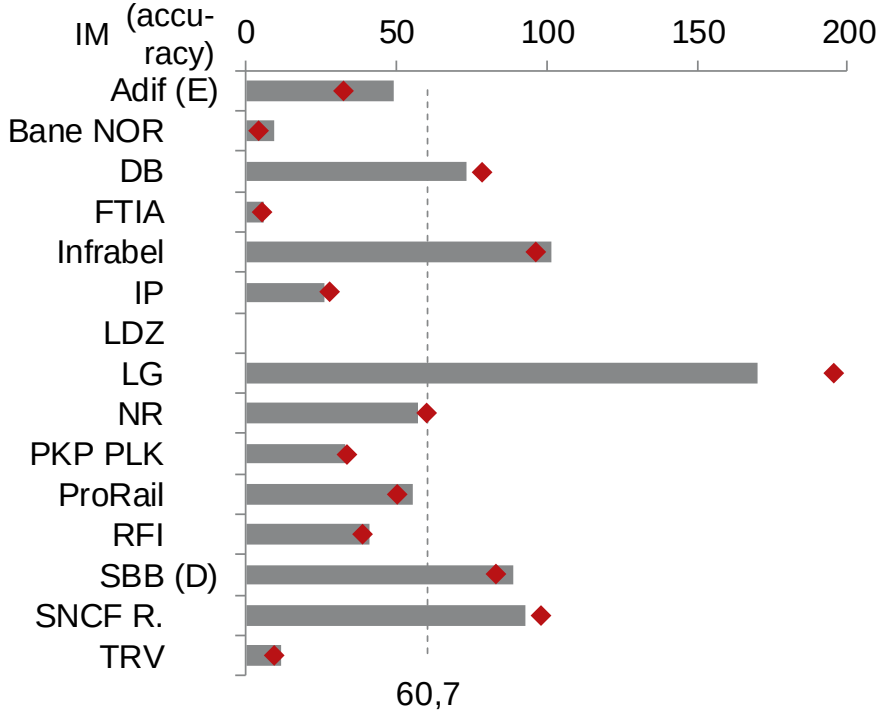
Average annual revenues from track access charges are 61 thousand Euros per main track-kilometre

TAC revenue in relation to network size[1)]

KPI 87

1.000 Euro per main track-km (2017)



- The range of TAC revenues in relation to network size varies between 6 and 170 thousand Euros per main track-km and year
- TAC revenues appear to be relatively constant over time
- This KPI illustrates the degree to which IMs manage to generate user revenues to cover the cost of the network. The degree to which IMs generate revenues from the utilisation of the network by operators is provided by relating TAC revenue to the traffic volume (additional KPI 82)
- An in-depth analysis could focus on
  - Track access charge regimes
  - Differentiation into/ share of train types
- A more precise definition of TAC revenue and its constituents will be provided in the future

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

Data accuracy: No entry = Normal E = Estimate D = Deviating from definition P = Preliminary

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) Results are normalised for purchasing power parity

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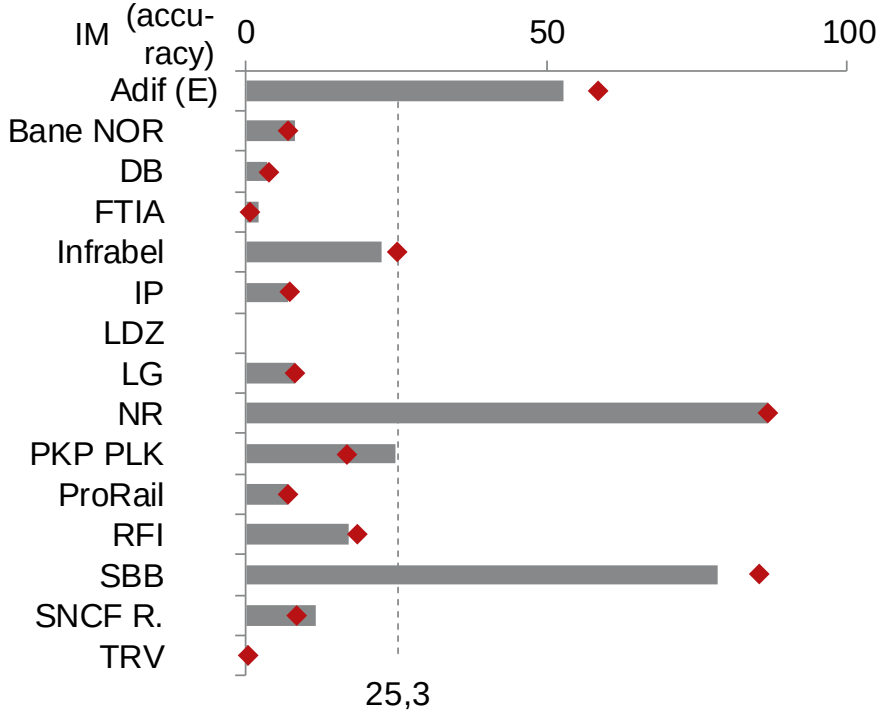
Average annual revenues from non-access charges are 25 thousand Euros per main track-kilometre

Total revenues from non-access charges in relation to network size[1)]

KPI 80

1.000 Euro per main track-km (2017)



- Three out of 14 IMs manage to generate above average revenues from non-access charges (Adif, NR and SBB)
- Thus it would be interesting to understand in detail, how IMs achieve these revenues and what they are based on
- SBB's above avg. revenues stem from providing goods (e.g. switches, rails, sleepers) and services (e.g. use of IT tools) to other IMs and RUs in Switzerland
- Total IMs annual revenues from non-access charges include commercial letting, advertising, telecoms but exclude station access charges, income from energy supply, grants and subsidies

Concerning the definition it should be ensured that income from energy supply is not included

Latest available year ◆ Average of available years 2012-2017 ----- Total weighted average of each IMs latest available year

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Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

1) Results are normalised for purchasing power parity

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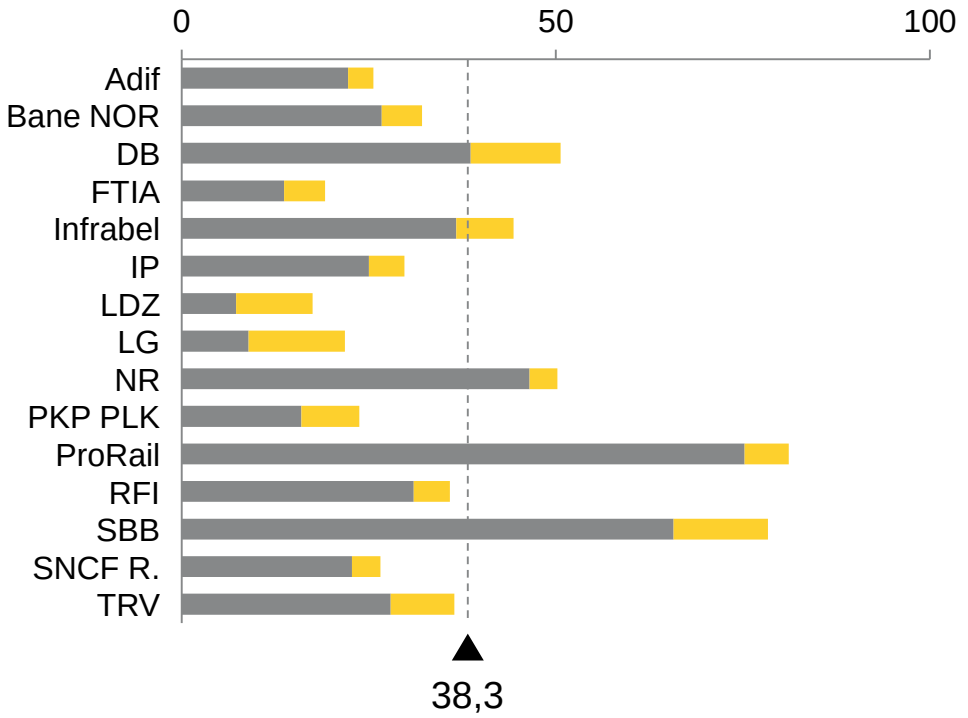
The majority of the peer groups' networks is frequented by passenger trains

Degree of network utilisation – all trains

KPI 92

Daily train-km per main track-km (2017)



- On average each of the peer group's railway tracks is frequented by 38 passenger and freight trains per day
- The utilisation of the peer groups' railway networks varies widely
- On average railway tracks are frequented between 17 to 81 times per day
- Only LDZ and LG are frequented by more freight than passenger trains
- Of course these figures do not provide any information about the distribution of utilisation in the network and across different types of lines
- The reasons for this situation are manifold and should be further explored: the geographic characteristics of the country, its location in Europe (transit countries), the quality and acceptance of railway services etc.

Passenger trains Freight trains ----- Total weighted average of sum of all trains

Source: civity calculations using data as provided by the infrastructure managers until 29 January 2019

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Further analysis should account for underlying root causes and identify opportunities for improvement

Questions for further analysis

- In order to **improve safety performance** (reduce the number of accidents and accident precursors) it would be valuable to investigate the **root causes and the programmes** that IMs initiated to mitigate them
- Further work is required by the IMs to collect data according to the PRIME **definition** in order to make **punctuality and delays** more comparable across the peer group. It should then be accounted for external network characteristics such as utilisation and network complexity. The breakdown of delays and train cancellations should be analysed by cause; this is addressed in the ongoing separate punctuality report
- Concerning **asset failure frequencies**, it would be interesting to **understand the reasons**/ the background for the wide range of frequencies among the peers, such as asset condition, maintenance regimes, different failure recording technologies etc. Still further work is required by IMs to collect data on possessions and speed restrictions
- The **impact** of **capacity constraints** (asset failures, speed restrictions or track closures) on **train operations** should then be analysed further
- In particular, implementation of **new timetabling rules** and coordination of temporary capacity restrictions as foreseen in Commission Delegated Decision (EU) 2017/2075, should allow the IMs to develop new common indicators in this regard.
- In order to identify financial good practice and to enable individual gap analyses, major **cost drivers** outside the (immediate) control of an IM need to be discussed and could be **normalised**; Furthermore, different **operational conditions** need to be **taken into account**
- From a total network perspective the utilisation of European railway infrastructure varies significantly; in order to better understand to what extent parts of the networks are over- or underutilised a **drill-down into the distribution of utilisation** would be valuable

Editors

Willi Flemming

Große Reichenstraße 27
20457 Hamburg
phone: +49 (0)40 181 22 36 50
willi.flemming@civity.de
www.civity.de

Klaus Wittmeier

Große Reichenstraße 27
20457 Hamburg
phone: +49 (0)40 181 22 36 67
mobile: +49 (0)160 706 32 25
klaus.wittmeier@civity.de
www.civity.de

Frank Zschoche

Große Reichenstraße 27
20457 Hamburg
phone: +49 (0)40 181 22 36 66
mobile: +49 (0)171 771 17 90
frank.zschoche@civity.de
www.civity.de

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