

PRIME

Key Performance indicators for performance benchmarking

Railway Infrastructure Managers

Draft version 0.62, Friday 17th of October, 2014

PRIME – Platform for Rail Infrastructure Managers in Europe

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Background

PRIME

PRIME is an open forum which enables benchmarking and exchange best practice, and serve as an "early warning mechanism" for infrastructure managers to alert the Commission on the main challenges and advise the Commission on both operational and regulatory activities. The work of PRIME should also lead towards a better mutual understanding between Infrastructure Managers (IMs) and the Commission, as well as better services to the customers of IMs and a better functioning European network.

Mission

According to the Declaration of Intent, IMs should seek to grow cooperation to help facilitate the delivery of safe, sustainable, high performing, and value generating rail transport across Europe.

Key performance indicators (KPIs) are identified as a tool to achieve this, along with subsequent benchmarking and exchange of best practices.

KPIs aims is to ensure a common definitions of topics and a foundation for comparison. Subsequently, the work should enable enhanced sharing of best practices and facilitate improvement of the railways in general.

Objectives

The IMs shall cooperate to develop KPIs in order to:

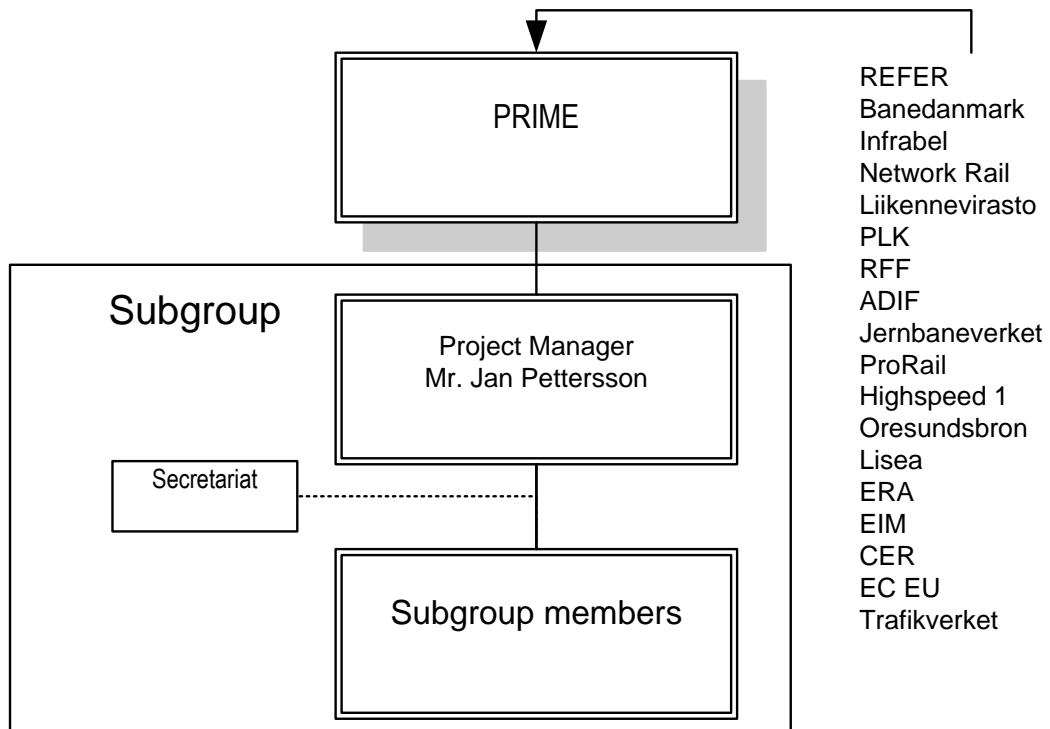
- provide a foundation for benchmarking
- support exchange of best practice
- increase performance of IMs

The KPIs that are suggested should be beneficial for both the IMs and the industry at large. Some further guidelines in the work are:

- Focus on business development for the IMs.
- Keep it simple
- Clear definitions
- Avoid duplications of existing work
- Ensure transparency

If necessary, anonymize results.

Project organization



Organization for continuous learning benchmarking

For the PRIME group to discuss

Key performance indicators

ERTMS

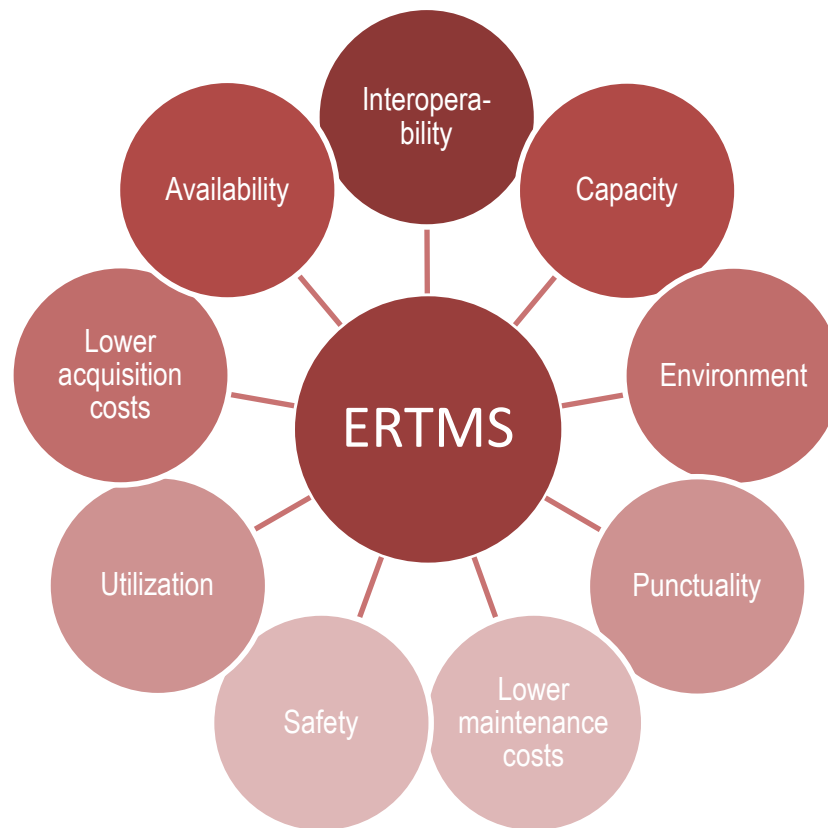


Figure 1. This image summarizes the expected effects from deployment of ERTMS. ☒

ERTMS and the deployment of ERTMS is a complex topic for the rail sector. While deployment of ERTMS is costly, it is also often not solely to the responsibility of IMs to choose to deploy ERTMS on their networks. However, ERTMS is crucial for infrastructure management in many ways and often influence some of the core functions of IMs. Furthermore, the benefits of ERTMS deployment can be numerous, such as increased availability, increased safety and increased interoperability.

The objectives of benchmarking on the topic ERTMS, is to:

- Assess the business case and potential benefits in deployment of ERTMS (as for the benefits for IMs)
- Deliver a high-performing network to the customers (to benefit punctuality, availability and utilisation of the network)
- Deliver a network interoperable cross-border in EU (to fulfil the aims set out in Union framework – increasing mobility through rail infrastructure and supporting growth in Europe).

KPIs for ERTMS

Underlined words are defined in the chapter “Definitions”. When KPIs and definitions are decided there will be links between underlined words and the corresponding definitions.

Nr	Title	Description	Unit for KPI	Intervals	Source	Remarque
A1	Accepted plans for <u>deployment</u> of ERTMS	The <u>IM</u> has a plan for <u>deployment</u> of ERTMS accepted by the government, YES or NO.	Yes or No	Annually	IM	
A2	<u>Main tracks</u> with ERTMS in operation	Current <u>main tracks</u> (measured in <u>track-km</u>) with ERTMS in operation in proportion to all <u>main tracks</u> (measured in <u>track-km</u>).	Percentage of total	Annually	IM	
A3	<u>Train-km</u> with ERTMS in operation	Current <u>train-km</u> with ERTMS in operation compared to totality of <u>train-km</u> .	Percentage of total	Annually	IM	
A4	In 2020, <u>main tracks</u> with planned <u>deployment</u> of ERTMS.	In 2020, the sum of <u>IMs main tracks</u> (measured in <u>track km</u>) planned to have <u>deployment</u> of ERTMS compared to the totality of the <u>IMs main track</u> , (measured in <u>track km</u>).	Percentage of total	Annually	IM	

Safety

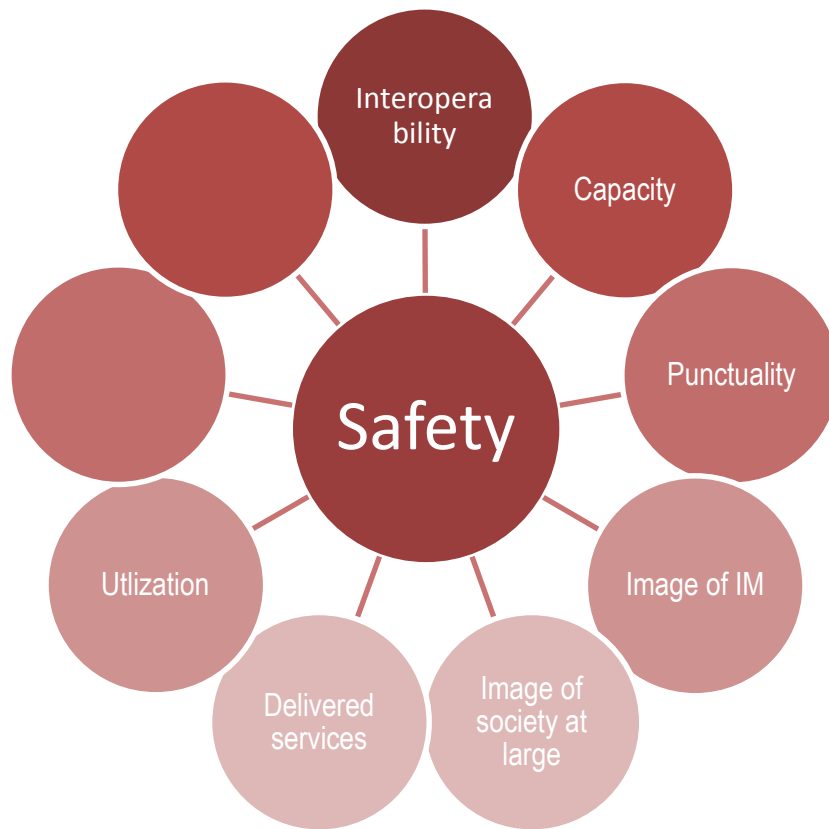


Figure 2. This figure is under development.

Safety is a key element in the performance of an IM. Not only does safety directly influence the service delivered to IMs' customers, it also affects the image of IMs and society at large.

From the viewpoint of Corporate Social Responsibility policy, in the business of infrastructure management, safety also holds a larger perspective than the already fundamental task of providing a stable and securely functioning network for the user. Safety should thus be considered from a holistic approach – and relates also to e.g. suicide prevention and workers' safety during work on tracks, which is not directly linked with operating a network.

The objectives benchmarking on safety are to:

- Enforce the safety related structures within IMs through identification and exchange of best practices.
- Deliver a safe network to the RUs to benefit safety levels when operating and to benefit performance and availability of the network.
- Deliver a safe network to society at large to fulfil the aims set out in legal framework of the Union and to act according to corporate social responsibility principles.

KPIs for Safety

Words or sentence with an underline are explained in the chapter with definitions.
When KPIs and definitions are decided there will be links to follow between them.

Nr	Title	Description	Unit for KPI	Intervals	Source	Remarque
A1	Number of significant accidents	Total and relative number of <u>significant accidents</u> based of following types of accidents (<i>primary accidents</i>): <ul style="list-style-type: none"> - <u>Collision of train with rail vehicle</u> - <u>Collision of train with obstacle within the clearance gauge</u> - <u>Derailment of train</u> - <u>Level crossing accident</u>, including accident involving pedestrians at level crossing - <u>Accident to persons involving rolling stock in motion</u>, with the exception of <u>suicides</u> and <u>attempted suicides</u> - <u>Fire on rolling stock</u> - <u>Other accident</u> 	Total and relative to <u>train-kilometres</u>	Annually	<u>NSA</u> or <u>ERA</u>	KPI A1 is the same as current CSI "Indicators relating to accidents". Primary accident: Each significant accident shall be reported under the type of the primary accident, even if the consequences of the secondary accident are more severe (e.g. a derailment followed by a fire).
A2	Number of persons seriously injured and killed	Total and relative number of persons <u>seriously injured</u> and <u>killed</u> by accidents based upon following categories <ul style="list-style-type: none"> - <u>Passenger</u> - <u>Employee or contractor</u> - <u>Level crossing user</u> - <u>Trespasser</u> - <u>Other person at a platform</u> - <u>Other person not at a platform</u> 	Total and relative to <u>train-kilometres</u>	Annually	NSA or ERA	KPI A2 , is the same as current CSI "Number of persons seriously injured and killed by type of accidents".
B	Suicides and attempted suicides	Total and relative number of <u>suicides</u> and <u>attempted suicides</u> .	Total and relative to <u>train-kilometres</u>	Annually	NSA or ERA	KPI B , is the same as current CSI "Number of suicides and attempted suicides"
C	IM related precursors to accidents	Total and relative number of the following types of precursors: <ul style="list-style-type: none"> - Number of <u>broken rail</u> - Number of <u>track buckle and track misalignment</u> - Number of <u>wrong-side signalling failure</u> 	Total and relative to <u>train-kilometres</u>	Annually	IM	New KPI , based upon current CSI "Number of precursors to accidents". Compared to current CSI following precursors are removed: <ul style="list-style-type: none"> -Signal passed at danger when/ without passing a danger point. -Broken wheel on rolling stock in service - Broken axle on rolling stock in service

D1	Overall workforce safety: Number of IMs employees, contracted consultants and contractors killed and seriously injured by work accidents.	Total and relative number of IMs employees , contracted consultants and contractors killed and seriously injured while at work at IMs premises.	Total, per million hours worked and per number of employees	Annually		New KPI All accidents at IM's premises or to or from those during working hours for all IMs employees, contracted consultants or contractors that result in serious injury or killed are included
D2	Workforce safety: Number of IMs employees or contractors seriously injured and killed by accidents during work on IMs track or trackside	Total and relative number of IMs employees or contractors killed and seriously injured in accidents while at work on track or trackside	Total, per million hours worked and per number of employees	Annually	IM	New KPI Includes all accidents that may occur within the limitation track - trackside. Thus also accidents related to electrical work, etc.

Punctuality

Punctuality for the Railway networks are one of the most important KPIs in judging the degree of quality in service. The requirements on punctuality differs between infrastructure managers, high-speed routes, core network, customer groups etc. It has a highly and in some part measureable effects on the benefits and costs for society.

To be able to compare punctuality between the Railway Infrastructure managers in the Prime group are essential. The dependability within the Railway assets are an important part of the performed punctuality. But the impact from the Railway assets has to be assessed together with punctuality as whole, in order to keep focus on the Railway customer

s and other stakeholders.

KPIs for punctuality

Nr	Title	Description	Unit for KPI	Intervals	Source	Remarque
A1	Trains punctuality.	Trains arrived at final station with less than 5 minutes delay compared to all trains . <i>The comparison are to be done between all trains ran against the original time plan.</i>	Percentage of trains.	Annually	IM	
A2	Passenger trains punctuality.	Passenger trains arrived at final station with less than 5 minutes delay compared to all passenger trains . <i>The comparison are to be done between passengers trains ran against the original time plan.</i>	Percentage of trains.	Annually	IM	
A3	Freight trains punctuality.	Freight trains arrived at final station with less than 15 minutes delay compared to all freight trains .	Percentage of trains.	Annually	IM	

		<i>The comparison are to be done between freight trains ran against the original time plan.</i>				
A4	Minutes of delays caused by the infrastructure manager	Total delay minutes of trains arriving at final station caused by the infrastructure manager , compared to all trains and train km .	<i>Minutes per train and per train km</i>	Annually	IM	Definition of delay minutes for passenger trains, A2.. Definition of delay minutes for freight trains, A3.
A5	Percentage of train cancelled caused by the infrastructure manager.	In Time Table planned train services cancelled within xx hours before their scheduled time caused by the infrastructure manager .	Percentage	Annually	IM	

Definitions

Name	Source	Description	Remarque
Infrastructure Manager (IM)	ISSN 1977-0375 Eurostat Methodologies and working papers, Illustrated glossary for transport statistics 4 th edition. A.III-03	Any enterprise or transport operator responsible in particular for establishing of maintaining railway infrastructure, as well as for operating the control and safety system. An infrastructure manager can delegate to another enterprise the following tasks: maintaining railway infrastructure and operating the control and safety system.	
Deployment	The free dictionary by Farlex, point 3.	To put into use of action.	Another lexicon?
Track km	COMMISSION DIRECTIVE 2014/88/EU of 9 July 2014	Means the length measured in kilometres of the railway network in Member States, whose scope is laid down in Article 2. Each track of a multiple-track railway line is to be counted.	
Main tracks	ERA/2008/SAF/OP/01 Glossary of railway terms EU institutions IATE database (information at: http://iate.europa.eu/iatediff/about_IATE.html).	Tracks used for running trains in service. Excludes sidings, depots, stabling tracks and connecting lines.	
Train-km	COMMISSION DIRECTIVE 2014/88/EU of 9 July 2014	Means the unit of measure representing the movement of a train over on 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.	
Significant accident	Directive 2014/88/EU	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	

Significant damage	Directive 2014/88/EU	Damage that is equivalent to EUR 150 000 or more	
Extensive disruptions to traffic,	Directive 2014/88/EU	Train services on a main railway line are suspended for six hours or more	
Train (definition used within the Safety KPIs)	Directive 2014/88/EU	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	
Collision of train with rail vehicle	Directive 2014/88/EU	A front to front, front to end or a side collision between a part of a train and a part of another train or rail vehicle, or with shunting rolling stock	
Collision of train with obstacle within the clearance gauge	Directive 2014/88/EU	A collision between a part of a train and objects fixed or temporarily present on or near the track (except at level crossings if lost by a crossing vehicle or user), including collision with overhead contact lines	Explanation: The object must be hit by a train, so it will always be within the limits of the clearance gauge.
Derailment of train	Directive 2014/88/EU	Any case in which at least one wheel of a train leaves the rails	
Level crossing accident	Directive 2014/88/EU	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	
Accident to persons involving rolling stock in motion	Directive 2014/88/EU	Accidents to one or more persons who are either hit by a railway vehicle or by an object attached to, or that has become detached from, the vehicle, this includes persons who fall from railway vehicles as well as persons who fall or are hit by loose objects when travelling on board vehicles	
Other accident	Directive 2014/88/EU	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
Fire in rolling stock	Directive 2014/88/EU	A fire or explosion that occurs in a railway vehicle (including its load) when it is running between the departure station and the destination, including when stopped at the departure station, the destination or intermediate stops, as well as during re-marshalling operations	
Passenger	Directive 2014/88/EU	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	
Employee or contractor	Directive 2014/88/EU	Any person whose employment is in connection with a railway and is at work at the time of the accident, including the staff of contractors, self-employed contractors, the crew of the train and persons handling rolling stock and infrastructure installations	

Level crossing user	Directive 2014/88/EU	Any person using a level crossing to cross the railway line by any means of transport or by foot;	
Trespasser	Directive 2014/88/EU	Any person present on railway premises where such presence is forbidden, with the exception of a level crossing user	
Other person at a platform	Directive 2014/88/EU	Any person at a railway platform who is not defined as "passenger", "employee or contractor", "level crossing user", "other person not at a platform" or "trespasser"	Examples: Person standing on a platform: Struck by an open train door or other out of gauge item, Struck by an item fallen from a train, infringing the normal kinematic envelope of a train and struck by the train; Person who falls from a platform and is struck by a train; Person other than workforce authorised to cross railways between platforms and struck by a train.
Other person not at a platform	Directive 2014/88/EU	Any person not at a railway platform who is not defined as "passenger", "employee or contractor", "level crossing user", "other person at a platform" or "trespasser";	Examples: Person in a road vehicle that impinges on the railway (not a level crossings) and is struck by a train; Person outside the railway struck by -a derailed train -an object fallen from a train.
Killed (Death (killed person))	Directive 2014/88/EU	Any person killed immediately or dying within 30 days as a result of an accident, excluding any suicide	
Serious injury (seriously injured person)	Directive 2014/88/EU	Any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding any attempted suicide.	
Suicide	Directive 2014/88/EU	An act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority	
Attempted suicide	Directive 2014/88/EU	An act to deliberately injure oneself resulting in serious injury	
Broken rail	Directive 2014/88/EU	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	
Track buckle or other track misalignment	Directive 2014/88/EU	Any fault related to the continuum and the geometry of track, requiring track to be placed out of service or immediate restriction of permitted speed	
Wrong side signalling failure	Directive 2014/88/EU	Any technical failure of a signalling system (either to infrastructure or to rolling stock), resulting in signalling information less restrictive than that demanded	
Level crossing	Directive 2014/88/EU	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	
Road	Directive 2014/88/EU	Any public or private road, street or highway, including adjacent footpaths and bicycle lanes	
Passage	Directive 2014/88/EU	Any route, other than a road, provided for the passage of people, animals, vehicles or machinery	
Trackside	Sub-group PRIME	Area adjacent to a railway track such as embankments, level crossings, platforms, shunting yards.	Accidents at workshops, warehouses and depots; should be excluded.
NSA		National Safety Authority	
ERA		European Railway Agency	
5 minutes, 15 minutes	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 4.1 – Rounding rules number 2.	“2. Round down until 29, round up from 30, 4:30 is considered as 5, 14:30 is considered as 15.	
Punctuality	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 4 Measurement of punctuality	<p>“Punctuality of a train is measured on the base 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”.</p> <p>“Punctuality are measured by setting up a threshold up to which trains are considered as punctual and building a percentage.”</p> <p>“Number of measures with delays more than 5 minutes compared to number of all measures.”</p> <p>“It is recommended to set this threshold to 5 minutes.”</p> <p>When measuring punctuality following are to be included all in service trains, i.e. Freight and passenger but excluding Empty Coaching Stock movements and engineering trains.</p>	
Cancelled train	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 6 – Cancelled services	<p><i>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.</i></p> <p><i>In the event of rerouting of the trains, if a commercial stop is missed on the original path it is considered cancelled.</i></p> <p><i>A replacement road service – either for the whole route or for sections of it – should be considered as cancelled to.</i></p>	<i>This definition needs further development.</i>

Delay causes	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 5 – Causes for delays and cancelled services.	Delay causes should include both primarily causes and secondarily causes, Primarily and secondarily causes are described in the referred source part Appendix A. Causes for cancelled trains are the same as for delays.	
Cancelled train causes	UIC CODE, 450 – 2, OR, 5th edition, June 2009, 5 – Causes for delays and cancelled services.	See delay causes	
IMs responsibility for delay minutes	UIC CODE, 450 – 2, OR, 5th edition, June 2009, Appendix A	Table, column 1-, 2-, 3- (Operational and planning management, Infrastructure installations, Civil Engineering causes)	Weather causes under discussion.
Failure (under development)	SIS-EN 13306:2010	"Termination of an item to perform a given service." And in this case the failure also affects the train services.	This definition needs further development.
Assets (under development)	EC Directives, European Commission 5 th Framework Programme Improve rail, Deliverable D3, "Benchmarking exercise in railway infrastructure management" as referred in the UIC Lasting Infrastructure Cost Benchmarking (LICB) project.	"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: <ul style="list-style-type: none"> - 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." 	This definition needs further development.
Passenger trains	ERA, European Railway Agency, Implementation guidance for CSIs, Annex 1 of directive 2004/49/EC AS Amended by directive 2009/149/EC.	"Each train primarily used for transport of passengers including at least one passenger railway vehicle. A train mainly carrying road vehicles, even though it includes a passenger railway vehicle should not be considered as passenger train. Railway vehicle is a vehicle for the conveyance of passengers, even if it comprises one or more compartments with spaces specially reserved for luggage, parcels, mail, etc.. These vehicles include special vehicles such as sleeping cars, saloon cars, dining cars, ambulance cars and vans carrying accompanied road passenger vehicles. Each separate vehicle of an indivisible set for the conveyance of passengers is counted as a passenger railway vehicle. Included are railcars if they are designed for passenger transport."	
Freight trains	ERA, European Railway Agency, Implementation guidance for CSIs, Annex 1 of directive 2004/49/EC AS Amended by directive 2009/149/EC.		
Passenger-km	ERA, European Railway Agency, Implementation guidance for CSIs, Annex 1 of directive 2004/49/EC AS Amended by directive 2009/149/EC.	"7.2. "passenger-km" means the unit of measure representing the transport of one passenger by rail over a distance of one kilometre. Only the distance on the national territory of the reporting country shall be taken into account."	This definition needs further development.

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