

ANNEX I

COMMON SAFETY INDICATORS

Common safety indicators (CSIs) shall be reported annually by the national safety authorities.

If new facts or errors are discovered after the submission of the report, the indicators for one particular year shall be amended or corrected by the national safety authority at the first convenient opportunity and at the latest in the next annual report.

Common definitions for the CSIs and methods to calculate the economic impact of accidents are laid down in the Appendix.

1. Indicators relating to accidents

1.1. Total and relative (to train-kilometres) number of serious accidents and a break-down for the following types of 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, and a further break-down for the five types of level crossings defined in point 6.2,
- accident to persons involving rolling stock in motion, with the exception of suicides and attempted suicides,
- fire in rolling stock,
- other.

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).

1.2. Total and relative (to train-kilometres) number of persons seriously injured and killed by type of accident divided into the following categories:

- passenger (also relative to total passenger-kilometres and passenger train-kilometres),
- employee or contractor,
- level crossing user,
- trespasser,
- other person at a platform,
- other person not at a platform.

2. Indicators relating to dangerous goods

Total and relative (to train-kilometres) number of accidents involving the transport of dangerous goods by rail divided into the following categories:

- accident involving at least one railway vehicle transporting dangerous goods, as defined in the Appendix,
- number of such accidents in which dangerous goods are released.

3. Indicators relating to suicides

Total and relative (to train-kilometres) number of suicides and attempted suicides

4. Indicators relating to precursors of accidents

Total and relative (to train-kilometres) number of precursors to accidents and a break down on the following types of precursor:

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- broken rail,
- track buckle and other track misalignment,
- wrong-side signalling failure,
- signal passed at danger when passing a danger point,
- signal passed at danger without passing a danger point,
- broken wheel on rolling stock in service,
- broken axle on rolling stock in service.

All precursors are to be reported, both those resulting and those not resulting in accidents. (A precursor resulting in a significant accident shall also be reported under indicators relating to precursors; a precursor not resulting in a significant accident shall only be reported under indicators relating to precursors).

5. Indicators to calculate the economic impact of accidents

Total in euro and relative (to train-kilometres):

- number of deaths and serious injuries multiplied by the Value of Preventing a Casualty (VPC),
- cost of damages to environment,
- cost of material damages to rolling stock or infrastructure,
- cost of delays as a consequence of accidents.

National safety authorities shall report the economic impact of significant accidents.

The VPC is the value society attributes to the prevention of a casualty and as such shall not form a reference for compensation between parties involved in accidents.

6. Indicators relating to technical safety of infrastructure and its implementation

- 6.1. Percentage of tracks with Train Protection Systems (TPSs) in operation and percentage of train-kilometres using on-board TPSs, where these systems provide:
 - warning,
 - warning and automatic stop,
 - warning and automatic stop and discrete supervision of speed,
 - warning and automatic stop and continuous supervision of speed.
- 6.2. Number of level crossings (total, per line kilometre and track kilometre) by the following five types:
 - (a) passive level crossing
 - (b) active level crossing:
 - (i) manual,
 - (ii) automatic with user-side warning,
 - (iii) automatic with user-side protection,
 - (iv) rail-side protected.

Appendix

Common definitions for the CSIs and methods of calculating the economic impact of accidents

1. Indicators relating to accidents

- 1.1. 'significant accident' means 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;
- 1.2. 'significant damage to stock, track, other installations or environment' means damage that is equivalent to EUR 150 000 or more;
- 1.3. 'extensive disruptions to traffic' means that train services on a main railway line are suspended for six hours or more;
- 1.4. 'train' means 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;
- 1.5. 'collision of train with rail vehicle' means 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;
- 1.6. 'collision of train with obstacle within the clearance gauge' means 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;
- 1.7. 'derailment of train' means any case in which at least one wheel of a train leaves the rails;
- 1.8. 'level crossing accident' means 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;
- 1.9. 'accident to persons involving rolling stock in motion' means 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;
- 1.10. 'fire in rolling stock' means 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;
- 1.11. 'other (accident)' means 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;

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- 1.12. 'passenger' means 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;
- 1.13. 'employee or contractor' means 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;
- 1.14. 'level crossing user' means any person using a level crossing to cross the railway line by any means of transport or by foot;
- 1.15. 'trespasser' means any person present on railway premises where such presence is forbidden, with the exception of a level crossing user;
- 1.16. 'other person at a platform' means 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';
- 1.17. 'other person not at a platform' means 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';
- 1.18. 'death (killed person)' means any person killed immediately or dying within 30 days as a result of an accident, excluding any suicide;
- 1.19. 'serious injury (seriously injured person)' means any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding any attempted suicide.
- 2. **Indicators relating to dangerous goods**
 - 2.1. 'accident involving the transport of dangerous goods' means any accident or incident that is subject to reporting in accordance with RID⁽¹⁾/ADR section 1.8.5;
 - 2.2. 'dangerous goods' means those substances and articles the carriage of which is prohibited by RID, or authorised only under the conditions prescribed therein.
- 3. **Indicators relating to suicides**
 - 3.1. 'suicide' means an act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority;
 - 3.2. 'attempted suicide' means an act to deliberately injure oneself resulting in serious injury.
- 4. **Indicators relating to precursors of accidents**
 - 4.1. 'broken rail' means 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;
 - 4.2. 'track buckle or other track misalignment' means 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;

- 4.3. 'wrong side signalling failure' means any technical failure of a signalling system (either to infrastructure or to rolling stock), resulting in signalling information less restrictive than that demanded;
- 4.4. 'Signal Passed at Danger when passing a danger point' means any occasion when any part of a train proceeds beyond its authorised movement and travels beyond the danger point;
- 4.5. 'Signal Passed at Danger without passing a danger point' means any occasion when any part of a train proceeds beyond its authorised movement but does not travel beyond the danger point.

Unauthorised movement as referred to in points 4.4 and 4.5 above means to pass:

- a trackside colour light signal or semaphore at danger, or an order to STOP where a Train Protection system (TPS) is not operational,
- the end of a safety related movement authority provided in a TPS,
- a point communicated by verbal or written authorisation laid down in regulations,
- stop boards (buffer stops are not included) or hand signals.

Any case in which a vehicle without any traction unit attached or a train that is unattended runs away past a signal at danger is not included. Any case in which, for any reason, the signal is not turned to danger in time to allow the driver to stop the train before the signal is not included.

National safety authorities may report separately on the four indices of unauthorised movement listed in the indents in this point and shall report at least an aggregate indicator containing data on all four items indices.

- 4.6. 'broken wheel on rolling stock in service' means a break affecting the wheel and creating a risk of accident (derailment or collision);
- 4.7. 'broken axle on rolling stock in service' means a break affecting the axle and creating a risk of accident (derailment or collision).

5. **Common methodologies to calculate the economic impact of accidents**

5.1. The Value of Preventing a Casualty (VPC) is composed of:

- (1) Value of safety per se: Willingness to Pay (WTP) values based on stated preference studies carried out in the Member State for which they are applied.
- (2) Direct and indirect economic costs: cost values appraised in the Member State, composed of:
 - medical and rehabilitation cost,
 - legal court cost, cost for police, private crash investigations, the emergency service and administrative costs of insurance,
 - production losses: value to society of goods and services that could have been produced by the person if the accident had not occurred.

When calculating the costs of casualties, fatalities and serious injuries shall be considered separately (different VPC for fatality and serious injury).

5.2. Common principles to appraise the value of safety per se and direct and/or indirect economic costs:

For the value of safety per se, the assessment of whether available estimates are appropriate or not shall be based on the following considerations:

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- estimates shall relate to a system for valuation of mortality risk reduction in the transport sector and follow a WTP approach according to stated preference methods,
- the respondent sample used for the values shall be representative of the population concerned. In particular, the sample has to reflect the age/income distribution along with other relevant socioeconomic and/or demographic characteristics of the population,
- method for eliciting WTP values: survey design shall be such that questions are clear/meaningful to respondents.

Direct and indirect economic costs shall be appraised on the basis of the real costs borne by society.

5.3. Definitions

5.3.1. ‘Cost of damage to environment’ means costs that are to be met by Railway Undertakings and Infrastructure Managers, appraised on the basis of their experience, in order to restore the damaged area to its state before the railway accident.

5.3.2. ‘Cost of material damage to rolling stock or infrastructure’ means the cost of providing new rolling stock or infrastructure, with the same functionalities and technical parameters as that damaged beyond repair, and the cost of restoring repairable rolling stock or infrastructure to its state before the accident, to be estimated by Railway Undertakings and Infrastructure Managers on the basis of their experience, including also costs related to the leasing of rolling stock, as a consequence of non-availability due to damaged vehicles.

5.3.3. ‘Cost of delays as a consequence of accidents’ means the monetary value of delays incurred by users of rail transport (passengers and freight customers) as a consequence of accidents, calculated by the following model:

VT = monetary value of travel time savings

Value of time for a passenger of a train (an hour)

$$VT_P = [VT \text{ of work passengers}] * [\text{Average percentage of work passengers per year}] + [VT \text{ of non-work passengers}] * [\text{Average percentage of non-work passengers per year}]$$

VT_P is measured in EUR per passenger per hour

‘Work passenger’ means a passenger travelling in connection with their professional activities excluding commuting.

Value of time for a freight train (an hour)

$$VT_F = [VT \text{ of freight trains}] * [(Tonne-km)/(Train-km)]$$

VT_F is measured in EUR per freight tonne per hour

Average tonnes of goods transported per train in 1 year = (Tonne-km)/(Train-km)

CM = Cost of 1 minute of delay of a train

Passenger train

$$CM_P = K1 * (VT_P/60) * [(Passenger-km)/(Train-km)]$$

Average number of passengers per train in 1 year = (Passenger-km)/(Train-km)

Freight train

$$CM_F = K2 * (VT_F/60)$$

Factors K1 and K2 are between the value of time and the value of delay, as estimated by stated preference studies, to take into account that the time lost

as a result of delays is perceived significantly more negatively than normal travel time.

Cost of delays of an accident = $CM_P \cdot (\text{Minutes of delay of passenger trains}) + CM_F \cdot (\text{Minutes of delay of freight trains})$

Scope of the model

Cost of delays is to be calculated for significant accidents, as follows:

- real delays on the railway lines where accidents occurred as measured at terminal station
- real delays or, if not possible, estimated delays on the other affected lines.

6. Indicators relating to technical safety of infrastructure and its implementation

- 6.1. ‘Train Protection System (TPS)’ means a system that helps to enforce obedience to signals and speed restrictions.
- 6.2. ‘On-board systems’ mean systems assisting the driver to observe line-side signalling and in cab signalling and thus providing protection of danger points and enforcement of speed limits. On-board TPSs are described as follows:
- (a) Warning, providing automatic warning to driver.
 - (b) Warning and automatic stop, providing automatic warning to driver and automatic stop when passing a signal at danger.
 - (c) Warning and automatic stop and discrete supervision of speed, providing protection of danger points, where ‘discrete supervision of speed’ means supervision of speed at certain locations (speed traps) at the approach of a signal.
 - (d) Warning and automatic stop and continuous supervision of speed, providing 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.

Type (d) is regarded as Automatic Train Protection (ATP) system.

- 6.3. ‘level crossing’ means 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.
- 6.4. ‘road’ means, for the purpose of railway accident statistics, any public or private road, street or highway, including adjacent footpaths and bicycle lanes.
- 6.5. ‘passage’ means any route, other than a road, provided for the passage of people, animals, vehicles or machinery.
- 6.6. ‘passive level crossing’ means a level crossing without any form of warning system or protection activated when it is unsafe for the user to traverse the crossing.
- 6.7. ‘active level crossing’ means a level crossing where the crossing users are protected from or warned of the approaching train by devices activated when it is unsafe for the user to traverse the crossing.
- Protection by the use of physical devices includes:
 - half or full barriers,
 - gates.

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- Warning by the use of fixed equipment at level crossings:
 - visible devices: lights,
 - audible devices: bells, horns, klaxons, etc.

Active level crossings are classified as:

- (a) Manual: a level crossing where user-side protection or warning is manually activated by a railway employee.
- (b) Automatic with user-side warning: a level crossing where user-side warning is activated by the approaching train.
- (c) Automatic with user-side protection: a level crossing where user-side protection is activated by the approaching train. This shall include a level crossing with both user-side protection and warning.
- (d) Rail-side protected: a level crossing where a signal or other train protection system permits a train to proceed once the level crossing is fully user-side protected and is free from incursion.

7. Definitions of the scaling bases

- 7.1. ‘train-km’ means the unit of measure 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.
- 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.
- 7.3. ‘line km’ means the length measured in kilometres of the railway network in Member States, whose scope is laid down in Article 2. For multiple-track railway lines, only the distance between origin and destination is to be counted.
- 7.4. ‘track km’ 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.

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- (1) RID, Regulations concerning the International Carriage of Dangerous Goods by Rail, as adopted under Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods ([OJ L 260, 30.9.2008, p. 13](#)).