Railway Safety Performance in the European Union

2016

Biennial Report

EUROPEAN UNION AGENCY FOR RAILWAYS

About this report

This report is the fifth biennial report on the development of railway safety performance in the European Union, issued by the European Union Agency for Railways. The presented data have been provided by National Investigation Bodes (NIBs) and National Safety Authorities (NSAs) in the EU Member States, the European Commission, and other official sources.

Monitoring safety performance is a priority task of the Agency in its mission to promote a harmonised approach to railway safety in Europe. A harmonised Safety Management System (SMS) is the foundation for managing and controlling risks, and building trust among railway undertakings and infrastructure managers in the European Union.

For the present report, National Safety Authorities used Common Safety Indicators (CSIs) to gather information from railway undertakings and infrastructure managers, which combined with other relevant data, makes a comparative analysis possible, and serves as basis for policy recommendations at EU level.

About the European Union Agency for Railways

The European Union Agency for Railways, formerly known as European Railway Agency (ERA), was established in 2004 to devise the technical and legal framework for creating a Single European Railway Area (SERA) as mandated under European Union law. ERA's core activities are creating a harmonised approach to safety, removing technical barriers, advancing the single European Train Control and Communication System (ERTMS), and promoting simplified access for customers for the European rail sector.

With the entry-into-force of the technical pillar of the 4th Railway Package in 2016, the mandate of the Agency has been extended to that of a European authority, issuing rail vehicle authorisations, safety certificates, and approval for ERTMS infrastructure. After a period of legal transposition into EU Member State law, these changes are expected to take effect by 2019/2020.

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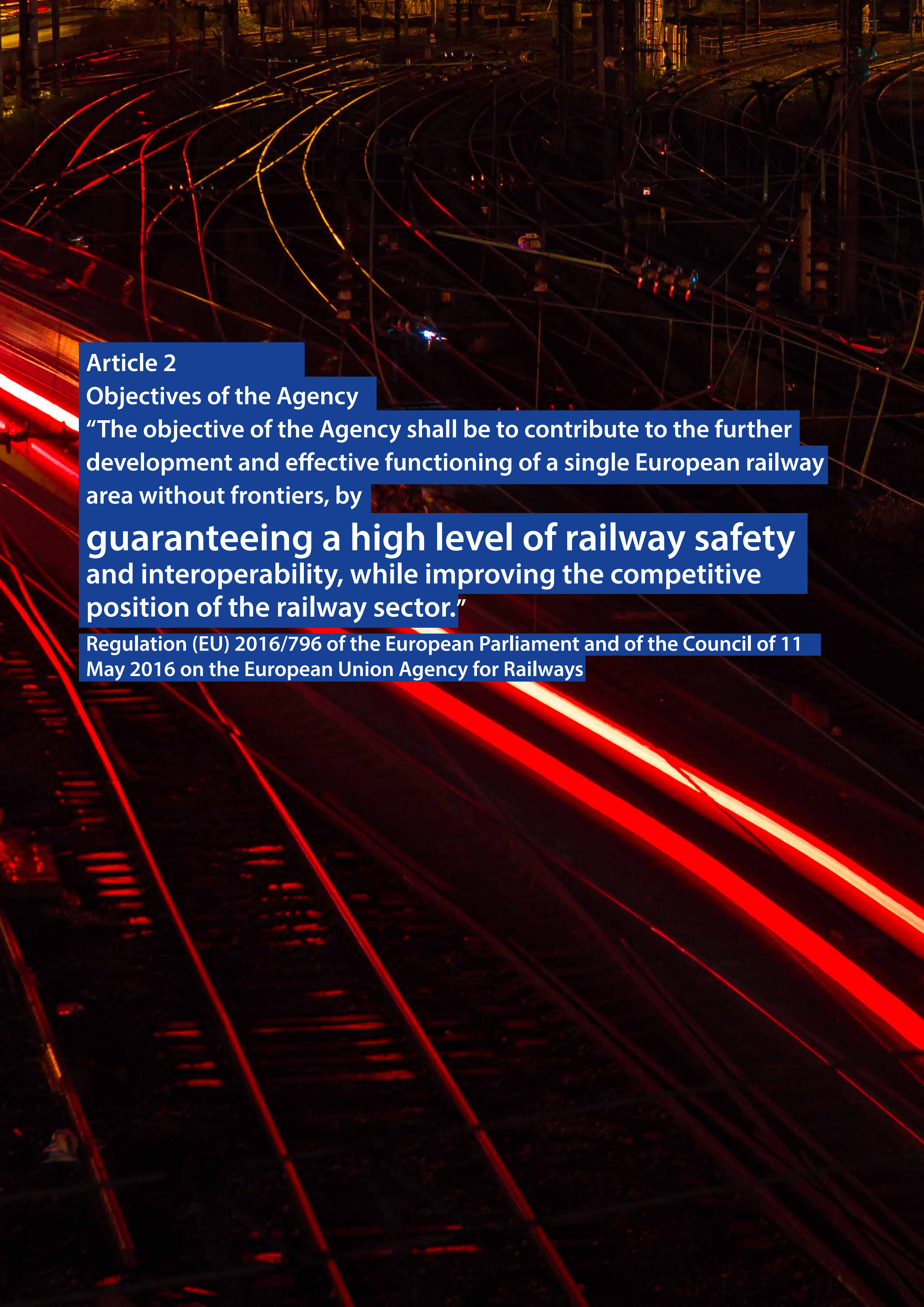

Article 2

Objectives of the Agency

"The objective of the Agency shall be to contribute to the further development and effective functioning of a single European railway area without frontiers, by

guaranteeing a high level of railway safety

and interoperability, while improving the competitive position of the railway sector."

Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways

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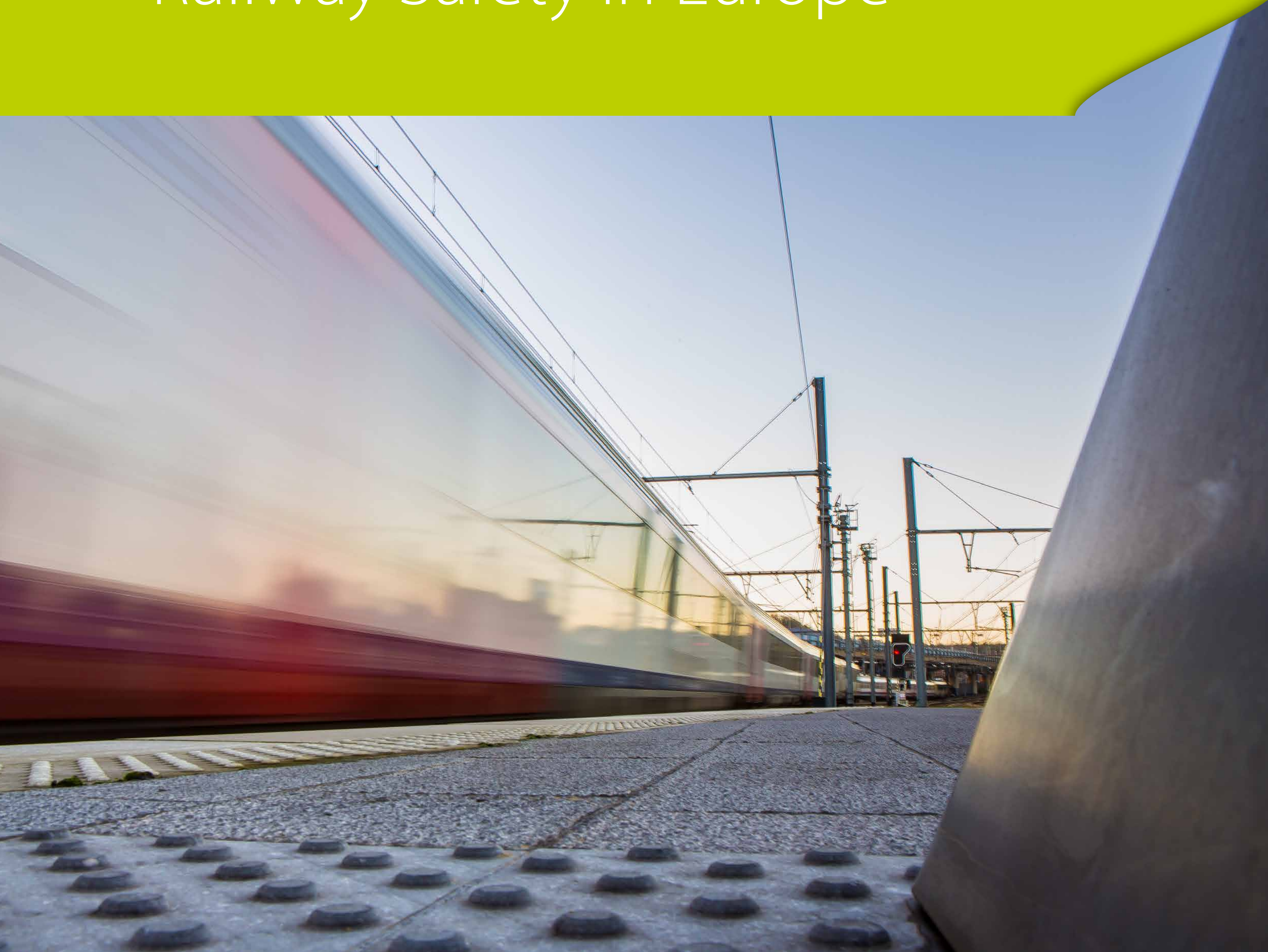


Josef DOPPELBAUER
Executive Director

The Agency's Vision for Railway Safety in Europe

Rail is to play an important role in creating a sustainable future for transport in Europe – and there is broad consensus that this should be so. Rail transport may help to achieve essential policy objectives such as tackling climate change, fighting congestion, creating economic growth, contributing to the re-industrialisation on the European continent, and providing mobility to citizens of all ages and social backgrounds. Transport is the backbone of economy, and rail should be the backbone of transport.

In order to play this vital role for society – I have said this on many occasions this year – rail has to solve its problem of cost and scalability, and take on innovation to improve customer services on and off board.

But first and foremost, rail transport is safe.

Looking at the data in this report, European railways are the safest mode of land transport. The safety level has improved at impressive pace over the past decade and the railway industry can be proud of its achievements, mostly achieved through technical advances.

However, although extremely rare, catastrophic, multi-fatality accidents – as happened recently in Germany and Italy - have a heavy impact on the confidence of passengers, customers, public funders and investors. As well as the human cost, every accident, whether they result in injuries or not, represents a significant business cost in a highly competitive environment. Catastrophic accidents have the potential to close otherwise viable businesses and reduce services altogether.

This is why the European Union Agency for Railways seeks to inspire, and to implement, a truly lived European Safety Culture for railways.

The Agency remains steadfast in its belief that a systematic approach to managing safety risks, supported by organisational and regulatory cultures that are positive about safety improvement, is the only way to maintain progress in European railway safety. This cultural commitment to safety is driven by effective leadership, at all levels of all the organizations that influence safety, regulators and operators alike. Emphasis needs to be on human factors as well as on new technology which can be both an opportunity and a threat.

Looking at Europe's best performers, as well as the impressive records of some non-European countries, I strongly believe that improvement is both possible and essential. The Agency can provide transparency and visibility around safety performance, together with targets that contribute to highlighting our shared goals and creating momentum for change. Greater convergence in the safety levels of Europe's railways would support a more open market, through reduced safety regulatory barriers, as well as moving us closer to our vision for Europe as the world leader in railway safety.

If we work hard and work together in the European railway sector, we can build the essential trust among each other, and with our customers, and rail will continue to be the backbone of transport in Europe, and around the globe.

Foreword

Christopher CARR
Head of Safety Unit

Foreword

Presenting this report on railway safety in 2016 is something of a double-edged sword. On the positive side, looking at the sheer numbers, we can confirm that rail is one of the safest modes of transport in Europe. Our ambitious programme of work to understand and improve safety outcomes in the worst performing (priority) countries is progressing well – we are confident this work will help us all focus our efforts. At the same time, we are leading new initiatives targeting the underlying causes of poor safety performance: improved criteria for assessing Safety Management Systems, a robust framework for monitoring NSAs – the "eyes and ears on the ground", collecting better data on safety failures and developing the culture needed to support excellence in managing risks at all levels.

And yet, the stark reality is that each year, more than thousand people lose their lives as a result of accidents on railway network of 28 EU Member States. For the first time, data for this reporting period show a 5% year on year increase in significant accidents, as well as an increase in the numbers of precursors to accidents. Our future work on better railway safety statistics will help us to understand whether this reflects better reporting, or worsening of safety performance.

Railway safety occurrences recorded every day on our railway networks remind us that railway safety is never something to take for granted, it is a result of concerted dynamic and daily effort of all relevant actors who interact in the railway system. Although rare, catastrophic railway accidents over recent years show that "business as usual" is not enough. These tragic accidents are occurring in Member States with otherwise strong safety performance: that suggests we are measuring the wrong things (or not enough of the right things) and that there is room for improvement in our ability to understand and manage the safety of the whole system.

If all EU Member States currently peforming above the current EU average (EU-28) could achieve a railway fatality risk equal to the EU-28, the overall fatality rate would drop by 40 % to 0.16 fatalities per million train kilometres, a value comparable to best performing countries worldwide. This would bring a significant reduction in economic costs of accidents (€0.5 billion in terms of prevented casualties alone) and the convergence of safety performance levels. This would help towards the achievement of a single European railway area, by facilitating a reduction in administrative barriers associated with safety regulation, and deliver benefits to all Europeans.

We must do more and we must do better.

A management system-based approach is well suited to reducing regulatory barriers. But it is also the best approach for reducing safety risk, by requiring those creating rail safety risks, who are closest to understanding them, to take responsibility for managing them. To do this at a local and global level, we need the right systems in place, including data to support monitoring, as well as the right attitudes and leadership about safety. We need a shared vision for rail safety in Europe, and a common understanding and commitment to safety culture.

As well as the commitment to improve, practical improvement comes from a thorough understanding of our activities and the associated risks. To do this, we need to ensure we are listening to those doing the job and understanding their daily work, monitoring in a systematic and proactive way, and making sense of what we learn in terms of the key risks we are aiming to reduce. This biennial report on the development of railway safety in the EU represents a unique source of data, information and knowledge available at the EU level.

Background

Background

The European Railway Agency (ERA) is a cornerstone of the EU strategy for a Single European railway area, in which trains can run freely and safely across national borders. It supports national safety authorities (NSAs) and national investigation bodies (NIBs) in their tasks and provides evidence for policy actions at EU level. It develops and promotes the common safety framework as a means for achieving an open railway market in the EU.

As a body of the European Union, the Agency sits at the heart of EU railway safety and collaborates with many industry stakeholders and public bodies, in close cooperation with the Commission and the Member States.

As per our founding Regulation, monitoring safety performance is one of the key tasks of the Agency. The ERA collects, processes and analyses different sets of data. The information provided by this data supports the safety oversight work carried out in Member States, as well as decision and rule making at national and EU level. We notably advise the European Commission and develop various recommendations on actions to be taken at EU level. By continually monitoring and analysing safety performance, the Agency provides the assurance that the policy objective of maintaining and improving safety where reasonably practicable is achieved.

This report is one of the regular outputs of the Agency's activities in the area of monitoring safety performance. It is also part of the Agency's effort to provide to its stakeholders a thorough, transparent overview of the development of railway safety in the European Union. In accordance with the EU legislation ( ), it has been published by the Agency on a biennial basis since 2006.

The report builds primarily on the information provided by the National Safety Authorities and National Investigation Bodies, under their legal reporting obligations. Notably, the National Safety Authorities gather Common Safety Indicators from the railway undertakings and infrastructure managers that provide a footprint of safety performance in Member States and of the Union. Although this report is largely based on this data, it also makes use of data and information gathered from other internal and external sources.

([1]) Article 9(2) of the Agency Regulation (881/2004/EC).

Summary

Summary

Most recent available data confirm that railways remain one of the safest modes of transport in the European Union. However, there is still a way to go for Europe to become world leader in railway safety. Safety performance of EU Member States varies considerably, with a more than ten-fold difference in risk levels in all categories of railway users. Although there has been no significant reduction in these variations over the past ten years, we believe this evidence suggests there is clear potential for improvement in a number of areas.

More than 2 000 significant accidents occur each year on the railways of the EU Member States. These accidents account for costs in excess of EUR 1.4 billion each year. In these accidents, more than 1 000 persons are killed and a similar number of persons are seriously injured each year.

For the first time since 2007, the number of significant accidents increased year over year; however the resulting casualties continued to decrease.

Collisions of trains and train derailments represent a mere 5 % of all significant accidents each, while accidents to persons caused by rolling stock in motion (mostly trespassers) and level-crossing accidents constitute 84 % of railway accidents, excluding suicides.

There has been no progress in reducing the number of several types of accidents. The number of train collisions, train derailments and fires in rolling stock has been stagnating in the past three years, while the number of level crossing accidents saw only a minor reduction in the same period.

The safety of infrastructure saw only limited improvements at the EU level, judging by the available figures on the extent of the installation of automatic train protection systems on the network and by the number of active level crossings with user-side protection. More effort is needed in this area to drive safety improvements in the future.

There were four train collisions with fatalities on EU railways in 2015 and several other accidents that would qualify as serious accidents; most of these accidents have been investigated by National Investigation Bodies of Member States. In total, the NIBs opened investigations into 209 accidents and incidents that occurred in 2014.

Railway environmental factors do not appear to play any significant role in expected safety performance in the short term. The overall traffic volume has been practically constant at the EU level and is unlikely to grow significantly in coming years. The traffic mix, including the share of traffic by non-incumbent operators, shows some developments, but there is no evidence to suggest this change would have an impact on railway safety performance.

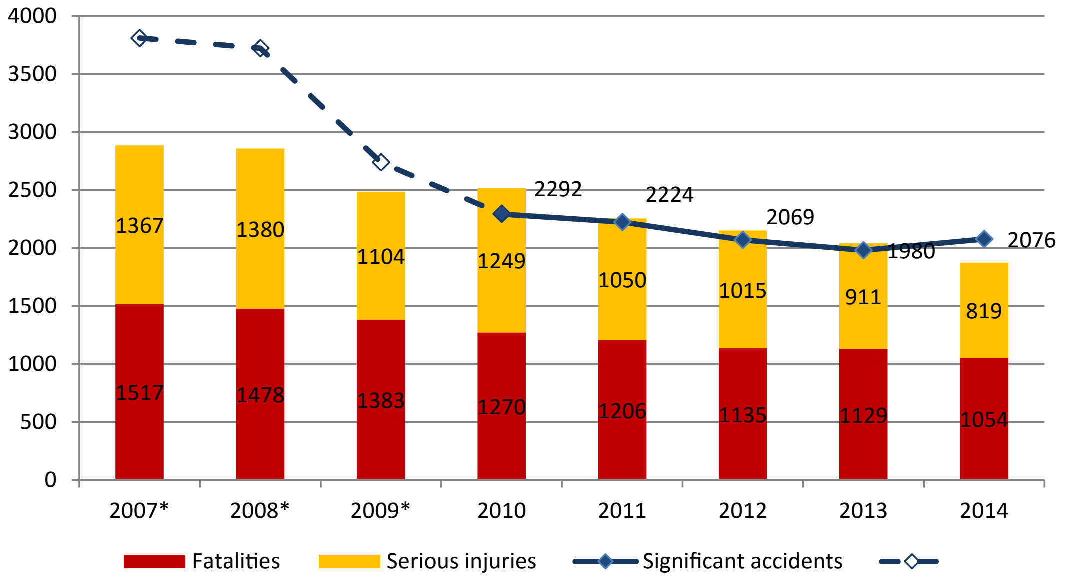
Accidents with less-serious consequences as well as incidents strongly outnumber significant accidents. These occurrences are however not collected at the EU level. The Single European Railway Area would greatly benefit from broader occurrence reporting and analysis as this would improve the identification and understanding of risks and their management.

1. SAFETY OVERVIEW

SAFETY OVERVIEW

For 2014, the Member States reported 2 076 significant accidents resulting in 1 054 persons killed and 819 persons seriously injured. This represents a 5 % increase in the number of significant accidents and a 7 % drop in casualties compared to 2013. Unlike for serious injuries and significant accidents, there was a close to uniform reduction in the number of fatalities over the period 2007-2014 (Figure 1).

Figure 1 — : Significant accidents and resulting casualties for the EU-28 countries (2007–2014) ([2])



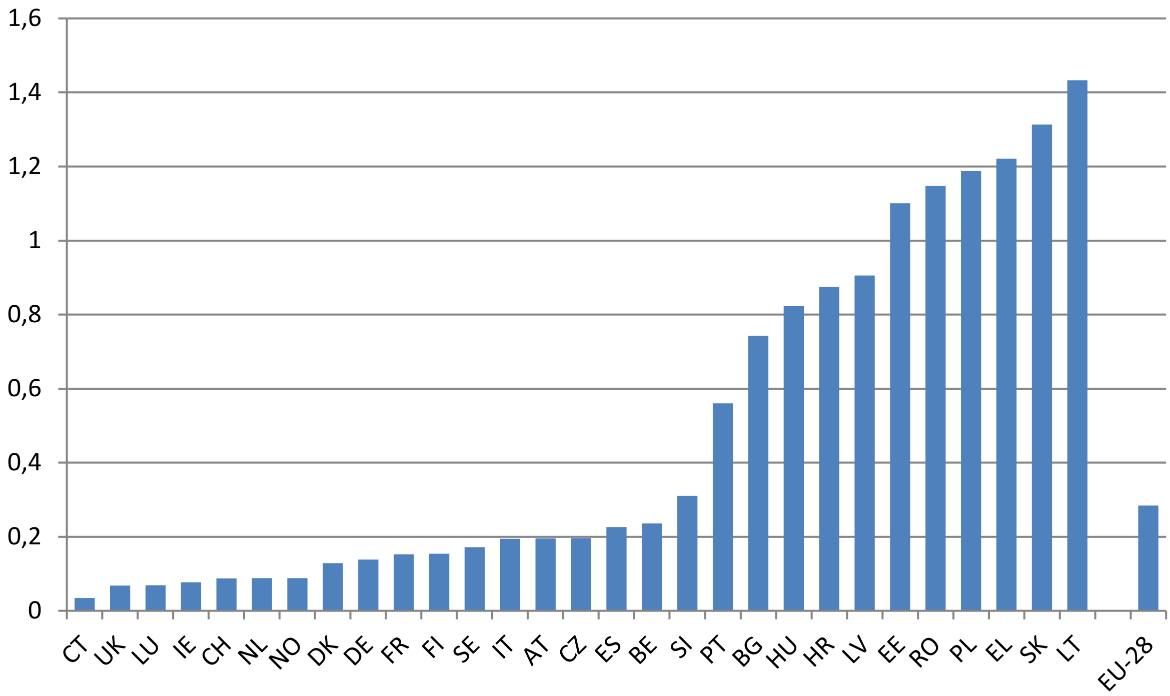
For the period 2010-2014, the number of "internal accidents" (collisions and derailments) was increasing, while it was decreasing for "external accidents" (accidents on level crossings and accidents to persons caused by rolling stock in motion). The overall flat trend of the past three years is however confirmed by the most recent accident counts. In the past five years, there was about one casualty (either fatality or serious injury) per significant accident on average. Multiple casualty accidents are far less frequent.

Catastrophic accidents are fortunately very rare but have a major impact on accident statistics, in particular on the accident outcome figures. Such accidents understandably generate a great deal of public interest, but because of the complex nature of the causes of catastrophic accidents, they are a poor predictive indicator of railway risk and the adequacy of risk management methods. The outcomes of accidents and incidents can be highly unpredictable and dependent on complex factors.

The level of railway safety is traditionally expressed as the accident and casualty risk being a rate of the number of outcomes per exposure. Considering all railway fatalities (excluding suicides), the fatality risk per million train-km (system risk) in the period 2010-2014 was 0.28 killed per million train km at the EU level. Similarly, one can estimate the fatality risk of railway passengers (passenger risk). This was 0.14 killed passengers per billion train kilometres in the period 2006-2014. It appears that the safety levels vary greatly among Member States. One third of Member States (11) have significantly higher risk than other countries; the variations in risk within that group of countries are also significant (Figure 2).

([2]) EU-27 countries for period 2007-2009 due to the absence of data for Croatia.

Figure 2 — : Railway fatalities per million train-km (2010-2014)



If all Member States reduced their fatality risk to the risk level of the EU-28, the overall fatality rate would drop by 40 % to 0.16 fatalities per million train kilometres, a value comparable to best performing countries worldwide. Besides the clear human benefits in terms of lives saved, Member States would benefit from a significant reduction in the economic costs of accidents (half billion EUR in terms of prevented casualties alone), as well supporting a truly single European railway area with leaner, more efficient regulatory interventions.

CSI data on accident precursors provide additional information on the level of safety performance; however its value in supporting effective safety management at EU and national level is limited. A detailed survey of the national occurrence reporting regimes and systems carried out in 2015 for the Agency revealed that there are major differences in reporting obligations and practices in respect to precursors across the EU, with only a few NSAs collecting and analysing precursors other than those reported under the CSI framework. Reporting and analysis of precursors is common practice amongst RUs and IMs, in part to satisfy requirements in Regulation 1078/2012 (Common Safety Method for Monitoring).

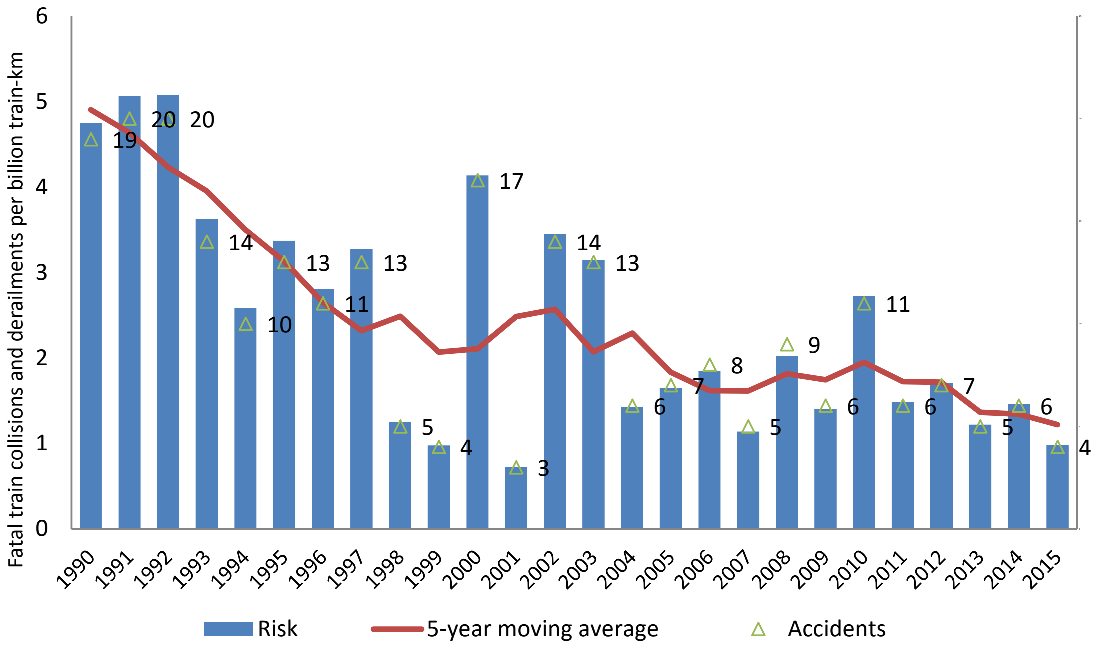
The survey also showed that accident precursor indicators are not always systematically used by NSAs as part of safety monitoring to plan safety supervision. It also appears that the monitoring of railway occurrences that do not result in an accident varies considerably between Member States. This may represent an obstacle for the effective joint monitoring and supervision of railway undertakings operating in more than one Member State.

1.1. HISTORICAL DEVELOPMENT OF RAILWAY SAFETY

Risk of fatal train collisions and derailments

The overall level of railway safety in Europe, as measured by fatal train collisions and derailments per billion train-kilometres, has gradually improved since 1990, although there is considerable scatter from year to year. The estimated overall trend since 1990 is a reduction in the accident rate of 4 % per year (Figure 3). The estimated underlying average number of fatal train collisions and derailments per billion train-kilometres was about 4.8 in 1990 and 1.1 in 2015[3] . Despite a positive long-term trend in the risk of fatal train collisions and derailments over the past two decades, the data in Figure 3 suggests that the progress has been slowing down, in particular since the late 1990's.

Figure 3 — : Fatal train collisions and derailments per billion train-kilometres in 1990–2015 for the EU-28, Switzerland and Norway ([4])



In summary, available historical data on fatal railway accidents shows a solid gradual improvement in railway safety over the past three decades, which has slowed down however since the late-1990's. This "softening" of the trend is observable when analysing both absolute and relative figures of fatal train collisions and derailments in Europe.

Catastrophic accidents with five or more fatalities

Since past accident records may not always be complete in all EU countries, narrowing the scope to accidents with severe consequences may provide more robust confirmation of the trends identified and at the same time highlight the most serious events that occurred in the past and their impact on overall accident statistics.

Railway accidents with multiple fatalities rarely escape the attention of the media and the public, so data on these accidents are assumed to be more complete. Figure 4 is based on

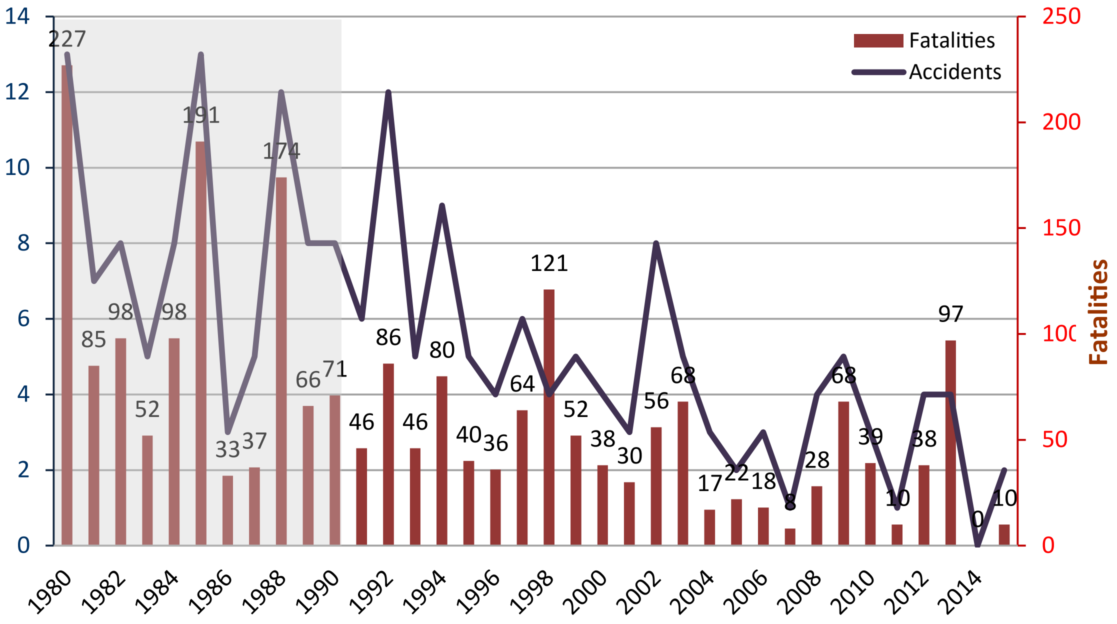
([3]) The data for 2015 has been retrived from the ERAIL database based upon NIB notifications.

([4]) Data prior to 2006 retrieved from the database of fatal train accidents and collisions maintained by Andrew W. Evans (Imperial Collegeand University College London) and from the databases on train-km of UIC, Eurostat and the ERA. Data for Croatia only from 2010 onwards.

data from the historical archive of railway accidents maintained by the Agency; it shows the number of major accidents and resulting fatalities for the 36 years 1980–2015. It includes not only the train collisions and derailments with five or more fatalities, but also the major level-crossing accidents, train fires, and accidents involving groups of persons struck by rolling stock in motion.

The trend in the accident rate per billion train-kilometres for accidents resulting in five or more fatalities (for which a longer time series is available) is strongly downward over the period 1990-2015, but somewhat less steep if taken back to 1980-2015. Figure 4 shows that there were on average eight major railway accidents each year during the 1990s, this figure has now reduced to an average of five accidents per year in the 2000s. There were no accidents in this category in 2014 but there were two accidents with five or more fatalities in Europe in 2015; these were accidents at level crossings resulting in five car occupant fatalities each.

Figure 4 — : Railway accidents with five or more fatalities (EU-28, 1980–2015) ([5])



The analysis of data in Figure 4 suggest that the number of catastrophic railway accidents has seen a gradual decline over the past two and half decades. However there have still been on average two such accidents per year in this decade.

Even though there was no single train collision or derailment with catastrophic consequences in 2014, the risk of these accidents remains, as apparent from two catastrophic accidents that occurred in 2016[6] . The graph has been updated to show the situation in 2015. The complexity of the railway systems combined with the trends toward higher travel speed, growing infrastructure capacity constraints and the constant cost pressures on risk management activities may contribute to the likelihood of these disasters.

There are however proven risk management strategies available, such as building high-reliability organisations, adding more safety redundancy to the system, disciplined and evidence-based decision-making and robust regulatory and enforcement regimes. Accident investigations should continue to analyse and report on the success or failures of these systemic risk management methods.

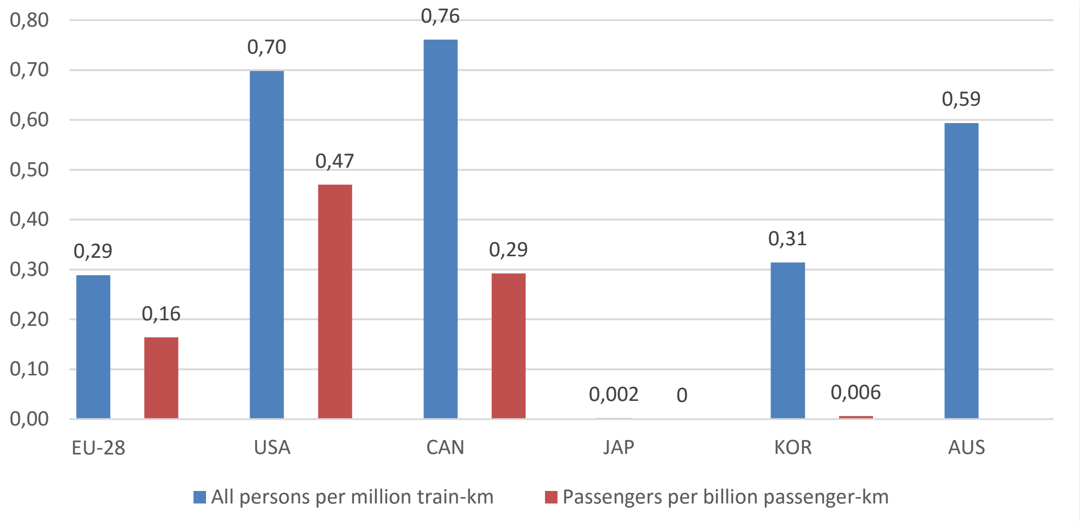
([5]) All EU countries, Norway and Switzerland, excluding Romania and Croatia for the period 1980–1989. Accidents on railway lines not covered by the RSD are also included.

([6]) Trains collisions near Bad Aibling (DE) on 9 February 2016 and at Bari – Barletta (IT) on 12 July 2016. Additionally, there was the train derailment near Eckwersheim (FR) on 14 November 2015..onwards. Data for Croatia only from 2010 onwards

1.2. WORLDWIDE RAILWAY SAFETY

The relative safety performance of the EU railway system can be assessed by comparing the fatality risk of EU-28 Member States with the fatality risk in other jurisdictions for which data are publically available. Two measures of risk are used: railway fatality risk and passenger fatality risk. Estimates were made for a five year period. While the definition of a fatality and train kilometres are comparable between countries, the reporting practice for trespassers and suicide fatalities may not always be fully comparable, so these statistics should be read with caution. Railway fatality risk and passenger fatality risk estimated for the period of the past five years are shown in Figure 5, which reveals that EU train passengers enjoy a relatively high level of safety, but EU rail is not yet a world leader in railway safety.

Figure 5 — : Railway fatality risk and passenger fatality risk for EU-28, USA, Canada, South Korea and Australia in 2010-2014 ([7])



Notably no passenger fatalities on railways of Japan and only one on railways of South Korea were reported for the period of past five years. Although these rail networks are smaller and more oriented to passenger transport than the EU railway system, those railway systems nowadays provide a higher level of safety to passengers on board trains. The safety performance of Japanese railways is particularly impressive, with only eleven persons killed on railways in five years.

For all the countries for which the risks were estimated, the underlying trend in risk is downwards over the past decade. The pace of decrease seen for the EU-28 is comparable to the trend seen for the USA and Canada; it however falls short when compared to the trend registered in South Korea.

([7]) Source of data: USA: Annual report FRA; Canada: Transport Safety Board; South Korea: KMMI; Australia: Annual report. In case of South Korea and Australia, the reference period is fiscal year, not calendar year. Passenger kilometres data for Canada and Japan taken from the OECD transport database.

1.3. RAILWAY SAFETY COMPARED TO OTHER TRANSPORT MODES

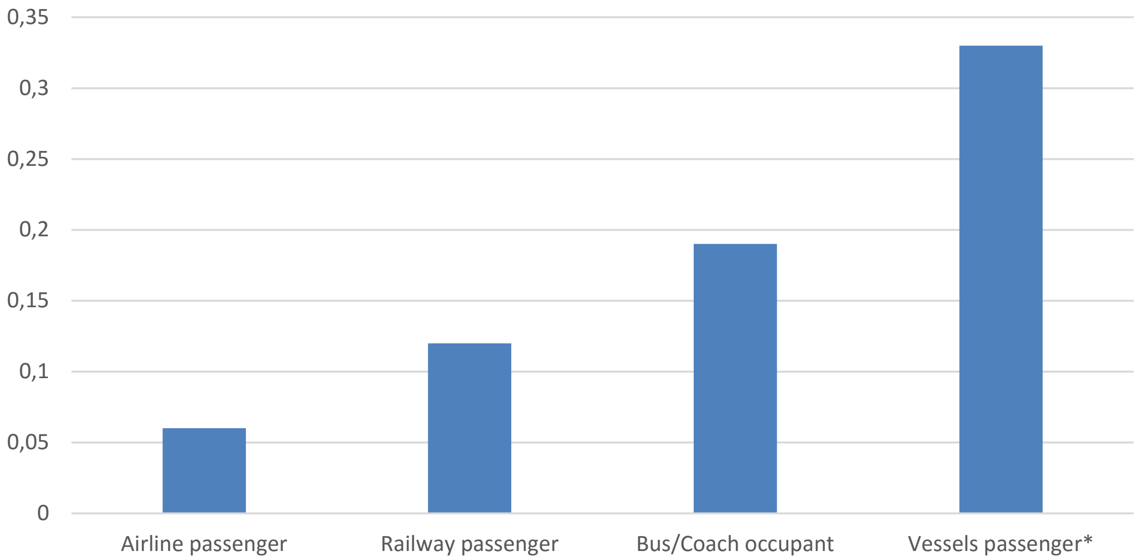
Although the use and nature of transport modes differ widely, a direct comparison of safety is possible using certain travel scenario hypotheses. One such scenario is the risk of fatality for a passenger travelling over a given distance using different transport modes.

The fatality risk for an average train passenger is about 0.12 fatalities per billion kilometres, making it comparatively the safest mode of land transport in the EU. The fatality risk for a train passenger is by one third lower compared to the risk for a bus/coach passenger, but at least twice as high as that for commercial aircraft passenger. Travelling on board of a sea ships carries highest passenger fatality risk among all transport systems (Figure 6). Nevertheless, using the individual transport means, such as passenger car, or motorcycle carries substantially higher fatality risk: car occupants have at least 20 times higher likelihood of dying compared to train passenger travelling over the same distance (not included in Figure 6).

One should note here that the risk estimated for commercial air travel, but also for bus and train travel, is subject to wider variations, as one single accident may result in dozens of fatalities. Moreover, the annual number of aircraft, train and coach fatal accidents is relatively small. Thus the risk estimated for a relatively short period, in this case, for five years, should be read with caution. Last, but not least, the results of such comparative exercise also strongly depends on the type of exposure data considered (e.g. number of journeys or time spent by passengers).

Comparing the past trends in fatality risks in different transport modes for the period of the past ten years, it appears that for bus/coach passengers, the annual average reduction was 7 % per annum, while it was 13 % for train passenger. If assuming no change in passenger kilometres and a continuation of the past trends, the safety advantage of train transport over coach transport should increase in the future.

Figure 6 — : Fatalities per billion passenger kilometres for different mode of transport (EU-28 in 2010-2014) ([8])



([8]) Source of data: Passenger kilometre data taken from the EU transport in figures (Statistical Pocketbook 2014, DG MOVE 2014, European Commission). Airline passenger fatalities over EU-28 territory by any operators (Annual Safety Review 2014, EASA), Bus/occupant fatalities estimated from available data in CARE database (European Commission), Vessels passenger fatalities as reported by EU and EFTA MS as per Directive 2009/18/EC for years 2011-2014 (EMSA, 2016)

1.4. COMMON SAFETY TARGETS

Common safety targets (CSTs) are quantitative measures of risk assessing whether the current safety levels of the railways in the Member States are at least maintained. In the long term, they could also help to focus efforts to reduce the differences in railway safety performance. Railway transport is the only mode of transport for which the targets have been prescribed by European legislation. The CSTs are EU-wide maximum risk values, the national reference values (NRVs) are the maximum risk levels set for individual Member States. The risk level is measured in terms of the number of weighted fatalities and serious injuries (9) per train-kilometre. There are risk categories for passengers, employees, level-crossing users, unauthorised persons on railway premises, others and as applied to society as a whole.

In accordance with the Common Safety Method, a second set of CSTs/NRVs were applied for the third assessment carried out in 2012. The second set of CSTs/NRVs was adjusted in 2013 following the fourth annual assessment carried out by the Agency. In general, the second set contains reference values that are slightly stricter compared to values estimated in the first set.

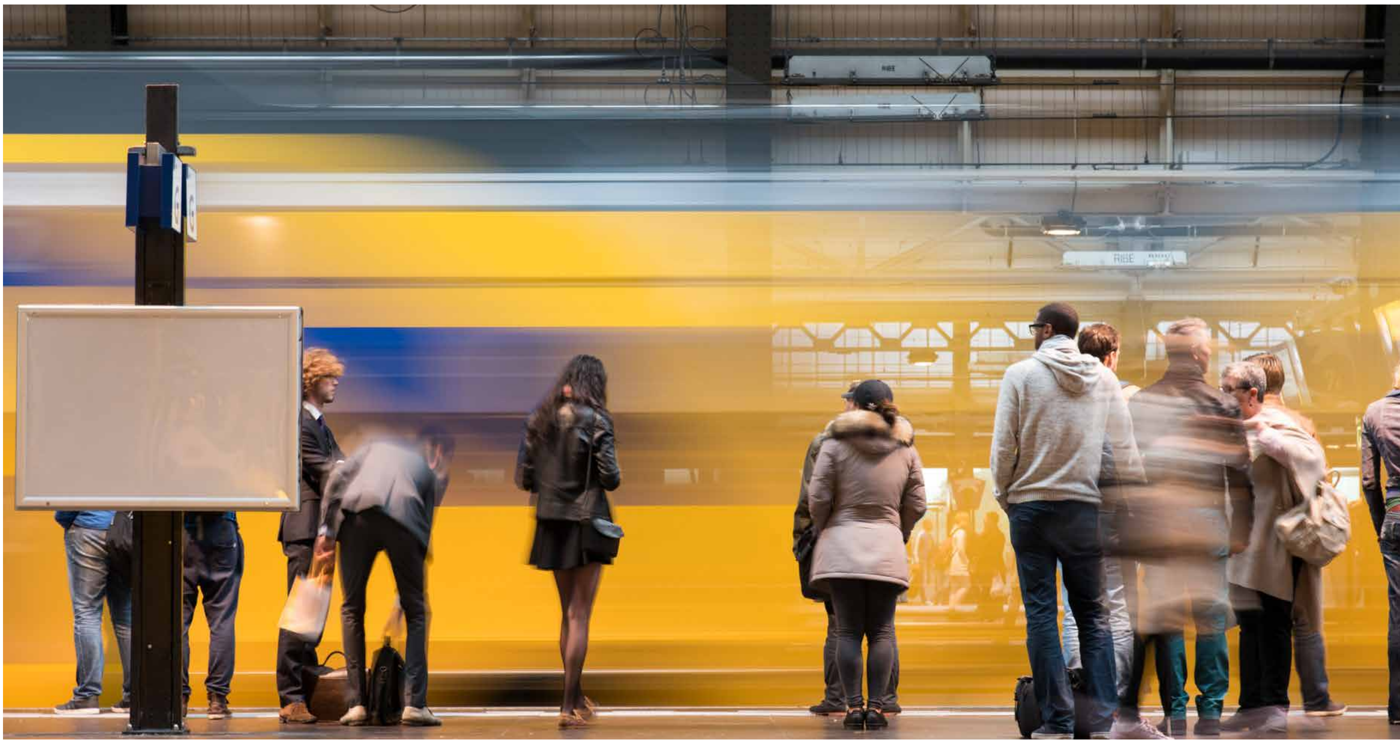
The latest, seventh annual assessment was carried out by the Agency in spring 2016; the seventh assessment uses the values of risk estimated for the period 2010-2014 and for the single year 2014 and compares them with the national reference values of the second set (risk estimated for period 2004-2009). The results of that latest annual assessment of achievements of CSTs/NRVs indicates that railway safety performance remains acceptable for the EU as a whole for all categories of railway users under consideration. For individual Member States the past assessments of achievements of CSTs/NRVs occasionally resulted in possible or probable deterioration of safety performance (and never for the Union). In these instances, the Member States usually provided satisfactory explanations of the direct and indirect causes of the deterioration.

Member States are more likely to achieve acceptable safety performance in the category of passengers, level crossing users and other persons. Possible or probable deterioration of safety performance is most frequently determined in the categories of employees and unauthorised persons.

Table 1 — : Number of Member States showing possible [probable] deterioration of safety performance (10)

Assessment	Passengers	Employees	Level crossing users	Other users	Unauthorised persons	Whole society
First (2010)		1	1		1	1
Second (2011)	1	2	1		2	2
Third (2012)					1	
Fourth (2013)	1/1	2+1		1	3	1
Fifth (2014)		4	1	[2]		
Sixth (2015)		2	1		1	[1]
Seventh (2016)		4	1	1	2	[1]

(9) Weighted fatalities and serious injuries (FWSI) are the normalised measure of railway safety outcome. One seriously injured person is considered as 0.1 fatalities and added to the number of fatalities in the given year.
(10) Results of the annual assessments of achievements of CSTs/NRVs prepared by the Agency for the European Commission in accordance with the Commission Decision 2009/460/EC. Results of the 2014 assessment were not available at the time of the publication of this report.



The past assessments of the achievements of CSTs/NRVs showed that the current common safety targets defined as NRVs are set so high for most Member States so that they do not provide sufficient incentive for Member States to improve their safety performance. According to the information available to the Agency, only a few Member States have defined and used the CSM/CST framework at national level. This is why a revision of the CSM/CST will be proposed in 2017. The Agency strongly believes that enabling and assuring convergence of safety levels across Member States is needed to achieve the Single European Railway Area, since the variations undermine trust between national authorities and thereby mutual acceptance of regulatory decisions.

Given the fact that the current safety targets represent the minimum required safety levels and thus do not provide any incentive for improvement, we believe that tangible aspirational safety targets would support further improvements in safety. Nevertheless, they would have to be underpinned by practical programmes and plans in order to deliver on improvement.

2. Accident outcomes

2.1. SERIOUS ACCIDENTS

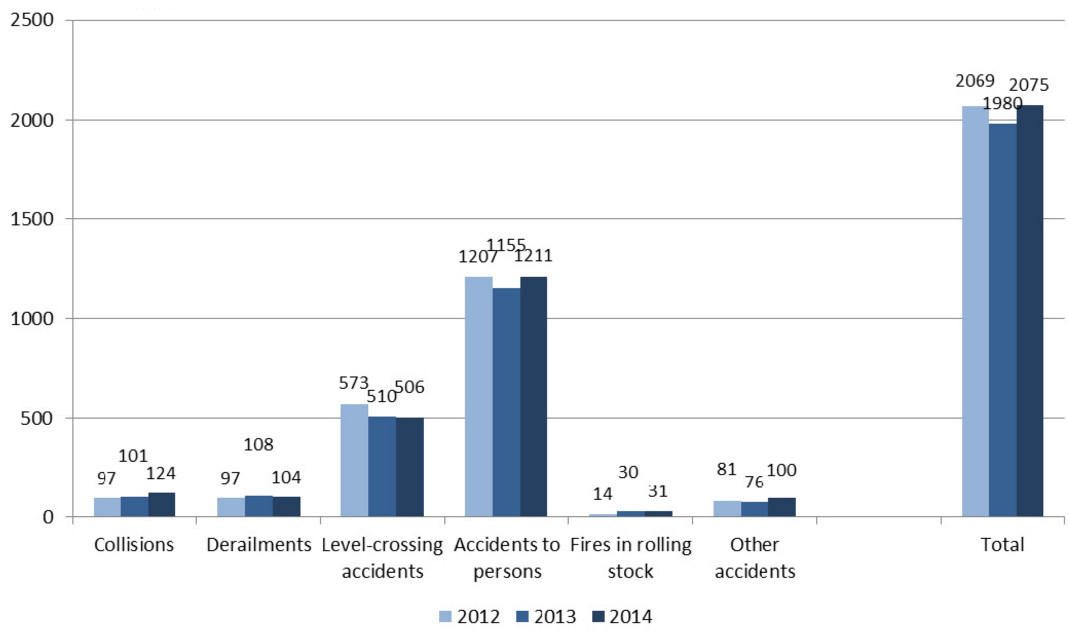
Serious accidents are train collisions or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage of at least two million EUR and similar accidents with the same consequences. These accidents are rare: less than ten serious accidents typically occur each year in EU-28 countries. In 2014, the Agency identified six serious accidents, in 2015 four serious accidents and, sadly, at the time of finalising this report (September 2016) four serious accident had occurred during the first eight months of 2016 at Bad Aibling – Kolbermoor (DE), Serres (EL), Hermalle-sous-Huy (BE) and on the Bari – Barletta line (IT) resulting in 39 fatalities and 37 serious injuries. The 2014 and 2015 accidents are summarised in Annex I. Serious accidents will also always be reported under significant accidents.

2.2. SIGNIFICANT ACCIDENTS

Around 2 000 significant accidents[11] occur each year on the railways of the EU Member States. Collisions and derailments represent a mere ten per cent of them. Accidents to persons caused by rolling stock in motion and level-crossing accidents constitute the majority of significant accidents, excluding suicides. The number of significant accidents per accident type in the period 2012–2014 is shown in Figure 7.

The number of significant accidents increased by 5 % in 2014 year-over-year in EU-28 Member States. This is the first Year over Year (YoY) increase in ten years.

Figure 7 — : Significant accidents per type of accidents (EU-28: 2012-2014)



[11] '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. Accidents in workshops, warehouses and depots are excluded.

collisions are reported every week in the EU, causing significant disruptions to railway operations. Unlike for other types of accidents, there is an increasing trend of those accidents internal to the railway system over the past five years. The increase is particularly steep for collisions. However the increase in collisions during 2014 can be partly explained by a significant increase in the number of collisions with overhead lines in two Member States (FR and PT). In this context, it is noticeable that collisions between two rail vehicles represent 25% of all collisions reported.

The number of accidents increased also in certain other categories in 2014: The Member States reported 1 211 accidents to persons caused by rolling stock in motion in 2014, up 5% from 1 155 in the previous year. An increase was also observed in the category of other accidents.

There was a stagnation in the number of level crossing accidents, with 506 accidents recorded on railways of the EU-28 countries in 2014, compared to 510 accidents in 2013. However, over the past five years, a slightly decreasing trend of 3 % per annum has been observed.

The number of fires in rolling stock reported for 2014 (31) is only slightly higher than the 2013 figure of 30. Sixteen countries reported no fires in rolling stock in motion in 2014.

A wide range of accidents, not included within the specific types of accidents, are included in the category of other accidents. The 100 occurrences reported in 2014 include collisions and derailments of shunting rolling stock/maintenance machines, dangerous goods released during transport, objects projected by the running train, and electrocution in connection with the rolling stock in motion.

Figure 8 provides a breakdown of significant accidents per type estimated for the past three years. It shows that accidents to persons account for 58 % of all accidents reported, followed by level crossing accidents (26 % of all accidents). Collisions, derailments and other accidents account for about 5 % of all accidents each.

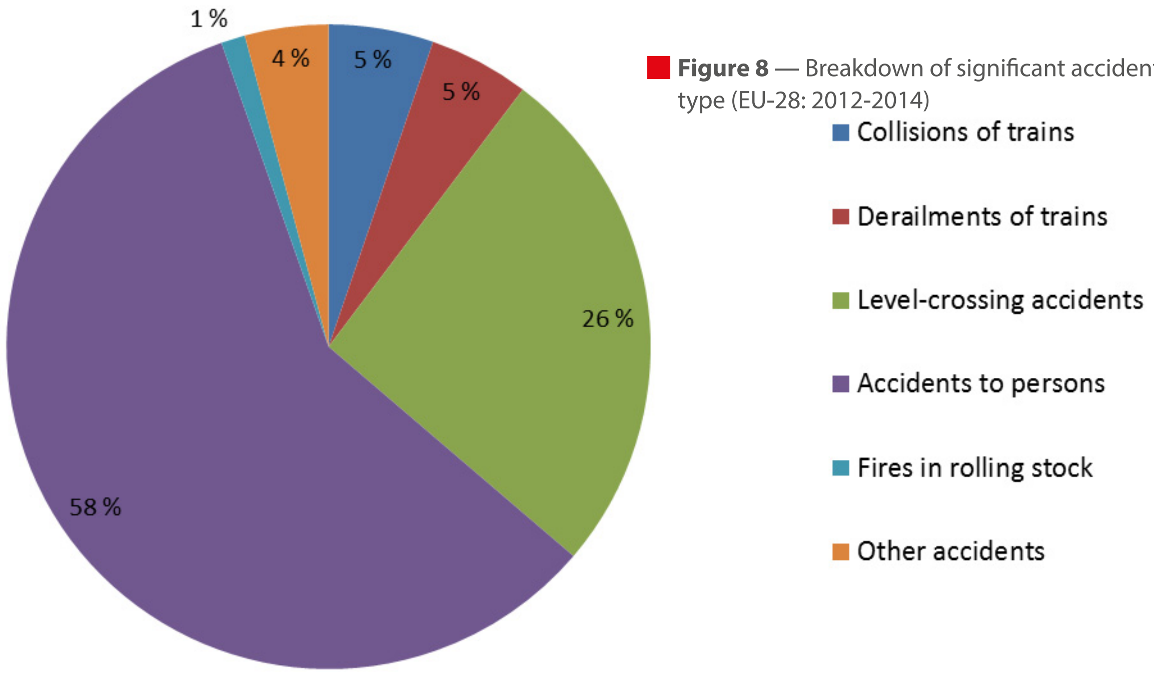


Figure 8 — Breakdown of significant accidents per type (EU-28: 2012-2014)

Accidents with less-serious consequences as well as incidents strongly outnumber significant accidents. These occurrences are however not collected at the EU level. While it is essential that they are monitored and analysed at operational and national regulatory level, the Single European Railway Area would greatly benefit from broader occurrence reporting and analysis as this would improve the identification and understanding of risks and their management.

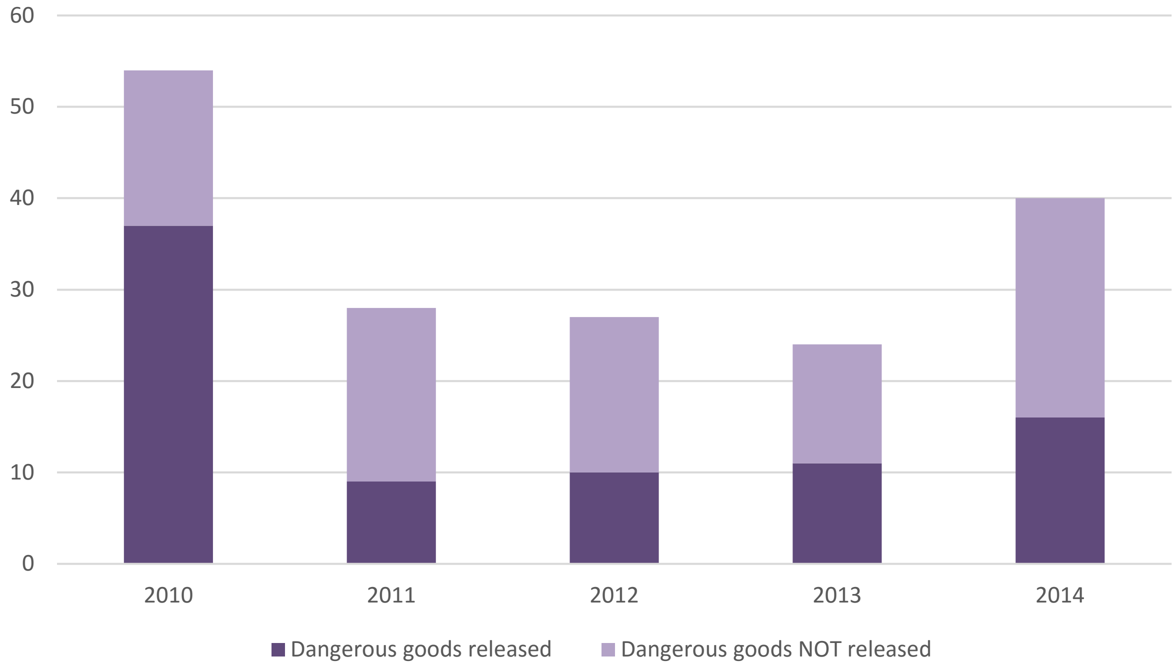
2.3. ACCIDENTS AND INCIDENTS INVOLVING TRANSPORT OF DANGEROUS GOODS

Any accidents involving dangerous goods may have catastrophic consequences in terms of human health impacts or environmental damage. This is why, in addition and without prejudice to the general EU legislation on railway safety, specific requirements on the classification, containment and loading/unloading of substances apply. They are reported in accordance with international criteria developed under the ADR/RID UNECE ([12]) convention which are transposed in EU legislation by the EU Directive 2008/68 on the inland transport of dangerous goods. Depending on the type and consequences, such accidents may also be reported as a significant accident.

For 2014, Member States reported a total of 40 accidents and incidents that involved transport of dangerous goods; in 16 of these, the dangerous goods being transported were released during the accident. These 40 accidents involving dangerous goods occurred across only 11 EU Member States. Among them, Germany alone reported 18 occurrences in 2014. Although the relevant traffic data are not available at the EU level, the distribution of the reported occurrences across Member States suggests that the reporting may not yet be fully harmonised and complete in the EU.

([12]) RID: the Regulations concerning the International Carriage of Dangerous Goods by Rail, appearing as Appendix C to the Convention concerning International Carriage by Rail (COTIF) concluded at Vilnius on 3 June 1999.

Figure 9 — : Accidents and incidents involving transport of dangerous goods with and without release (EU-28)



Whereas detailed exposure statistics are not available at the EU level, it can still be concluded that the safety of transporting dangerous goods by rail in the EU is high compared to other transport modes: below 0.1 fatality per billion tonne kilometre, which is at least ten times lower than the fatality risk for the transport of dangerous goods by road.

Notwithstanding that the likelihood of an accident related to the transport of dangerous goods is statistically very low compared to other railway accidents, the potential consequences of these accidents are significant. A proportionate approach to managing these risks requires that reducing safety incidents for this type of transport must be a priority.

2.4. SUICIDE EVENTS

Suicide events on railways are not regarded as railway accidents which per definition are unwanted and unintended events. They are therefore reported separately from rail accident statistics, which they outnumber by a significant amount.

About 3,000 suicide events on railway premises are reported each year by Member States. In suicide events, a person has deliberately taken their life. Where the person has attempted to deliberately take their life and this resulted in serious injury, they will be counted as attempted suicide. More information about those event outcomes is available later in the report.

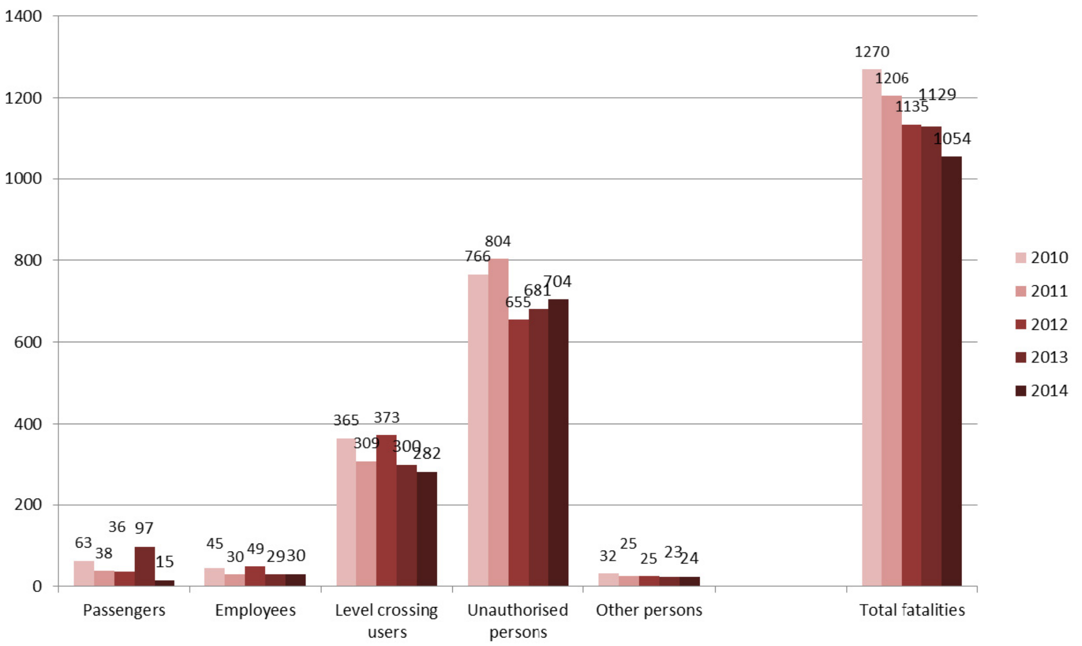
Suicide related events on railway premises have a heavy negative impact on railways. Besides the often devastating impact on the lives of relatives and other people involved, including railway staff, they incur direct and indirect costs that have to be borne by railways. Notably, the costs of delays due to suicides represent a significant share of total costs of delays incurred to railway undertakings. It typically takes up to two hours to open a railway line when a person is struck by a train. This is a significantly longer time compared to delays caused by technical failures. Besides, the delays and events themselves undermine the attractiveness of railways as a modal choice and reduce its societal benefits.

Suicides on railway premises represent under 8 % of all suicides in Europe. This ratio varies considerably between Member States with the ratios found in the range of 2-14 %. Since the general rate of suicides is an important predictor for suicides on railway premises, the direct comparison of suicide rates should be used with caution. Analysis based on basic statistical models suggest that the suicide fatality rate per train kilometre is to some extent influenced by train frequency and population density.

2.5. CASUALTIES FROM SIGNIFICANT ACCIDENTS

In parallel with the decrease in railway accidents, the total number of casualties resulting from accidents, excluding suicides, has fallen steadily in recent years. There were 1 054 fatalities reported for the year 2014, a seven per cent decrease from the previous year (1 129 fatalities recorded in 2013). Between 2010 and 2014, the number of railway fatalities decreased by 17 % (4 % p.a. on average).

Figure 10 — : Number of fatalities per victim category (EU-28: 2010–2014)



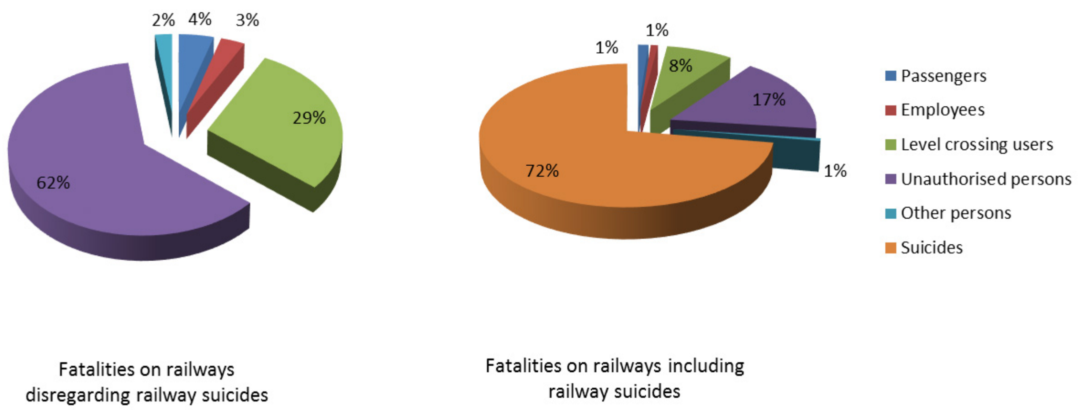
The number of fatalities in different categories of persons over the period 2010–2014 is shown in Figure 10. With 704 fatalities in 2014, unauthorised persons represented 67 % of all persons killed on railway premises, suicides excluded. Unauthorised person fatalities rose in the past three years.

The number of passenger fatalities in 2014 (15) was the lowest ever recorded. However, the figure is subject to significant variation over time due to its nature. The number of employee fatalities, which also includes staff of contractors, was 30 in 2014. The figure includes various categories of staff such as track workers, train drivers and train controllers.

The number of fatalities in all railway accidents has seen a distinct, downward trend for all categories of accidents, except level-crossing accidents. This can be partly explained by the continuous increase in road traffic across Europe, which may increase the likelihood of a level-crossing accident.

The number of fatalities among level crossing users is the lowest since 2006. The 2014 figure represents 27 % of railway fatalities, but only 1 % of road-user fatalities. Level crossing safety might therefore be perceived as a marginal problem by the road sector, while it is a key problem for the railway - also because of its impact on railway operations.

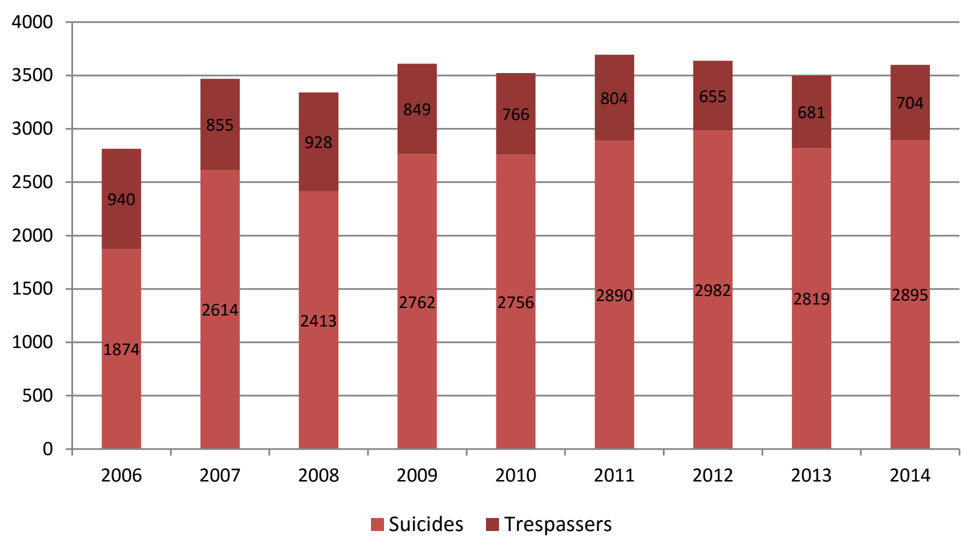
Figure 11 — : Relative share of fatalities per victim category among all fatalities (2012-2014



Suicides are reported separately from accident fatalities. They represent 72 % of all fatalities on railways and, together with the unauthorised person fatalities, constitute 89 % of all fatalities occurring within the railway system.

Figure 11 shows that if we disregard suicide fatalities, the majority of fatalities are unauthorised persons. Level-crossing accidents account for 29 % of fatalities, whereas passenger and employees fatalities make up 7 % of all fatalities on railways. People strictly internal to railway operation (passengers, employees and other persons) represent less than ten per cent of persons killed on EU railways.

Figure 12 — : Unauthorised person fatalities and suicides on railway premises (EU-28 in 2006-2014) [13]



(13) Data not available for Croatia in the period 2006-2009 and for Luxembourg in the period 2006-2008.)

Classification of fatalities among persons hit by a train when on tracks is usually decided by Police forces, but there are considerable differences in these practices in Member States. Moreover, different decision-making criteria and processes result in under- and over-reporting of suicide fatalities in different Member States. While the extent of these is difficult to establish, it is noticeable that trespasser fatalities represent between 5 and 60 % of persons killed on the tracks in different Member States.

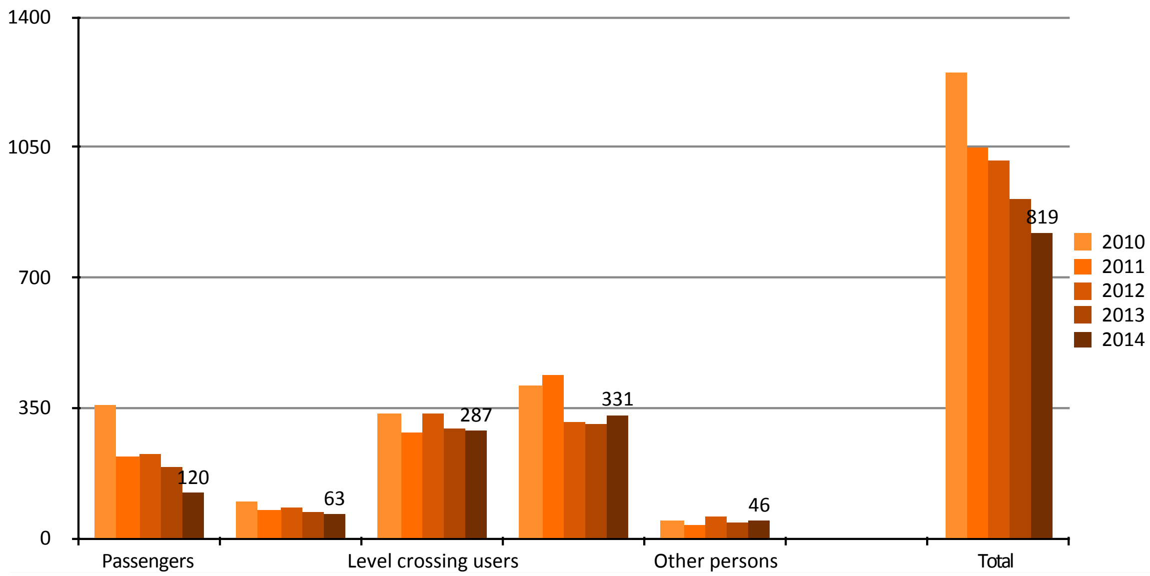
Relying on the statistics reported by Member States, there were on average more than eight suicides recorded everyday on the EU railways, totalling 2 895, the second highest number since 2006. Despite the possible classification problems, an overall rising trend can be observed with an average annual increase of two per cent. This is shown in Figure 12. Suicide fatalities are the only category of users where there has not been a reduction in fatalities over the past ten years.

One suicide fatality occurs per 1.4 million train-km meaning that an average train driver will experience it at least once every 15 years. The total costs of suicide occurrences were estimated as high as 7.4 billion EUR in 2014, of which internal railway costs represent some 0.3 billion EUR.

Over and above the number of fatalities, a large number of persons are seriously injured each year on the railways. Many of those injured persons suffer life-long disabilities as a consequence of their injury. Over the past five years, for each 10 persons killed, Member States reported some nine seriously injured persons. This ratio, illustrating the seriousness of accidents, has been constant over time. As a reminder, seriously injured person means any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding attempted suicides.

In 2014, 819 persons were seriously injured, a decrease of 10 % from the previous year (Figure 13). The number of seriously injured has seen a steady decrease over the past nine years. An average annual decrease over that period was 7 % per annum. This means a steeper decreasing trend than that for fatalities (5 % only).

Figure 13 — : Seriously injured persons per victim category (EU-28: 2010-2014)



Although the total number of seriously injured person is lower than the total number of killed persons, the number of seriously injured is disproportionally high for passengers, employees and other persons. This can in part be explained because persons hit by a train are more likely to die from the injuries sustained. This is shown in Figure 14, in which a ratio between killed and seriously injured railway fatalities is estimated for all categories of persons.

Statistics on seriously injured persons reported by Member States may be less reliable than statistics on deceased persons. This is due to the national regulatory requirements as well as the complexity of reporting procedures involved in exchanging data between hospitals and railway or statistical authorities.

Figure 14 — : Ratio of fatalities to serious injuries for person categories (EU-28: 2010-2014)

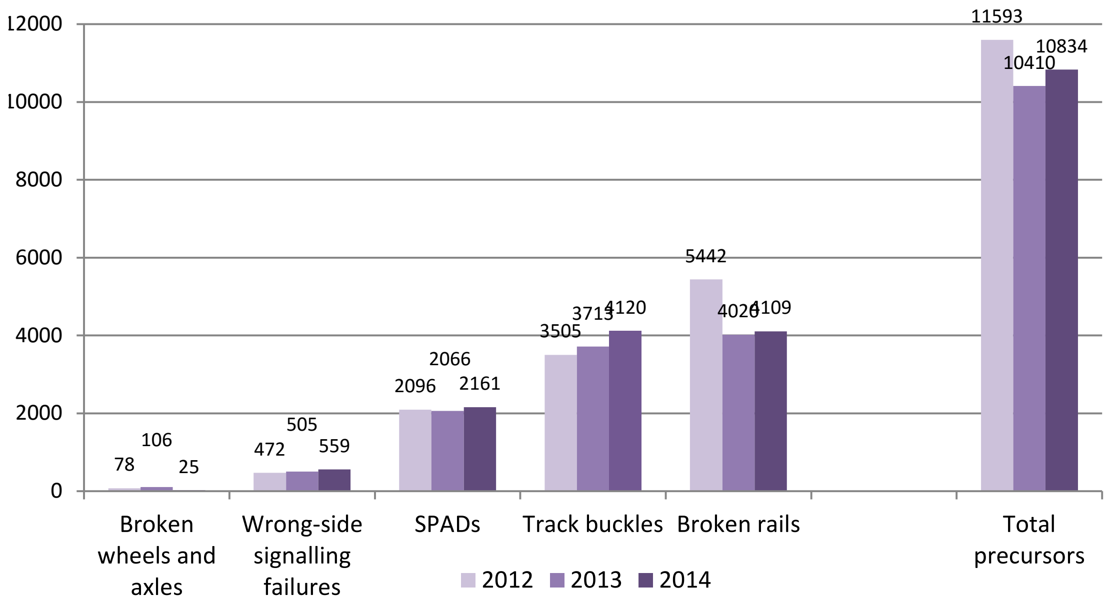
A similar ratio can also be calculated for the persons attempting suicide on railway premises. For the first time, some Member States reported to the Agency the number of attempted suicides resulting in serious injuries. For the ten countries which provided data, there were 12 fatalities per 1 seriously injured person, this is by far more than for any other category of persons.

2.6. PRECURSORS TO ACCIDENTS

As accidents on railways are rare, the monitoring of events with less serious consequences occurring on railways is a vital part of proactive safety management. The 'Precursors to accidents' collected within the CSIs (also known as near-misses or close-calls) are indicators of incidents that under other circumstances could have led to an accident. The indicators reported under the CSIs are: broken rails, track buckles, signals passed at danger, wrong-side signalling failures, broken wheels and broken axles (Figure 15).

Over the period 2012–2014, EU countries reported more than 10 000 precursors to accidents per year as defined under CSIs; this is a ratio of up to five precursors to one significant accident. However, if we discard accidents to persons caused by rolling stock in motion, the ratio between the precursors and accidents rises to 9:1. This reveals the great potential benefit in analysing precursors in the proactive monitoring of railway safety.

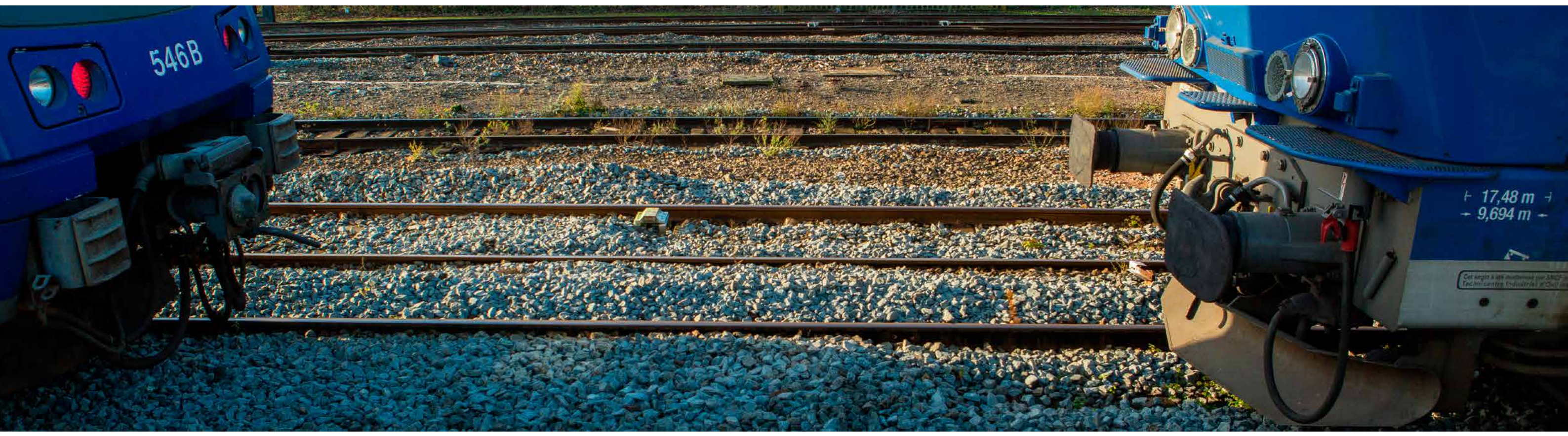
Figure 15 — : Accident precursors (EU-28: 2012-2014)



Broken rails are the most common type of common accident precursors; they alone account for almost half of all reported precursors. A relatively high number of broken rails were reported by Greece, Poland and Romania in 2014, confirming the same findings from previous years. The number of broken rails increased only modestly year on year, by two per cent.

Track buckles were the second most prevalent type of precursors in the past three years. In 2014 alone, 4 120 cases were reported across the EU. A relatively high number of track buckles occurred in Southern European countries, notably in Italy, Greece and Portugal, but the number of incidents was high also in Sweden. The number of track buckles has seen a steep increase in recent years, with an 11 % increase between 2013 and 2014.

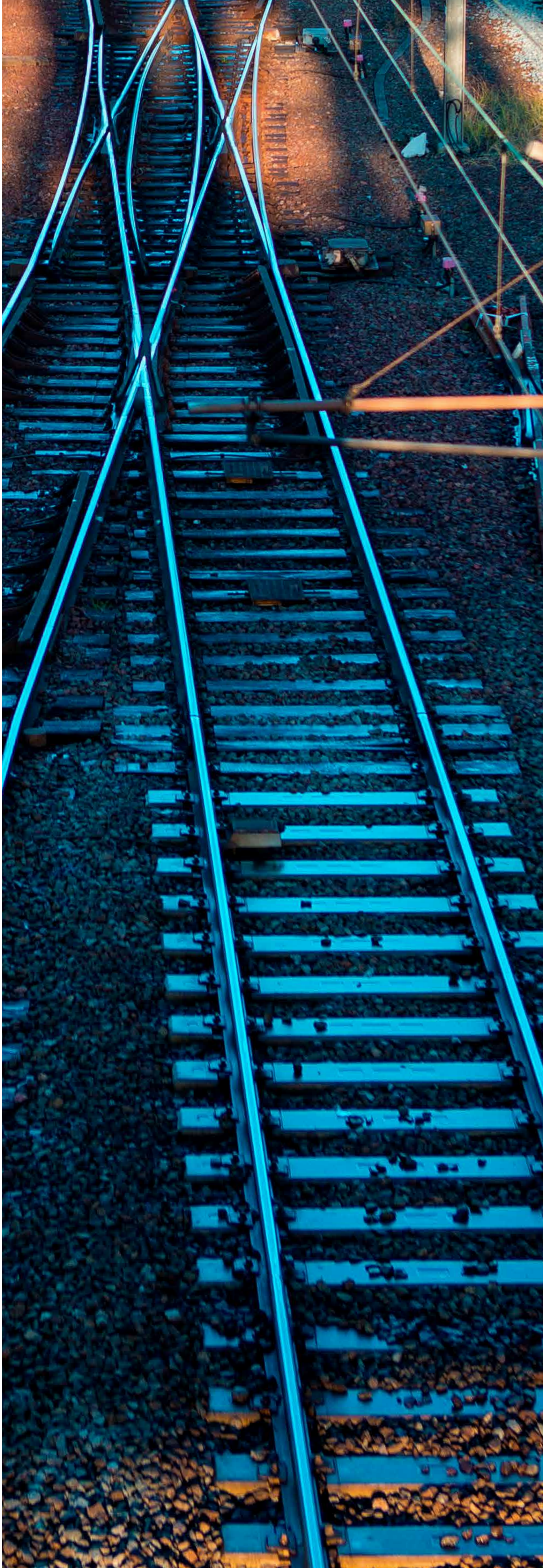
Signal passed at danger (SPAD) is one of the most common types of accident precursors and one of the most serious incidents in the operation of trains. Their number is relatively stable at around 2 100 cases reported each year. A relatively high number of SPADs was reported by Romania, Denmark, Sweden and Norway in 2014. For the first time, some Member States reported disaggregated numbers of SPADs. The data received from seven countries indicate that SPADs in which the train passed a danger point represent only about 15 % of all reported SPADs.



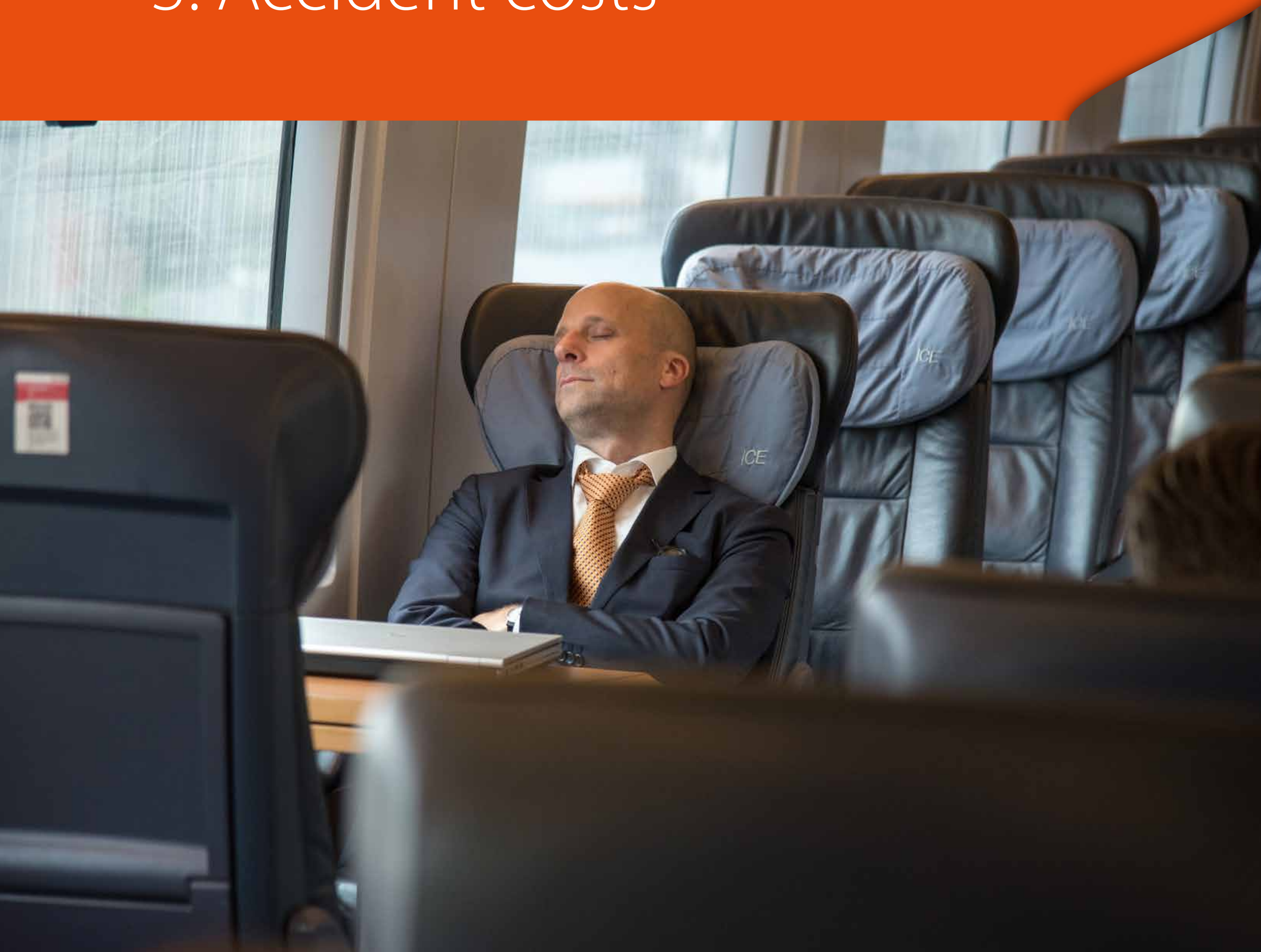
Wrong-side signalling failure is a less common type of accident precursors. Altogether, 13 EU Member States reported zero precursors of this type in 2014. A relatively high number of this type of failure was reported in Ireland, France and Denmark.
The number of broken wheels and broken axles reported in 2014 is relatively small compared to other precursor types. There were 11 broken wheels and 14 broken axles on rolling stock in service in 2014.

CSI data on accident precursors provide additional information on the level of safety performance; however its value in supporting effective safety management at EU and national level is limited. A detailed survey of the national occurrence reporting regimes and systems carried out in 2015 for the Agency unveiled that there are major differences in reporting obligations and practices in respect to precursors across the EU, with only a few NSAs collecting and analysing precursors other than those reported under the CSI framework. Reporting and analysis of precursors is common practice amongst RUs and IMs, in part to satisfy requirements in Regulation 1078/2012 (Common Safety Method for Monitoring).

The survey also showed that accident precursor indicators are not always systematically used by NSAs as part of safety monitoring to plan safety supervision. It also appears that the monitoring of railway occurrences that do not result in an accident varies considerably between Member States. This may represent an obstacle for the effective joint monitoring and supervision of railway undertakings operating in more than one Member State.



3. Accident costs



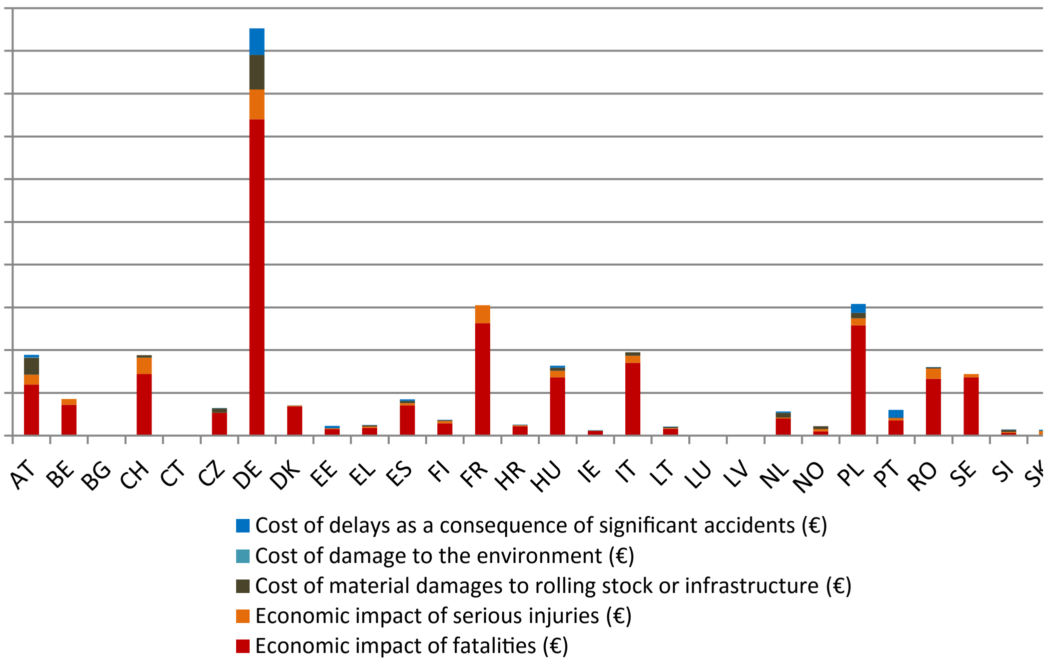
Costs of accidents are the economic impact of fatalities and serious injuries, costs of delays, costs of material damage to rolling stock or infrastructure and costs to the environment. They are estimated using the common methodology that is part of Annex I to the RSD. While the economic impact of casualties can be estimated for all countries, the costs of delays are only available for 18 Member States. Nine Member States reported no material damage, even if all but two of them recorded at least one significant accident.

The economic impact of significant accidents in 2014 per Member State is shown in Figure 16. It illustrates the completeness of reporting for different cost components and their relative weight in the total accident costs. Social costs of casualties (fatalities and serious injuries) represent the majority of costs of significant accidents.

At the level of EU-28 countries, the estimated value of prevented casualties in 2014 was 1.4 billion EUR. The total costs of material damage was 103 million EUR, total costs of delays 71 million EUR and the costs of damage to the environment, 71 million EUR.

Although not considered as railway accidents, suicide events represent a substantial burden to both railways and society. A study prepared for the Agency in 2015 determined the annual cost of suicide at railway premises in the EU, Norway and Switzerland at €7.1 billion per annum. Although the majority of those costs are indirect costs to society, the railway specific costs are also considerable, estimated as at least €270 million per annum. Currently a minority of infrastructure managers apply a value for preventing a casualty approach to assessing the financial impact of suicide on railway premises and only half of those responding to the survey had a suicide prevention programme. There is thus a far greater justifiable spend that can be applied to preventing suicide on EU railways.

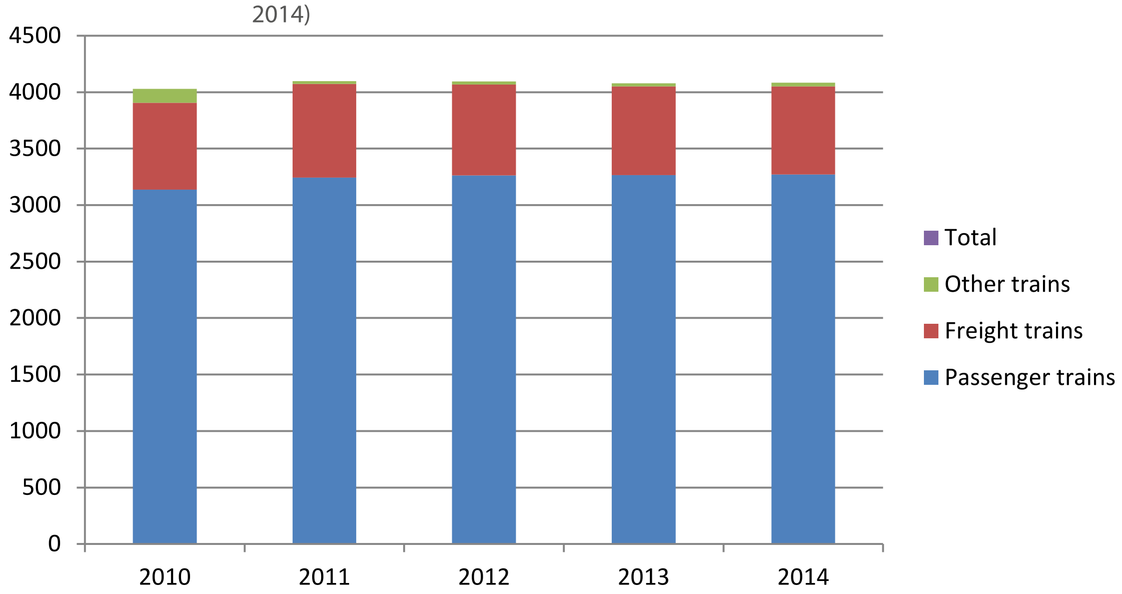
Figure 16 — : Economic impact of significant accidents in 2014 in EU-28 countries (in million EUR)



4. Traffic volumes

Trains run over more than four billion train kilometres in the EU every year (4.1 bn in 2014). Passenger trains performed 79 % of the total number of train kilometres (3.3 bn in 2014). The traffic volumes are stable from year to year, thus having no impact on expected accident outcomes (Figure 17).

Figure 17 — : Number of million train-kilometres per type of train traffic (2010–2014)



Germany is the country with the highest number of train-kilometres, accounting alone for one quarter of all train-kilometres in the EU. It is followed by the UK and France, each reporting more than 500 million train-km in 2014. These three countries account for 53 % of train traffic in the EU (Figure 18).

Figure 18 — : Number of million train-kilometres (2012–2014)

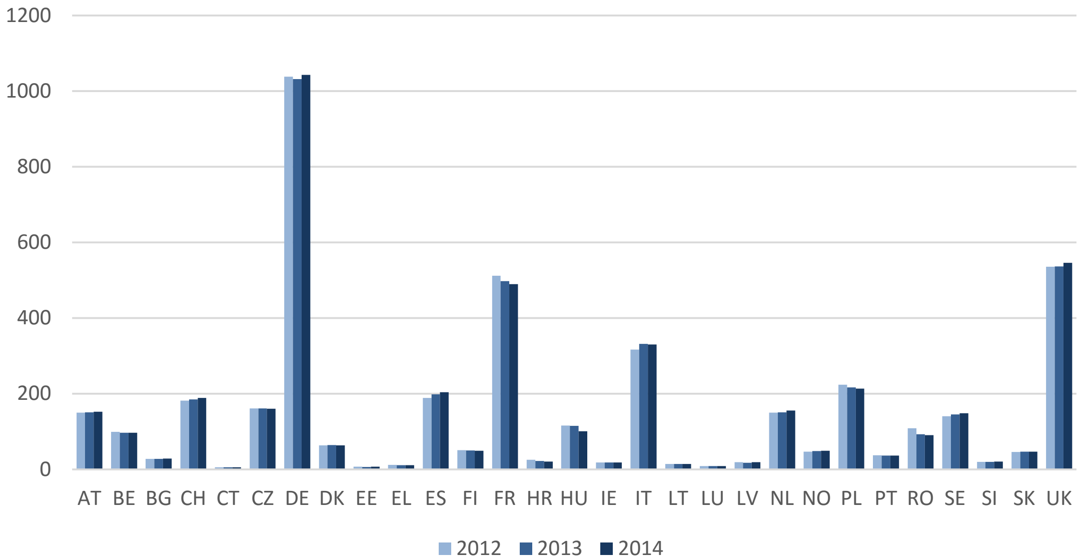
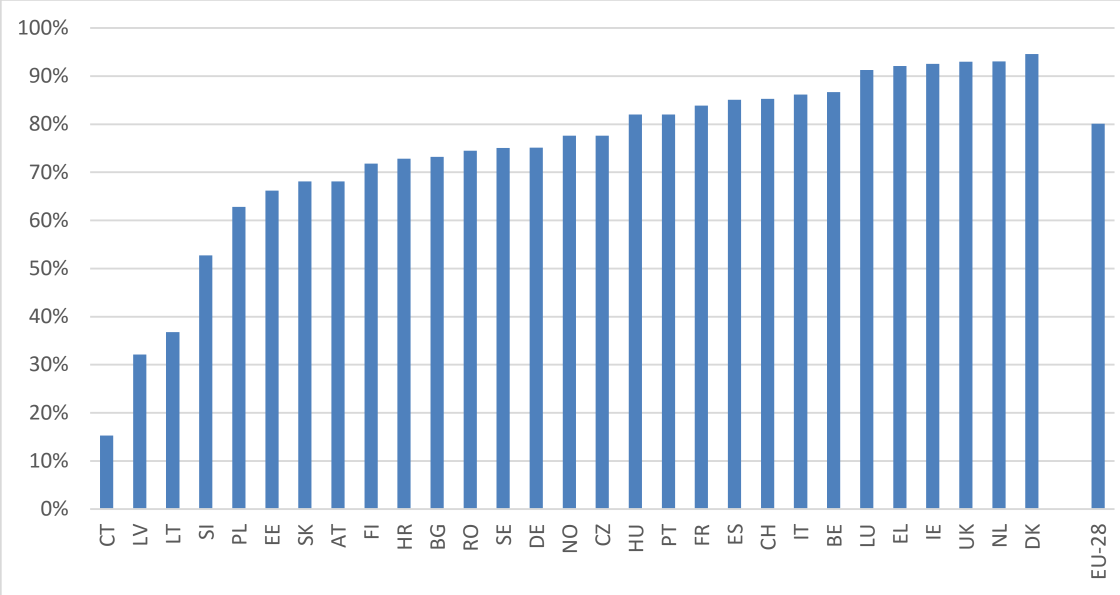
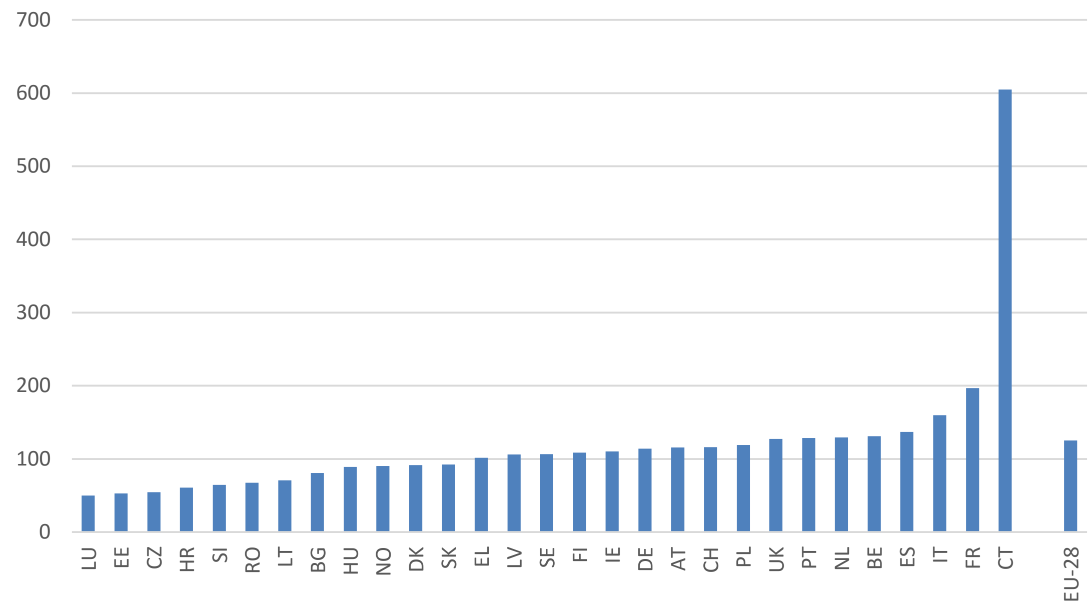


Figure 19 — : Percentage of passenger train-kilometres among all train-kilometres in 2014



At the level of the Union, passenger traffic represents 80 % of all train-kilometres. Member States with high population density show a comparatively higher share of passenger train traffic among all train traffic. Baltic countries have the highest share of freight train traffic in the EU. The share of passenger train-kilometres exceeds 90 % in Denmark, Ireland, Greece, Luxembourg, the Netherlands and the UK (Figure 19).`

Figure 20 — : Passenger kilometres per passenger train-km in 2014

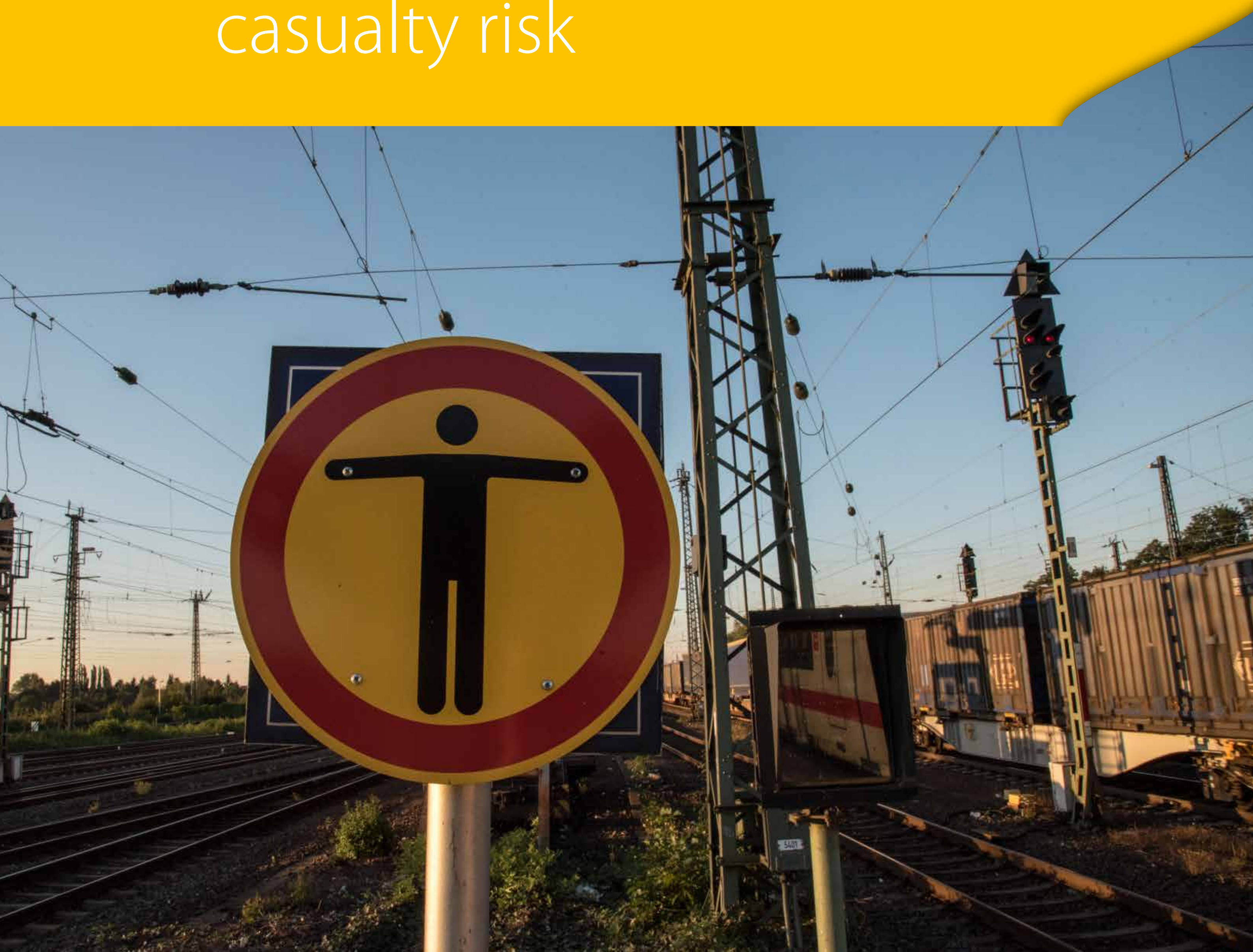


Data on passenger kilometres allow a rough understanding of the relative use of capacity of the railway system. In 2014 alone, passengers travelled 400 billion kilometres on board passenger trains. The number of passenger train kilometres increased in 15 Member States year on year. Across a longer time period, the number of passenger kilometres actually increased by 12 % over the past five years, alongside a modest 2 % increase in the number of passenger train kilometres. This indicates an increased efficiency of train passenger transport. However, the number of passenger kilometres decreased in 12 Member States. In all but one (Greece), it was accompanied by a modest reduction of passenger train kilometres.

The estimated average passenger load expressed as the number of passenger kilometres per number of passenger train kilometres is shown in Figure 20. It reflects the mix of passenger train services in different countries and the operational conditions such as infrastructure use fees. The hypothetical average passenger load was 125 passengers per passenger train at the EU level in 2014. Higher loads appear to be typical for countries with high-speed railway systems and for countries with high passenger demand due to high population density.

Given the reported traffic volumes, it is conceivable that the developments in railway traffic have had little influence on the accident outcomes and can be disregarded when analysing those outcomes at the EU level. This situation is likely to be sustained since traffic volumes are unlikely to increase significantly in the next years.

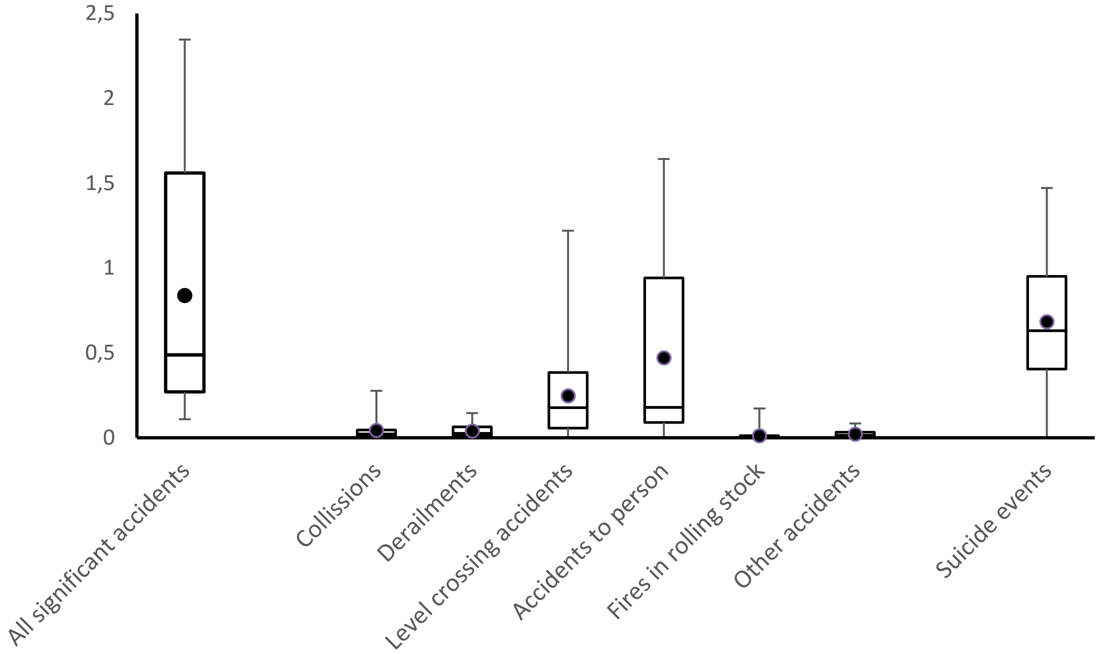
5. Accident and casualty risk



5.1. ACCIDENT RISK

The accident rate per million train kilometres for each country was calculated by taking the total number of significant accidents in that country, dividing it by the total number of train kilometres, and multiplying it by one million. Figure 21 summarises the accident rate in all countries using a box plot. Box plots are helpful because they help to summarise a number of statistics in one image. In this figure, it provides information on the following: the average, the median, the lower quartile, the upper quartile and minimum. Each of these statistics is explained and provided in the text beneath Figure 21. The purpose of providing these statistics is to provide an understanding of the safety picture in different accident categories.

Figure 21 — : Summary of the EU-28, NO and CH significant accident rates per million train-km (2012-2014)



The main statistics from the graph are:

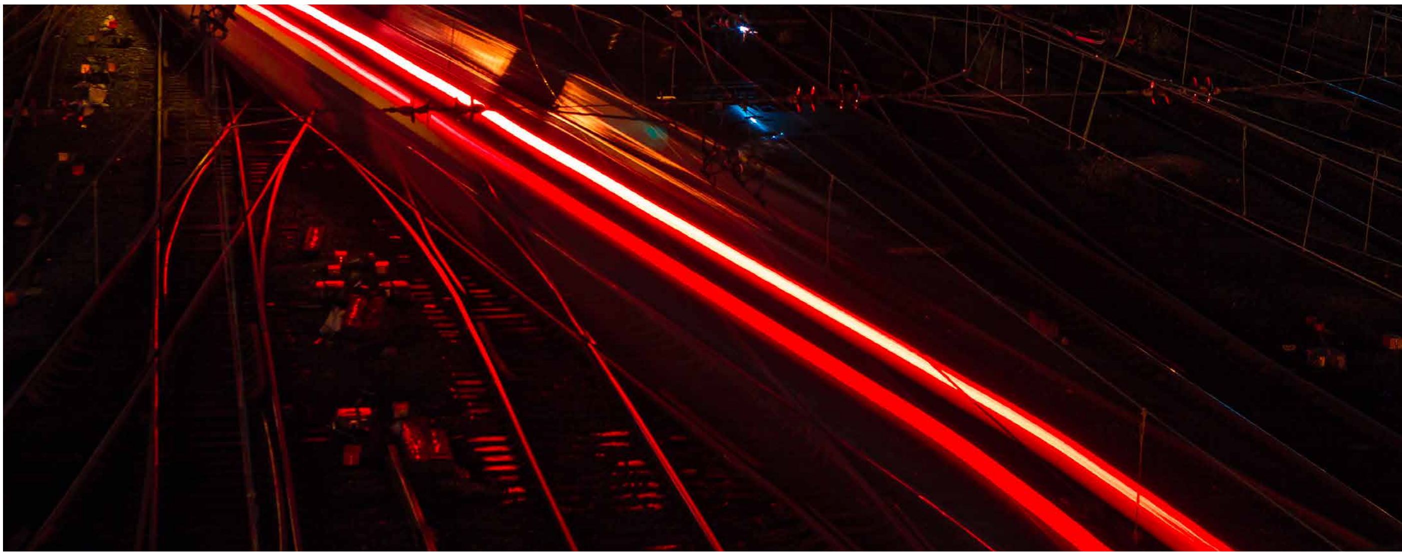
The **average** (sometimes called the mean) accident rate is a measure of central tendency. This was calculated by totalling the individual accident rates and dividing by 29, which represents the number of reporting NSAs. The average was calculated as 0.84 significant accidents per million train kilometres and is represented in Figure 21 by a solid black dot in the centre of the upper box. The average accident rate for collisions and derailments is 0.04 each.

The **median** is another measure of central tendency. It is the mid-point in the data where the accident rates have been arranged in order from smallest to largest; effectively the middle point of the data. In Figure 21, it is shown as a black line that splits the black box into two parts. The median accident rate was 0.49 accidents per million train kilometres, which is relatively far from the average accident rate. Actually for all accident types, the median value is lower compared to the average value. This reflects the fact the accident rates show a right skewed distribution, as most values are concentrated to the left of the mean, with extreme values to the right. This means that a small number of countries have significantly higher accident rates compared to the average.

The minimum is the lowest value in the dataset and it was 0 for all types of accidents, except for their total (all significant accidents). This means that for single accident categories, there was at least one country in which no single accident was reported over the past three years. Similarly, maximum is the highest value in the dataset and shows the accident rate for single countries with the highest accident rate.

The bottom perimeter line of the box indicates the lower quartile value. This line shows the value below which 25 % of the accident rates lie when the rates are arranged in order from smallest to largest. In this case the value is 0.27 per one million train kilometres. In conjunction with the minimum value, this indicates that 25 % of countries had an accident rate between 0.11 and 0.27 and that a further 25 % of countries had an accident rate between 0.27 and 0.49 accidents per million train kilometres.

The upper perimeter line of the black box indicates the positioning of the upper quartile. This line shows the value above which 25 % of the accident rates lie when the figures are arranged in order from smallest to largest. In this case, the value is 1.56 per million train kilometres. In conjunction with the median value this indicates that 25 % of countries had an accident rate between 0.49 and 1.56 and that 25 % of countries had an accident rate above 1.56.



5.2. FATALITY RISK

Fatality risk from railway accidents is of greater interest to public authorities and to the public in general as it shows the extent of the negative impact of railway accidents on society. Estimating risk levels for different Member States allows us to highlight the differences in safety performance between individual Member States.

This is done here in two ways, first looking at the risk in the railway system and second by looking at the risk for passengers in the railway system. The risk is expressed in the number of casualties per exposure and is calculated using the moving weighted averaging techniques described in the CSM for the assessment of achievements of safety targets. This technique allows slight smoothing of extreme values (catastrophic accidents resulting in a high number of casualties), which may distort the overall safety picture.

The fatality risk in the railway system was estimated by dividing the number of all railway fatalities (excluding suicides) by the number of train kilometres over the period 2010-2014. The fatality risk estimated for all EU-28 Member States was 0.28 killed per million train km. Yet the values of risk vary greatly between countries as can be seen in Figure 22.

There appears to be west-east divide in terms of fatality risk. Six Member States have the risk exceeding 1 fatality per million train kilometres. Most of these countries have been part of the Agency' priority countries programme. The countries with a fatality risk higher than average show much greater variations in risk than those outperforming the EU average. The risk levels of one third of countries seriously undermine the low level of risk at EU level: these EU countries have a level of risk that is at least four times higher than the EU average.

Figure 22 — Railway fatality risk 2010-2014 (MWA)

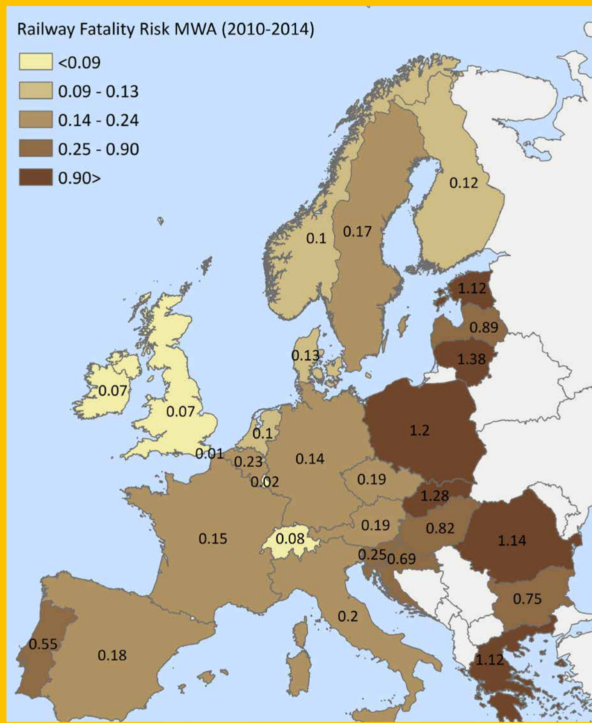
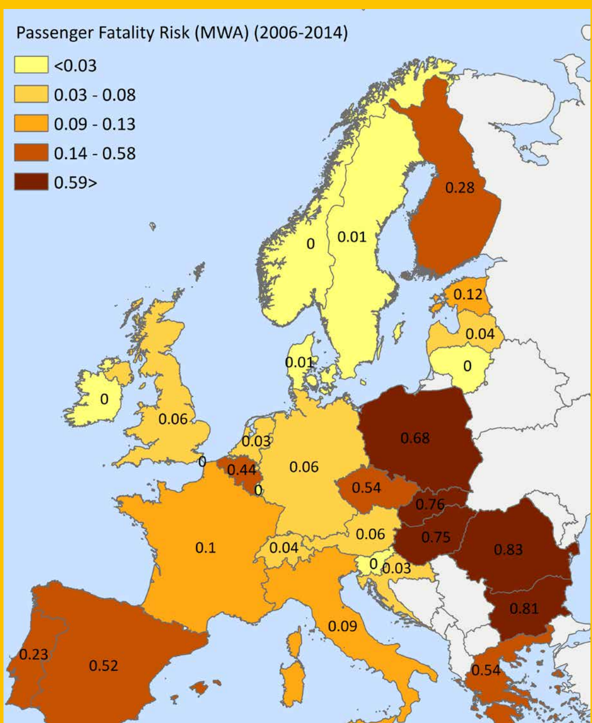


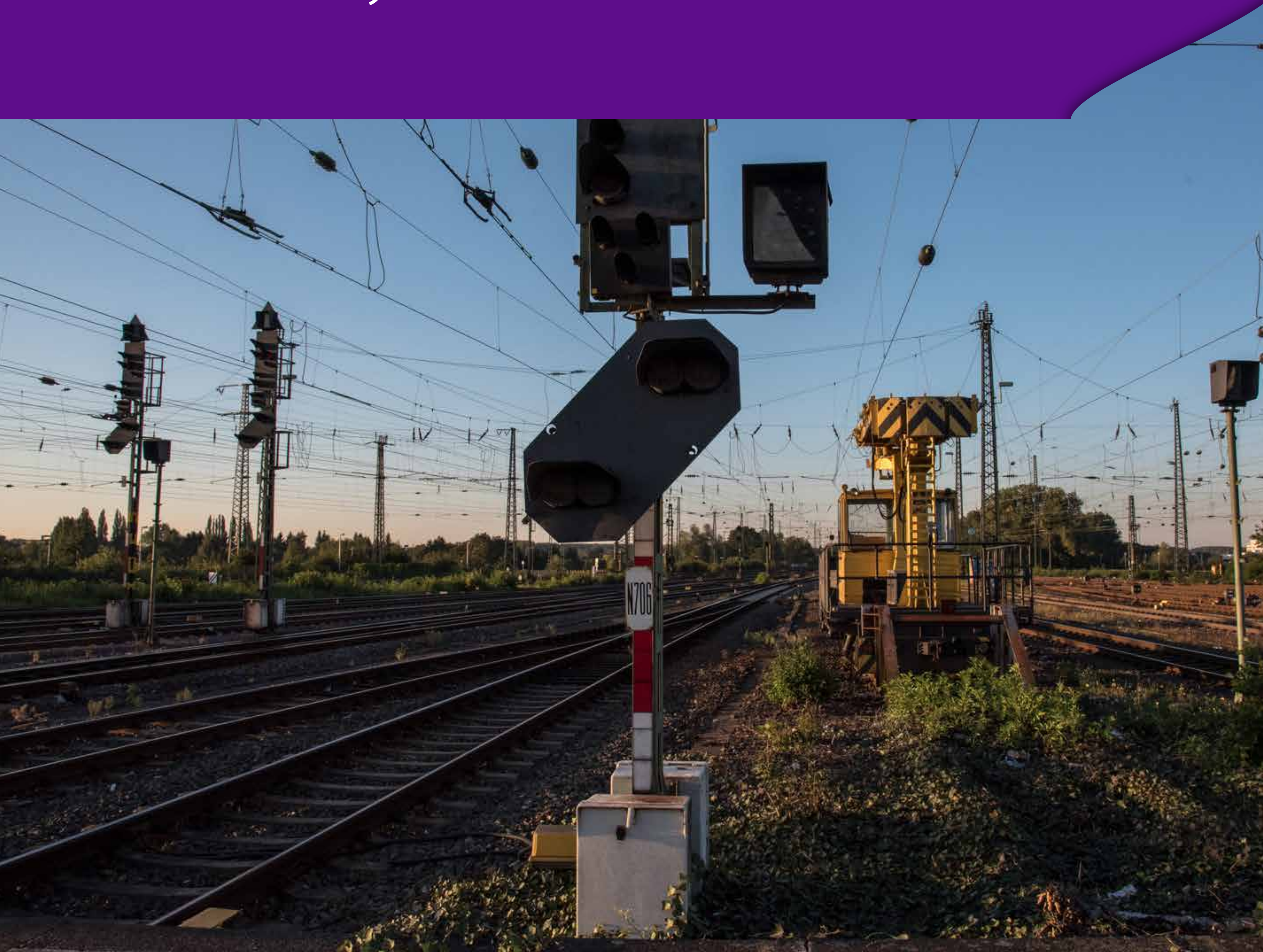
Figure 23 — Passenger fatality risk 2010-2014 (MWA)



Six countries and the Channel Tunnel have recorded no passenger fatality in the period 2006-2014, thus their passenger fatality risk is zero. The countries with a level of risk higher than the average are typically those with a high risk for all persons on railways (8 countries have fatality risks for passenger and all users higher than EU average). This fact, together with the similarities in the distribution shapes, counters the common belief that the two measures of risk are not comparable and that the safety of passengers is not correlated to safety of other users.

There are certain limitations in the two benchmarking indicators: They rely on the numbers of fatalities only, since serious injury data are not fully comparable between countries and the period considered is not of the same length, because of limited compatibility of certain data before 2009..

6. Safety of infrastructure



6.1. TRAIN PROTECTION SYSTEMS

Various types of train protection systems (TPSs) are installed across Europe offering different functionalities and consequently various level of safety assurance. Among them, the automatic train protection system (ATP) ([14]), is the most advanced type of train protection systems. It is considered to be the most effective technical measure that infrastructure managers can implement to reduce the risk of collisions and derailment on mainline railways ([15]). It enforces obedience to signals and speed restrictions by speed supervision, including automatic stop at signal.

All Member States but three reported the presence of ATP systems on their railway network. However, the reported figures show a continuous problem of misclassification of different types of train protection systems. The Agency could verify the validity of reported figures in only a small number of them. In these countries, the percentage of tracks equipped by ATP systems was generally under 20 %.

Five Member States reported voluntarily a breakdown of figures for the different types of TPSs. These figures suggest that TPSs with lower functionality (providing warning or warning and automatic stop only) are more common than ATP systems.

In addition to reporting the percentage of ATP lines, almost all NSAs also reported the percentage of train kilometres on tracks with ATP in operation. This percentage is higher than the one of ATP lines, however for many countries there is surprisingly a relatively small difference, since one would expect intensive use of ATP equipped infrastructure, typically installed on lines with the highest traffic volumes.

6.2. LEVEL CROSSINGS

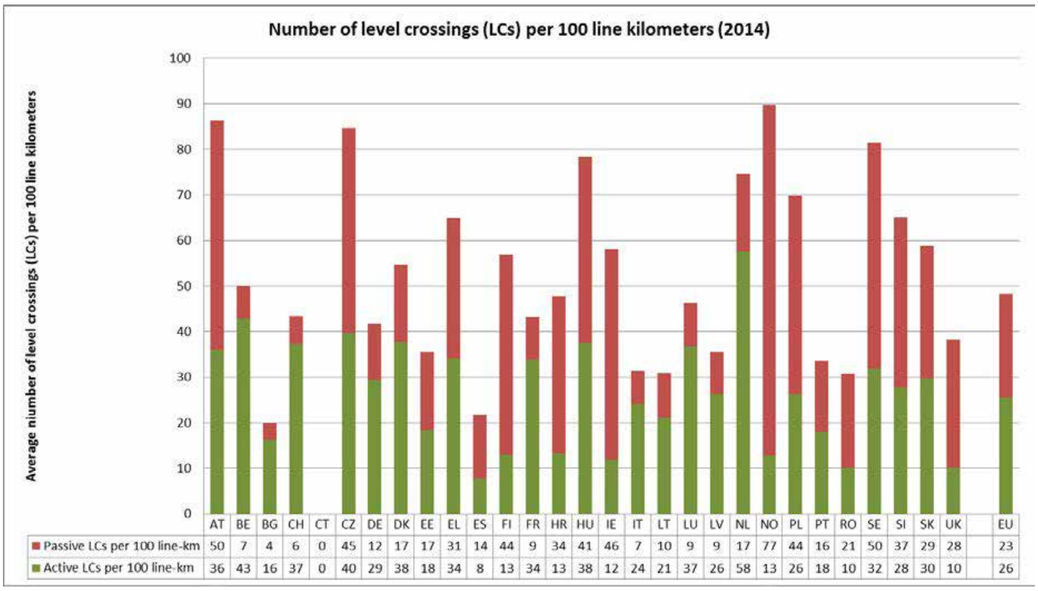
Level crossings belong to the critical parts of railway infrastructure, which create a hazard of collision between the train and road user. Although various technical systems exist to eliminate that hazard, the empirical evidence shows that even after providing protection devices, there remains a residual risk that needs to be further addressed. It is therefore commonly understood that the elimination of level crossings should be the ultimate goal for infrastructure managers, however, in the meantime and in parallel, the right mix of non-technical or operational measures jointly implemented by road and rail authorities is needed to reduce the risks in the short term.

There were 114 580 level crossings in the 28 EU Member States in 2014. Their number saw a continuous slight decrease of about 4 % per year over the past five years across Europe. At the current rate of reduction half of these passive level crossings will remain after 2030. On average, there are five level crossings per 10 line-km in the EU; this share varies considerably between countries. Sweden, Austria, the Czech Republic and Hungary have the highest density of level crossings in terms of level crossings per line-kilometre (more than 75 per 100 kilometres). Bulgaria and Spain have the lowest density of level crossings with less than 25 level crossings per 100 line kilometres.

Passive (unprotected) level crossings represent 47 % of all level crossings. These level crossings are usually equipped with a St Andrew cross traffic sign, but do not provide any active warning to the road users. Since 2010, their relative share was falling by one per cent per year. A low ratio of active level crossings to all level crossings is typical for the less densely populated countries (Figure 24).

([14]) Automatic train protection (ATP) means a system that enforces obedience to signals and speed restrictions by speed supervision, including automatic stop at signals. Systems where track signalling information is substituted and/or supplemented by cab signalling are included.
([15]) Interfleet (2011). Investigating the links between historic accident rate reduction and the underlying changes, Report prepared for ERA in 2011. Report can be downloaded from the ERA website.

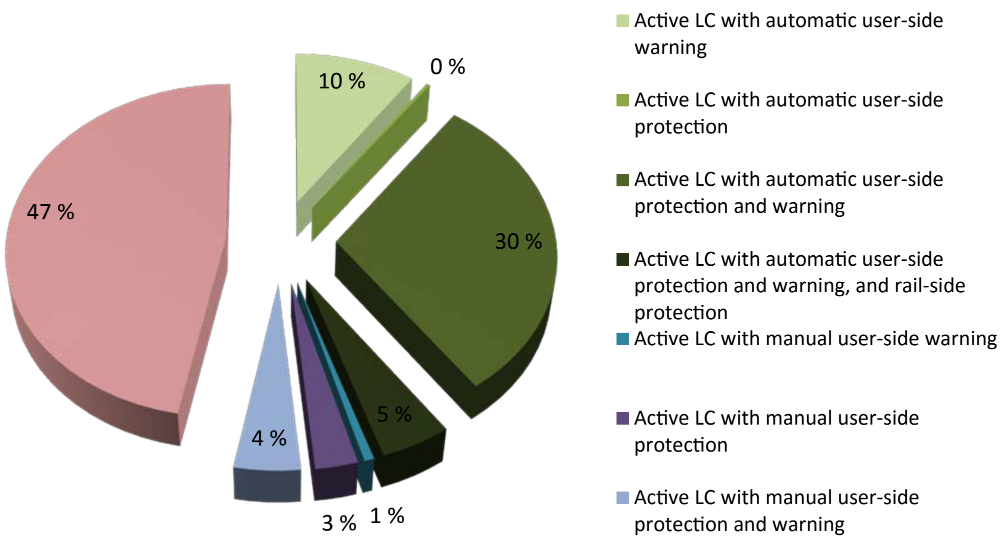
Figure 24 — Number of active and passive level crossings per 100 line-km in 2014



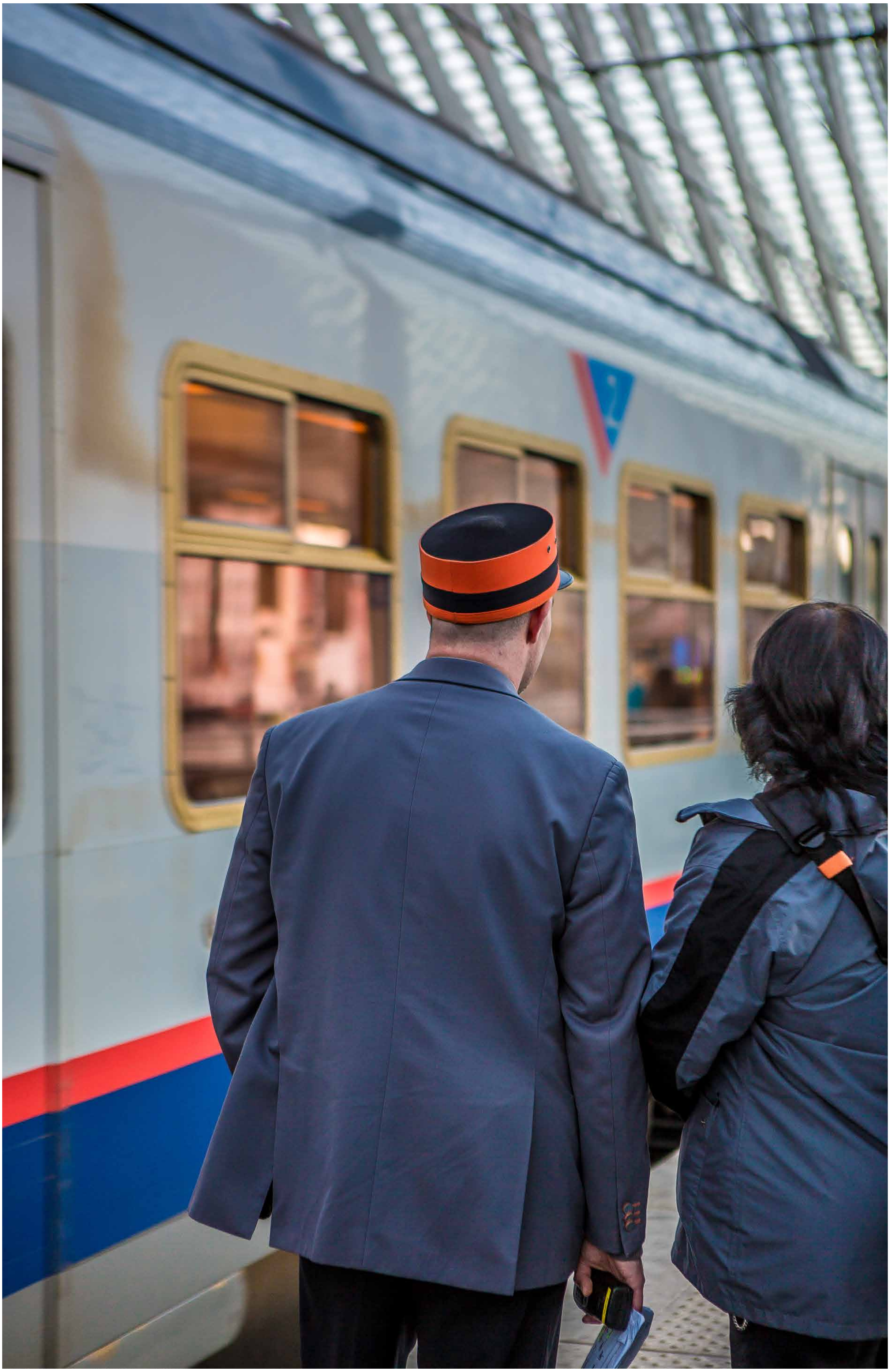
	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU
Passive LCs per 100 line-km	50	7	4	6	0	45	12	17	17	31	14	44	9	34	41	46	7	10	9	9	17	77	44	16	21	50	37	29	28	23
Active LCs per 100 line-km	36	43	16	37	0	40	29	38	18	34	8	13	34	13	38	12	24	21	37	26	58	13	26	18	10	32	28	30	10	26

Detailed statistics are available on the type of active level crossings at European level. In Figure 25, the data for 28 EU countries show that level crossings with automatic user-side protection and warning (arm barriers and flashing lights) are the most common type of active crossings (65 % of all level crossings), followed by the level crossings with user-side warning (20 %). The level crossings that combine full road side protection with rail protection account for 9 % of all active level crossings (5 166 in absolute terms).

Figure 25 — Breakdown of level crossings per type of protection in 2014 (EU-28)



Accident rates per type of level crossing are available for eight Member States for 2014. They confirm the earlier evidence that the majority of accidents at level crossings occur on passive level crossings. However, they are not uncommon on protected level crossings, with the exception of rail-side protected level crossing type, for which there were no accidents reported in 2014 (in eight Member States).



7. Managing safety

7.1. INTRODUCTION

A safety management system is a pro-active system that identifies the hazards of the activity, assesses the risks of those hazards that are present, and takes actions to reduce those risks in a plan-do-check-act cycle. The RSD requires a system-based approach as the best basis for managing the complex causes of serious, multi-fatality accidents in a cost-effective and business-oriented way. This approach can be "scaled-up" to a regulatory, national or EU level to ensure that the safety risks inherent in each role are properly managed.

The RSD contains a number of concrete instruments for the effective management of railway safety, such as harmonised safety certification, vehicle authorisation, supervision and risk assessment. They are meant to support an overarching objective of a creation of an internal market for railway vehicles and train services across Europe while assuring a high level of railway safety.

The revised Directive adds several new elements for effective safety management in a Single European Railway Area such as European occurrence reporting, requirements for safety and reporting culture, risk-based supervision and common method for the assessment of safety levels of railway operators. These new requirements underline the importance of continuous monitoring to support risk-based decision making.

7.2. SAFETY REGULATION

The European safety regulatory framework is thoroughly described in the RSD. It has been in place for more than ten years, with the revised Directive coming into force at the end of May 2016. However, in several Member States, the safety regulatory framework is still developing. Notably, the transparency and availability of the national safety rules applied by the RUs operating on the railway network remains an issue given its importance for market opening and removal of regulatory barriers. The long-term objective of the Railway Safety Directive is the gradual reduction of national rules in order to move towards a more harmonised European approach to safety. Many of these national rules are redundant as common requirements have now been enacted at EU level. It is therefore timely to review and clarify the scope that remains for national safety rules in the Member States. Also, as substantiated by Agency reports and feedback from the sector, there is a need to increase transparency in how national safety rules are established, published and made available.

Besides the development of safety rules, the full set of Technical Specification for Interoperability (TSIs) has become available and provides a stable basis for the delivery of technical (sub-) systems. The TSIs include an essential requirement for safety, intended to ensure that the interface specifications provide part of the safety protection for technical systems. Although the end objective of TSIs is to help assure technical interoperability, some specifications relate to safety-critical technical systems thus providing safety-specific regulatory requirements. Little is known about the effects of these changes on safety performance of those systems, since the data and information about the performance of these system is not available at EU level. Nevertheless, it is noticeable that some Member States made substantial progress with consolidating and revising safety rules. On the whole, the large number of national rules continue to exist in the EU and require an accelerated effort with a view to further improve the functioning of the European railway area. Rule reduction has been identified by the Commission as a top priority for the Agency and Member States in the framework of the Fourth Railway Package.

In 2015, the revised OPE TSI became a Regulation and included for the first time a number of Common Operational Principles and Rules (Appendix B). The Member States, ERA and EC agreed on a common structure of the National Implementation Plans, to facilitate a coordinated implementation and development of this TSI where possible and needed.

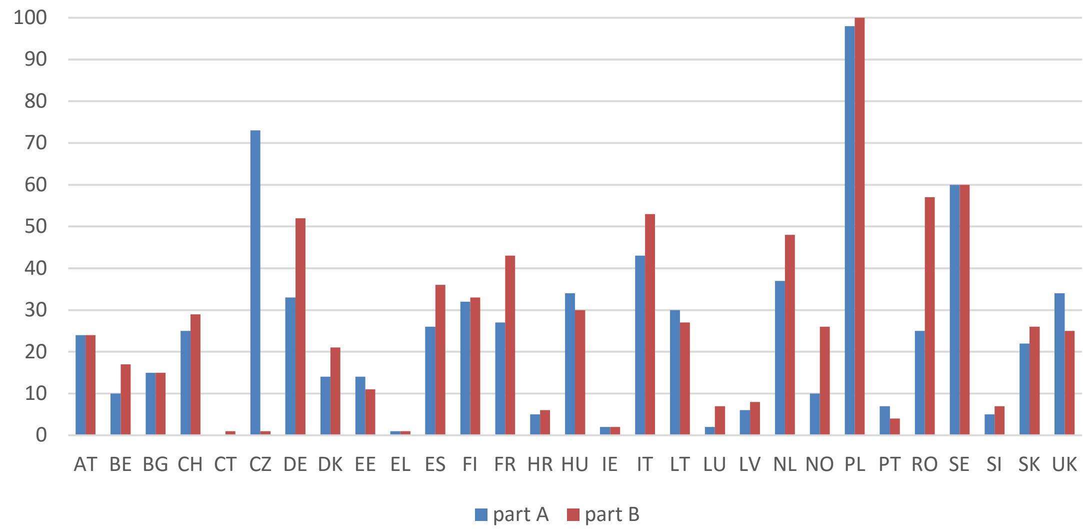
7.3. SAFETY ASSURANCE

Safety assurance and oversight is primarily a responsibility of the National Safety Authorities through the award of safety certificates and authorisations to RUs and IMs respectively, based on a conformity assessment of the safety management systems of applicants. This certification is supported by planned and targeted supervision, in accordance with the relevant Common Safety Method. With the recast of the RSD, the Agency will assume responsibility for the award of some safety certificates.

7.3.1. Safety certification

The Railway Safety Directive requires the railway undertakings to hold a safety certificate issued by the national safety authority to access the railway infrastructure. Similarly, infrastructure managers must obtain a safety authorisation from the NSA to manage and operate rail infrastructure in a Member State. The NSA assesses the Safety Management System (SMS) of RUs and IMs applying for safety certificates and safety authorisations against the assessment criteria set out in Regulation (EU) N°1158/2010 and Regulation (EU) N°1169/2010 respectively. Railway undertakings are awarded a part A safety certificate which is valid throughout the EU, after demonstrating the adequacy of their SMS provisions. RUs also need to obtain part B certificates for each Member State in which they operate, relating to the specific requirements for safe operation on the relevant network.

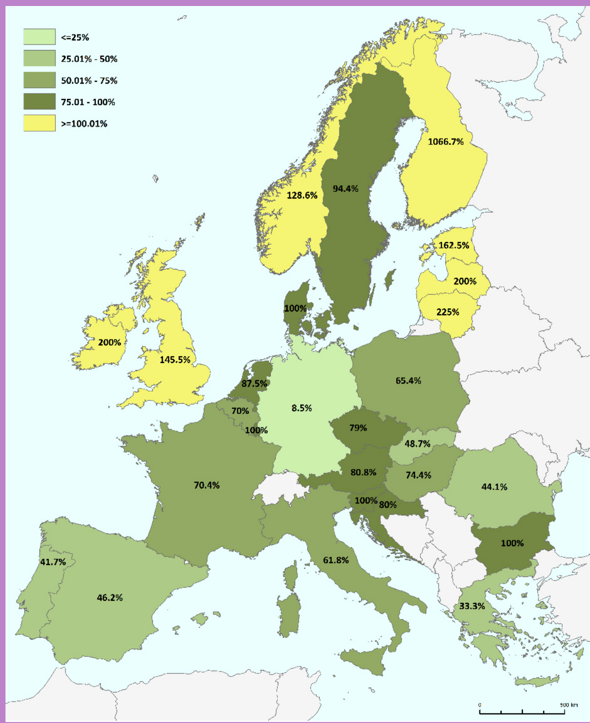
Figure 26 — Number of valid Safety Certificates — Part A and B per Member State (ERADIS – 1.1.2016)



There were a total of 1 485 valid safety certificates in EU-28 countries, Norway and Switzerland (714 part A and 771 part B certificates) issued in accordance with the RSD and valid on 1 January 2016, as shown by records in the ERADIS database. This figure includes all new, renewed or amended safety certificates and shows an increase of 19 % of valid safety certificates since the previous year, in particular in Germany, Hungary, Italy and Austria.

The number of valid safety certificates issued by the NSAs is shown in Figure 26. The NSAs of Poland, followed by the Czech Republic, Germany, Sweden and Italy, issued the highest number of safety certificates. On the other side of the spectrum, in eight countries with a railway network, the number of RUs granted with a Part A safety certificate is lower than 10, possibly indicating a limited development of the railway market in these countries. A lower number of Part B certificates compared to Part A certificates for some Member States indicates that for some the Part B certificates had already expired and the notification of renewal has not yet been submitted in the ERADIS database. In the case of several Member States, the number of valid Part A safety certificates notified in the ERADIS database outnumber significantly the number of Part B safety certificates. The discrepancy between the number of part A and part B certificates and the difference between the number of licences and certificates raises questions about the functioning of the systems. The work on developing the One Stop Shop arrangements under the technical pillar of the fourth railway package may help to address this issue.

Figure 27 — Proportion of licensed railway undertakings with Part A safety certificates 2015 (ERADIS)



Figures 27 and 28 show the proportions of licensed railway undertakings with Part A and B respectively on a map base. The maps show the proportion of licensed railway undertakings holding safety certificates. In contrast to the situation described in Figure 26, Germany has the lowest proportions for both parts (8,5% for part A and 12,9% for part B). There are 389 railway undertakings in Germany with valid licences (August 2016). The Czech Republic has the lowest proportion of Part B safety certificates (1,2%) for licensed railway undertakings. Discussions between ERA and the National Safety Authorities are ongoing to resolve the issues relating to these data. Equally, we need to understand those Member States with proportions greater than 100%. It is too early to determine all causes behind these results. Nevertheless, the reported data makes clear differences in the way the legislative framework regarding safety certification has been implemented between Member States.

Figure 28 — Proportion of licensed railway undertakings with Part B safety certificates 2015 (ERADIS)

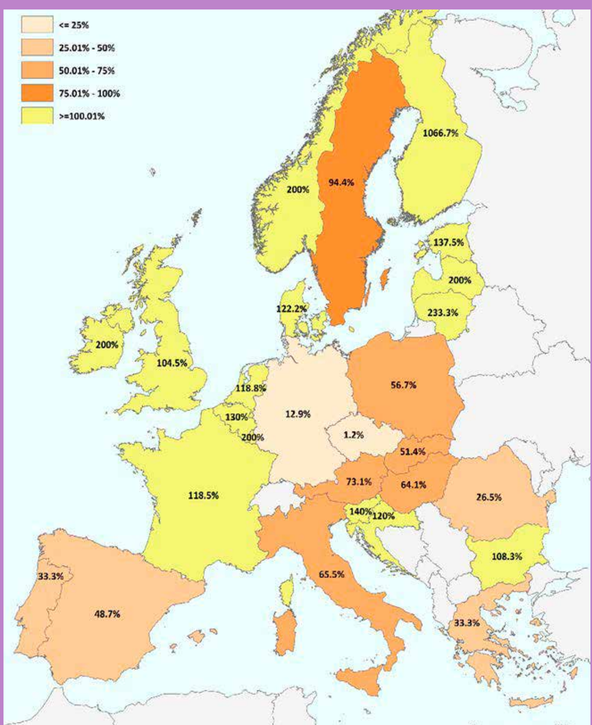
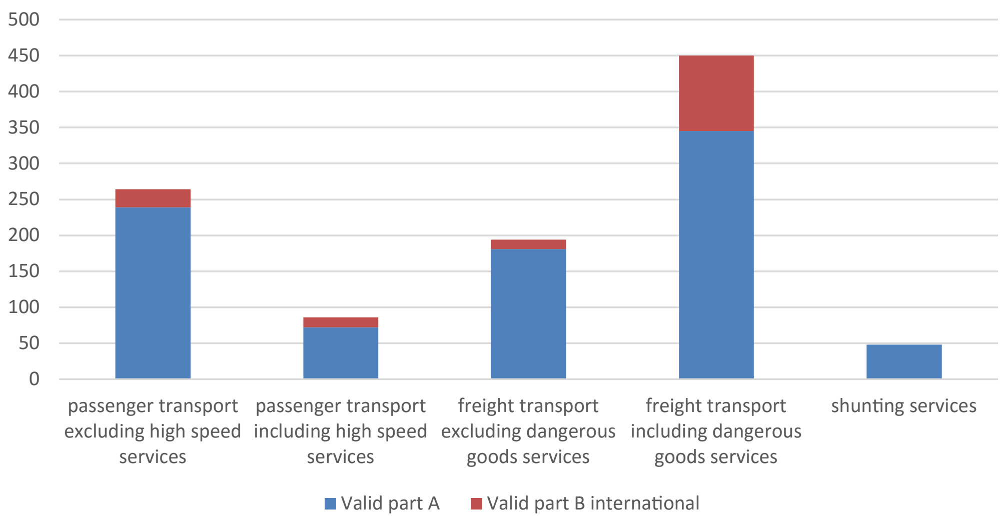


Figure 29 shows more details on the number of safety certificates per type of service, valid at the beginning of 2016 and registered in the ERADIS database. This figure shows the share of international part B certificates (16) in comparison with the overall number of issued part A certificates. Similarly to the previous year, it shows that only a relatively small number of RUs run cross-border train operations in Europe and choose to apply for a new safety certificate Part A and B in other Member State(s). It has also to be acknowledged that a lot of RUs have partnerships with other RU(s) holding a Part A safety certificate in another Member State and so do not apply for international Part B safety certificate(s). International part B safety certificates remain rather rare for RUs operating passenger train services; they are more common for RUs operating freight transport services with dangerous goods. This is comparable to the numbers registered three years ago. The relative share of different types of certificates with respect to type and extent of services remains similar to the previous year.

The NSAs also report to the ERA, as part of their annual safety report, the number of safety certificates (new, updated and renewed) they issued in the previous year. However, the number of safety certificates reported in the annual safety report significantly differs from the figures in the ERADIS database, highlighting problems related to the accuracy of reporting into ERADIS.

Figure 29 — Number of valid Safety Certificates — Part A and B, international operations only, per type of service (ERADIS – 1.1.2016)



7.3.2. Safety authorisation

Infrastructure managers (IMs) must obtain a safety authorisation from the NSA to manage the rail infrastructure in a Member State. European IMs are typically state-owned entities with national coverage; a small number of IMs that are privately owned manage small infrastructure networks, typically at ports. Detailed information about IMs with valid safety authorisation is currently not available at EU level. However, the information available in the annual safety reports of NSAs indicates that two NSAs issued new authorisations in 2014, Slovenia and Finland. The authorisation in Finland related to private sidings.

7.4. SAFETY MANAGEMENT AT OPERATIONAL LEVEL

Only limited information is available to the Agency regarding the SMS of RUs, IMs and other operational actors. It comes from the feedback on the application of various common safety methods.

7.4.1. Application of the CSM on risk evaluation and assessment

Regulation 352/2009 for risk assessment, applicable since 2010, and Regulation 402/2013, applicable since May 2015, request railway undertakings and infrastructure managers to report to their NSA on their experience with the application of the CSM for risk evaluation and assessment. Only some NSAs provided summaries of the requested feedback in 2015. The received information does not enable to conclude with assurance whether NSAs have not included all inputs they have received or whether railway undertakings and infrastructure managers did not communicate to the NSAs the necessary information. However, some NSAs report that the CSM is not used in their country. The available information further suggests that the smaller actors find application of the CSM application difficult. Some of them doubt the usefulness of the CSM, given the size of their activities; others seem to deliberately classify all changes as non-significant so as to avoid its application, but do not specify the method used instead of the CSM. More generally, the guide to support classification of significant changes seems to be rarely used, but the procedure is usually applied correctly.

7.4.2. Safety supervision

The Regulation (EU) N°1077/2012 requires the National Safety Authorities (NSAs) to oversee the safety performance of the railway undertakings and infrastructure managers operating in their respective Member State. For that purpose, the National Safety Authorities can adopt various techniques for supervision, ranging from management system audits to inspections in the field. NSAs often use a combination of audits and inspections in their annual supervision plans to ensure that appropriate safety requirements are met.

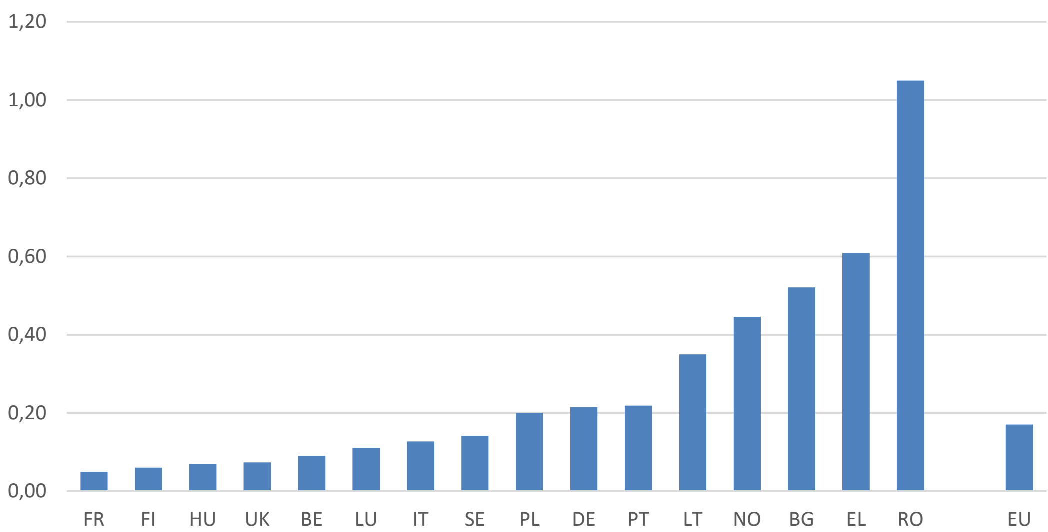
The NSAs report to the ERA, as part of their annual safety report, the number of audits and inspections that they carried out in the previous year. In 2015, less than half of the NSAs included as part of their annual safety report the number of audits and inspections they performed in 2014. .

The numbers of audit and inspections vary widely within Member States. This is partly due to ambiguous definitions of what constitutes an audit and an inspection. Even when accounting for possible misclassification of inspections as audits and vice-versa, the variation in the supervision effort across the EU appears to be significant. The information available to the ERA also shows that the approach to supervision differs substantially between Member States. This may in the future represent an obstacle to a supervision regime where cooperation and coordination between NSAs become more and more important in supervising those railway undertakings operating in more than one Member State.

ERA also receives information from Member States on the number of internal audits carried out by RU's and IM's each year. The number of internal audits conducted by RUs and IMs in 2014 were not provided by 20 % of the NSA's. Although the total combined number of RUs and IMs varies significantly between countries, in three Member States (UK, Italy and the Czech Republic) more than 1 000 internal audits were carried out by RU's and IM's. The remaining reports ranged from 1 to over 800.

When comparing the amount of full-time employees (FTEs) working in railway supervision in 2014, the number and the definitions vary within the Member States. Some countries did not provide the number of FTEs but rather the number of personnel involved in supervision activities. Therefore the data are not totally comparable but they are given here for illustrative purposes. Relative work effort is expressed in the number of FTEs per million train-kilometres in Member States (for which data was available); it is presented inFigure

Figure 30 — FTEs undertaking supervision activities per million train-kilometres (2014)



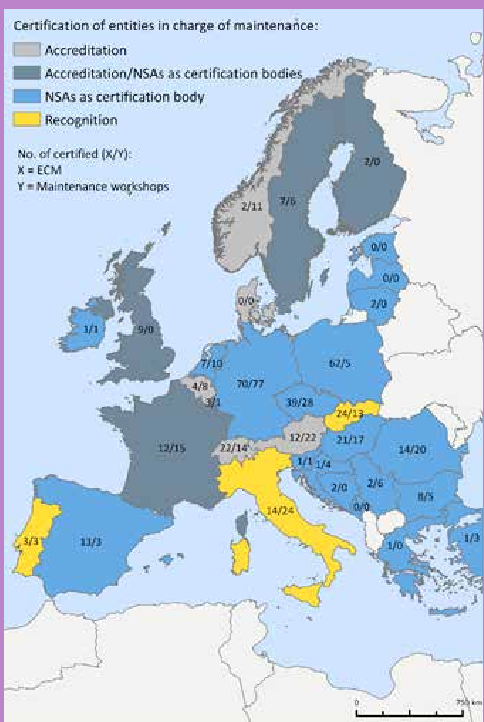
Having a common understanding of the (risk based) approach to supervision becomes more and more necessary in the single railway area. Achieving this would also enable a more meaningful comparison of supervision work in various NSAs. The ERA is currently working on the development of further guidance for NSAs to achieve that goal.

7.4.3. Certification of the entities in charge of maintenance

Proper maintenance of railway vehicles is vital in ensuring that they continue to deliver safe performance. The certification of Entities in Charge of Maintenance (ECM), according to the Regulation No 445/2011, provides evidence of responsibility and traceability of the maintenance undertaken on freight wagons. Shortly after the introduction of this mandatory scheme in May 2011, its scope has been extended to all OTIF non-EU countries. All EU Member States and 6 OTIF non-EU contracting States implemented the ECM certification on time. There are currently 40 certification bodies in those countries.

In line with the provisions of this Regulation, the Member States and other OTIF non-EU countries can either choose between accreditation and recognition or they can nominate the NSA as certification body. Although accreditation is the preferred option under European legislation to provide assurance on capability of conformity assessment bodies, it has only been chosen by one third of countries. The NSA acts as a certification body in a total of 15 Member States and four OTIF non-EU countries. Only 8 % of ECMs opted for being certified by certification bodies established in other countries. Nevertheless it is a positive indicator of an increasingly single market for accredited and recognised certification bodies.

Figure 31 — Certification scheme chosen by different countries together with the number of certified ECMs and maintenance workshop by 1.1.2016



Accreditation refers to the certification bodies accredited by a National Accreditation Body. Three Member States (Austria, Belgium, and Denmark) and two OTIF countries (Norway and Switzerland) opted for it. Recognition means certification bodies recognised by the countries according to the article 5.2 of Commission Regulation 765/2008. Three Member States (Italy, Portugal, and Slovak Republic) opted for it. Altogether 19 countries, 15 of which are EU Member States, chose the NSA to act as the certification body. A combined approach of accreditation and NSA acting as a certification body is applied in five EU Member States (Luxembourg, France, Finland, Sweden and United Kingdom).

The ECM certification is now widely adopted across Europe. By 1 January 2016, 353 ECMs were certified and 283 maintenance workshops were certified while 98 % of the freight wagons registered in National Vehicles Registers are maintained by certified ECMs.

While there has been a sound progress in the implementation, there is a need for reflection on how to further harmonise the work of the certification bodies and how to assure maturity of implementation of CSM on risk assessment and CSM on monitoring in the process of certification. The effective exchange of information between the railway actors, mainly RUs, keepers and ECMs is also an important point.

7.5. SAFETY MONITORING AT EU LEVEL

Per applicable EU legislation, monitoring of railway safety by the Agency focuses on accident and certain incident outcomes, enabling it to provide high-level feedback to regulators on the effectiveness of the regulatory framework. Relying exclusively on the outcome indicators, such as the number of accidents and resulting casualties means that there is limited ability to proactively manage current and emerging hazards. Moreover, this reactive high level monitoring does not provide understanding of underlying causes and contributing factors to accidents. To enhance safety monitoring at the EU level, a common approach to occurrence reporting in the single European railway area is ultimately needed.

In the meantime the Agency has invested in other activities to provide monitoring and support understanding of safety performance and system management. They are intended to provide additional value to the monitoring of safety performance at operational and national level. This is reflecting the regulatory framework under which the railway safety is managed at three different levels: At the level of operational actors, at the level of Member States and at the level of the EU. A thorough understanding of the functioning of this regulatory regime is a vital input to the daily management of railway safety across Europe.

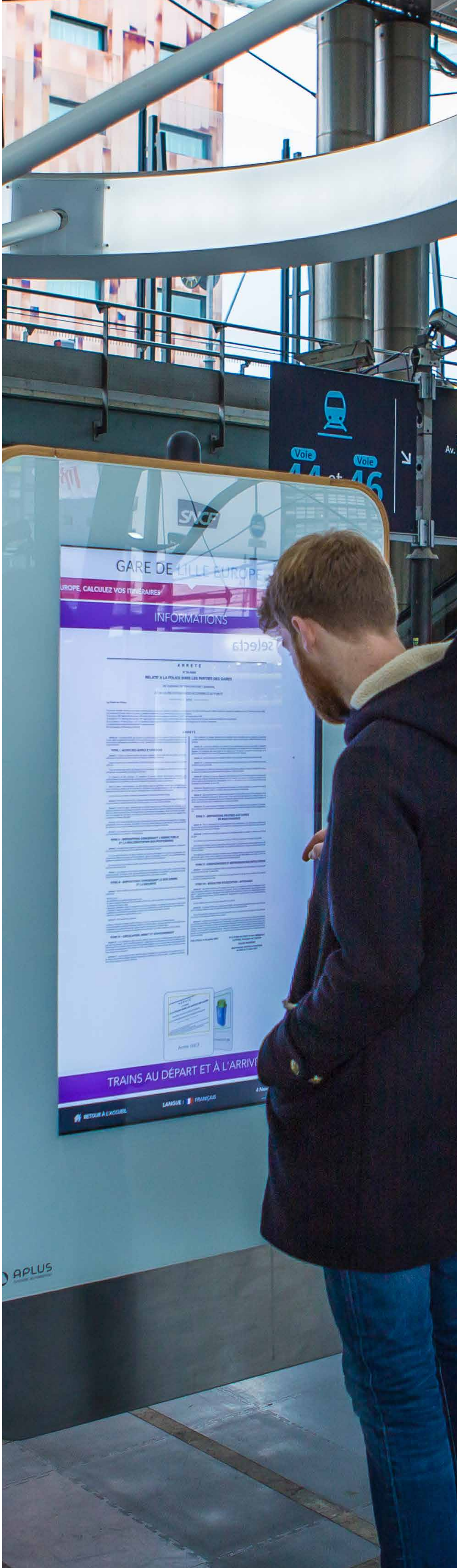
Under the Matrix assessment, the risk regulation regime is understood as the combination of the institutional framework, rules and practices that are associated with the regulation of particular risks or hazards. The regulatory regime is more than rule-making, reporting or prioritisation; it includes interface management and governance and accountability, within and between relevant organisations. Since the (effectiveness of) the risk regulation regime directly impacts upon the safety performance of the system, a holistic evaluation of the railway system includes evaluating the risk regulation regime and its components.

The following sections describe the various assessment tools used nowadays by the Agency. While the tools were developed separately, they have now been incorporated into a systematic programme of work: the Priority countries programme.

7.5.1. NSA voluntary cross-audits

Supported by the Agency, the NSAs agreed to a programme of audits, to evaluate the performance of their three main activities required by the Safety and Interoperability Directives: safety certification and safety authorisation, supervision and authorisation for placing in service of vehicles, and to share best practices. Following a two year pilot, the first full audit cycle of all NSAs began in 2013.

At this stage, the audit programme focuses on the implementation of the necessary working processes and methodologies and on the control processes of those working processes, and does not look critically at the decision-making or risk assessment applied as part of those processes. By the end of 2015, eight NSA cross audits had been completed and five were on going. In total by the end of 2016, 19 will



have been completed. The programme cycle 2013-2018 as planned has been amended to synchronise with the priority countries programme (see later).

At this stage, NSAs appear committed to improvement. They implemented processes for delivering their mandatory activities but there are discrepancies at the level of internal control processes that should be addressed in the coming years. There is also insufficient harmonisation of the decision-making process and supervision of safety performance.

7.5.2. NIB voluntary assessments

Since its launch in 2013, nine NIB assessments were carried out by the Agency. In these assessments the following countries were voluntarily assessed: Hungary, Belgium, Poland, Austria, Ireland, Norway, Sweden, Czech Republic and Spain. Of those, Norwegian, Swedish and Czech NIBs were assessed in 2014. Assessment of the Spanish NIB in 2015 was the last voluntary assessment, marking the end of the initial voluntary assessment programme. The voluntary assessments were carried out using the method jointly developed by the NIBs and the Agency.

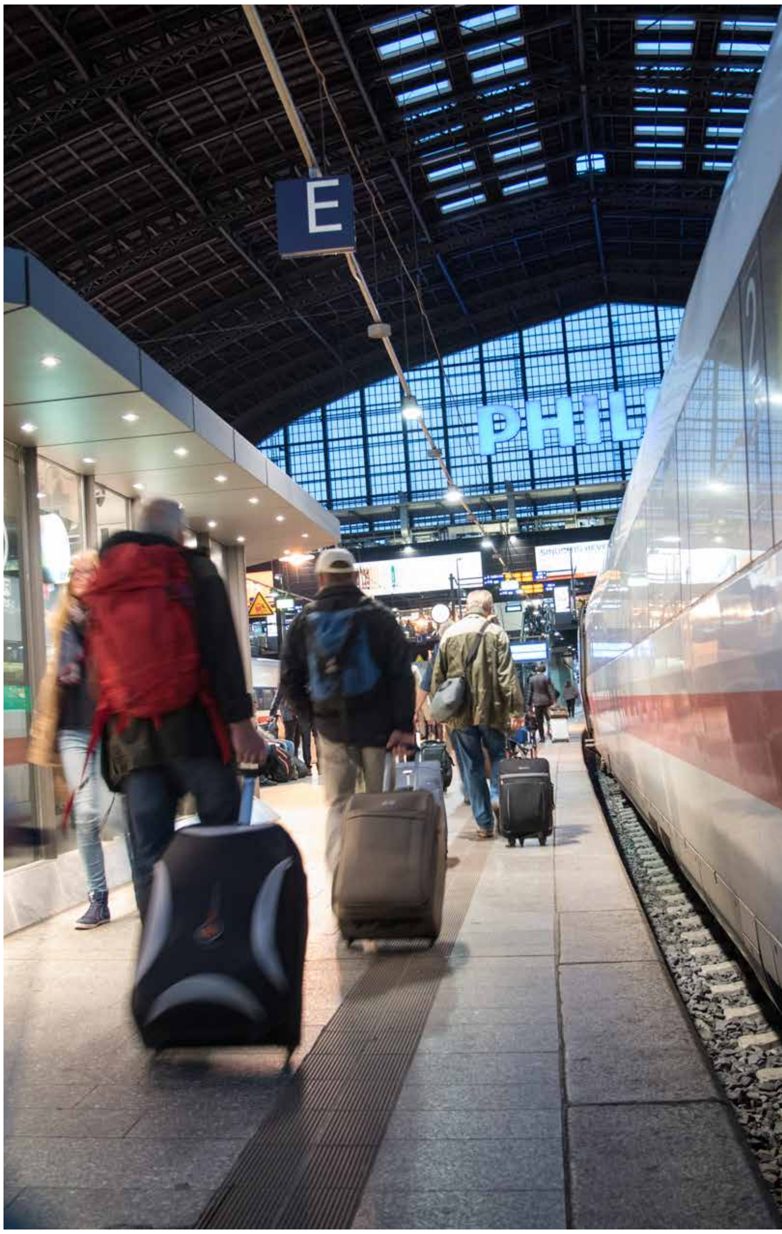
The objective of these voluntary assessments is to support NIBs in identifying their strengths and weaknesses in their organisational core processes and deliverables. This with the ultimate goal to improve their

performance in preventing future accidents and incidents in the national and European railway system. The assessments further allowed the sharing of identified good practices with other NIBs in order to allow quicker learning.

Some of the NIBs assessed in the past two years have a high level of independence; this includes sufficient budget and staff and well-equipped infrastructure. They not only properly organised their core processes, they also assured their improvement. But there are some other NIBs which still suffer from the lack of independence, including sufficient resources to properly organise their processes to achieve the end objectives. Their work is further hampered by insufficient transposition and the implementation of the EU legal framework. In addition, the overall legal framework sometimes influences the aspects of the investigation such as openness and the extent of sharing intermediate results of the ongoing investigation with involved stakeholders.

These assessments also showed that while all assessed NIBs have effectively carried out investigations into past accidents, the approaches vary greatly between countries. This is also visible when analysing the detailed results of these assessments in the five process groups. For example, the feedback from the implementation of recommendations is actively sought by some NIBs which engage in regular discussion with the NSAs and with the railway sector.

With the start of the Priority countries programme in 2015, the NIB assessments are now carried out as integral part of this programme on a mandatory basis. Three NIBs were subject to assessment in 2014 (Romania, Estonia and Croatia) with three further assessments launched in 2015 (Lithuania, Slovakia and Latvia).



The amended railway safety directives foresees a further development in the organisation and method for NIB assessment. The NIBs will have to develop and manage a programme of peer reviews in order to monitor the effectiveness of their investigations and share the results with the Agency.

7.5.3. Matrix assessment

The Agency has developed a tool for assessing the maturity of processes underpinning the risk regulatory regime in Member States. Unlike other similar tools developed by the Agency, such as the NSA cross-audit and the NIB assessment methods, the Matrix is looking at the regulatory framework that Member States put in place to manage railway safety. It also provides a high-level insight of how the regulatory authorities (the Ministry in charge of Transport, the NSA and the NIB) carry out their duties, including their respective interfaces. Under the Matrix 1.0 methodology, a maturity level is assigned to 26 processes (sub-elements) grouped under five process groups (the 5 basic elements: steering, organising, resourcing, performing and evaluating). The Matrix evaluation is using common protocols aiming for assuring the consistency between single evaluations, but it must be recognised that various evaluation teams may derive slightly different conclusions.

When the Matrix evaluation is conducted in a Member State, the results are summarised in a report. Such a report is made composed of a descriptive part, providing an explanation of findings and good practices, and of an analytical part, in which the maturity levels are established. The evaluation report is confidential, but some Member States disclose the report to the sector and to the public in general.

There were six pilot Matrix evaluations accomplished in 2014. So far, three standard Matrix assessments were carried out in 2015 as part of the Priority Countries programme. While there are considerable differences between the maturity levels established for pilot countries, as compared to priority countries, some clusters and findings emerge when analysing the detailed results of the assessment in terms of maturity levels for single process areas.

Assuming "level 3" as an assumed acceptable threshold, the result of the first Matrix 1.0 evaluations shows that 14 processes (sub-elements) out of 26 (the version 1.0 of the Matrix contained 26 sub-elements) are below the assumed acceptance threshold. They are typically related to the basic element "Evaluating". It shows that a standard process for continuous improvement, including monitoring, is not always in place in the three organisations (the Ministry in charge of Transport, the NSA and the NIB), preventing them from improving their overall safety performance. The assessments unveiled that priority countries in particular would benefit from developing and enhancing application of the risk based approach and from a better management of changes and interfaces between different entities.".

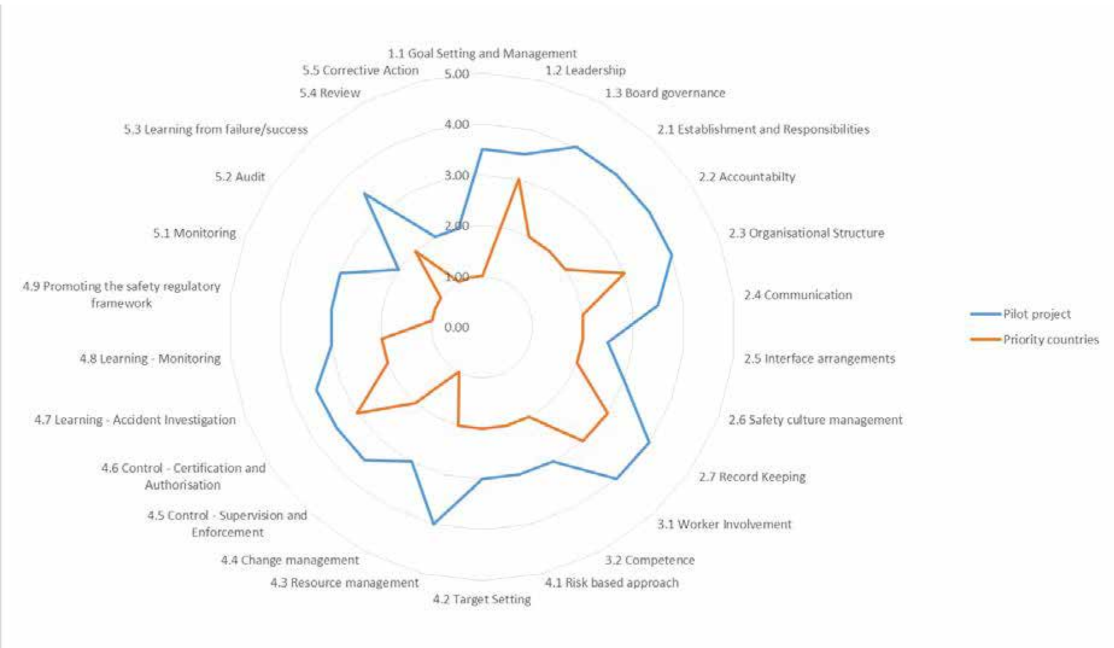
In general, the performance in terms of maturity levels is highest in the process group "performing" which, in the Matrix 1.0, covers the main standard regulatory tasks of the assessed actors. It is also relatively high in the basic element "planning" with the sub-elements "record keeping", "delivering safety certificates/authorisations" and "workers involvement". The certification and authorisation processes are normally sufficiently structured and implemented but not always reviewed; the processes of monitoring the railway system and carrying out accidents investigations are in a similar state.

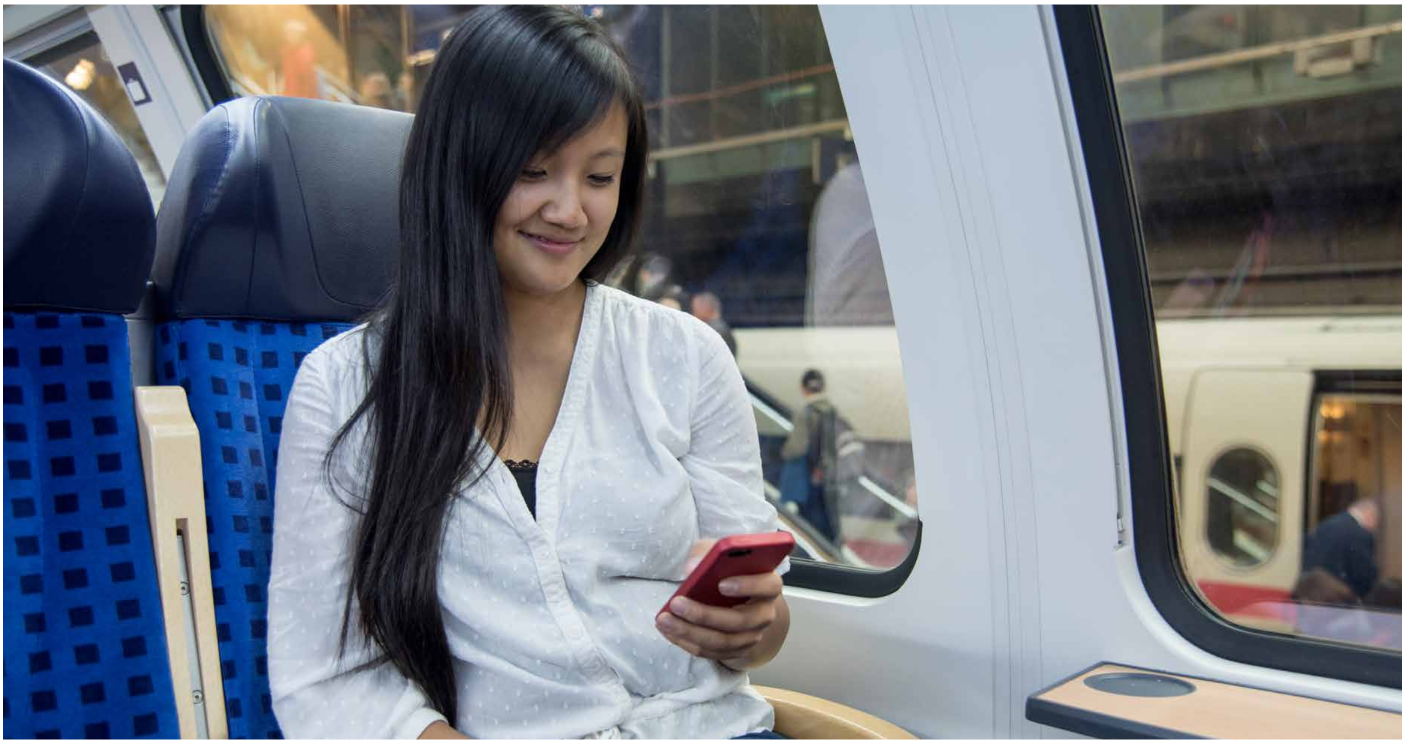
There are significant differences in terms of overall maturity levels established for single Member-States. According to the configuration of levels in the Matrix 1.0, the organisations with the highest score have almost reached the level "managing" in their processes, i.e., they have a system based approach where learning from mistakes and improving is assured. On the other hand the organisations with the lowest scores are only initiating their risk regulatory regime processes, meaning that they only have implemented essential processes without any form of monitoring, review and improvement.

The sub-element with the highest deviation in maturity scores is "4.8 Learning – Monitoring", which indicates great variations in learning and monitoring practices and cultures across the nine Member-States.

A few good practices were identified during the assessments: in two Member States the highest maturity level was found in the sub-elements "Workers involvement", "Learning – Monitoring" and "Promoting the safety regulatory framework".

Figure 32 — Median maturity levels for different sub-elements in pilot and in priority countries





In conclusion, the first Matrix assessments show that regulatory authorities in Member-States were able to set-up and implement processes for safety certification/authorisation, monitoring the railway system at national level and accident investigation. However they were not always able to ensure the implementation of a process for improving their functioning continuously. Improvements are needed also as regards management of interfaces, change management and capability to manage risks.

7.5.4. Priority countries programme

On the request from the EC, the Agency started with the Priority countries programme in 2014. The programme builds on the EC request for advice regarding safety performance of Member States with a relatively lower level of safety. Under the programme, six Member States were chosen on the basis of their past safety performance, as established with the help of the CSM on safety targets. Three Member States were subject to assessment in 2014 and 2015 (Romania, Estonia and Croatia) with three assessments launched in 2015 (Lithuania, Slovakia and Latvia).

The programme uses the three assessment tools described earlier (NSA assessment, NIB assessment and Matrix assessment) to provide a thorough review of the safety regulatory framework and of the maturity of key processes needed to fulfil regulatory tasks of public authorities. Besides looking at the application of the risk regulatory regime, the assessment covers a range of the operational aspects, relating to the organisation of the work of train drivers, ECMs, state of rolling stock and on the state of railway infrastructure.
By 2015, two reviews were produced by the Agency with the final reports made available to the respective countries and to the Commission. The completed reviews show that the implementation of some aspects and functions of the regulatory framework has not yet been completed and that not all processes are yet managed and controlled by responsible actors.

The completed reviews also suggest that in some countries assessed, the technical conditions of the railway infrastructure together with the basic safety culture may be negatively impacting the safety performance.

8. Independent accident investigation

8.1. INTRODUCTION

Independent accident investigation into the causes of accidents provides a unique learning opportunity to both the railway industry and regulators. It assures that lessons are learnt from past accidents and that actions can be taken to prevent similar accidents from happening in the future.

The Railway Safety Directive requires that serious accidents are independently investigated by a dedicated National Investigation Body (NIB) of the Member State where the accident occurred. The role of the Agency is limited to supporting the relevant national bodies in their tasks.

8.2. OCCURRENCES INVESTIGATED BY NIBS

According to the provision of the RSD, the NIBs have to investigate all serious accidents that occurred on their territory and may in addition investigate other accidents and incidents. The serious accidents that occurred in the last two years are shown together with basic descriptive information in Annex I for reference.

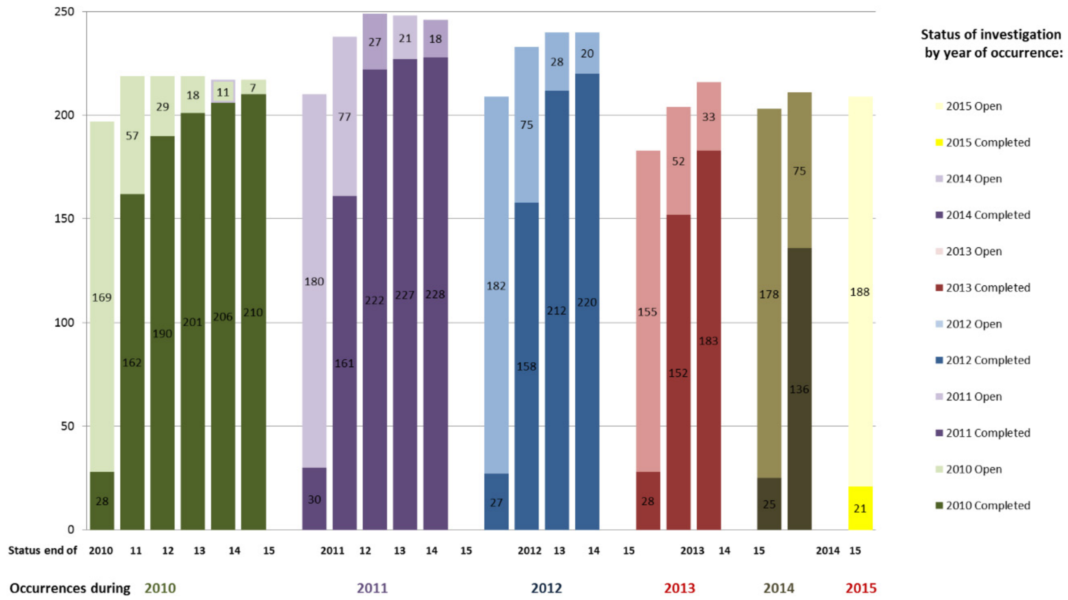
All occurrences investigated by the NIBs are subject to mandatory reporting to ERA ([17]). The information on each accident is submitted to ERA twice: as a notification of opening an investigation and when the final investigation report is published. Both records are available in the Agency's database ERAIL.

The Agency receives notifications for a majority of the serious accidents investigated, although, this notification is not always sent within the one week deadline. The compliance of Member States with the requirements for notification and submission of final reports has nevertheless been improving over time. In 2015, around one third of notifications on the start of an investigation were submitted within one week after the accident. As the Agency does not yet systematically receive information on the starting date of the investigations, the date of the accident occurrence is used as a reference. It should be noted that the time between the occurrence and the decision to investigate can, in certain cases, be longer than a week. The average number of days between the accident and the notification of investigation submitted to the Agency has been decreasing over time; it went down to 24 days in 2015. Despite an improvement recorded over time, only half of started investigations are notified to the Agency within 10 days after the decision has been taken to start the investigation.

The final reports on the investigations carried out by NIBs should be made public as soon as possible, and normally not later than one year after the date of occurrence. The average number of months before the final report is submitted to the Agency has also been decreasing over time, however less than half of final investigation reports are submitted to the Agency within one year. For occurrences in 2014, only 41 % of investigations were closed within one year

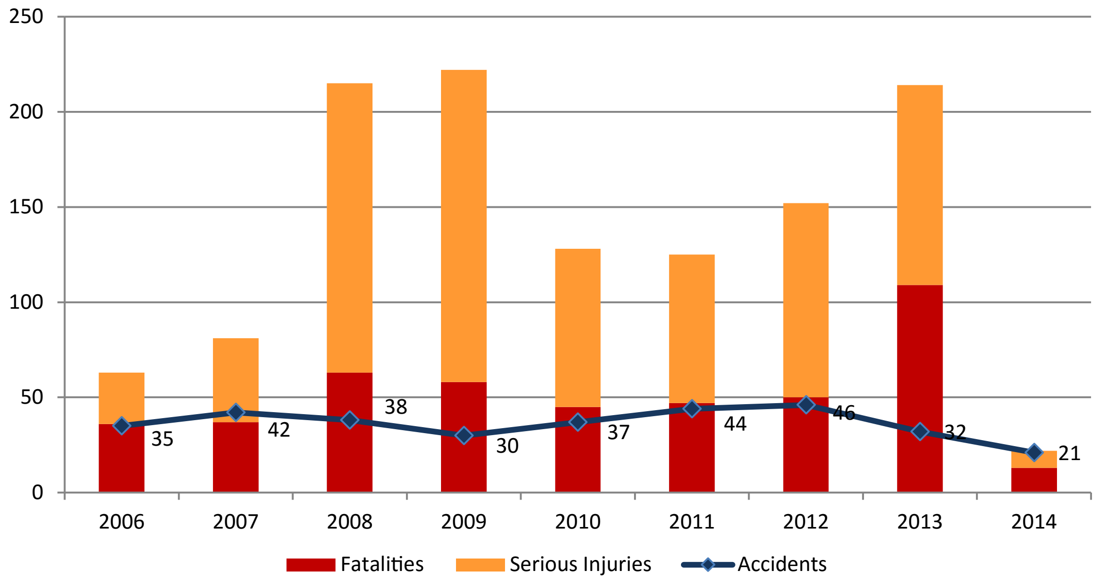
([17]) "Within one week after the decision to open an investigation the investigation body shall inform the Agency thereof. The investigation body shall send the Agency a copy of the final investigation report." (Art.24(1,2) RSD (49/2004/EC)).

Figure 33 — NIB investigation carried out since 2010 with the status of investigation (ERAIL database)



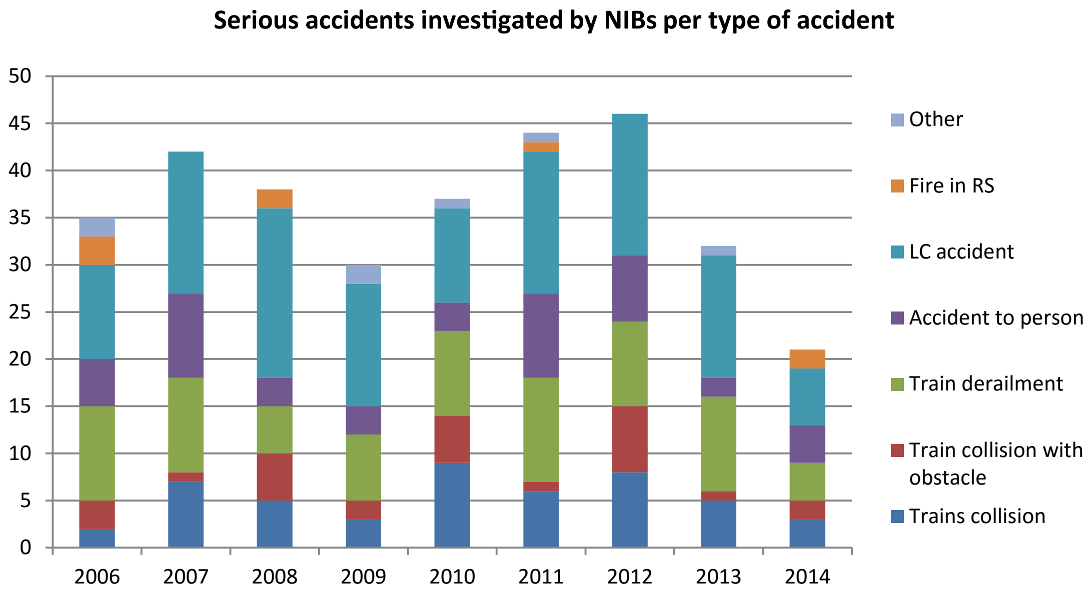
Among more than 200 accidents and incidents investigated by NIBs of Member States each year, serious accidents, as classified by the NIBs, account for less than 20 %. The number of serious railway accidents investigated by NIBs has been decreasing in the past three years. In 2014, only 21 serious accidents were investigated by NIBs (Figure 34).

Figure 34 — Serious railway accidents investigated by NIBs together with the resulting casualties (EU-28)



A detailed look into the type of serious accidents investigated by NIBs shows that train derailment is the most commonly investigated type of serious accident (23 % of accidents), followed by train collision (15 % of accidents). However, the largest number of accidents classified as serious by the NIBs and investigated by them are level crossing accidents (Figure 35).

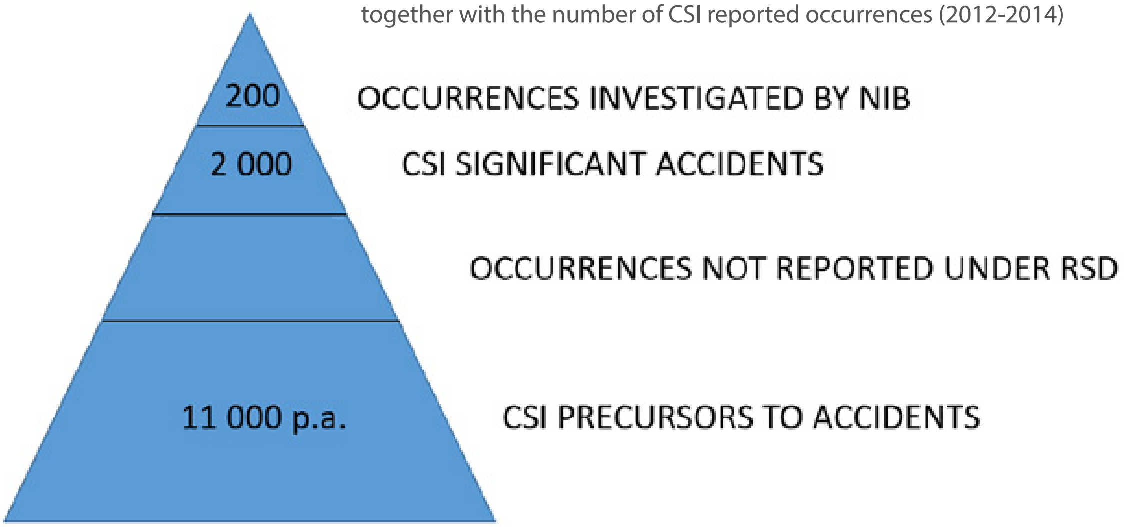
Figure 35 — Serious accidents investigated by NIBs per type of accident (EU-28 countries in 2006-2014)



In addition to serious accidents, the NIBs investigate accidents and incidents which under slightly different conditions might have led to serious accidents and notify the Agency thereof. These occurrences represent at least 80 % of all investigated occurrences. Figure 36shows that the investigated occurrences represent a fraction of the total number of significant accidents and accident precursors. For each investigated occurrence there are 10 significant accidents and 55 accident precursors defined under CSIs. The railway undertakings (RUs) and infrastructure managers (IMs) should normally also investigate occurrences other than significant accidents as part of their safety management systems (SMSs), however the extent of RU/IM investigation into significant accidents and into accident precursors at the EU level is not known.

Due to their high potential risk some accident precursors are subject to independent accident investigation in Member States. Signals passed at danger is the most commonly investigated type of accident precursor with about 15 investigations per year in the EU.

Figure 36 — Average annual number of occurrences investigated by NIBs together with the number of CSI reported occurrences (2012-2014)

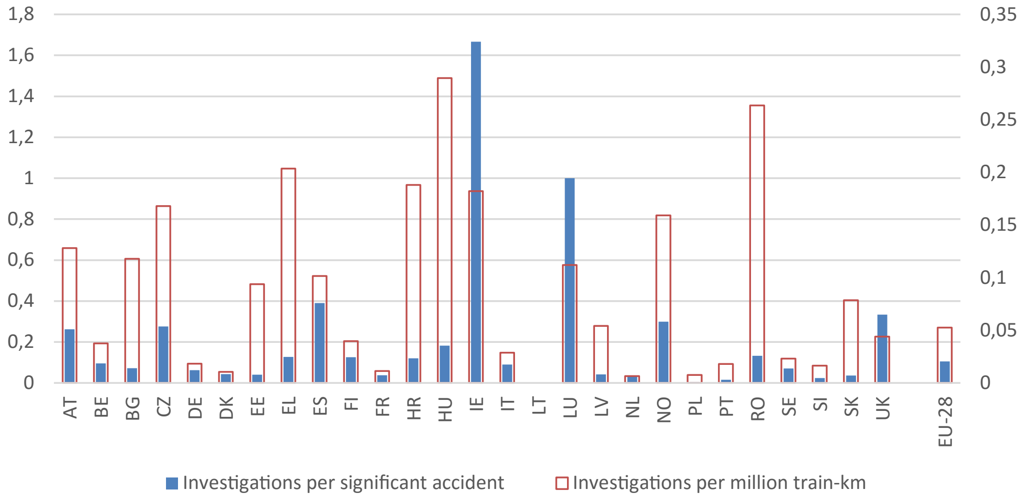


While the majority of serious accidents in the EU are investigated by the NIBs, the share of other similar accidents and other accidents and incidents investigated vary greatly among countries. NIBs carried out nine investigations per year on average in the period 2012-2014 that were notified to the Agency.

The variation in investigation effort by individual NIBs is demonstrated in Figure, which shows the number of notified investigation per country standardised by the number of significant accidents and by train kilometres in the period 2012-2014. All occurrences for which an NIB investigation was started were considered, regardless of whether the investigation has been carried out and closed in practice.

For one Member State (Lithuania), no single NIB accident investigation was notified to ERA; for seven Member States (Austria, Czech Republic, Germany, Spain, Hungary, Romania and UK), the number of investigations exceeded 50 over three years (occurrences of 2012-2014). The number of notified investigations standardised by significant accidents and train-km gives an indication about the relative extent of independent investigation in individual Member States (Figure 37). A relatively small number of NIB investigations are carried out in Germany, Denmark, France, Netherlands, Poland, Portugal, and Slovenia. The number of occurrences investigated by NIBs is relatively significant in Spain, Hungary, Ireland, Luxembourg and the UK.

Figure 37 — Investigated occurrences as notified to ERA per significant accidents and per million train kilometres (2012-2014)



By end 2015, there were 1 765 final investigation reports available in the ERAIL system, representing the NIB investigation effort since 2006. These reports are publically available and are used as reference or data source for further analysis. A systematic analysis of the reports however represents a challenge due to their text format and the fact that they are produced in national languages.

8.3. CONCLUSIONS

In the majority of Member States, the independent accident investigation of railway accidents and incidents is assured by an independent NIB and contributes to the overall learning from occurrences. The number of occurrences investigated per year is above 200, while the quality of investigations is gradually improving through an extended investigation into the underlying causes of accidents including the role of the safety management systems as well as better targeted safety recommendations. However, there are still many NIB investigations that do not identify anything other than direct causes of an occurrence (see e.g. overview of closed investigations in Annex I) and there are still NIBs that do not have sufficient independence. There are prevailing major differences between NIBs in terms of resources, organisational structure, level of independence and the impact of their work. For example, half of NIBs in the EU are part of a multimodal organisation also investigating other types of transport accidents; some are part of the Ministry of Transport and some others carry out no investigations in practice.

Despite the improvements one continuing concern is the proportion of investigations for which the final investigation report is available within one year. This notably concerns serious accidents, as visible from the overview of serious accidents that occurred in 2014 (Annex I).

The NIB network established under the auspices of the Agency facilitated networking and exchange of information between the NIBs. This is particularly useful when an investigated accident involves organisations established in another Member State. Similarly, NIBs are regularly sharing information about safety hazards through the safety information system, which contributes to timely response to emerging risk across Europe.

9. Background information

The report Railway safety performance in the European Union summarises information on the development of railway safety in Europe. The primary purpose is to provide safety intelligence and information on risks to EU policy-making bodies, NSAs, NIBs, and to the general public. The report reviews the performance levels achieved during 2014 across a number of topic areas. It includes basic statistical analyses on a wide range of safety performance indicators and highlights significant findings.

The report is based on the common safety indicators (CSIs) data reported to the ERA by 31 January 2016. Any changes after that date have not been taken into account. Information presented on serious accidents and their investigations is based on reports available to the ERA on 1 September 2016. Any event occurring after that day is not covered by this report. This report covers the railways in 26 of the 28 EU countries; Cyprus and Malta do not have railway systems that are covered by EU legislation. These 26 Member States are referred to as 'Member States', 'EU', or 'EU countries' in the report. The Channel Tunnel (CT) is a separate reporting entity, so that relevant data are given separately to the French and UK data. The data are also reported by Norway. Therefore, there were a total of 28 reporting entities in 2015; the term 'Europe' was sometimes used for this complete group in the report.

European legislation requires Member States to report to the ERA on significant accidents and serious accidents occurring on their territory. The NSAs must report all significant accidents. The NIBs must investigate all serious accidents, notify the ERA of these investigations and, when closed, send the investigation report to the ERA. The term significant accident covers a wider range of events than serious accidents. The legislation provides the following definitions for these two groups of accident

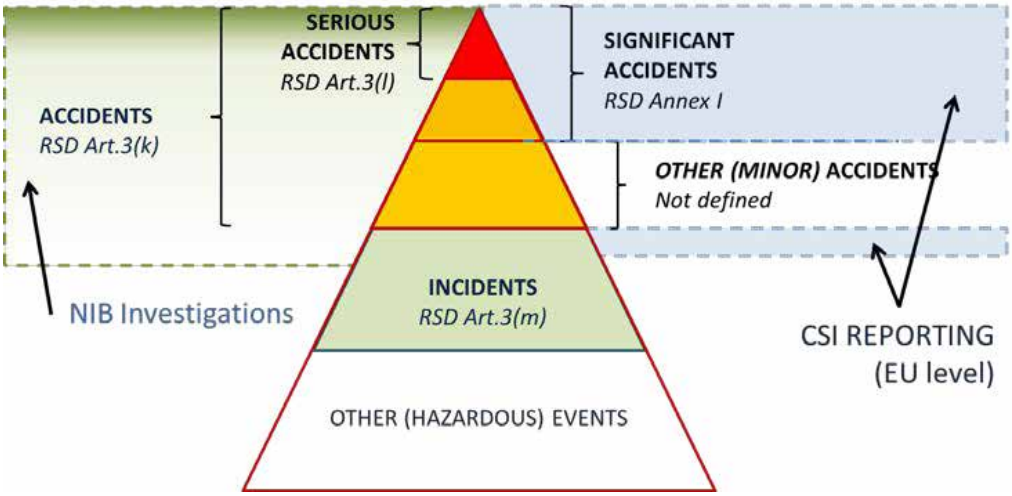
Table 2 — Accidents reported to the ERA according to the EU legislation

Significant accident	Serious accident
Directive 2004/49/EC, Commission Directive 2009/149/EC and Regulation (EC) No 91/2003	DIRECTIVE 2004/49/EC
'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. Accidents in workshops, warehouses and depots are excluded ([18]). Significant damage is damage that is equivalent to EUR 150 000 or more.	'serious accident' means any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety; 'extensive damage' means damage that can immediately be assessed by the investigating body to cost at least EUR 2 million in total ([19]).
Reporting of CSIs by NSAs	Accident investigation by NIBs
Each year the safety authority shall publish an annual report concerning its activities in the preceding year and send it to the Agency by 30 September at the latest. The report shall contain information on: the development of railway safety, including an aggregation at Member State level of the CSIs laid down in Annex I ([20])	Within one week after the decision to open an investigation the investigating body shall inform the Agency thereof. The investigating body shall send the Agency a copy of the final report normally not later than 12 months after the date of the occurrence ([21]).

([18]) Appendix to Annex I to the RSD, Article 1.1.
([19]) Article 3(1) of the RSD.
([20]) Article 18 of the RSD.
([21]) Article 24 of the RSD.

The current legislative framework does not require Member States to collect information on all railway accidents. The reporting is often limited to significant accidents and a selection of other events. Data on incidents are not necessarily collected by RUs/IMs and the NSAs do usually rely on accident data when planning their supervision activities. Moreover, the information about less serious accidents and incidents are not systematically collected at the EU level. This absence may represent an obstacle to efficient learning and early identification of recurring safety issues in the EU railway system.

Figure 38 — Overview of the current common occurrence reporting in the EU



INFOGRAPHIC: SAFETY CULTURE

WHAT

> All people and organisations have a culture,

> how important is safety in that culture?

> How is safety perceived in an organisation: beliefs, actions and rules

> Leadership has a big impact

> Focus on learning, transparency and encouraging, not punishing, reporting

WHY

> Getting the best out of people, system and tools

> Managing the risk of big, complex accidents

> Safety regulation in an open market

Safety management system and Safety culture

HOW

> Inspiring Rail leaders

> Roles and powers of National Safety Authorities and National Investigation Bodies

> Creating an effective reporting system

EUROPEAN UNION AGENCY FOR RAILWAYS

10. ANNEXES

*vom 28. Jun bis
Dortmund 8:
Düsseldorf
ICE INTERNATIONAL
Amsterdam Centraal
Utrecht Centraal 7:32
Oberhausen 9:00
Düsseldorf Hbf 9:23
*nicht 15., 21., 22., 28.,
Trier 6:15 – Gerolstein
Euskirchen 9:03
Erftstadt 9:18 – Köln
Trier 6:22 – Gerolstein
Euskirchen 9:03
Erftstadt 9:18 – Köln
*nicht 3. Okt
Koblenz 8:18 – Neuwied
Königswinter 9:09 – BN-Beuel
Troisdorf 9:28 – Porz(Rhein)
Koblenz 8:18 – Neuwied

10.1. ANNEX I: SERIOUS AND OTHER SIMILAR ACCIDENTS

10.1.1. Serious accidents in 2015

In this section we provide an overview of serious accidents that occurred during 2015 and are known to the Agency. Serious accidents are train collisions and derailments with a fatality or at least five serious injuries, or extensive damage (above EUR 2 millions) and any other similar accidents with an obvious impact on railway safety regulation or the management of safety. These accidents are subject to mandatory investigation by national investigation bodies, according to Article 21 of the RSD. The investigation reports of these accidents should be available during 2016 at the latest. The accidents are listed in order of occurrence.

Event	Freight train collision with obstacle
Date, time and location:	8 April 2015, Linz-Ebelsberg station, Austria
Outcomes:	1 fatality (other user)
Notification (ERAIL):	AT-4788
Short description:	Collision between a stroller and a freight train carrying out dangerous goods. The stroller parked at the platform came into motion by wind action and collided laterally with the 12th wagon of the train. The child in the stroller died at the accident site. The cause was the insufficient fixing of the stroller.

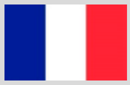
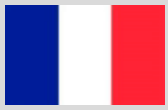
Event	Passenger trains collision
Date, time and location:	6 May 2015, Waldstein station, Austria
Outcomes:	2 fatalities (train passenger and employee) and 8 minor injuries (7 passengers and 1 employee)
Notification (ERAIL):	AT-4789
Short description:	Head on collision of two passenger trains on a single-track route. One train driver and one passenger suffered fatal injuries. The direct cause was an unauthorised departure of one of the trains from the station Waldstein.

Event	Freight trains collision
Date, time and location:	30 October 2015, 04:57, Řehlovice station, Czech Republic
Outcomes:	1 fatality (employee), material damage of about 1 m EUR
Notification (ERAIL):	CZ-4928
Short description:	Collision of two freight trains with consequent derailment of four wagons. One of the trains arriving to the station did not stop on the stop signal and collided with other freight train being stopped at the station.

Event	Shunting movement and freight train collision
Date, time and location:	28 November 2015, 02:07, Bremerhaven-Speckenbüttel station, Germany
Outcomes:	1 fatality (employee)
Notification (ERAIL):	DE-4958
Short description:	Railway vehicles collided with a trailer being pushed by another train, during shunting.

10.1.2. Other accidents with serious consequences in 2015

In this section we provide an overview of other accidents with serious consequences which occurred in 2015. These accidents do not necessarily meet the definition of a serious accident, but they are similar to them in terms of consequences and/or possible impacts on management of safety. Majority of them have been subject of investigation by the NIBs.

Event	Fire in rolling stock  
Date, time and location:	17 January 2015, 12:30, Channel tunnel
Outcomes:	material damage > 2 m EUR
Notification (ERAIL):	FR-4709
Short description:	Fire started on board of a truck shuttle travelling in the tunnel.
Event	Train collision 
Date, time and location:	20 February 2015, Rafz, Switzerland
Outcomes:	Five slight injuries (passengers)
Notification (ERAIL):	N/A
Short description:	Two passenger trains collided laterally after one of the train derailed on the switch.
Event	Level crossing accident 
Date, time and location:	20 April 2015, Nangis, France
Outcomes:	3 serious injuries (2 passengers and 1 employee), material damage > 2 m EUR
Notification (ERAIL):	FR-4773
Short description:	Intercity train hit an articulated lorry blocked on a level crossing.
Event	Shunting movement and freight train collision 
Date, time and location:	28 November 2015, 02:07, Bremerhaven-Speckenbüttel station, Germany
Outcomes:	1 fatality (employee)
Notification (ERAIL):	DE-4958
Short description:	Railway vehicles collided with a trailer being pushed by another train, during shunting.
Event	Level-crossing accident 
Date, time and location:	16 May 2015, 11:30, Ibbenbueren, Germany
Outcomes:	2 fatalities (train driver and passenger), 15 injured
Notification (ERAIL):	N/A
Short description	Regional passenger train (EMU) hit a tractor-trailer on a level crossing protected by light signals and barriers.
Event	Level crossing accident 
Date, time and location:	22 May 2015, Between station Purgstall and Scheibbs station, Austria
Outcomes:	5 fatalities and 3 serious injuries (level crossing users)
Notification (ERAIL):	AT-4796
Short description	A local passenger train collided with a passenger car at a passive level crossing equipped with St Andrew cross and stop traffic sign. After the collision, the car was pulled for 150 meters, the train did not derail.

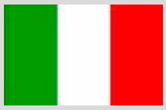
Event	Derailment	
Date, time and location:	29 June 2015, 21:45, Hoppegarten, Germany	
Outcomes:	material damage > 2 m EUR	
Notification (ERAIL):	DE-4807	
Short description	Light passenger train (S-Bahn) derailed while entering railway station Hoppegarten. The derailment occurred on the switch. Four coaches situated at the end of the train set derailed.	
Event	Freight train derailment	
Date, time and location:	30 June 2015, 14:30, Langworth, Lincoln, United Kingdom	
Outcomes:	material damage > 2 m EUR	
Notification (ERAIL):	UK-4839	
Short description	A freight train consisting of 22 empty diesel fuel tank wagons derailed due to a track misalignment. Two wagons derailed but remained upright.	
Event	Passenger train and freight train collision	
Date, time and location:	15 July 2015, 08:04, Leopoldau station, Austria	
Outcomes:	material damage > 2 m EUR	
Notification (ERAIL):	AT-4835	
Short description	Empty passenger train collided with the oncoming freight train on the switch.	
Event	Level crossing accident	
Date, time and location:	22 July 2015, 07:43, Studénka, Czech Republic	
Outcomes:	3 fatalities (passengers) and 3 serious injuries (2 passengers and 1 employee), material damage > 2 m EUR	
Notification (ERAIL):	CZ-4827	
Short description	Express train collided with a truck at the level crossing located at the entrance to the station Studenka. The trailer was pushed by the train through the station causing damage to the platform.	
Event	Level crossing accident	
Date, time and location:	23 July 2015, 11:10, Csorna, Hungary	
Outcomes:	4 fatalities (car occupants)	
Notification (ERAIL):	HU-4831	
Short description	Regional passenger train (EMU) collided with a passenger car on a level crossing located close to Csorna station at a speed at about 90 km/h.	
Event	Train collision	
Date, time and location:	1 August 2015, 11:22, Logan, East Ayreshire, Scotland, United Kingdom	
Outcomes:	material damage > 2 m EUR	
Notification (ERAIL):	UK-4851	
Short description	While travelling within the work site and rounding a right-hand curve, engineering freight train ran into the rear of other stationary engineering freight train.	
Event	Level-crossing accident	
Date, time and location:	12 September 2015, 06:07, Kirn-Bad Sobernheim	
Outcomes:	5 fatalities (car occupants)	
Notification (ERAIL):	DE-4923	
Short description	Regional passenger train collided with a passenger car on a level crossing near Kirn-Bad Sobenheim at a speed of about 139 km/h. The level crossing was protected by half-barriers.	

Event Date, time and location:	Level-crossing accident 05 November 2015, 22:00, Vilseck-Freihung
Outcomes:	2 fatalities (lorry and train drivers), 22 injured
Notification (ERAIL):	DE-4807
Short description	Regional express train collided with a heavy good vehicle on protected level crossing. The truck was overweight load vehicle transporting military equipment and become blocked at the crossing due to its low clearance. As a result of the collision, the train caught a fire. The front of the train car and the truck were burnt as a result.

Event Date, time and location:	Derailment of a test train 14 November 2015, 01:58, Eckwersheim, France
Outcomes:	11 fatalities and 37 serious injuries (employees)
Notification (ERAIL):	FR-4943
Short description	High speed train derailed on a curve during acceptance tests on the new high speed line.

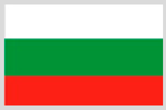
10.1.3. Investigations of serious accidents that occurred in 2014

In this section we provide an overview of accidents that occurred in 2014, both serious and some other similar accidents, for which the investigation report should normally have been published within one year. Serious accidents are train collisions or train derailments, with at least one fatality or five serious injuries, or extensive damage. These accidents are subject to mandatory investigation by national investigation bodies, according to provisions of Article 19 of the RSD. The investigation reports of these accidents should be available in year 2015 at latest. The accidents are listed in order of occurrence.

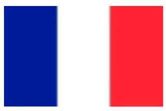


Event	Passenger train collision with obstacle
Date, time and location:	12 January 2014, 22:55, Firenze Santa Maria Novella station, Italy
Outcomes:	1 fatality (employee), material damage
Report published:	8 September 2014
ERAIL ID:	IT-3172
Main causes: - direct:	Sudden, unexpected and undue spontaneous movement of the convoy.
- Underlying / root:	Performing, by the agent serving as a pointsman, the manoeuvre for the placement of the RS for the train without the activation of the ATP. Performing, by the pointsman, the manoeuvre placement alone instead of with the presence in the cab of another agent enabled.

Event	Freight train derailment
Date, time and location:	26 January 2014, 14:25, Bitterfeld - Wolfen, Germany
Outcomes:	material damage > 2 m EUR
Report published:	Not published yet
ERAIL ID:	DE-3255



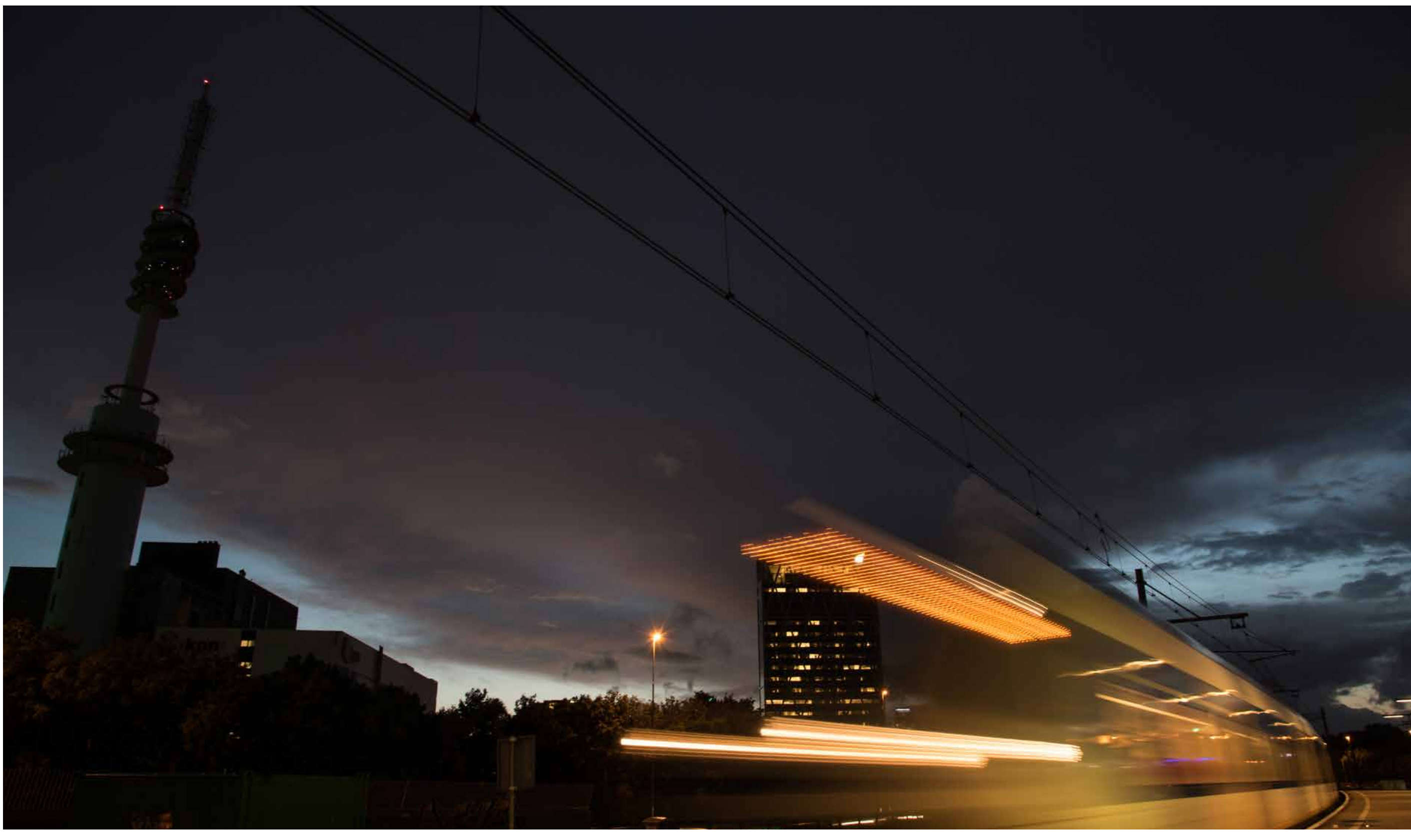
Event	Passenger train derailment
Date, time and location:	12 July 2014, 15:17, Kaloyanovets station, Bulgaria
Outcomes:	1 fatality (employee), significant material damage to the electric locomotive, five passenger wagons and infrastructure elements
Report published:	December 2014
ERAIL ID:	BG-3959
Main causes: - direct:	Passing the red signal and entering the switches at excessive speed.
- Underlying / root:	The locomotive crew did not respect the basic requirements of the regulations for the operation of railway infrastructure governing the safe movement of trains.



Event	Passenger train and high speed train collision
Date, time and location:	17 July 2014, 22:55, Denguin, France
Outcomes:	2 serious injuries (passengers), material damage to rolling stock > 2 m EUR
Report published:	January 2016
ERAIL ID:	FR-3902

Event	Passenger train derailment
Date, time and location:	13 August 2014, 12:30, Tiefencastel, Switzerland
Outcomes:	1 killed passenger, 4 passengers serious injuries, 6 passengers minor injuries, considerable material damages to rolling stock
Report published:	Investigation ongoing (info on the website of Swiss NIB)
ERAIL ID:	N/A

Event	Freight train and passenger train collision
Date, time and location:	1 August 2014, 20:51, Mannheim main station, Germany
Outcomes:	4 serious injuries (passengers), material damage > 2 m EUR
Report published:	23 September 2015
ERAIL ID:	DE-3981
Main causes: - direct: - Underlying / root:	The train was stopped after passing the stop signal. The emergency brake was then released by the train driver without establishing connection with the traffic controller.



10.2. ANNEX II – COMMON SAFETY INDICATORS

List of tables

10.3. ANNEX III – NATIONAL SAFETY AUTHORITIES AND NATIONAL INVESTIGATION BODIES OF EU MEMBER STATES

Country	National Safety Authority	National Investigation Body
Austria	Bundesministerium für Verkehr, Innovation und Technologie Oberste Eisenbahnbehörde www.bmvit.gv.at	Sicherheitsuntersuchungsstelle des Bundes, Schiene Bundesanstalt für Verkehr (VERSA) http://versa.bmvit.gv.at
Belgium	Dienst veiligheid en interoperabiliteit der spoorwegen - Service de Sécurité et d'Interopérabilité des Chemins de Fer et d'Interopérabilité des Chemins de Fer http://mobilit.belgium.be/fr/traficferroviaire/autorite_nationale_de_securite	Federale Overheidsdienst Mobiliteit en Vervoer Onderzoeksorgaan voor Ongevallen en Incidenten op het Spoor Service Public fédéral Mobilité et Transports Organisme d'enquête sur les Accidents et les Incidents ferroviaires www.mobilit.fgov.be
Bulgaria	Изпълнителната агенция "Железопътна администрация"(Ministry of Transport – Railway Administration Executive Agency) www.iaja.government.bg	Ministry of Transport – Railway Accident Investigation Unit (RAIU) www.mtitc.government.bg

Czech Republic	Drážní Úřad (DU) (Rail Authority) www.ducr.cz	Drážní inspekce (DI) www.dicr.cz
Germany	Eisenbahn – Bundesamt (EBA) www.eba.bund.de	Bundesministerium für Verkehr, Bau und Stadtentwicklung Eisenbahn-Unfalluntersuchungsstelle www.bmvbs.de
Denmark	Trafikstyrelsen www.trafikstyrelsen.dk	Havarikommissonen for Civil Luftfart og Jernbane (HCLJ) www.havarikommissionen.dk
Estonia	Tehnilise Järelevalve Amet www.tja.ee	Ohutus-juurdluse Keskus (OJK) www.ojk.ee
Greece	Ρυθμιστική Αρχή Σιδηροδρόμων (Regulatory Authority for Railways) www.ras-el.gr	Hellenic Ministry of Infrastructure, Transport and Networks Committee for Accident Investigation www.yme.gr
Spain	Ministerio de Fomento Dirección General de Infraestructuras Ferroviarias www.fomento.es	Ministerio de Fomento Comision de Investigación de Accidentes ferroviarios www.fomento.es
Finland	Liikenteen turvallisuusvirasto (TraFi) www.trafi.fi	Onnettomuustutkintakeskus (Accident Investigation Board) www.onnettomuustutkinta.fi
France	Établissement Public de Sécurité Ferroviaire (EPSF) www.securite-ferroviaire.fr	Bureau d’Enquêtes sur les Accidents de Transport Terrestre www.bea-tt.equipement.gouv.fr
Croatia	Agencija za sigurnost željezničkog prometa www.asz.hr	Agencije za istraživanje nesreća u zračnom, pomorskom i željezničkom prometu (AIN) http://azi.hr
Hungary	Nemzeti Közlekedési Hatóság - National Transport Authority www.nkh.hu	Közlekedésbiztonsági Szervezet (Transportation Safety Bureau) www.kbsz.hu
Ireland	Commission for Railway Regulation www.crr.ie	Railway Accident Investigation Unit www.raiu.ie
Italy	Agenzia Nazionale per la Sicurezza delle Ferrovie www.ansf.it	Direzioine generale per le investigazioni ferroviarie – Ministero delle Infrastrutture e dei Trasporti www.mit.gov.it
Lithuania	Valstybinė geležinkelio inspekcija www.vgi.lt	Katastrofų tyrimų vadovas www.transp.lt
Luxembourg	Ministère du Développement durable et des Infrastructures Administration des Chemins de Fer (ACF) www.railinfra.lu	Administration des Enquêtes Techniques www.mt.public.lu/transports/AET
Latvia	Valsts dzelzceļa tehniskās inspekcijas www.vdzti.gov.lv	Transporta nelaimes gadījumu un incidentu izmeklēšanas birojs - Transport Accident and Incident Investigation Bureau (TAIIB) www.taiib.gov.lv
Netherlands	Inspectie Leefomgeving en Transport (ILT) www.ilent.nl	Onderzoeksraad voor Veiligheid www.onderzoeksraad.nl
Norway	Statens Jernbanetilsyn (SJT) www.sjt.no	Statens Havarikommisjon for Transport - Accident Investigation Board Norway (AIBN) www.aibn.no
Poland	Urząd Transportu Kolejowego www.utk.gov.pl	Państwowa Komisja Badania Wypadków Kolejowych (NIB) www.mf.gov.pl/ministerstwo-finansow

Portugal	Instituto da Mobilidade e dos Transportes Terrestres www.imtt.pt	Gabinete de Investigação de Segurança e de Acidentes Ferroviários (GISAF) www.gisaf.min-economia.pt
Romania	Autoritatea Feroviară Română (AFER) www.afer.ro	Autoritatea Feroviară Română (AFER) Romanian Railway Investigating Body www.afer.ro
Sweden	Transportstyrelsen www.transportstyrelsen.se	Statens haverikommission www.havkom.se
Slovenia	Javna agencija za železniški promet Republike Slovenije (AŽP) www.azp.si	Ministry of Transport Railway Accident and Incident Investigation Division www.mzp.gov.si
Slovakia	Úrad pre reguláciu železničnej dopravy (URZD) http://nsat.sk/en/home/	Ministry of Transport Posts and Telecommunication www.telecom.gov.sk
United Kingdom	Office of Rail Regulation (ORR) www.rail-reg.gov.uk	Rail Accident Investigation Branch www.raib.gov.uk
Channel Tunnel	Channel Tunnel Intergovernmental Commission (IGC) Commission intergouvernementale Tunnel sous la Manche http://www.channeltunneligc.co.uk Assisted by: Channel Tunnel Safety Authority ctsa@orr.gsi.gov.uk Secrétariat général au Tunnel sous la Manche (SGTM) www.cigtunnelmanche.fr	See the relevant authority or body in France or United Kingdom for the respective part of the Channel Tunnel

10.4. ANNEX IV – CSI DATA TABLES

Table 1	Fatalities by category of person																													
Victim types - fatalities	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Passengers	2012	0	0	1	0	0	2	3	1	0	0	4	0	2	0	3	0	2	0	0	0	1	0	15	0	1	0	0	1	0	36
	2013	0	0	0	0	0	0	0	0	0	0	79	0	4	0	4	0	2	0	0	0	0	0	6	1	1	0	0	0	0	97
	2014	0	0	2	1	0	2	0	0	1	0	3	0	0	0	3	0	1	0	0	0	0	0	2	0	1	0	0	0	0	15
Employees	2012	1	1	2	3	1	3	9	0	0	0	0	0	4	0	1	0	1	1	0	0	0	0	15	0	3	1	1	1	1	46
	2013	5	0	0	1	0	1	8	0	0	0	2	0	3	1	0	0	2	0	0	0	0	0	2	0	2	0	0	2	0	28
	2014	2	1	1	1	0	3	8	0	1	0	1	0	1	0	1	0	3	0	0	2	0	0	1	0	2	1	0	0	1	29
Level crossing users	2012	14	13	7	5	0	19	45	2	4	8	5	6	33	8	27	0	12	3	0	5	13	1	61	8	41	7	4	21	7	373
	2013	17	6	3	2	0	15	32	6	2	4	7	2	29	11	22	0	10	2	2	2	15	2	52	10	25	7	4	6	9	300
	2014	13	11	5	2	0	23	41	6	5	5	8	2	25	7	18	0	7	4	0	4	7	1	38	4	19	9	3	9	9	282
Unauthorised persons	2012	17	3	11	11	0	2	74	4	3	10	16	3	32	0	41	0	53	15	0	10	1	0	180	16	81	5	0	45	33	655
	2013	4	9	9	11	0	8	91	2	0	5	17	4	45	6	75	1	45	15	1	10	2	2	165	14	73	10	1	47	22	681
	2014	10	9	15	14	0	2	104	5	2	4	13	4	36	12	85	1	42	7	0	7	1	0	163	15	74	14	0	67	12	704
Other persons	2012	1	1	0	0	0	0	7	1	0	0	2	0	0	6	0	0	0	0	0	3	1	0	0	0	0	2	0	0	1	25
	2013	0	0	0	3	0	0	6	0	2	0	0	0	4	0	1	0	2	0	0	2	0	0	2	1	0	0	0	0	3	23
	2014	0	1	0	1	0	1	7	1	0	0	0	0	3	0	1	1	0	0	0	2	1	0	2	0	0	1	0	0	3	24
Total persons	2012	33	18	21	19	1	26	138	8	7	18	27	9	71	14	72	0	68	19	0	18	16	1	271	24	126	15	5	68	42	1135
	2013	26	15	12	17	0	24	137	8	4	9	105	6	85	18	102	1	61	17	3	14	17	4	227	26	101	17	5	55	34	1129
	2014	25	22	23	19	0	31	160	12	9	9	25	6	65	19	108	2	53	11	0	15	9	1	206	19	96	25	3	76	25	1054

Table 2 **Serious injuries by category of person**

Victim types - Serious injuries	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Passengers	2012	5	1	8	5	0	7	9	1	0	0	4	0	6	5	41	0	6	0	0	0	28	0	79	3	11	1	0	12	1	228
	2013	13	0	3	17	0	4	6	1	0	0	73	0	34	1	20	0	3	0	0	0	9	1	8	3	8	1	0	4	2	193
	2014	7	1	15	19	0	7	13	1	0	0	4	1	12	3	24	0	1	0	0	0	0	0	6	9	2	0	1	12	1	120
Employees	2012	18	3	3	6	2	2	10	1	1	2	2	0	6	5	1	0	7	1	0	1	8	3	5	0	1	0	0	2	1	82
	2013	15	0	1	2	0	1	18	0	0	1	1	0	2	0	5	0	2	0	0	1	0	0	4	0	13	0	1	6	1	72
	2014	3	5	4	4	0	3	9	0	0	0	3	4	8	1	7	0	3	1	0	0	0	0	4	0	4	1	0	2	1	63
Level crossing users	2012	24	5	15	2	0	34	36	4	3	2	3	6	10	17	23	0	5	2	0	3	8	0	36	5	60	10	6	15	4	336
	2013	25	6	12	3	0	26	35	1	2	3	3	1	19	12	20	0	7	2	0	0	4	1	34	5	48	9	9	11	2	296
	2014	18	11	12	2	0		23	0	0	3	3	2	26	5	43	1	9	5	0	0	4	2	24	5	70	4	7	12	0	287
Unauthorised persons	2012	11	5	6	4	0	23	35	2	0	1	7	2	11	0	23	0	21	5	0	3	2	0	63	7	59	6	0	12	9	313
	2013	9	4	5	4	0	19	27	3	0	2	5	2	16	6	37	0	21	6	0	7	0	1	55	5	56	7	0	12	4	308
	2014	7	7	14	10	0	18	37	2	7	8	5	0	24	6	16	0	28	3	0	7	0	2	57	7	53	3	0	19	3	331
Other persons	2012	1	0	0	1	0	0	25	3	3	0	1	0	4	9	0	0	0	0	0	1	2	0	1	1	0	1	0	0	4	56
	2013	0	1	0	3	0	2	21	0	1	0	0	0	1	0	5	1	0	0	0	2	0	0	0	1	0	0	0	4	3	42
	2014	1	3	0	2	0	0	27	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	4	0	0	1	0	1	4	46
Total persons	2012	59	14	32	18	2	66	115	11	7	5	17	8	37	36	88	0	39	8	0	8	48	3	184	16	131	18	6	41	19	1015
	2013	62	11	21	29	0	52	107	5	3	6	82	3	72	19	87	1	33	8	0	10	13	3	101	14	125	17	10	37	12	911
	2014	36	27	45	37	0		109	3	7	11	15	8	74	15	90	1	41	9	0	7	4	4	95	21	129	9	8	46	9	819

Table 3	2014	Fatalities by type of accident and victim category																													
Accident types	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Collisions of trains	Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	4
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Employees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2
Derailments of trains	Total	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Employees	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Level-crossing accidents	Total	13	11	6	2	0	24	41	6	6	5	8	2	25	7	19	0	7	4	0	4	7	1	43	4	20	10	3	9	9	293
	Passengers	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Employees	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
	Level crossing users	13	11	5	2	0	23	41	6	5	5	8	2	25	7	18	0	7	4	0	4	7	1	38	4	19	9	3	9	9	282
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	4
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Accidents to persons caused by rolling stock in motion	Total	12	11	16	17	0	7	118	5	3	4	17	4	37	12	88	2	46	7	0	11	1	0	162	15	76	15	0	67	15	751
	Passengers	0	0	1	1	0	2	0	0	0	0	3	0	0	0	3	0	1	0	0	0	0	0	2	0	1	0	0	0	0	13
	Employees	2	1	0	1	0	2	7	0	1	0	1	0	0	0	0	0	3	0	0	2	0	0	1	0	1	1	0	0	1	23
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	10	9	15	14	0	2	104	4	2	4	13	4	34	12	85	1	42	7	0	7	1	0	159	15	74	13	0	67	12	696
	Other persons	0	1	0	1	0	1	7	1	0	0	0	0	3	0	0	1	0	0	0	2	0	0	0	0	0	1	0	0	2	19
Fires in rolling stock	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Employees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other accidents	Total	0	0	0	0	0	0	1	1	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Employees	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 4 **2014** **Serious injuries by type of accident and victim category**

Accident types	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Collisions of trains	Total	0	1	0	0	0		8	0	0	0	2	0	5	1	0	0	1	0	0	0	0	0	3	0	1	0	1	0	0	23
	Passengers	0	0	0	0	0	7	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	15
	Employees	0	0	0	0	0	1	2	0	0	0	2	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	9
	Level crossing users	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4
	Other persons	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Derailments of trains	Total	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	Passengers	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	Employees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	4
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Level-crossing accidents	Total	18	11	16	2	0	32	31	0	0	6	3	2	29	5	16	1	9	5	0	0	4	2	25	5	71	5	7	20	0	321
	Passengers	0	0	4	0	0	0	6	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	1	0	0	7	0	21
	Employees	0	0	0	0	0	0	2	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	8
	Level crossing users	18	11	12	2	0	32	23	0	0	3	3	2	26	5	13	1	9	5	0	0	4	2	24	5	70	4	7	12	0	289
	Unauthorised persons	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accidents to persons caused by rolling stock in motion	Total	17	13	21	35	0	20	68	2	7	5	10	5	30	9	62	0	30	4	0	7	0	2	67	16	56	4	0	26	9	488
	Passengers	7	1	7	19	0	0	3	1	0	0	4	1	8	3	14	0	1	0	0	0	0	0	6	9	1	0	0	5	1	72
	Employees	2	3	0	4	0	2	4	0	0	0	1	3	2	0	2	0	1	1	0	0	0	0	2	0	2	0	0	1	1	27
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
	Unauthorised persons	7	7	14	10	0	18	36	1	7	5	5	0	16	6	16	0	28	3	0	7	0	2	55	7	53	3	0	19	3	316
	Other persons	1	2	0	2	0	0	25	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	4	0	0	1	0	1	4	43
Fires in rolling stock	Total	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Employees	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other accidents	Total	0	0	0	0	0	0	2	1	0	0	0	1	10	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	27
	Passengers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	Employees	0	0	0	0	0	0	1	0	0	0	0	1	4	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	11
	Level crossing users	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unauthorised persons	0	0	0	0	0	0	1	1	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	Other persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 **Suicide events (fatalities)**

Category	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Suicide events	2006	78	97	32			174		21		1	189	42	351		128	7	126	0		6	190	11	25	40	16	69	6	49	227	*1874*
	2007	113	94	39		0	150	706	24	0	4	188	54	344		111	5	138	0		10	193	8	28	52	24	78	14	48	197	*2614*
	2008	93		27		0	160	714	15	1	1	174	52	289		111	7	137	0		9	164	7	29	50	29	71	20	58	202	*2413*
	2009	101	69	19	121	0	185	875	23	0	3	163	62	337		139	2	111	2	4	10	197	8	23	69	25	67	10	56	210	*2762*
	2010	90	84	18	126	0	198	899	20	0	2	124	44	328	19	121	6	109	4	3	13	201	7	44	51	23	68	15	48	224	2756
	2011	87	98	27	103	0	235	853	20	0	4	128	64	332	28	155	6	140	5	7	10	215	11	28	42	76	62	25	40	203	2890
	2012	80	102	33	140	0	224	872	32	5	1	138	32	356	24	148	5	124	13	5	7	202	8	80	58	57	82	16	38	248	2982
	2013	99	94	17	140	0	207	834	23	1	5	118	55	291	15	79	3	134	8	4	3	220	10	71	47	66	90	13	55	267	2819
	2014	92	97	29	151	0	279	781	21	5	4	139	64	298	28	79	5	143	6	6	6	192	15	71	44	80	77	18	44	287	2895

Table 6 **Significant accidents by type of accidents**

Accident types	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Collisions of trains	2012	1	3	3	4	0	6	23	1	3	2	3	0	17	1	1	0	7	0	0	0	3	10	6	1	0	4	1	1	10	97
	2013	4	1	2	6	0	5	29	0	0	2	5	0	10	0	2	1	4	0	0	0	3	17	6	1	1	2	0	2	21	101
	2014	1	3	4	0	0	13	32	0	0	1	7	1	23	2	0	0	9	0	0	0	3	13	6	7	1	4	4	0	3	124
Derailments of trains	2012	2	2	3	1	0	6	11	1	1	2	10	3	13	1	3	0	5	0	0	1	0	4	17	0	0	10	1	2	3	97
	2013	1	4	2	3	0	7	16	0	0	0	11	3	11	5	4	0	6	0	0	2	1	5	13	4	0	9	1	0	8	108
	2014	2	0	6	1	0	9	9	1	0	3	6	1	15	2	5	0	4	0	0	1	1	6	13	3	0	10	1	1	11	104
Level-crossing accidents	2012	36	18	15	8	0	47	79	5	10	6	8	11	38	18	37	0	13	4	0	6	19	2	77	11	59	11	8	27	10	573
	2013	37	13	11	3	0	36	59	5	11	5	11	4	42	13	35	0	14	4	2	2	21	3	75	12	44	13	11	18	12	510
	2014	27	21	11	4	0	46	67	5	5	10	10	4	51	6	28	1	16	5	0	3	13	2	65	9	50	13	9	20	11	506
Accidents to persons caused by rolling stock in motion	2012	43	12	26	25	0	37	150	11	6	8	29	5	51	20	107	0	79	22	0	18	5	0	275	23	151	14	1	65	49	1207
	2013	29	14	17	24	0	35	161	3	4	6	25	4	64	14	132	2	71	20	1	22	9	4	233	31	135	16	0	73	34	1155
	2014	29	22	37	51	0	32	182	7	10	8	27	8	63	20	135	2	74	11	0	18	1	2	227	31	133	17	0	92	25	1211
Fires in rolling stock	2012	0	1	1	1	2	1	2	1	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	0	3	0	0	0	14
	2013	0	0	0	0	1	2	1	0	0	0	0	0	8	0	2	0	2	0	0	0	1	1	1	0	0	2	1	0	9	30
	2014	1	1	0	1	0	0	5	0	0	1	1	0	2	1	9	0	0	0	0	0	1	0	0	0	1	3	1	0	4	31
Other accidents	2012	5	0	0	8	0	0	24	2	0	0	1	2	15	2	4	0	1	0	0	0	3	2	4	1	5	5	3	1	3	81
	2013	2	0	1	9	0	6	35	3	0	1	0	1	11	1	11	0	1	0	0	0	1	0	0	0	0	1	0	1	0	76
	2014	1	0	0	7	0	5	38	2	0	0	0	1	23	2	13	0	6	0	0	0	1	5	2	0	0	6	0	0	0	100
Total accidents	2012	87	36	48	47	2	97	289	21	20	18	51	21	136	42	152	0	106	26	0	25	30	19	379	36	215	47	14	96	75	2069
	2013	73	32	33	45	1	91	301	11	15	14	52	12	146	33	186	3	98	24	3	26	36	30	328	48	180	43	13	94	84	1980
	2014	61	47	58	64	0	105	333	15	15	23	51	15	177	33	190	3	109	16	0	22	20	28	313	50	185	53	15	113	54	2076

Table 7 Accidents and incidents involving transport of dangerous goods

Category	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Accidents involving at least one railway vehicle transporting dangerous goods in which dangerous goods are NOT released	2012	0	0	0	0	0	0	4	0	0	0	0	0	2	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0	10
	2013	0	1	0	0	1	0	4	0	0	0	0	0	2	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	11
	2014	0	0	0	0	0	0	9	0	0	0	0	0		0	0	0	2	3	0	1	0	0	0	1	0	0	0	0	0	16
Accidents involving at least one railway vehicle transporting dangerous goods in which dangerous goods ARE released	2012	0	2	0	0	0	0	4	1	0	0	2	1	1	0	0	0	0	3	0	1	2	0	0	0	0	0	0	0	0	17
	2013	0	0	0	0	0	0	4	0	0	0	3	1	2	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	13
	2014	0	1	0	0	0	0	9	1	0	0	0	4		0	0	0	0	0	0	1	1	2	1	2	0	4	0	0	0	24
Accidents involving at least one railway vehicle transporting dangerous goods	2012	0	2	0	0	0	0	8	1	0	0	2	1	3	0	0	0	1	4	0	2	2	0	1	0	0	0	0	0	0	27
	2013	0	1	0	0	1	0	8	0	0	0	3	1	4	0	0	0	1	2	0	2	0	1	1	0	0	0	0	0	0	24
	2014	0	1	0	0	0	0	18	1	0	0	0	4		0	0	0	2	3	0	2	1	2	1	3	0	4	0	0	0	40

Table 8 Precursors to accidents

Precursors to accidents	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Broken rails	2012	144	52	82	86	9	30	644	51	16	13	100	62	335	50	576	2	337	2	3	9	0	56	1800	45	643	34	94	145	164	5442
	2013	87	76	83	56	13	3	453	44	7	107	99	25	301	35	330	1	338	0	3	4	0	100	1145	29	484	53	72	74	154	4020
	2014	66	57	102	55	9	3	285	34	7	96	62	54	219	44	492	4	291	8	2	3	63	35	1293	52	593	39	61	66	104	4109
Track buckles	2012	168	26	0	40	0	0	29	2	0	5	267	35	217	11	4	4	1981	0	1	5	0	8	53	76	0	590	16	5	10	3505
	2013	204	29	0	27	0	0	37	3	0	53	472	50	172	31	0	3	1613	0	1	2	0	67	83	121	0	783	28	9	19	3713
	2014	137	6	1	23	0	1	31	3	0	44	323	103	138	11	0	0	1644	0	1	2	0	45	77	146	3	1422	12	1	14	4120
Wrong-side signalling failures	2012	2	12	0	1	0	0	0	47	12	0	2	5	366		0	0	0	1	0	0	0	12	5	0	0	1	0	15	4	472
	2013	3	4	0	0	0	0	0	35	0	0	4	1	416	0	3	14	0	1	1	0	0	1	13	0	0	1	0	9	0	505
	2014	0	3	0	2	0	0	0	47	0		1	23	395	0	6	21	0	2	0	0	39	12	10	0	0	3	0	8	1	*559*
Signals passed at danger	2012	10	75	4	124	6	80	400	139	2	1	77	20	122		21	8	20	4	5	3	1	51	33	25	447	328	6	39	220	2096
	2013	12	56	16	110	1	78	373	143	0	0	81	33	146	0	18	18	17	3	4	4	0	66	34	26	405	298	0	33	267	2066
	2014	11	66	16	115	4	84	470	116	4		83	30	148	0	18	10	21	1	6	3	112	68	64	30	288	249	8	18	301	2161
Broken wheels	2012	1	0	27	0	0	0	0	7	0	0	0	1	0		1	0	2	0	0	0	0	2	3	0	0	1	0	1	0	44
	2013	0	1	76	1	0	1	0	1	0	0	0	1	0	0	0	0	1	1	0	0	1	1	1	1	2	1	0	0	0	88
	2014	0	0	1	0	0	0	0	3	0		0	0	0	0	0	0	1	0	0	2	0	1	1	1	0	2	0	0	0	*11*
Broken Axles	2012	1	0	14	0	1	0	3	2	1	2	1	0	0		0	0	1	0	0	0	1	0	4	0	1	2	0	0	0	34
	2013	0	0	5	0	0	1	0	0	0	0	0	0	2	0	1	0	1	0	0	2	0	0	2	2	1	1	0	0	0	18
	2014	0	0	4	0	0	0	0	2	0		0	1	0	0	2	0	0	0	0	0	0	0	0	2	1	2	0	0	0	*14*

Table 9 Economic impact of accidents

Category	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Economic impact of fatalities (MEUR)	2012	74,39	59	12,17	72,95	1,982	17,33	291,8	22,46	4,348	15,7	35,88	17,6	133,8	7,634	44,99	0	109,6	10,22	0	8,839	35,2	4,982	166,3	22,56	86,32	36,69	4,693	36,23	85,77	1342
	2013	62,02	32,62	6,956	64,42	0	20,57	298,8	22,72	3,409	9,234	148,4	11,5	172,1	10,46	64,39	2,288	97,94	12,43	10,87	10,63	37,44	19,52	142,1	24,26	69,73	46,57	5,276	46,94	70,01	1440
	2014	59,63	36,06	0	72	0	26,57	369,9	34,07	7,67	9,234	35,34	14,44	131,6	11,04	68,18	5,534	85,1	8,044	0	0	19,99	4,88	129	17,73	66,28	68,48	3,166	0	56,58	1264
Economic impact of serious injuries (MEUR)	2012	18,16	3,486	2,507	9,499	0,532	5,964	33,59	3,822	0,574	0,571	2,797	2,021	9,735	2,653	7,374	0	8,076	0,595	0	0,524	14,4	2,098	15,4	2,012	12,13	6,435	0,735	2,986	4,652	162
	2013	20,19	3,634	1,645	15,11	0	6,042	32,23	1,757	0,338	0,806	14,35	0,743	20,35	1,492	7,365	0,29	6,807	0,808	0	1,014	3,906	2,054	8,624	1,747	11,66	6,806	1,376	4,316	2,88	161
	2014	11,72	6,723	0	19,27	0	0,116	34,81	1,054	0,788	1,478	2,625	2,595	20,92	1,178	7,619	0,29	8,457	0,909	0	0	1,18	2,739	8,112	2,62	12,04	3,603	1,101	5,366	2,16	137
Cost of material damages to rolling stock or infrastructure (significant accidents) (MEUR)	2012	27,77	1,271	0,202	7,778	0	5,895	31,86	0	0	0,399	3,426	2,753	0	0	3,254	0	13,41	0,522	0	0,804	34,78	3	6,051	0,244	0,082	0	0	0	12,81	146
	2013	30,67	6,352	0,08	14,65	0	6,161	47,57	0	0,004	0,07	16,65	4,547	0	0	0,617	0,109	12,17	0	0	0,142	13,14	4,072	5,793	6,286	0,523	0	0	0	0	151
	2014	19,79	0	0	2,847	0	5,457	40,6	0,182	0,176	1,545	2,756	0,987	0	0,13	3,814	0,021	4,09	1,177	0	0,092	5,683	3,339	6,519	0,845	1,672	0	2,636	0,308	4,224	103
Cost of damage to the environment (significant accidents) (MEUR)	2012	0,115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,01	0	0,123	0	0	0	0	0	0	0
	2013	0,186	3,212	0	0	0	0	0,059	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,231	0,028	0	0	0	0	0	0	3
	2014	0,192	0	0	0	0	0	0,072	0	0	0	0	0	0	0	0,019	0	0	0	0	0	0	0	0	0	0	0	0	0	2,294	3
Cost of delays as a consequence of significant accidents (MEUR)	2012	3,194	0	2E-04	0	0	0,138	31,5	0	0	0,29	1,13	0,209	0	0	0,284	0	0	0,522	0	0,778	12,73	0	1,906	0,467	0,299	0	0	0,967	1,184	56
	2013	3,587	2,763	6E-04	0	0	0,338	34,66	0	0,276	0,055	2,445	0,094	0	0	1,133	0,069	0	0	0,135	0,512	0,285	0	13,63	1,197	0,461	0	0	1,859	0	63
	2014	3,025	0	0	0	0	0,246	31,13	0	2,821	0,052	1,655	0,293	0	0,165	2,027	0,059	0	0,392	0	0	1,428	0	10,27	8,986	0,169	0	0,039	1,325	7,116	71
Economic impact of significant accidents (MEUR)	2012	123,6	63,76	14,88	90,22	2,514	29,33	388,8	0	4,923	16,96	43,24	22,58	143,5	10,29	55,91	0	131,1	11,86	0	10,95	97,12	10,08	189,8	25,28	98,83	43,12	5,428	40,18	104,4	1678
	2013	116,7	48,58	8,682	94,18	0	33,11	413,3	0	4,026	10,16	181,9	16,88	192,4	11,95	0	2,756	116,9	0	11	12,3	54,77	25,88	170,2	33,49	82,38	53,37	6,652	53,11	72,89	1707
	2014	94,36	0	0	94,12	0	32,39	476,5	35,31	11,45	0	0	18,31	0	12,51	81,66	5,904	97,64	10,52	0	0	28,28	10,96	153,9	30,18	80,15	0	0	0	72,38	1241

Table 10 Technical safety of infrastructure and its implementation

Category	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Perc. of track with ATP in operation	2012	82	9	11	3	100	0	95	25	23	0	86	82	73	31	54	5	100	39	100	66	100	74	0	64	97	82	67	21	4	
	2013	83	13	16	3	100	0	97	25	23	0	87	82	69	32	54	5	100	41	100	66	100	74	0	65	98	82	67	23	4	
	2014	78	15	13	3	100	0	97	25	23	0	22	82	73	0	56	0	100	41	100	66	100	74	0	67	100	84	67	21		
Perc of trainkm using operational ATP	2012	86		22	3	100	1	99	60	63	0	97	98	99	62	56	11	100	76	100	95	100	93	0	89	100	96			3	
	2013	86		24	3	100	1	99	60	77	0	98	98	85	65	56	11	100		100	95	100	93	0	88	100	96			3	
	2014	86		22	3	100	1	99	60	77	0	28	98	98	0		0	100	77	100	95	100	93	0	88	100	96				
Total nr of level crossings	2012	4680	1857	783	1697	0	8315	14275		328	1587	2400	3581	18055	1518	6041	1015	5600	539	137	634	2600	3660	14356	877	5262	8616	838	2254	6617	*112765*
	2013	4581	1848	785	1677	0	8041	14096	1372	325	1500	3330	3505	16144	1506	6041	1011	5271	545	137	640	2541	3629	13609	870	5272	8221	832	2101	6542	110666
	2014	4509	1818	774	1625	0	8001	13983	1338	326	1453	3304	3384	15943	1241	6041	978	5010	545	127	659	2282	3566	13447	856	5225	7892	787	2131	6142	108196
Tot nr of level crossings per track km	2012	0,636	0,288	0,152	0,320	0,000	0,720	0,232		0,152	0,522	0,124	0,403	0,393	0,510	0,571	0,469	0,230	0,246	0,221	0,162	0,370	0,941	0,501	0,271	0,262	0,585	0,385	0,485	0,208	*0,341*
	2013	0,626	0,286	0,161	0,316	0,000	0,696	0,229	0,428	0,151	0,538	0,160	0,395	0,324	0,506	0,571	0,467	0,222	0,249	0,221	0,164	0,361	0,877	0,487	0,268	0,264	0,567	0,382	0,305	0,207	0,326
	2014	0,614	0,279	0,158	0,307	0,000	0,692	0,227	0,418	0,152	0,526	0,159	0,399	0,321	0,417	0,680	0,452	0,212	0,249	0,205	0,168	0,325	0,845	0,358	0,264	0,262	0,544	0,361	0,310	0,194	0,312

Table 11 Level crossings by type

Level crossing types	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Active LC with automatic user-side warning	2012	766	210	0	104	0	2209	726	910	136	2	458	90	46	149	1015	3	39	310	3	413	10	98	1295	38	936	836	22	459	296	11377
	2013	775	208	0	113	0	2182	799	168	127	3	542	85	46	102	1009	3	31	302	3	409	10	98	1288	39	906	803	21	425	287	10573
	2014	801	201	0	118	0	2180	746	162	128	3	539	97	46	99	1009	3	21	303	2	403	66	98	1291	38	912	753	21	431	195	10450
Active LC with automatic user-side protection	2012	0	0	172	0	0	0	693		0	0	0	0	0	0	0	0	4	7	0	0	114	30	0	0	0	11	0	0	0	1001
	2013	0	0	187	0	0	0	193	0	0	0		0		0	0	0	3	7	0	0	114	25	0	0	0	10	0	0	0	514
	2014	0	0	120	0	0	0	191	0	0	0	0	0	0	0	0	0	2	7	0	0	0	25	0	0	0	12	0	0	0	332
Active LC with automatic user-side protection and warning	2012	921	1285	0	1233	0	1104	6547		29	0	0	704	10018	312	466	0	4039	13	82	62	1501	373	411	349	233	2215	281	512	492	31576
	2013	927	1278	0	1241	0	1150	6714	661	38	0		695	10798	231	472	0	3729	18	82	79	1485	368	414	350	200	2197	288	380	491	32677
	2014	917	1267	0	1255	0	1172	6818	652	40	0	0	670	10773	246	472	0	3552	18	79	77	1482	366	429	373	196	2154	284	374	641	32686
Active LC with automatic user-side protection and warning, and rail-side protection	2012	21	0	303	18	0	0	544		0	762	453	0	788	47	1155	196	277	15	0	0	3	0	444	2	0	77	0	149	56	5292
	2013	21	0	322	21	0	0	1002	93	0	726	624	0	840	0	1155	196	281	16	0	0	3	0	468	2	0	80	0	79	57	5965
	2014	4	0	386	23	0	0	981	96	0	708	621	0	0	0	1155	192	272	16	0	0	0	0	506	2	0	81	0	82	64	5166
Active LC with manual user-side warning	2012	169	70	0	0	0	0	97		0	0	0	0	0	0	5	0	0	28	18	16	297	0	38	4	2	87	0	0	0	831
	2013	165	71	0	0	0	0	111	1	0	0		0		49	5	0	0	21	18	2	297	0	54	4	1	68	0	33	0	900
	2014	151	62	0	0	0	0	112	3	0	1	0	0	0	0	5	0	0	21	16	5	176	0	55	4	1	55	0	49	0	716
Active LC with manual user-side protection	2012	9	0	171	0	0	422	324		0	23	0	0	840	69	73	8	1	3	2	0	0	0	1658	32	591	16	8	58	392	4700
	2013	9	0	139	0	0	411	159	10	0	48	4	0	840	56	73	6	1	3	2	4	3	0	1247	31	689	16	7	60	367	4185
	2014	8	0	126	0	0	397	187	11	0	47	4	0	0	0	73	6	1	4	2	5	0	2	1216	31	600	8	8	52	325	3111
Active LC with manual user-side protection and warning	2012	0	25	0	0	0	0	134		0	19	17	0	151	17	176	0	1	5	1	0	22	13	1562	10	25	40	24	4	433	2666
	2013	0	24	0	0	0	0	942	0	0	2	17	0	142	108	176	0	1	3	1	0	27	13	1549	10	1	18	24	63	452	3560
	2014	0	24	0	0	0	0	809	0	0	1	17	0	1656	0	176	0	1	3	2	0	38	14	1559	10	1	17	23	91	403	4831
Total number of active level crossings	2012	1886	1590	646	1355	0	3735	9065		165	806	928	794	11843	594	2890	207	4361	381	106	491	1947	514	5408	435	1787	3282	335	1182	1669	56533
	2013	1897	1581	648	1375	0	3743	9920	933	165	779	1187	780	12666	546	2890	205	4046	370	106	494	1939	504	5020	436	1797	3192	340	1040	1654	58374
	2014	1881	1554	632	1396	0	3749	9844	924	168	760	1181	767	12475	345	2890	201	3849	372	101	490	1762	505	5056	458	1710	3080	336	1079	1628	57292
Total number of passive level crossings	2012	2794	267	137	342	0	4580	5210	452	163	781	1472	2787	6212	924	3151	808	1239	158	31	143	653	3146	8948	442	3475	5334	503	1072	4948	56684
	2013	2684	267	137	302	0	4298	4176	439	160	721	2143	2725	3478	960	3151	806	1225	175	31	146	602	3125	8589	434	3475	5029	492	1061	4888	52292
	2014	2628	264	142	229	0	4252	4139	414	158	693	2123	2617	3468	896	3151	777	1161	173	26	169	520	3061	8391	398	3515	4812	451	1052	4514	50904

Table 12	Traffic and infrastructure data																														
Reference data	Year	AT	BE	BG	CH	CT	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	EU-28
Total number of Train km (million)	2006	152,2		36,1			159,0	1014	80,5		19,1	185,1	50,9	508,0		106,8	18,2	377,0	13,8		17,1	133,0	47,4	221,7	39,3	94,9	132,3	19,0	51,0	535,8	*3964*
	2007	155,0	103,6	36,0		6,53	152,9	1049	78,7	7,55	19,9	185,6	52,6	529,5		114,0	16,8	370,0	15,0		18,6	140,0	47,4	223,0	41,0	96,3	134,3	19,2	51,0	521,3	*4137*
	2008	158,4	92,9	35,1		5,54	175,0	1044	82,0	7,13	21,2	192,8	53,3	541,0		109,0	19,9	366,9	15,8		19,5	139,0	46,8	224,4	41,8	96,1	138,2	20,1	49,3	549,1	*4197*
	2009	152,3	91,9	31,5	175,4	5,65	163,2	1003	82,2	6,82	19,6	188,1	50,0	504,0		106,3	18,2	350,5	14,1	8,06	18,7	132,0	43,3	208,6	40,6	88,5	143,1	18,2	45,0	568,6	*4059*
	2010	156,1	98,0	30,6	178,3	5,71	160,2	1032	63,7	8,93	17,0	186,7	51,0	484,8	24,1	102,5	17,7	324,0	14,1	8,16	16,6	146,2	46,5	219,1	40,0	93,5	141,3	18,8	47,5	520,0	4028
	2011	152,2	100,6	31,2	180,3	5,60	160,6	1053	64,9	7,00	12,5	191,4	51,1	501,5	25,6	110,2	18,1	317,4	15,3	8,86	18,5	149,1	45,9	227,3	37,2	104,2	140,3	20,3	45,4	528,5	4098
	2012	149,8	99,3	27,8	181,5	5,76	161,4	1038	63,2	7,05	11,7	188,7	50,9	511,9	25,7	115,7	18,4	316,5	14,7	8,75	18,9	149,8	46,8	224,0	37,5	108,5	140,4	19,9	46,3	535,6	4096
	2013	150,7	97,0	28,2	185,4	5,94	160,9	1032	64,1	6,78	11,2	198,6	50,5	498,0	22,5	114,9	18,3	331,6	14,1	9,02	17,6	151,0	48,5	217,0	36,3	93,3	145,6	20,1	46,8	536,3	4078
	2014	152,4	96,64	28,8	189,3	5,67	160,1	1043	63,28	7,49	11,5	204,2	49,68	489,9	20,94	101,1	18,27	330,6	14,3	9,013	19,03	155,5	49,37	213,4	36,55	90,48	148,4	20,52	47	546,1	4084
Number of Passenger km (million)	2006	8830	9607	2420			6909	77803	6274		1811	20478	3540	76470		9586	1872	58679	430		992	15600	2860	18173	3876		9716	11	2194	49750	*385021*
	2007	9149	9932	2423		1	6907	79100	5080	274	1930	20584	3778	78740		10080	2007	49090	409		983	16400	2860	19374	3990	6724	10296	812	2148	50474	*390685*
	2008	10600	10403	2334			6659	82500	5196	274	1657	22074	4052	87000		8288	1976	49408	397		951	16500	2860	20144	4154	6956	10838	834	2279	53002	*408475*
	2009	10500	10493	2144	17291		6472	81612	5055	232	1414	21729	3876	83260		7945	1681	46426	357	333	747	16800	2996	18577	4152	6177	11216	840	2247	52765	*397049*
	2010	10700		2100	17881	497	6553	83702	5230	456	1144	20978	3959	81750	1742	7666	1678	43474	373	350	741	16621	3153	17800	4111	5500	11036	813	2291	55831	387094
	2011	10900	9494	2067	18223	506	6750	85035	5405	393	958	21399	3882	82750	1486	7795	1639	41326	389	354	733	16892	3036	18049	4143	5141	11434	773	2428	56059	398181
	2012	11160	9493	1876	18008	519	6750	85034	5468	249	832	20789	4035	85230	1103	8070	1583	41609	403	377	717	17247	3208	17738	3803	4897	11530	742	2462	58883	402599
	2013	11800	10886	1826	18172	546	6750	88541	5506	231	755	22569	4053	87690	858	7830	1568	44093	391	394	721	17524	3311	16679	3649	4537	11587	760	2865	59427	414036
	2014	12000	10974	1702	18722	525		89326	5485	263	1072	23763	3874	80810	927	7379	1863	45479	373	409	649	18699	3458	15943	3852	4540	11868	697	2952	64711	*410135*
Number of passenger train km (million)	2012	102,5	85,3	20,1	155,7	1,0	125,0	783,7	59,5	3,3	10,9	161,8	36,1	423,5	18,2	88,4	17,3	274,6	5,38	7,96	6,23	138,0	36,0	142,0	29,3	80,9	100,8	11,1	31,6	498,3	3263
	2013	102,9	84,1	21,1	158,2	1,0	125,5	777,5	60,5	3,5	10,6	170,1	36,1	418,0	16,7	86,3	17,0	286,9	5,30	8,23	6,15	144,2	38,3	137,7	29,7	68,7	107,8	10,7	31,6	497,7	3265
	2014	103,8	83,7	21,1	161,4	0,9	124,3	783,7	59,8	5,0	10,6	173,8	35,7	410,9	15,2	82,9	16,9	284,9	5,26	8,22	6,11	144,8	38,3	134,1	30,0	67,4	111,4	10,8	32,0	507,7	3271
Number of Freight train km (million)	2012	40,30	13,93	6,66	25,80	0,27	36,40	254,4	3,71	3,78	0,77	23,73	14,81	88,42	5,99	27,19	0,36	40,35	9,29	0,71	12,62	11,31	7,747	76,24	8,16	27,52	39,63	8,76	13,56	37,25	806
	2013	40,30	12,57	6,23	27,14	0,43	35,40	254,7	3,62	3,31	0,62	25,14	14,36	80,00	5,23	28,48	0,53	43,21	8,63	0,73	11,43	6,590	8,347	74,18	5,45	24,62	37,83	9,46	14,08	38,60	786
	2014	41,40	12,60	6,85	27,90	0,28	35,80	254,6	3,43	2,53	0,91	27,38	13,99	78,96	5,09	18,06	0,53	44,66	8,81	0,71	11,53	9,989	8,151	74,42	6,28	23,11	37,03	9,70	14,00	38,40	781
Number of Other train km (million)	2012	7,00	0,00	1,02	0,00	4,52	0,00	0,00	0,00	0,00		3,18	0,00		1,60	0,12	0,70	1,58	0,00	0,08	0,00	0,46	3,06	5,70	0,00	0,00		0,00	1,14	0,00	*27*
	2013	7,50	0,33	0,84	0,00	4,52	0,00	0,00	0,00	0,00		3,36	0,00	0,00	0,62	0,15	0,74	1,49	0,22	0,07	0,00	0,27	1,86	5,14	1,12	0,00		0,00	1,12		*27*
	2014	7,20	0,31	0,87	0,00	4,52	0,00	5,00	0,00	0,00	0,00	3,07	0,00	0,00	0,60	0,15	0,83	1,06	0,22	0,08	1,38	0,78	2,90	4,92	0,29	0,00	0,00	0,00	1,00	0,00	*32*
Number of Freight tonne km (million)	2012	21523		7,154	11019	49,22	29046	1E+05	2278	10302	282,7	7150	9275		2332	9093	90,84	20945	14172	759	21867	0,06	3813	49079	2421	16972	22000	3815	17322	23193	*394040*
	2013	21157		7,139	11775	62,42	33554	1E+05	2448	15167	237,4		9470		2391	8521	98,85	17282	13344	264,3	19532	0,057	3866	47475	2290	16750	20700	3799	17632	24165	*388960*
	2014	22462		7,721	12278	10,93	34257	1E+05	2453	6153	335,7		9597		2190	14647	99,82	21225	14307	270,2	19441		3595	47622	2438	15740	21300	4278	17981	22066	*391512*
Number of line kilometres (double track lines are to be counted ONCE)	2012	5257	3587	3946	3750	159	9487	33479	2459	918	2523	13996	5944	29675	2722	7691	1683	16722	1768	275	1859	3063	3646	19961	2541	17168	9944	1209	3631	16219	217886
	2013	5217	3595	3896	3750	159	9468	33483	2446	918	2265	15312	5944	36818	2722	7590	1683	16131	1768	275	1859	3063	3891	19269	2544	17088	9765	1209	3631	16086	224204
	2014	5223	3631	3897	3750	159	9458	33483	2446	918	2238	15183	5944	36831	2604	7706	1683	15990	1767	275	1860	3061	3973	19265	2546	17028	9689	1209	3627	16086	223806
Number of track kilometres (double track lines are to be counted TWICE)	2012	7360	6446	5154	5300	200	11554	61432	3210	2164	3041	19326	8883	45937	2976	10577	2165	24334	2189	621	3909	7033	3891	28665	3239	20077	14739	2177	4648	31752	333807
	2013	7314	6472	4885	5300	200	11554	61486	3202	2146	2788	20861	8883	49778	2976	10577	2165	23731	2189	621	3909	7033	4136	27942	3242	19997	14510	2177	6888	31546	339072
	2014	7340	6522	4886	5300	200	11554	61490	3202	2146	2762	20761	8485	49715	2976	8883	2165	23602	2189	621	3915	7030	4219	37538	3244	19936	14511	2177	6872	31591	346314

Natural variation
Due to one extreme accident
Unknown reason for variation
Change of definition or reporting procedure
Value not available
More detailed explanation available

■ **Table 13** — Table of abbreviations

Abbreviation	Explanation
AsBo	assessment body
CAB	conformity assessment body
CCM	change control management
CCS	control, command and signalling
CEFR	Common European Framework of Reference for Languages
CIS	Commonwealth of Independent States
CR	conventional rail
CSM	common safety methods
CUI	common user interface (of RINF)
DCS	data collecting system
DeBo	designated body
DG Move	Directorate-General for Mobility and Transport of the European Commission
DI	degree of implementation
DMU	diesel multiple unit
DoA	date of application
DV 29 bis	Commission Recommendation 2014/897/EU
EA	European cooperation for Accreditation
EC	European Commission
ECM	entity in charge of maintenance
ECVVR	European Centralised Virtual Vehicle Register
EFTA	European Economic Area and the European Free Trade Association
EiF	entry in force
EMS	energy measurement system
EMU	electric multiple unit
EN	European standard
ER	essential requirement
ERA	European Railway Agency, from 15th June 2016: The European Union Agency for Railways
Eradis	European Railway Agency Database of Interoperability and Safety
ERATV	European Register of Authorised Types of Vehicles
ERTMS	European Rail Traffic Management System
ETA	estimated time of arrival
ETCS	European Train Control System
ETI	estimated time of interchange
EU	European Union
GIS	geographical Information system
GSM-R	Global System for Mobile communications — Railways
HS	high speed >>>
IEC	International Electrotechnical Commission
IM	infrastructure manager
INEA	Innovation and Networks Executive Agency
INF	infrastructure
IOD	interoperability directive (Directive 2008/57/EC)

Abbreviation	Explanation
ISO	International Organisation for Standardisation
JSG	Joint Sector Group
MS	Member State (of the European Union)
NAB	national accreditation body
NoBo	notified body
NSA	national (railway) safety authority
NTR	national technical rules
OJ	Official Journal of the European Union
QMS	quality management system
OP	open point
OSJD	Organisation for Cooperation of Railways
OTIF	Intergovernmental Organisation for International Carriage by Rail
RDD	reference document database
RIC	Regolamento Internazionale delle Carrozze/International Coach Regulations
RINF	Register of Infrastructure
RIV	La Réglementation Internationale des Wagons/International Wagon Regulations
RSRD	Rolling Stock Reference Database
RST	rolling stock
RU	railway undertaking
SC	specific case
SMS	safety management system
SRT	safety in railway tunnels
TAF	telematics applications for freight service
TAP	telematics applications for passenger service
TEN-T	Trans-European networks — transport
TRAN	Committee on Transport and Tourism of the European Parliament
TSI	technical specification for interoperability
UIC	International Union of Railways
UIP	International Union of Wagons Keepers
UNIFE	Union des Industries Ferroviaires Européennes/Association of the European Rail Industry
UTP	uniform technical provisions (of OTIF)
VKMR	Vehicle Keeper Marking Register
WIMO	Wagon and Intermodal Unit Operational

Please note, that some of the abbreviations above are used with an 's' at the end for plural, e.g. 'ERs' for 'essential requirements'.

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