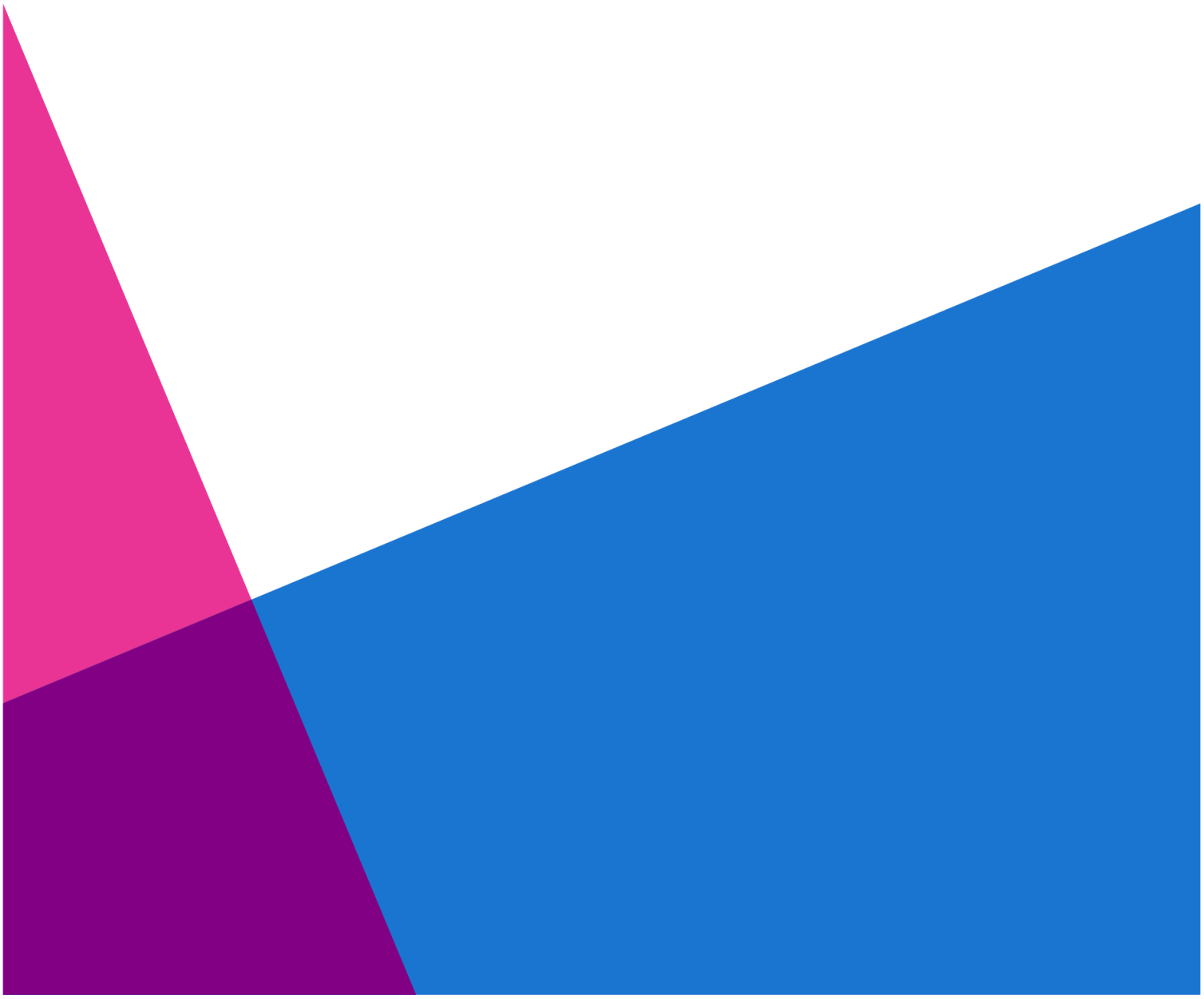
TRAFICOM

Liikenne- ja viestintävirasto
Transport- och kommunikationsverket
Finnish Transport and Communications Agency

# Annual Railway Safety Report 2018

## NSA Finland



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Finnish Transport and Communications Agency
Traficom
Transport- och kommunikationsverket Traficom
Helsinki 2019

# 1 Introduction

## 1.1 Purpose, scope and addressees of the Report

This Annual Railway Safety Report 2018 of the Finnish Transport and Communications Agency Traficom describes the status of railway safety in Finland in 2018. The report also describes key points related to Traficom's authorisations, supervision and regulatory functions related to railways in 2018.

The Annual Railway Safety Report is Traficom's annual report on railways, as referred to in section 17 of the Rail Transport Act 1302/2018. Under the Act, Traficom shall each year prepare a report on its operations and the development of railway safety in Finland in the previous year and submit the report to the European Union Agency for Railways (ERA) by 30 September. The report is also submitted to the Ministry of Transport and Communications and published on Traficom's website.

The sources of safety information presented in the Annual Railway Safety Report include the safety reports of infrastructure managers and railway operators, accident and incident reports, and the Safety Investigation Authority's accident investigation reports. The sources of information on Traficom's operations include interviews with its public officials and documents concerning its operations.

The structure of the Annual Railway Safety Report follows the latest version of ERA guidelines for such reports issued in April 2019.

Until the end of 2018, the Finnish Transport Safety Agency Trafi performed the duties of the national safety authority for railways. Following a public administration reform, the agency was renamed as the Finnish Transport and Communications Agency Traficom from the beginning of 2019. This report refers to Trafi in the context of issues relevant to 2018, and to Traficom when discussing matters relevant to 2019.

## 1.2 Main conclusions of the reporting year

In 2018, the status of railway safety was good in Finland and the level of passenger safety, in particular, was excellent. When examined over a longer term, the safety of rail traffic has clearly improved, and such occurrences as collisions and derailments are extremely rare. There were no significant collisions or derailments in 2018[1] (Figure 1). During the reporting year, two fires occurred in rolling stock in rail traffic, resulting in material damage exceeding the limit of a significant accident, i.e. EUR 150,000. Regardless of the low number of accidents, however, serious incidents do occur in rail traffic every year, including routing failures.

[1] A 'significant accident' is an accident involving at least one railway vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or the environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.

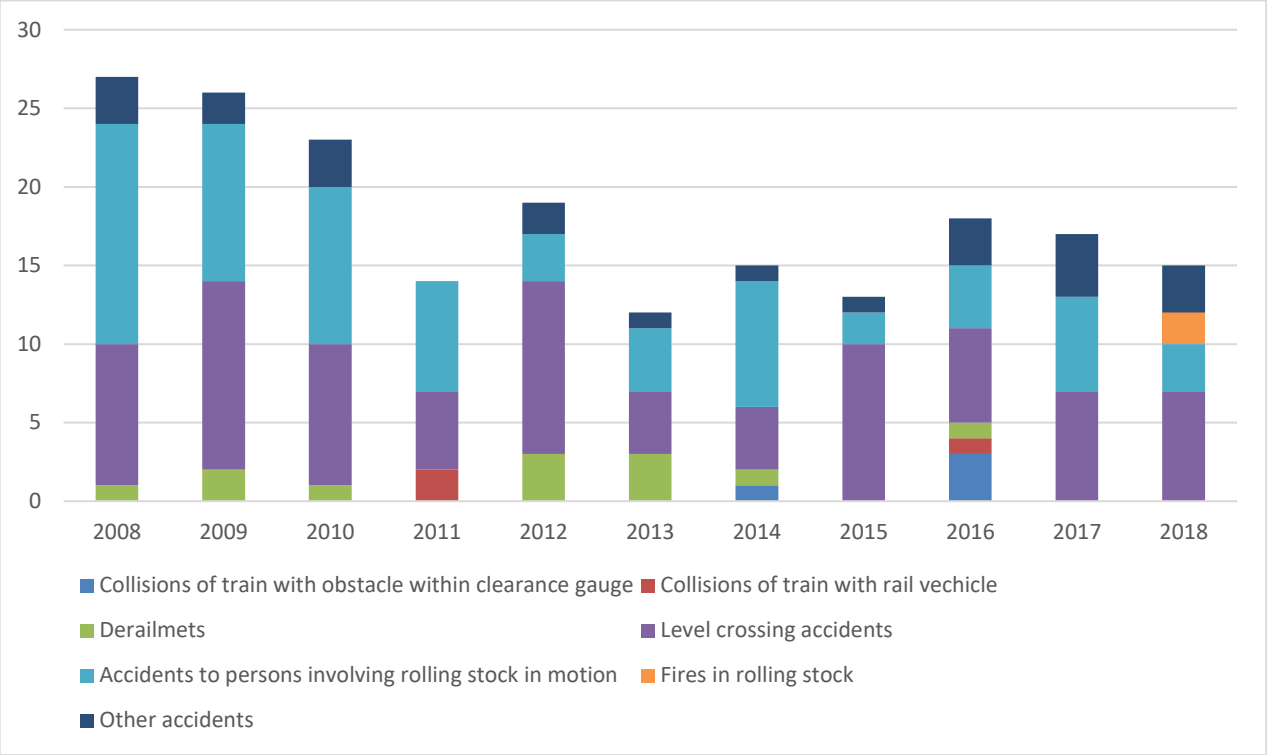


*Figure 1. Significant railway accidents in Finland in 2008–2018.*

Most accidents to persons on railways are caused by persons being struck by rolling stock in motion. No clear trend can be observed in the annual numbers of these accidents, which typically cause 50 to 60 fatalities every year. Most of these are deliberate.

Another category of accidents that claim several lives each year is level crossing accidents. In 2018, a total of 27 level crossing accidents resulted in 4 fatalities. The numbers of both accidents and fatalities are slightly below the averages recorded in recent years. While the annual number of level crossing accidents has significantly declined in Finland in the 2000s, the safety situation of level crossings in Finland remains clearly worse than for example in Sweden and Norway.

The safety of shunting operations has improved in Finland in the 2010s, but in 2018, the number of accidents and incidents in shunting work increased slightly from previous years. Several serious accidents and incidents occur in shunting every year. Their precursors are often associated with the shunting foreman’s or driver’s incorrect practices.

The derailment of tank wagons in temporary storage in Kinni, Mäntyharju on 7 April 2018 resulted in significant damage to the environment. While serious railway accidents involving the transport of dangerous goods are rare in Finland, a few less serious cases of leaks occur every year.

Safe coordination of track work and train traffic has been a key challenge to rail safety for a number of years, and there was no essential improvement in the safety situation in 2018, either. Typical occurrences related to track work, including unauthorised passing of the track work boundary, working without a track work permit, and errors in the opening of the track work site to traffic pose risks to the safety of both train traffic and track workers. Typical precursors of occurrences related to track work include lack of competence and shortcomings in the safety culture.

A great deal of work has been done recently to improve competence and the safety culture in the railway sector. While changes take time, sufficient competence can be ensured across the sector and the safety culture improved by sustained long-term efforts. The importance of a good safety culture is underlined as responsibilities related to railway safety are shared between an increasing number of operators. A good safety culture promotes the sharing of safety information, which further facilitates learning across the sector and improves safety.

# 2 Traficom's safety operations and organisation

## 2.1 Strategy and planning activities

In 2018, Trafi was commissioned by the Ministry of Transport and Communications to draft a Railway Safety Programme for 2019–2021. The purpose of the Safety Programme is to promote railway safety work by identifying development needs and proposing measures in response to these needs. The documentation of the Railway Safety Programme was completed in early 2019, at which time systematic implementation of the programme was also launched. While Trafi did not previously have a formal safety programme, the agency has used risk-based operations management for a number of years to develop railway operations.

The Safety Programme documentation describes the operators in the railway sector, their areas of responsibility and the legislative framework applicable to the railways. However, the main focus of the Safety Programme is on the current status of and challenges to safety and railway system development. The Safety Programme contains a number of proposals for actions of different scope and importance to respond to the challenges identified in the current state of safety and Trafi's field of operation. The challenges were identified and the proposals for actions developed by Trafi's experts. An effort was made to limit the proposed actions to those that could be implemented within Trafi's remit. However, some of the actions will also require an input from other railway actors.

The 30 actions proposed in the Railway Safety Programme were grouped under broader themes summing up the identified challenges to safety and Trafi's operations. These umbrella themes are:

- Challenges related to communication and situational awareness
- Development of guidance
- Needs to develop proactive safety work and supervision
- Comprehensive improvement of risk and change management
- Changes in safety situation and improving monitoring
- Evaluation of needs for regulatory measures.

A large share of the actions concern improving the flow of information between Trafi and the stakeholders involved in the railway system. More extensive information activities are needed about responsibilities in the railway system and situational awareness of safety, among other things. Efforts will be made to improve level crossing safety by continuing the implementation of a level crossing safety

programme together with the infrastructure manager, the Finnish Transport Infrastructure Agency (FTIA). Intervention in problems related to accidents to persons involving rolling stock in motion will include developing cross-administrative cooperation on this theme. The utilisation of safety information in the sector will be promoted by improving the accident and incident reporting rate and establishing a cooperation group that focuses on safety analyses in the railway sector. Several of the actions are related to the transport of dangerous goods, including updating the plan for supervising the transport of dangerous goods and promoting risk assessments concerning dangerous goods. The operators' monitoring activities will be improved by actively informing them about the importance of internal monitoring and developing the related reporting and official supervision. Efforts will be made to support FTIA's work to improve the safety of track work by organising joint meetings and in connection with renewing FTIA's safety authorisation and the subsequent audits.

Responsibilities for implementing Safety Programme actions have been assigned to the Trafi's personnel. A schedule for the actions has been prepared, and their implementation is reviewed each quarter. Some of the actions have also been tied to Trafi's performance targets. In the future, the Safety Programme is to be updated as necessary.

A safety culture evaluation model developed by ERA was piloted in Finland. In cooperation with three pilot organisations, the aim was to investigate how the model could be used to improve railway operators' safety culture, to find out if the evaluation is useful in terms of supervision, to test the suitability of ERA's model for the needs of Finnish rail traffic, and to test the method's effectiveness.

## 2.2 Safety recommendations

Table 1 below lists the safety recommendations issued by the Safety Investigation Authority to Trafi in recent years as well as the actions taken as a result.

*Table 1. Actions taken by Trafi based on the Safety Investigation Authority's recommendations.*

| **Safety recommendation** | **Actions taken** | **Status of implementation** |
|---|---|---|
| 2018-S14 When approving examiners and railway operators' safety management systems, the Finnish Transport Safety Agency should ensure that they have adequate procedures for verifying competence and that competence verification is reported on comprehensively. | Trafi applies EU level criteria for approving safety management systems. Evaluation has been harmonised in the EU area. In its audits, Trafi supervises in accordance with EU Regulations that activities are compliant with the operators' safety management systems. Competence and competence management are a priority area in Trafi's supervision activities. | In progress |
| 2018-S18 The Finnish Transport Safety Agency | Supervising the practical implementation of procedures | In progress |

| | | |
|---|---|---|
| should begin to supervise the practical implementation of safety management systems. | included in safety management systems is a specific target of Trafi's audits. However, with the current resources it is impossible to cover the entire safety management system in every audit. | |
| 2018-S17 The Finnish Transport Safety Agency should require radio controls used in shunting to have a separate emergency stop button with no delay. | In Trafi's view, adding an emergency stop button to old locomotives would be time-consuming and costly, and there is no sufficient evidence of its presumed benefits. | In progress |
| 2018-S4 The Finnish Transport Safety Agency should specify in greater detail the checks to be carried out as part of railworthiness inspections and the criteria for the competence and independence of the party carrying out the inspection. | The railworthiness inspection is part of rolling stock maintenance procedures. These procedures are described in the operator's safety management system, which Trafi supervises by means of audits.<br><br>Rolling stock maintenance is included in Trafi's audit plan. | In progress |
| 2017-S30 The Finnish Transport Safety Agency should impose on train drivers the duty of keeping a lookout when in train traffic. | Railway undertakings have added this to their internal guidelines. | Implemented |
| 2017-S6 The Finnish Transport Safety Agency and railway operators should supervise shunting work more effectively. | The level of supervision has been increased in audits and in operators' internal monitoring. | Implemented |
| 2016-S12: The Finnish Transport Safety Agency should create a harmonised system for occurrence reporting and classification covering all operators. | VR Group's occurrence reports are transmitted to Trafi via an electronic interface. An electronic interface with the Finnish Transport Infrastructure Agency's reporting system was completed in August 2019. Smaller operators submit their reports to the | Implemented |

| | | |
|---|---|---|
| | database by email or by using an online form. | |

## 2.3 Safety measures implemented unrelated to the recommendations

For other safety measures launched by Trafi, see section 2.1.

## 2.4 Safety organisational context

The ministry responsible for transport issues in Finland is the Ministry of Transport and Communications. It drafts the policies, strategies and legislation concerning the transport sector. The organisation structure in the Ministry of Transport and Communications' administrative branch was reformed at the beginning of 2019. Until the end of 2018, the national safety authority responsible for railways in Finland was the Finnish Transport Safety Agency Trafi. At the beginning of 2019, the Finnish Transport Safety Agency, the Finnish Communications Regulatory Authority and parts of the Finnish Transport Agency were merged to form the Finnish Transport and Communications Agency Traficom, which today serves as the national safety authority. A rail regulatory body that oversees the effectiveness and fairness of the rail market also operates in conjunction with Traficom.

The Finnish Transport Agency, which is the infrastructure manager of the state rail network, was renamed the Finnish Transport Infrastructure Agency (FTIA) at the beginning of 2019. Similar to its predecessor, the FTIA is also responsible for roads and waterways. In connection with the reform, the Finnish Transport Agency's traffic management services were incorporated in a state-owned company with a special task, Traffic Management Finland Oy (TMF Oy). TMF Oy's subsidiary, Finrail Oy, is responsible for traffic management on railways. Other subsidiaries of TMF Oy specific to each mode of transport are responsible for traffic management services for shipping, road traffic and aviation.

The Safety Investigation Authority, which operates in conjunction with the Ministry of Justice, is responsible for investigating rail accidents in Finland.

Traficom has more than 800 employees, of whom approximately 30 work mainly with railway matters. In early 2019, Trafi's organisation incorporated into the Traficom organisation almost in old form, and no changes were made to the organisation of tasks related to railways. Traficom has two units whose tasks focus on the railway sector: the unit Rai Transport Operators is responsible for processing safety authorisations and certificates as well as the supervising the railway sector. The unit Rail Infrastructure is responsible for approvals for rolling stock and rail infrastructure. Traficom also has a railway sector management group responsible for managing railway matters as a whole. A few persons in other Traficom units also work with tasks related to the regulation of railways and safety monitoring.

Traficom has a shared competence management system, which contains information on the personnel's qualifications and skills related to their tasks. The system is used for performance appraisal discussions with personnel members, and it contains information on the needs and objectives of developing personnel competence.

# 3 Safety performance

## 3.1 Safety of train traffic

The safety of train traffic remained at a good level in Finland in 2018. Significant accidents in train traffic are extremely rare, and the number of minor accidents is also low. The most typical accidents in train traffic leading to fatalities or personal injuries are level crossing accidents and accidents to trespassers involving rolling stock in motion. Other occasional train traffic accidents with typically less severe consequences include fires in rolling stock and collisions with obstacles.

While the safety level is good and accidents are rare, major precursors of incidents are present in train traffic. The speeds and masses involved in train traffic are extremely great, which is why any accidents may have very serious consequences. Normally, technical safety systems and staff competence are relied on to ensure train traffic safety, which is thus protected by several factors. However, the inadequate functioning of one or more safety factors causes serious incidents each year. In 2018, situations of this type included a train carrying dangerous goods that travelled with very inadequate break power and the operation of a passenger train without an effective Automatic Train Protection (ATP). In these cases, it was mainly good luck that kept accidents at bay. The occurrence of situations such as these clearly shows that, in order to ensure safety, continuous efforts are needed in the sector to develop safety management and risk management cooperation.

**Accidents in train traffic**

According to the statistics compiled by the FTIA, there were a total of 258 cases in which a train collided with an obstacle in 2018. Of these, 84% were collisions between a train and an animal. While collisions with animals rarely affect railway safety, they have major negative effects on the punctuality of train traffic. In the FTIA's classification, the rest of the cases were evenly divided between collisions with trees (8%) and other obstacles (8%).

In VR Group's statistics, collisions with animals are not classified as collisions, and VR Group's collision category is more limited also in other respects than the corresponding category of the FTIA. VR Group reported five collisions with obstacles in 2018 (Figure 2). In 2013–2017, VR Group has reported on average 6.8 collisions in its train traffic every year.

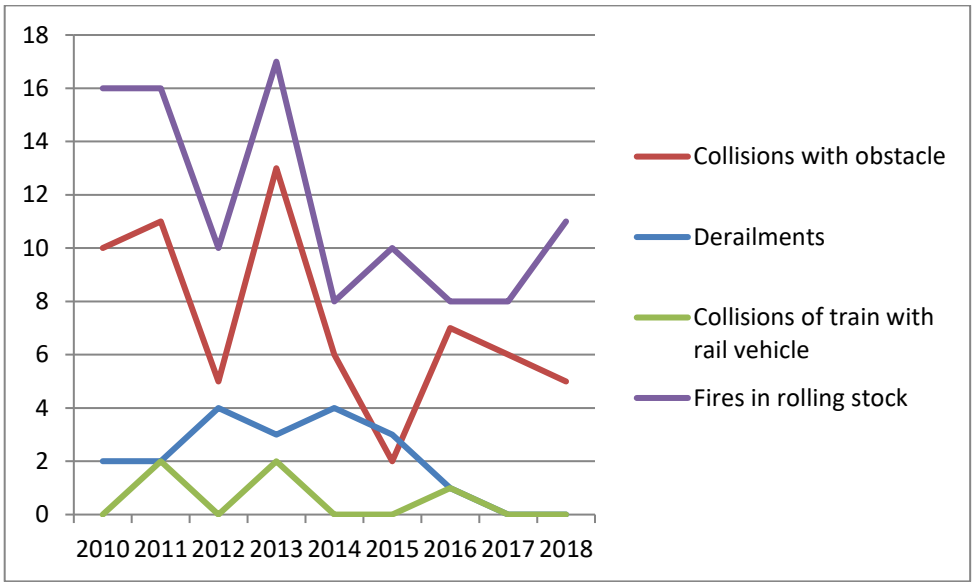


*Figure 2. Collisions, derailments and fires in VR Group's train traffic in 2010–2018.*

The number of collisions has decreased in the statistics of both the FTIA and VR Group. One of the factors contributing to the decrease has been that the FTIA has removed trees along tracks.

No collisions with an obstacle classified as a significant accident occurred in train traffic in 2018. The most recent collision with an obstacle classified as a significant accident took place in 2016, when three significant collisions with an obstacle occurred. In 2013–2017, an average of 0.8 significant collisions occurred each year.

An accident occurred in Salo on 9 June 2018 in which a car went through the safety railing at a flyover and fell onto the tracks. Several hours later, a passenger train travelling on the tracks collided with the car at the approximate speed of 140 km/h. The driver of the car died. The height difference between the place where the car left the road and the track exceeded 12 metres. This accident is not classified as a significant collision as it is unclear if the driver died when the car fell onto the tracks or when the train collided with the car.

There were no collisions between a train and another rolling stock vehicle in 2018. In the 2010s, on average 0.5 collisions between a train and another railway vehicle have occurred annually. The last collision between a train and another rolling stock vehicle classified as a significant accident took place on 13 August 2016 as a freight train collided with wagons standing on the tracks in the Oulu freight yard.

There were no significant rolling stock derailments in 2018. In 2013–2017, on average 2.2 derailments have occurred every year. The most recent derailment classified as a significant accident in Finland occurred in 2016 as a stop block left on the track derailed two wagons of a freight train on departure.

There were eleven fires in rolling stock in 2018. In 2013–2017, there were an average of 10.2 fires in rolling stock each year. In most cases, fires in rolling stock start in locomotive engine rooms or passenger carriages' heating equipment.

Two of the fires in rolling stock in 2018 are classified as significant accidents because of the material damage caused. A railbus caught fire in Huutokoski on 15 October 2018. Around 70 passengers were evacuated to Huutokoski station from the burning railbus. While no personal injuries were sustained, the costs of damage to the rolling

stock exceeded the limit of a significant accident, or EUR 150,000. The other fire classified as a significant accident occurred in Turtola on 23 February 2018 in the locomotive of a freight train. The fire originated in the engine room and damaged the locomotive beyond repair. The costs incurred were considerably above the limit value of EUR 150,000. Before this, the most recent fire in rolling stock classified as a significant accident in Finland occurred in 2007.

On 2 July 2018, the cab of a passenger train caught fire in a tunnel on the Ring Rail Line. Following instructions issued, the driver took the passenger train to the next station (Aviapolis), where it was evacuated. The accident caused no personal injuries and only relatively minor material damage.

**Incidents in train traffic**

As accidents in train traffic are rare and random variations play a major role in their yearly numbers, the short-term trend in accident numbers is not the best indicator for developments in the level of safety. Incidents happen more frequently, and by monitoring their numbers and risk levels, a more accurate picture can be obtained of the development of safety. A change in the number of reported incidents may indicate changes not only in the safety situation but also in the culture of reporting occurrences. In recent years, no major changes have occurred in the total numbers of incidents in train traffic.

As in previous years, coordination of train traffic and track work resulted in a number of incidents in 2018. For more information about these incidents, see the section Safety of track work.

According to FTIA statistics, there were 41 cases of passing a signal at danger in 2018 (Figure 3). The number of these incidents was somewhat smaller in 2018 than in previous years. Four of the cases in 2018 caused an immediate collision risk. Some factors of uncertainty are associated with the statistics on passing a signal at danger, and the figures thus cannot be considered fully reliable. The numbers of incidents of passing a signal at danger reported by railway operators do not match the numbers reported by the FTIA; therefore, no firm conclusions on trends in incident numbers can be made.

Passing a signal at danger is a significant incident, and these cases have led to accidents in the past. Usually, they occur at low speeds, and the automatic train protection (ATP) device stops the rolling stock as soon as the signal has been passed. When operating without ATP, however, the risks of passing a signal at danger are accentuated.

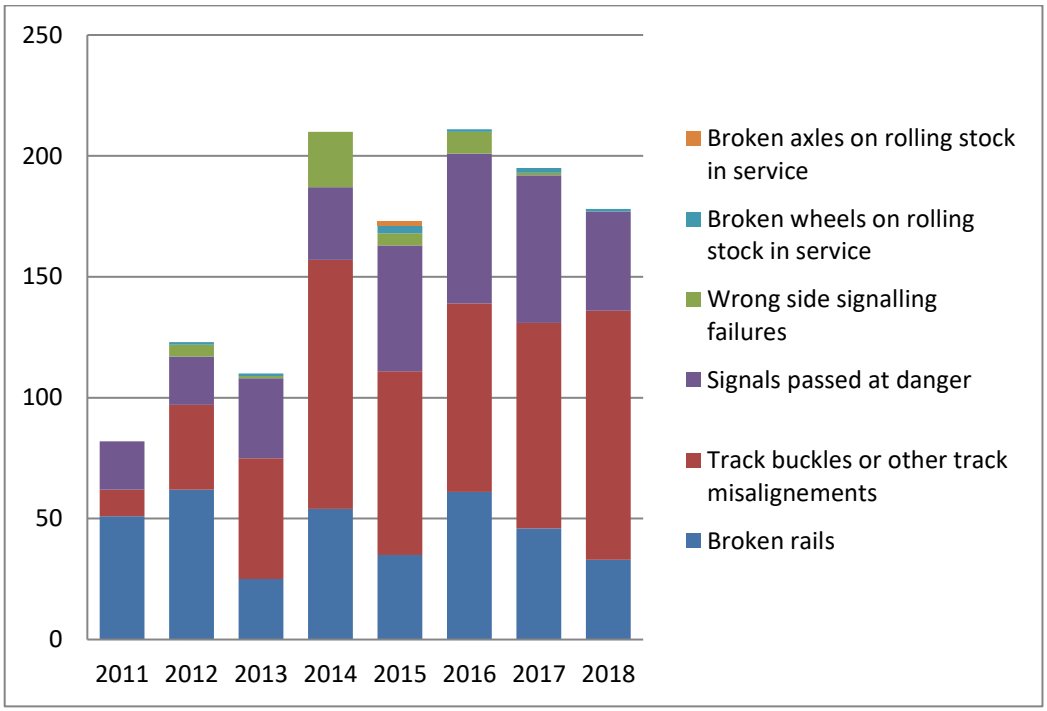


*Figure 3. Incidents and precursors on railways according to the EU Common Safety Indicators in 2011–2018.*

*Incidents involving infrastructure*

In 2018, 147 route protection failures occurred. In seven cases, rolling stock was erroneously routed to tracks with an obstacle, and in the remaining 140 cases to tracks with no obstacle. According to FTIA statistics, the number of route protection failures in proportion to train-kilometres slightly reduced compared to 2016 and 2017. The FTIA's analysis indicates that approximately 80 per cent of the route protection failures are caused by traffic control errors and the remaining 20 per cent by errors in the automated traffic control system. A typical consequence of a route protection failure is that a train is directed to wrong tracks. According to the FTIA's analysis, these incidents are frequently associated with work induction situations, situations related to track work or shunting, and situations involving different changes, including exceptional stops and timetable adjustments.

As a result of a route protection failure, a freight train carrying dangerous goods, which was early, was incorrectly directed to the tracks closest to a passenger platform in Hankasalmi on 8 September 2018. The freight train prevented passengers from accessing a passenger train, which arrived later, from the platform area. The passengers had to pass between and underneath the freight wagons with dangerous goods, getting their hands and clothes dirty. At least one of the passengers developed mild skin symptoms.

A relatively high number of route protection failures is seen in marshalling yard traffic control. Marshalling yard traffic control refers to an operating model introduced in 2016 in which the party maintaining the area provides traffic control within a limited area while carrying out yard maintenance work. One of the factors contributing to these kinds of failures is often the workers' relatively short experience of the railway system.

A wrong-side signalling failure means a situation arising from a technical defect where the signalling information given to the train is less restrictive than that demanded. No wrong-side signalling failures were reported in 2018. In previous years, the number of these incidents has varied between one and 23. The large variation in the number of wrong-side signalling failures may partly be explained by the definition of these incidents being open to interpretation.

A declining trend can be observed in the yearly numbers of broken rails. In 2013–2017, an average of 44 broken rails were reported annually, whereas 33 were reported in 2018. In the worst case, a broken rail may result in derailment. According to an expert at the FTIA, broken rails are caused by failures in welding work. Broken rails tend to come as a surprise because of shortcomings in track inspection activities. The FTIA has launched actions to improve the quality of track and welding work. A total of 103 track buckles were reported in 2018. Track buckle means any fault related to the continuum and the geometry of track, requiring track to be placed out of service or immediate restriction of permitted speed. In 2013–2018, on average 78 track buckles were reported each year. There is a growing trend in the numbers of reported track buckles, which is at least partly explained by the better coverage of reporting. The FTIA also keeps statistics on other damage to track structures. The number of reported cases of damage to track structures has varied between 223 and 707 in recent years. In 2018, 341 cases of damage to track structures were reported.

In the FTIA's view, the condition of the railway infrastructure has mainly remained unchanged in recent years, but some parts have deteriorated. This deterioration is, above all, caused by the rail network repair backlog, which has led to reduced accuracy. The number of different safety device faults has increased in recent years. These faults make it necessary to transfer to manual traffic control, which increases risk levels. Safety device faults also cause traffic delays. The disruptions due to the repair backlog and safety device faults increase the workload of traffic control, thereby also increasing the risk levels associated with this function.

*Incidents involving rolling stock*

One case of a broken wheel in rolling stock was reported in 2018. In 2013–2017, on average 1.4 of these incidents have been reported yearly. No broken axles of rolling stock were reported last year, and such incidents have also been extremely rare in previous years. A broken axle or wheel may result in derailment.

A significantly greater than average number of open doors in rolling stock was reported in 2018. The number of cases reported last year was 27, whereas the average of the previous five years is 19.6. Typically, as an open door in rolling stock is reported a door remaining open in a freight train, or a door on a passenger train that opens because of a fault in the door control or because the door is not locked.

A total of seven cases where wagons became uncoupled were reported in 2018. The number of these incidents was clearly lower than the average of the last five years (14.4). The risks associated with uncoupling of wagons are usually fairly low because the uncoupling will lead to the emptying of the brake pipe, application of breaks, and the stopping of the train.

*Vandalism*

The Finnish Transport Infrastructure Agency (FTIA) reported 207 cases of vandalism in 2018. The number was substantially smaller than the average for the period 2013–2017, in which it was 382. The FTIA divides vandalism cases into the subclasses of vandalism, traffic vandalism and metal theft. The subclass of vandalism contains cases that do not cause danger to the railway system. This class included 53 cases. The subclass of traffic vandalism contains cases that cause a hazard to the railway system. A total of 152 of these cases were reported, while two cases were placed in the class of metal theft. Damage caused by vandalism to the rolling stock and the tracks is typically minor, but vandalism always bears the risk of causing a serious accident. In many cases, the perpetrators put themselves at the greatest danger as they have the risk of being run over.

**Event risk classifications and safety factors in train traffic**

Traficom classifies the event risk of all accidents and incidents reported to it. The event risk classification is based on an estimate of how likely similar incidents are to result in accidents and what the estimated consequences of the accidents most likely to result from the incidents would be. Based on the event risk classifications, events with the highest risk are accidents to persons involving rolling stock in motion and level crossing accidents, as they result in several serious accidents to persons each year. Based on the event risk classifications, signals passed at danger, collisions with obstacles, route protection failures, incidents involving track work and level crossing accidents are the occurrences putting the train itself and the staff and passengers on the train at the highest risk. The risk profiles of incidents involving signals passed at danger and route protection failures are very similar. The likelihood of individual incidents in these two categories leading to an accident is fairly low. However, the consequences of the accidents that may result from such incidents would, in typical cases, probably be quite serious, primarily because of the personal injuries caused by the potential collision. Similarly, a collision between a train and a track work machine or a vehicle may also cause serious injuries to train passengers.

In connection with the event risk classifications, an effort is made to identify safety factors in occurrence reports. Safety factors are factors on which safety is based or which may contribute to an accident or an incident and its development, either negatively or positively. When safety factors contributing to incidents and accidents in train traffic between 2014 and 2019 are examined, it emerges that a poor situational awareness played an important role in many high-risk cases. The poor situational awareness of the train driver has led to such incidents as passing of signals at danger and situations where the train is in motion even though the ATP device is switched off. The poor situational awareness of traffic controllers, on the other hand, has led to route protection failures.

Other negative safety factors repeatedly occurring in high-risk events include the appropriateness of practices for real-life situations, the practical application of procedures and information, and the clarity of presenting information. It has been estimated that shortcomings related to the appropriateness of practices have been precursors for such incidents as passing of signals at danger, route protection failures and a situation where a train is in motion with the ATP device switched off. Inadequacies in the practical application of procedures and information have mainly contributed to route protection failures and cases involving the passing of signals at danger. Shortcomings associated with the clarity of information have emerged in cases of passing signals at danger, errors associated with an automated traffic

control system, information flows in exceptional situations, and a situation where a train has been operated with the ATP device switched off.

The examination of positive safety factors identifies factors that have prevented incidents from developing into accidents. Situational awareness is highlighted as the most common positive safety factor of occurrences in train traffic. In a typical case, the train driver notices a routing failure or the conductor spots an open door in a passenger train in motion before there are more serious consequences. Good situational awareness has also been identified in situations where the staff's rapid reaction and resourcefulness have prevented accidents to persons involving rolling stock in motion. Problem-solving and decision-making have been identified as positive safety factors in a few cases, for example in situations where the train driver has, by making the right decisions, minimised the impacts of fires in rolling stock.

## 3.2 Safety of shunting

Shunting refers to the moving and sorting of vehicles to support train traffic. More accidents and incidents usually occur in shunting operations than in train traffic because, unlike in train traffic, technical safety systems only play a minor role in shunting, and the shunting staff has the main responsibility for ensuring the safety of the work. Because of the low speeds involved, however, the consequences of shunting accidents usually are less serious than those occurring in train traffic. Nonetheless, extremely serious accidents may also occur in shunting because of the great masses of the vehicles and the potential of dangerous goods being present.

A clear decreasing trend can be discerned in the numbers of shunting accidents and incidents in the 2010s. The factors promoting the positive development in safety have included at least improved work instructions and working practices and the improved condition of private sidings. Milder than average winters have improved working conditions and reduced the number of derailments occurring in shunting operations. In 2018, the total number of shunting occurrences slightly increased. Especially the number of derailments in shunting went up compared to the previous years. This increase may have been influenced by the higher volume of shunting work resulting from increased train traffic.

The causes of shunting accidents and incidents are frequently associated with the shunting foreman's or driver's incorrect practices, such as keeping insufficient lookout or excessive speed. Incorrect work practices are often a result the feeling of being in a rush, tiredness, a poor level of alertness or challenging winter conditions. Misunderstandings and lack of standard phrases in spoken communication often contribute to occurrences.

One of the most serious shunting accidents of recent years took place at Kinni traffic operating point in Mäntyharju on 7 April 2018. Fifty tanker wagons, which were in temporary storage at Kinni traffic operating point, started moving and collided with a buffer stop. The wagons crushed the buffer stop, and two of them were derailed. The tank of one of these wagons was broken in the collision, and approximately 35,000 kilograms of MTBE used for manufacturing petrol leaked into the ground. The number of stop blocks used to secure the wagons had not been sufficient to hold the

wagons once the weather became warmer and humidity affected the blocks' holding ability. The leak caused extensive damage to the environment.[2]

Several other incidents also occurred in 2018 where wagons left standing on the track started moving of their own accord. In Kouvola on 16 June 2018, for example, a group of 20 wagons ran away, unlocking two points before they stopped approximately one kilometre away from where they started.

In addition to the dangerous goods accident in Kinni, two significant shunting accidents occurred in 2018. In Simpele on 11 January 2018, two shunting unit wagons were derailed, damaging three points and several point heating system covers. The material damage caused by this accident exceeded EUR 150,000. In Kouvola on 8 November 2018, two wagons carrying dangerous goods were derailed on a private siding, damaging the wagons and the point. This accident also caused material damage exceeding EUR 150,000.

According to VR Group's statistics, 82 derailments occurred in shunting work in 2018 (Figure 4). Even though the statistics compiled by VR Group do not cover all shunting work performed in Finland, they currently provide the most comprehensive data on the subject. The number of derailments clearly increased compared to the average of the five previous years, or 66.4. The winter of 2018 also brought the greatest volumes of snow seen in Finland for a few years, and it is likely that this contributed to the number of shunting derailments. In addition to snow and ice, litter accumulatng in grooved rails typically causes derailments of empty freight wagons, especially on private sidings.

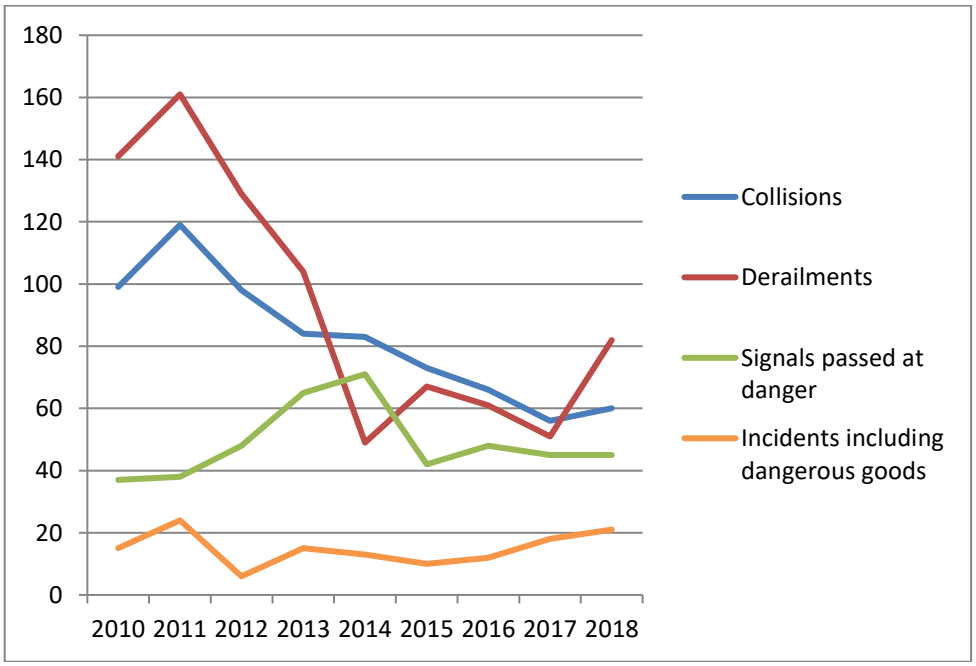


*Figure 4. Shunting occurrences in VR Group's statistics in 2010–2018.*

According to VR Group's statistics, a total of 60 derailments took place in shunting operations in 2018. In 2013–2017, an average of 72.4 collisions occurred each year. In the early 2010s, an average of almost one hundred collisions occurred in shunting annually, and the trend in collision numbers thus is clearly declining. Collisions in

[2] Säiliövaunujen suistuminen Mäntyharjulla 7.4.2018 [Rail tank wagon derailment in Mäntyharju 7 April 2018]. Safety Investigation Authority. Investigation report R2018-01 (in Finnish). <*www.turvallisuustutkinta.fi*>. Retrieved on 12 July 2019.

shunting are typically caused by shunting workers' errors, including excessive speeds or keeping insufficient lookout.

One collision and one serious incident occurred in hump shunting in 2018. In Kouvola on 11 April 2018, shunting hump breaks failed as a group of 18 diesel wagons was passing through. The tank wagons unlocked the point and collided with wagons carrying sawn goods that were on the tracks, derailing one of them. In Tampere, wagons ran away over a shunting hump on 25 May 2018. The wagons rolled all the way to the tracks used by a freight train, causing a risk of collision. The incident was caused by incorrect use of shunting hump breaks.

VR Group reported 45 cases of passing a signal at danger in shunting work in 2018. In 2013–2017, an average of 54.2 of such incidents were reported each year.

Occurrences related to the transport of dangerous goods (derailments, collisions and leaks), numbered 21 in total according to VR Group's statistics for 2018. The number of these occurrences clearly increased compared to the average for 2013–2017, which was 13.6.

VR Group has striven to improve shunting safety by improving the safety culture and attempting to ensure that safe work practices are used in shunting. Among other things, shunting safety can also be improved by avoiding excessively tight schedules, investing in marshalling yard maintenance and by using digital communications and standard phrases.

**Event risk classifications and safety factors in shunting operations**

Traficom classifies the event risk of all accidents and incidents reported to it. The event risk classification is based on an estimate of how likely similar incidents are to result in accidents and what the estimated consequences of the accidents most likely to result from the incidents would be. Based on the event risk classifications, the greatest risks in shunting are associated with passing a signal at danger, level crossing accidents, collisions between vehicles, and collisions with obstacles. A relatively high number of cases of passing signals at danger occur in shunting every year, and they often cause rather high risks, for example because of the collision risk. A few level crossing accidents occur in shunting every year, and because of the resulting fatal and non-fatal injuries, the risk level of these cases is high. Collisions between vehicles sometimes result in personal injuries and major material damage, which is why their risk level is high. An accident that occurred in Mäntyharju on 7 April 2018 is classified as a collision with an obstacle, and it accounts for most of the risk level for this category. However, most of the collisions with obstacles occurring in shunting work have a fairly low risk level.

In connection with the event risk classifications, an effort is made to identify safety factors in occurrence reports. Safety factors are factors on which safety is based or which may contribute to an accident or an incident and its development, either negatively or positively. Poor situational awareness and the practical application of procedures emerge as negative safety factors contributing to shunting occurrences. Lack of situational awareness has been highlighted in several cases involving passing of signals at danger, collisions, routing failures and derailments. Practical application of procedures and information as a negative safety factor may, for example, involve a situation where a breach of work instructions has contributed to a collision, derailment, runaway rolling stock, or a routing failure. Keeping insufficient lookout or

poor communication are typical examples of problems involving the practical application of procedures and information. Practices that are inappropriate for real-life situations and problems related to the availability of information have also been identified as safety factors causing certain occurrences.

Positive safety factors in shunting work – that is factors helping to minimise the consequences of occurrences – include the availability of information at the right time, situational awareness, problem-solving and decision-making. The availability of information at the right time has helped minimise the consequences of occurrences in situations where a smooth flow of information has enabled the stopping of runaway rolling stock. Good situational awareness and the resulting fast responses have prevented, for example, a routing failure or a level crossing incident from developing into an accident.

## 3.3 Safety of transport of dangerous goods

The main data source for this section has been Trafi's report on accidents and incidents in the transport of dangerous goods by rail[3].

In 2017, a total of 5.0 million tons of dangerous goods were carried by rail in Finland. While the volumes of dangerous goods transported have remained more or less the same in recent years, they have slightly decreased from the 1990s level. While dangerous goods are transported almost across the entire rail network, rail sections in Southeast Finland are a clear focal point for these operations. Services from Russia to Finland represent slightly over 40 per cent of the dangerous goods carried on the Finnish railways. Transit traffic from Russia via Finnish ports accounts for roughly one third of the dangerous goods transports on the Finnish railways, and the remaining quarter is comprised of domestic traffic. Services for the chemical industry account for a majority of the dangerous goods carried by rail. In 2017, 55 per cent of the dangerous goods carried by rail were inflammable liquids, followed by corrosive substances (20%) and gases (17.2%). The shares of other categories in the transport volumes were clearly smaller.[4]

Currently, the most comprehensive statistics on accidents and incidents involving the transport of dangerous goods by rail are contained in VR Group's railway safety report, which is a compilation of data from VR's accident and incident reports. VR Group is responsible for most transport services of dangerous goods in Finland, and the company's statistics thus provide a relatively comprehensive picture of occurrences in the transport of dangerous goods. Of these, leaks constitute the most common type. The year 2018 was the second consecutive year in which no leaks of dangerous goods were reported in the rail transport sector. Overall, the trend in these leaks seems to be declining (Figure 5).

[3] Rautateillä vaarallisten aineiden kuljetuksissa tapahtuneet onnettomuudet ja vaaratilanteet. Trafi's publications 21/2018 Ville Vainiomäki. Helsinki 2018. *<https://arkisto.trafi.fi/filebank/a/1543399724/d554128b8cd33e669077a687d70eb0b6/32615-Trafin_julkaisuja_21_2018__Rautateilla_vaarallisten_aineiden_kuljetuksessa_tapahtuneet_onnettomuudet_ja_vaaratilanteet.pdf>*. Retrieved on 27 August 2019.

[4] Vaarallisten aineiden kuljetukset vuonna 2017. Traficom publications 4/2019. Hanna Strömmer Helsinki 2019. *<https://www.traficom.fi/sites/default/files/media/publication/Traficomin%20julkaisuja_4_2019_VaarallistenAineidenKuljetukset2017.pdf>.* Retrieved on 27 August 2019.

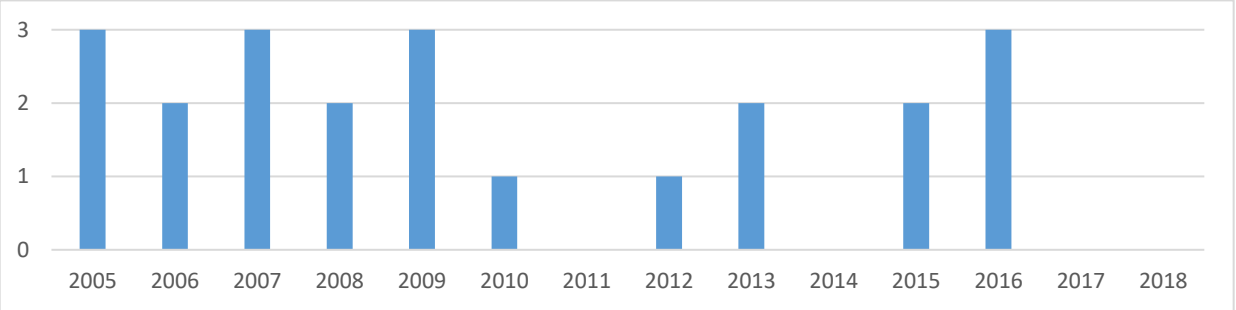


*Figure 5. Leaks of dangerous goods in rail transport in 2005–2018, VR Group's statistics.*

Apart from leaks, accidents involving the transport of dangerous goods are rare, but incidents do occur from time to time. One of the most threatening incidents in the transport of dangerous goods by rail in 2018 occurred between Turku and Uusikaupunki on 25 April 2018. No break pipe had been connected between the two locomotives of a freight train pulling ammonium wagons to Uusikaupunki; because of this, the breaks of only one locomotive worked on the train when it departed from Turku. The reduced break power was only detected when the driver tried to slow down the moving train as it was approaching a 30 km/h speed limit. Due to the lack of break power, the train hardly slowed down and was running significantly over the speed limit in the 30 km/h zone. There was no other traffic on this rail section, and the incident did not result in an accident.

A majority of the incidents involving the transport of dangerous goods occurs during shunting. VR Group's statistics show that the number of occurrences involving the transport of dangerous goods has slightly increased in 2017 and 2018 compared to 2012–2016 (Figure 6).

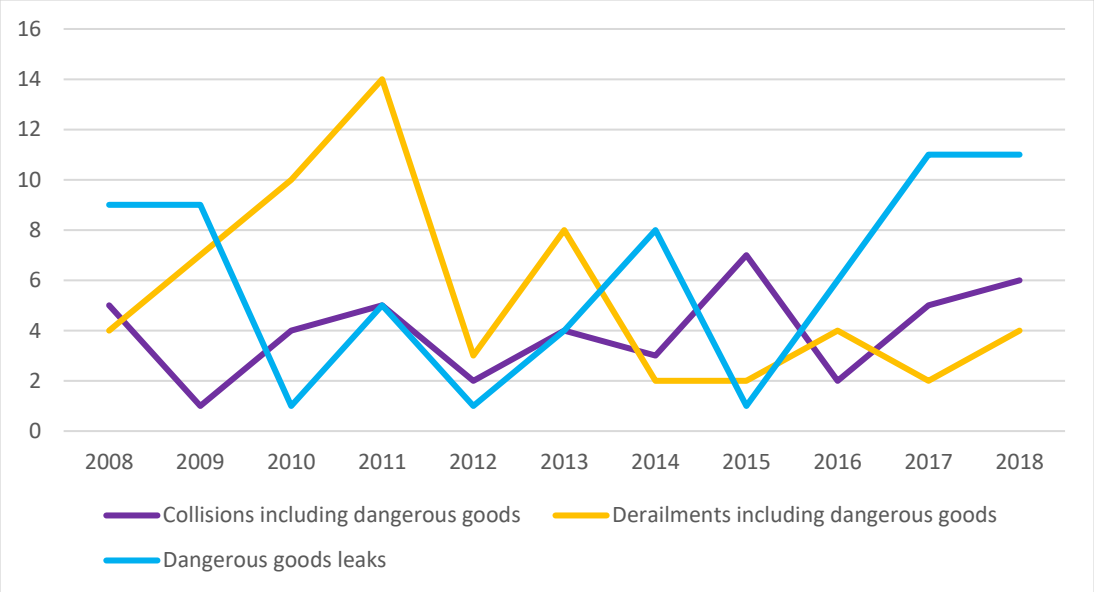


*Figure 6. Shunting occurrences involving the transport of dangerous goods in VR Group's statistics in 2008–2018.*

In recent years, leaks have been the most common type of shunting-related occurrences involving the transport of dangerous goods. Most of the leaks of dangerous goods during shunting have concerned liquids. Collisions have been the second most common shunting-related occurrence involving the transport of dangerous goods in recent years. Most of the collisions in shunting took place as a locomotive was pushing the wagons. Typically, shunting collisions involving the

transport of dangerous goods have resulted from a human error made by a shunting worker. The number of derailments of wagons carrying dangerous goods during shunting has gone down in the 2010s. A few derailments have been caused by stop blocks left on the rails. Snow and ice accumulating in grooved rails have caused derailments, especially of empty dangerous goods wagons. Most of the derailments of wagons transporting dangerous goods have not resulted in leaks. Typically, the leaks are minor leaks from valves, the most common reason for which is that the valve was not tight enough. The number of collisions between shunting units carrying dangerous goods has remained rather stable in recent years.

The most serious accident involving the transport of dangerous goods by rail in recent years took place at Kinni traffic operating point in Mäntyharju on 7 April 2018. Fifty tanker wagons, which were in temporary storage at Kinni traffic operating point, started moving and collided with a buffer stop. The wagons crushed the buffer stop, and two of them were derailed. The tank of one of these wagons was broken in the collision, and approximately 35,000 kilograms of MTBE used for manufacturing petrol leaked into the ground. The number of stop blocks used to secure the wagons had not been sufficient to hold the wagons once the weather became warmer and humidity affected the blocks' holding ability. The leak caused extensive damage to the environment.[2]

No clear trend can be observed in the total number of occurrences in the transport of dangerous goods by rail. The consequences of typical occurrences involving the transport of dangerous goods by rail are minor: derailments do not usually result in leaks, and any leaks are mainly minor ones through valves. However, individual extremely serious incidents occur each year, resulting in either a serious accident or a very near miss. As a rule, the dangerous goods most often involved in accidents and incidents are the same as the ones most commonly transported over the rail network: inflammable liquids, corrosive substances and gases.

## 3.4 Safety of track work

Track work refers to work carried out on or near the tracks that may affect traffic safety. Safe coordination of track work and train traffic has been a key challenge to railway safety for a number of years. Typical occurrences related to track work, including unauthorised passing of the track work boundary, working without a track work permit, and errors in the opening of the track work site to traffic pose risks to the safety of both train traffic and track workers.

Most track work is carried out on the state-owned railway network managed by the Finnish Transport Infrastructure Agency (FTIA). The FTIA gauges the development of the track work safety by incident frequency, in which the number of accidents, incidents and human errors is examined in proportion to the number of track work permits. The number of occurrences related to track work in total and in proportion to track work permits has slightly decreased compared to 2016 and 2017, but this change cannot be considered significant. In 2018, 50 cases of working without a track work permit were reported, and their incident frequency slightly decreased from the two previous years. In total, 41 cases of unauthorised passing of the track work boundary were reported in 2018, and the accident frequency rate of such cases remained unchanged compared to 2016 and 2017. The frequency of errors in opening a track work site to traffic and breaches of safety instructions decreased

compared to the two previous years. On the other hand, the frequency of errors in the lookout man procedure went up.

Based on the FTIA's observations, typical causal factors of safety occurrences are:

- rushing, or a feeling of being in a rush
- insufficient skills and induction training
- shortcomings in communication
- shortcomings in situational awareness and understanding of complex wholes
- presumptions
- inadequate advance planning of works
- experience of the routine nature of jobs
- shortcomings in safety culture.

The sector's safety culture has sparked discussions for years, and efforts have been made to improve it. The maturity of the safety culture in the rail transport sector varies greatly from one organisation to another, but also within organisations. There are examples of a good safety culture evidenced by active development efforts and open sharing of safety information. Shortcomings in safety culture are often related to the neglect of safety instructions or inadequate induction training and skills.

The opening up of track maintenance to competition brought about a major change in the operating environment. The number of companies operating in the sector and the volume of subcontracting have significantly increased. The use of agency workers is also more common. This change poses a great challenge to safety management, safety culture development and competence management in the sector. The key challenges in the sector include the broad-based development of safety culture and competence among all track work personnel.

The FTIA and operators in the sector have striven to improve the safety of track work by several different means in recent years. RUMA, a mobile platform for track work contractors was launched in 2018. This app has made it possible to digitalise track work notices and site locations. Experience has shown that the introduction of the RUMA system has reduced the number of cases of working without a permit and unauthorised passing of the track work boundary. The FTIA has also continued developing the operation of the Rail Training Centre (RTC) opened in Kouvola in 2017. At RTC, track maintenance workers can be trained for the maintenance of points, electrical equipment and safety devices in authentic conditions. Following changes in legislation on qualifications in the rail transport sector that entered into force in summer 2018, the qualification requirements for persons overseeing track work are no longer laid down by law. The FTIA's safety management system now contains a description of the qualification requirements and methods of verifying competence for track work tasks critical for safety. RTC plays a key role in training track workers and verifying their competence.

Other actions taken by the FTIA include updating the safety guidelines for track maintenance based on the observed shortcomings and developing its procurement and contract models to ensure that subcontractors focus on safety.

## 3.5 Level crossing safety

In the light of the key figures, 2018 was very similar to previous years in terms of level crossing safety. A total of 27 level crossing accidents occurred in 2018, which is slightly below the average for 2013–2017, or 31.2. The number of serious casualties resulting from level crossing accidents was also similar to the average for previous years. An examination covering a longer period shows a clear reduction in the number of level crossing accidents. In 2000–2018, there were an average of 42.8 level crossing accidents each year. Figure 7 illustrates this declining trend.

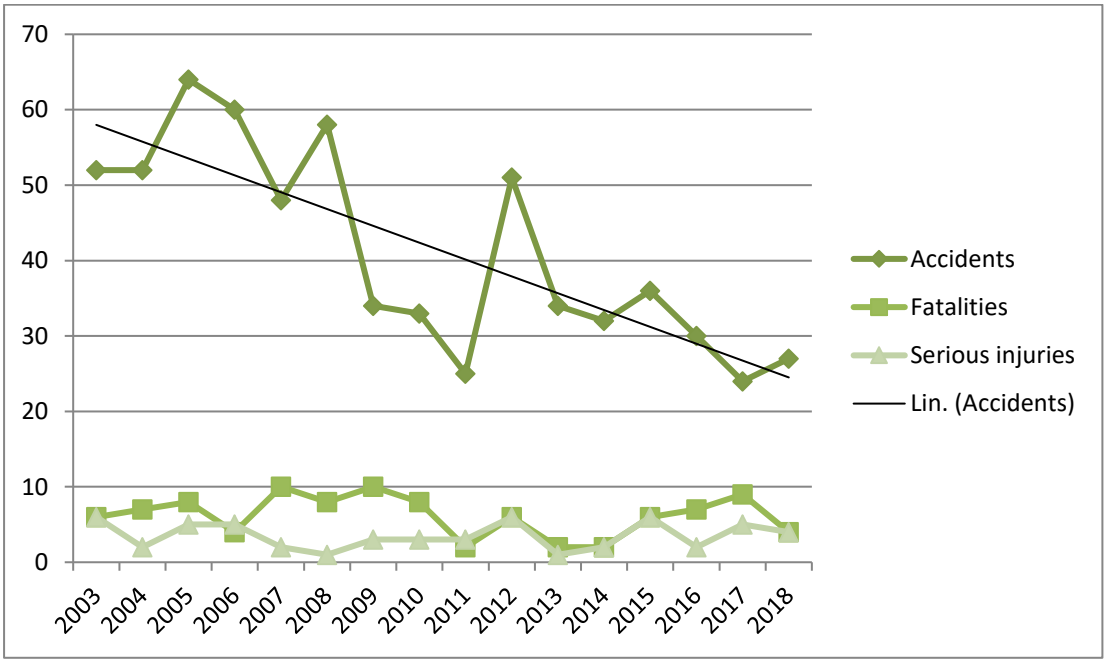


*Figure 7. Numbers of level crossing accidents and the resulting casualties in 2003–2018.*

Despite the reduction in the number of level crossing accidents, they still constitute one of the most significant safety risks in the railway system. They account for almost a half of all significant accidents occurring on the Finnish railway network. In addition to casualties and material damage, level crossing accidents also cause disruptions to the punctuality of traffic.

In 2018, level crossing accidents resulted in four fatalities, and four persons sustained serious injuries. Between 2013 and 2017, there were an average of 5.2 fatalities in level crossing accidents each year, while 3.2 persons sustained serious injuries. Seven of the level crossing accidents that occurred in 2018 are classified as significant accidents based on the resulting casualties. In 2013–2017, there were an average of 6.2 such cases each year. One of the significant level crossing accidents in 2018 took place at a crossing equipped with half barriers. The remaining six significant level crossing accidents occurred at passive level crossings. No level crossing accidents resulting in several deaths occurred in 2018.

One of the level crossing accidents with the most serious consequences in 2018 occurred in Kemijärvi on 12 December 2018, as a freight train collided with a truck. The truck driver lost his life in the accident, and one of the train's drivers was injured. The locomotive was derailed and badly damaged in the accident. There was also damage to the tracks over a distance of approximately 400 metres, which put this line section out of service for several days and hampered forest industry transport services in the area.

The most effective way of improving level crossing safety is eliminating level crossings. Consequently, a reduction in the number of level crossing to a great extent explains the reduction in the number of level crossing accidents over the last few decades. Other methods for improving level crossing safety include equipping crossings with barriers and warning systems and improving visibility in level crossing environments.

Following a level crossing accident that claimed the lives of three conscripts in October 2017, the Ministry of Transport and Communications adopted an action plan for improving level crossing safety for 2018–2021. The objective of the action plan is to improve level crossing safety by all possible means and to save as many lives as possible. Action plan projects include:

- Eliminating or improving 65 level crossings
- Putting up stop signs at level crossings
- Promoting the introduction of more cost-effective warning systems
- Investigating the potential of using geospatial data for improving level crossing safety.

The budget of this four-year action plan is approximately EUR 28 million. The main responsibility for implementing the action plan rests with the FTIA as the manager of the state-owned rail network.[5]

A report commissioned by Traficom on level crossing safety in the Nordic countries was completed in 2019. It compared level crossing safety in Finland to the situation in Sweden and Norway. The report also looked at the factors explaining the observed differences in safety levels. The examination of accident numbers was based on significant level crossing accidents. There is a high number of level crossings not only in Finland but also in Sweden and Norway, and similarly to Finland, many of these are passive, especially in Norway. The report indicates that in proportion to the population and number of level crossings, the number of level crossing accidents in Finland is slightly higher than in Sweden and clearly higher than in Norway. In Finland, more than 80 per cent of the level crossing accidents occur at passive crossings, whereas in Sweden and Norway, more than a half of these accidents take place at level crossings with warning systems. Several factors influence the differences in level crossing safety between the countries. One of the key factors is that in Sweden and Norway, the much more funding is allocated to railway network and level crossing maintenance, which may lead to the presumption that level crossings are in a better condition. While all three countries have a relatively high number of level crossings, there are differences between the condition and level of equipment of the crossings. The traffic environments in which level crossings are

[5] Liikenneviraston tasoristeyksien turvallisuuden parantamisohjelma sisältää 65 tasoristeyksen listan – toimenpiteet käyntiin heti [FTA's programme for improving level crossing safety covers 65 level crossings – measures launched immediately]. Finnish Transport Infrastructure Agency's website. <*https://vayla.fi/-/liikenneviraston-tasoristeyksien-turvallisuuden-parantamisohjelma-sisaltaa-65-tasoristeyksen-listan-toimenpiteet-kayntiin-heti#.XMLbu-gzY2w*>. Retrieved on 26 April 2019.

used are also different. No information is available on any differences in drivers' traffic behaviour between the countries.[6]

## 3.6 Safety of private sidings

Private sidings are tracks owned by industrial plants, ports and municipalities that connect to the state-owned railway network. There are about 130 private siding managers in Finland. The length of private sidings varies from a few hundred metres to networks of dozens of track kilometres. Most of the traffic on private sidings is shunting.

The safety situation on many of Finland's private sidings was quite poor in the late 1990s and early 2000s, and the bad condition of the sidings caused a small number of accidents. Over the last ten years, infrastructure managers have understood their responsibility for managing the infrastructure and invested in track maintenance, which has improved the safety situation of private sidings.

In 2016–2019, infrastructure managers of private sidings reported 91 accidents and incidents to Traficom. Only a small proportion of the occurrences on private sidings are reported, and the reported number does not correspond to the actual number of occurrences. The reported occurrences and the safety reports produced by the managers of private sidings do, however, give a good idea of the type of occurrences seen on private sidings.

The most common accident type by far reported on private sidings is derailment with 38 reported cases (Table 2). Approximately a half of the derailments on private sidings were caused by snow, ice or litter accumulated in grooved rails. Common causes for derailment also include stop blocks left on the tracks as well as lifting a wagon off the rails when unloading.

*Table 2. Occurrences reported on private sidings in 2016–2019.*

| Occurrence type | Number |
|---|---|
| Derailment | 38 |
| Other level crossing incident | 14 |
| Level crossing accident | 9 |
| Collision with an obstacle | 9 |
| Other incident | 4 |
| Collision between railway vehicles | 4 |
| Dangerous substance leak | 3 |
| Other accident | 2 |
| Broken rail | 2 |
| Route protection failure | 2 |
| Fire in rolling stock | 1 |
| Passing of signal at danger | 1 |
| Accident to persons involving rolling stock in motion | 1 |

[6] Tasoristeysturvallisuus Pohjoismaissa [Level crossing safety in the Nordic countries]. Traficom publications 18/2019. Marika Karhu & Jarkko Voutilainen. Helsinki 2019. <*https://www.traficom.fi/sites/default/files/media/publication/Tasoristeysturvallisuus%20Pohjoismaissa.pdf*>. Retrieved on 27 August 2019.

| | |
|---|---|
| Incident with a person involving rolling stock in motion | 1 |

Level crossing incidents and accidents are the second most common occurrence type reported on private sidings. Level crossing incidents and accidents are typically caused by vehicle drivers, but the contributing causal factors often include challenging conditions at level crossings on private sidings. On private sidings, the track often crosses the road at multiple points. The sight lines at level crossings on private sidings are also sometimes poor. In recent years, investments in level crossing safety have been made on many private sidings, for example by installing warning systems.

The third most common incident type reported on private sidings is collision with an obstacle. Typical obstacles are end buffers and gates of factory areas. In a typical case, the collision is caused by a human factor associated with shunting work, such as keeping insufficient lookout or excessive speed.

In addition to occurrence reports, managers of private sidings also report to Traficom on safety development in their annual safety reports. A safety report for 2018 was submitted to Traficom by 70 managers of private sidings. A majority of those who submitted a safety report noted that no accidents or incidents occurred on their infrastructure in 2018. Approximately one out of four private sidings had seen some type of rail accident during the reporting year, whereas several accidents had occurred on the railway networks of a few actors. Based on the safety reports, the most common occurrences on private sidings are level crossing incidents, followed by derailments. The safety reports indicate that crossing the track area carelessly is also a relatively common incident on private sidings.

A majority of the managers of private sidings said in their safety reports that no particular changes had taken place in their safety situation during the reporting year. A number of operators reported that improvements in safety management had also improved the safety situation of the private siding because of a clearer division of responsibilities and an increased awareness of risks, among other things. One operator reported that a significant growth in traffic volumes had increased the risk levels of their operations.

The safety targets of private sidings are often associated with the number accidents and incidents. Zero rail accidents is a common target. The targets are often also linked to indicators measuring such aspects as an industrial plant’s occupational safety occurrences. Issues related to rail network maintenance and development, including track renovations or improving level crossing safety, are also common targets. Some private siding mangers’ safety targets include mapping risks, updating the hazard record and taking other actions associated with improved risk management.

## 3.7 Casualties in railway accidents

In 2018, five persons lost their lives in railway accidents, while six persons sustained serious injuries. The number of fatalities in 2018 was smaller than the average for 2013–2017, which was eight. In 2013–2017, an average of six persons a year sustained serious injuries in railway accidents. Deliberate trespasser fatalities are discussed separately at the end of this section, and they are not included in the above figures.

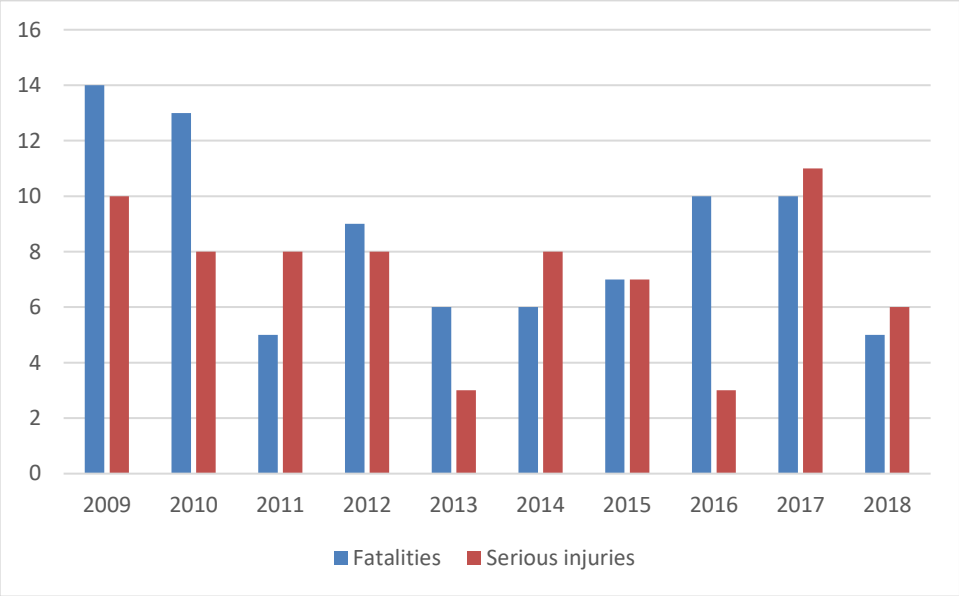


*Figure 8. Fatalities and serious injuries in railway accidents in 2009–2018.*

A declining trend can be seen in the number of fatalities and serious injuries caused by railway accidents in 2009–2018 (Figure 8). However, there is some uncertainty associated with the casualty numbers, for example, with respect to the seriousness of the injuries and the deliberateness of trespass. Moreover, annual variations in the numbers of fatalities and serious injuries caused by railway accidents are rather great, and a single serious accident may cause a large part of the casualties in that year. Consequently, extensive conclusions on the development of railway safety cannot be made based on these figures.

Four of those who died in 2018 lost their lives in level crossing accidents and one as a consequence of trespassing. Three of the fatalities in level crossing accidents were passenger car drivers, while one was a truck driver. Two thirds of those who lost their lives in rail accidents in 2009–2018 were level crossing users (Figure 9).

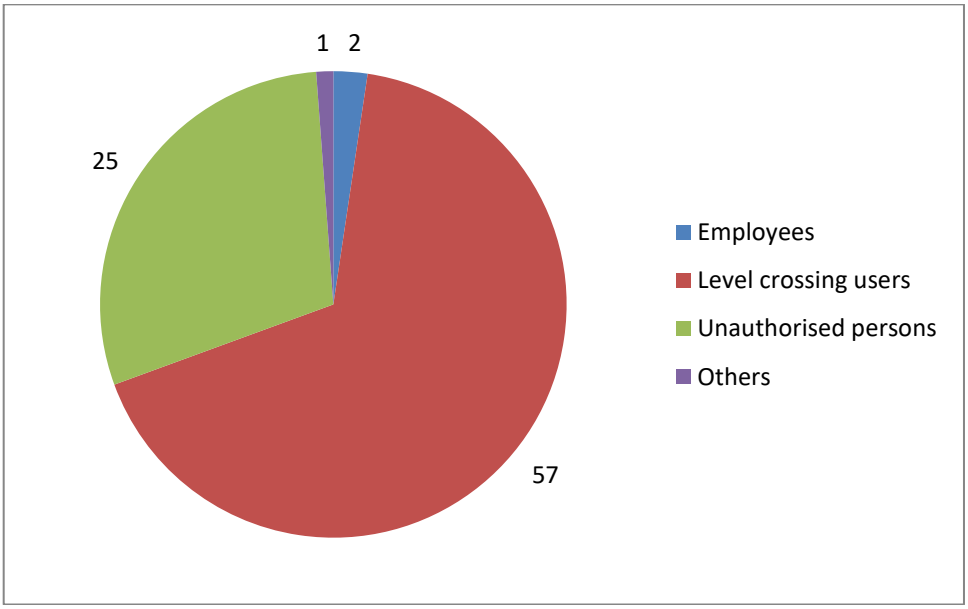


*Figure 9. Fatalities in railway accidents by group in 2009–2018.*

Four of the serious injuries resulted from level crossing accidents and two from accidents to persons involving rolling stock in motion. In 2009–2018, slightly less

than one half of those persons who sustained serious injuries in rail accidents were level crossing users, whereas one third were trespassers (Figure 10).

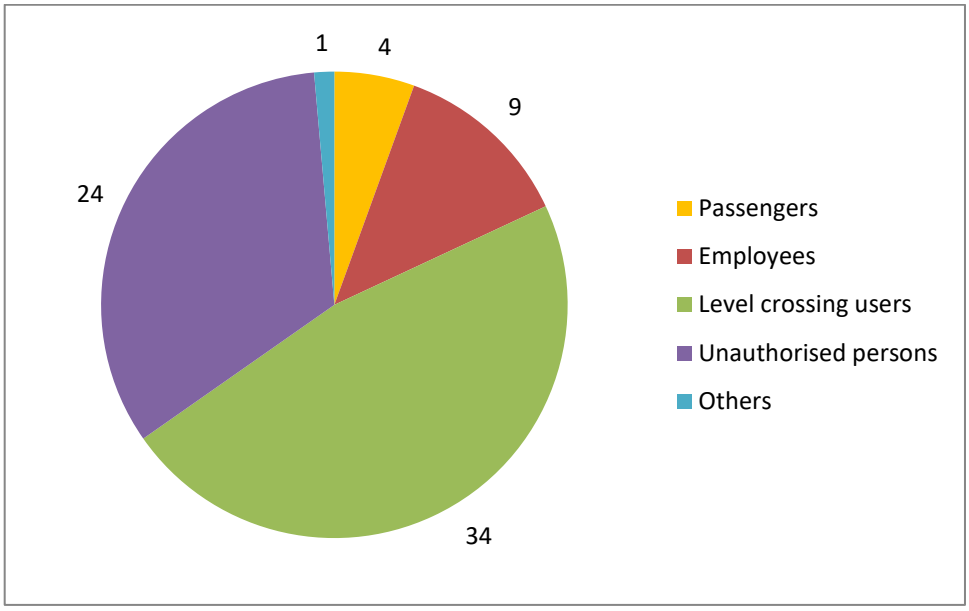


*Figure 10. Serious injuries sustained in rail accidents by group in 2009–2018.*

There were a total of 48 deliberate trespasser fatalities in 2018. In 2008–2017, there were an average of 52 such fatalities each year. Classifying accidents to persons involving rolling stock in motion as deliberate or accidental is always a matter of some uncertainty, and the railway authorities do not necessarily have detailed information about the nature of the case. According to the statistics, there were six cases of deliberate trespassing in 2018 resulting in serious injuries.

Deliberate trespasser fatalities account for 86 per cent of fatalities caused by all rail accidents in Finland in 2010–2018. At EU level, these cases represented 73 per cent of all fatalities in rail accidents in 2012–2016.

Accidents to persons involving rolling stock in motion are a multisectoral problem, and their consequences concern a broad range of different operators and authorities. A cooperation group convened by Traficom aiming to reduce accidents to persons involving rolling stock in motion started operating at the beginning of 2019. The objectives of this group include improving information exchanges between different actors and promoting research and actions related to the theme. In addition to rail sector operators, participants in this group include representatives of the police, research institutes and the social and health care sector.

In February 2019, a study was completed under the Safe Traffic 2025 research programme, investigating the most cost-effective ways of reducing the suicide rate on Finnish railways. In this study, experts assessed whether actions used or identified in other countries would be suitable for the Finnish railway environment. As measures with the greatest potential, the study identified training rail personnel to recognise suicidal persons, supervising the railway area by such means as radar,

motion sensors or cameras, developing cooperation between organisations, and learning from other countries' experiences.[7]

# 4 Changes in legislation and regulations

A major change in transport legislation was carried out in Finland in 2018: regulation on all modes of transport applicable to transport operators was collated in the new Act on Transport Services (320/2017, amended by Act 301/2018). This Act now contains provisions on operating authorisations in the railway system, preconditions for operating and train drivers; in other words, the Act updated the implementation of Directive 2007/59/EC on the certification of train drivers operating locomotives and trains. By virtue of the Act on Transport Services, the Finnish Transport Safety Agency (Trafi) also issued a regulation implementing Commission decision 2011/765/EU on criteria for the recognition of training centres involved in the training of train drivers, on criteria for the recognition of examiners of train drivers and on criteria for the organisation of examinations. This reform of provisions on qualifications simplified the regulatory framework, which now only applies to train drivers' tasks, while other safety-related tasks are covered by the operators' safety management systems.

A new Rail Transport Act (1302/2018), which combines the previous Railway Act and the Urban Rail Transport Act, was also passed in 2018. The backdrop to the reform was the EU's 4th Railway Package and the implementation of the railway safety and interoperability directives as part of it ((EU) 2016/798 and (EU) 2016/797). While the new Rail Transport Act entered into force on 1 January 2019, the regulation on the implementation of the 4th Railway Package entered into force later, on 16 June 2019.

As the year 2018 was marked by major changes in legislation, the Finnish Transport Safety Agency organised monthly or two-monthly cooperation group meetings with operators in the sector to discuss both of these legislative changes, thus helping operators prepare for them. In the Finnish Transport Safety Agency's view, the operators' preparation has progressed well, as has the transition to the operating models laid down by the Act on Transport Services.

# 5 Safety Certificates, Safety Authorisations and other certificates issued by the NSA

## 5.1 Safety certificates and authorisations

Trafi issued four safety certificates for railway operators in 2018. All four were renewals carried out at the expiry of a previous certificate. No new safety certificates were issued in 2018, but two safety certificates were revoked. One certificate was revoked because an undertaking gave up its railway operations and the other because an undertaking sold its railway operations to another railway operator. In August 2019, 32 railway operators had valid safety certificates in Finland. The largest groups among safety certificate holders are shunting operators, track maintenance

[7] Cost-effective ways to reduce suicides on Finnish railways. Finnish Transport and Communications Agency Research Reports 3/2019. Silla, Anne. Helsinki 2019. <*https://www.trafi.com.fi/sites/default/files/media/publication/Raideliikenteen%20allej%C3%A4%C3%A4nnit_3_2019.pdf*> Retrieved on 6 May 2019.

companies and operators of rolling stock in historical use. There are two railway undertakings operating commercial train traffic in Finland.

The number of safety authorisations issued to infrastructure managers in 2018 was 42. Six of these were new and 36 renewed authorisations. No safety authorisations were revoked in 2018. In August 2019, 103 infrastructure managers had a valid safety authorisation in Finland. In addition to the Finnish Transport Infrastructure Agency (FTIA), which manages the state railway network, other infrastructure managers include managers of private sidings, including industrial plants, ports and municipalities.

Under the new Rail Transport Act, which entered into force in 2019, it is no longer necessary for all private siding managers to apply for a safety authorisation referred to in EU legislation, as they can now use a national notification procedure. The notification procedure is a lighter option than the EU safety authorisation for the safety management of private sidings. A private siding manager using the notification procedure must maintain a safety management system that ensures the safe management and use of the private siding. The notification procedure is open for all private siding managers, excluding managers of railways to seaports and the VR Group's railway network.

The quality of applications for safety certificates and authorisations and the safety management system manuals has improved in Finland in recent years, and the authority does not need to ask for additional information concerning the applications as often as before. However, there are major variations in the quality of applications and safety management systems. It has been obvious from the applications of some of the smaller operators that the description of their safety management system has not been updated since the previous application round and it no longer matches the actual operations. In 2018, special attention in the processing of applications was given to descriptions of risk management and monitoring, as problems in these areas have come up in audits.

No changes were made in the process of handling applications in 2018. In the application process for safety authorisations, on-site visits to the applicants' premises were introduced in 2017 to get an idea of their operations. The experiences accumulated in 2018 show that this practice has worked well and helped to reduce the number of conditions issued in connection with the safety certificate.

Trafi did not engage in cooperation related to safety certificates with the safety authorities of other EU Member States in 2018.

## 5.2 Vehicle authorisations

In 2018, Trafi issued 277 authorisations for placing rolling stock in service. Of these, 13 were first authorisations for new stock, while 264 concerned renewed rolling stock. First authorisations were issued to new locomotives and track work machines, for instance. The authorisations for renewed rolling stock concerned modifications to passenger carriages and goods wagons, among other things.

Trafi is responsible for the FI verifications of rolling stock subsystems, which is why the agency is actively involved in the service authorisation process from the start. Trafi engages in active and instructive interaction with applicants seeking

authorisation throughout the process. Consequently, few problems have come up in the actual authorisation applications, and none have been rejected.

No changes were made in 2018 to the processing of authorisations for placing rolling stock in service.

## 5.3 Entities in charge of maintenance(ECM)

At the beginning of 2019, VR Group transferred vehicle maintenance to its new subsidiary, VR Maintenance Ltd. An ECM certificate was issued to the new subsidiary in 2018.

While no major changes in the ECM process were made by Trafi in 2018, the process was specified in more detail by updating the work instructions.

A derogation referred to in Article 15 of the Railway Safety Directive from the ECM certification system was granted to VR Group and Fenniarail Oy. This exemption concerns the maintenance of Russian rolling stock. The rolling stock entering Finland from Russia is subjected to a technical inspection on the border. The border inspections are performed in accordance with an agreement on rail links between Finland and Russia. VR Group is responsible for carrying out the inspections, and Fenniarail purchases this service from VR Group for the wagons that it operates.

## 5.4 Train drivers

In 2018, Trafi issued 798 train driving licences. No licences were amended or revoked in 2018. Seven train driving licence applications were cancelled in cases where the applicant failed to meet all the licence conditions. In total, 2,606 train driving licences issued in Finland were valid at the end of 2018.

The legislation on railway personnel’s qualifications was reformed in Finland as from 1 July 2018. Previously, the legislation on qualifications applied to not only train drivers but also traffic controllers, track work supervisors and shunting workers. In compliance with the Train Drivers Directive, the new legislation only applies to train drivers. The management of qualifications for other tasks associated with railway safety is left to the safety management systems of railway undertakings and infrastructure managers. Small-scale activity as a driver was also excluded from the legislation’s scope. Driver training requirements were amended to correspond to the requirements under the Train Drivers Directive, and the national additions to the qualification requirements were dropped. The legislation on qualifications was also lightened by simplifying the system of medical checks and abandoning the approval of training programmes.

Trafi accredited three railway sector training centres in 2018. Under the new legislation on qualifications, accreditation is required of training centres providing driver training but not of parties who only offer training for other railway sector tasks. In 2018, four training centres gave up their accreditations as they no longer organise train driver training.

## 5.5 Authorisations for placing in service fixed structural subsystems

In 2018, Trafi issued 38 authorisations for the placing in service of fixed structural subsystems. This figure is similar to the numbers of authorisations issued in previous

years. The scope and complexity of railway projects issued with authorisations vary greatly from comprehensive track improvement projects to smaller-scale sites limited to individual tracks. Several authorisations were issued for the improvement of the Seinäjoki-Oulu line section completed in 2018. The project involved, for example, improving traffic operating points, repairing bridges and removing level crossings. Smaller infrastructure projects issued with authorisations for placing in service included improvements to individual bridges and new tracks built for private sidings.

Authorisations for the placing in service of fixed structural subsystems are processed in accordance with the Interoperability Directive (2016/797/EU) and the national railway legislation. The applicant proves the compliance of a structural subsystem by means of an EC or FI declaration of verification. Trafi authorises the placing in service of a compliant subsystem or, if necessary, requests for additional information. No changes were made in 2018 to the application for and processing of authorisations for structural subsystems.

## 5.6 Exchange of information between NSA and railway operators

An effort has been made to keep the threshold for information exchanges between Traficom and the railway operators very low. Channels for liaising with the operators include information events organised by Traficom for stakeholders, one-to-one meetings between Traficom and operators, and direct discussions between Traficom public officials and operators' representatives. Traficom holds regular one-to-one cooperation meetings with the largest operators to discuss topical issues. There is also a great deal of less formal cooperation where necessary, and Traficom liaises almost constantly with VR Group and the Finnish Transport Infrastructure Agency, in particular. Contacts with smaller operators are less regular and focus on information events and, for example, meetings associated with authorisation renewals.

In 2018, the most prominent theme in discussions between Trafi and the stakeholders was preparation for the entry into force of the regulatory provisions under the 4th Railway Package. Other common topics included safety themes as well as practical issues related to safety authorisations, safety certificates and authorisations for placing in service.

# 6 Supervision

## 6.1 Strategy, plan, procedures and decision making

Each year, Traficom prepares a supervision plan for the railways. Following this plan, Traficom supervises operators in the sector by means of audits, inspections and safety discussions. The primary focus of supervision is on auditing railway operators' and infrastructure managers' safety management systems. The operations of ECMs are also audited. Traficom's inspections focus on practical activities.

In addition to railway operators, infrastructure managers and ECMs, Traficom also supervises training centres in the sector as well as the work of railway doctors and psychologists.

The nature and scope of an operator's activities and an actor's organisation profile are taken into account in the targeting of supervision. Organisation profiles are prepared by Traficom experts, and they are used to assess an operator's ability to

manage the risks inherent in their operations and to operate safely. These organisation profiles are based on supervision findings, accident and incident reports as well as other information about organisations available for Traficom experts. Operators' organisation profiles are prepared for operators of strategic importance, for whom individual annual supervision plans are also produced.

Traficom reviews the implementation of the railway supervision plan quarterly. If necessary, the schedule of the supervision plan is modified, and the targets may be prioritised mid-year. The emergence of new risks, for example, may make it necessary to update the supervision plan. The recommendations of the Safety Investigation Authority may also redirect supervision in the middle of the year. The safety themes that come up during the year are used to prepare the supervision plan for the following year.

As the safety management systems cover a large range of issues, Traficom targets audits thematically on certain areas of safety management as set out in the annual plan. The audit themes for 2018 were changes in legislation, monitoring, railway operators' training centre activities, infrastructure and rolling stock maintenance as well as traffic management procedures. Examining compliance with legislative amendments was selected as an audit theme because of the changes in legislation that entered into force in 2017 and 2018. Monitoring was picked as a theme for audits because of shortcomings found in operators' monitoring activities. The activities of railway operators' training centres were selected as a theme as the new legislation assigned to rail operators more responsibility for training their staff. Traffic management procedures on railway networks emerged as an audit theme as an increasing number of private sidings in Finland have more than one railway operator.

Reoccurring supervision themes in recent years have included operators' risk management, sub-contracting and leadership commitment. As the legislation on qualifications was updated, more attention has also been given to qualification management.

It is Traficom's practice to carry out its audits in a spirit of good cooperation with the audited operators. An effort is made to use a supportive and encouraging approach in the audits, especially if the safety management competence of the operator being audited is relatively insubstantial. During the audit, Traficom strives to arrive at a shared view with the audited operator of the audit observations and possible deviations. For these reasons, no complaints have been received concerning the audit findings.

## 6.2 Supervision results

Trafi audited the safety management systems of 19 railway operators and infrastructure managers in 2018. In addition, it also audited one ECM and one training centre audit. Three marshalling yards used for the transport of dangerous goods were inspected.

A majority of deviations found in the audits were classified as minor, and serious deviations were clearly less frequent. In 2018, the greatest number of deviations in safety management system audits were found in the risk management of the operator's activities as well as the management of risks caused by third parties. These shortcomings were related to such issues as the coverage and documentation

of risk management. Deviations related to the methodical approach and implementation of monitoring in organisations were also common. The second largest number of deviations was found in verification of monitoring by the management and monitoring of continuous improvement.

The audit of a training centre found shortcomings in the descriptions of the training system and procedures for issuing complementary certificates. In inspections of marshalling yards used for the carriage of dangerous goods, shortcomings were found in the documentation of safety reports and marshalling yards' fire-fighting infrastructure.

Trafi's interaction with the larger operators, including the Finnish Transport Agency and VR Group, has been more or less continuous. Issues related to supervision are also discussed at one-to-one cooperation meetings between Trafi and operators. The discussions concern topical issues, including the implementation of supervision, its targets and findings and, for example, changes related to safety. In 2018, topical discussion subjects related to supervision included risk management in the transport of dangerous goods, overall development of the safety management system, and verifying subcontractors' competence and qualifications. Contacts with smaller operators are less systematic, and in some cases limited to supervisory actions.

## 6.3 Coordination and cooperation

Trafi did not engage in cooperation related to supervision with other Member States' national safety authorities in 2018 as no railway operator operated in Finland and in another EU Member State under a single safety certificate in 2018. While there is some cross-border traffic between Tornio in Finland and Haparanda in Sweden, traffic across the border goes no further than the other country's border crossing. Finland and Sweden are planning to update their agreement on cross-border rail traffic, which goes back for decades, but so far the matter has not gone further than discussions.

# 7 Application of Common Safety Methods by RUs and IMs

## 7.1 Application of the Common Safety Method for safety management systems

The great variation in the sizes of Finnish railway operators also affects the operators' inputs in and resources available for safety management. This is why the level of safety competence and maturity of safety management vary significantly between organisations. As a whole, however, we can say that the level of safety management has clearly improved in recent years. During the 2010s, safety management has become an established part of railway operators' leadership, and safety management requirements are no longer regarded as pointless demands made by the authorities, an attitude which could still be discerned at times as late as the beginning of this decade.

The larger operators have better resources for safety management, enabling them to develop their operations with a more innovative and comprehensive approach. Some of the larger operators have developed their safety management in a highly goal-oriented manner and made great investments in human factors and risk management, for instance. On the other hand, it is sometimes challenging for larger

operators to ensure the practical implementation of safety management practices, especially if practical work is carried out by subcontractors.

A significant part of Finnish railway operators have very scant resources, which means that the resources available for the active development of safety management are extremely limited. On the other hand, smaller organisations have the advantage that typically the organisational and even physical distance between those responsible for safety management and those carrying out the practical work is short, which simplifies the implementation of practices.

In very recent years, operators' safety management systems have been less frequently prepared by consultants and subcontractors. The reason for this appears to be the operators' improved in-house safety management competence. At the same time, they have understood the importance of tailoring the safety management system to their own specific needs.

## 7.2 Application of the Common Safety Method for risk evaluation and assessment

An infrastructure manager or a railway operator applying for an authorisation for the placing in service of a subsystem must assess the significance of the change to be made in the early stages of the project. If the change is considered to be significant, the operator must carry out a risk assessment in compliance with the Common Safety Method (Regulation (EU) No 402/2013). If the change is not significant, the risk assessment should be carried out following the applicant's safety management system.

Previously, risk management in compliance with the Common Safety Method was required of all projects that required an authorisation for placing in service, but under the current Common Safety Method, the proposer of a change assesses its significance. The operators currently sometimes have a rather high threshold for considering changes to be significant, as a risk management in accordance with the Common Safety Method is more expensive to implement because it involves an independent assessment body. A majority of the changes are considered not significant. The six criteria for deciding whether or not a change is significant are rather brief and non-specific, enabling operators to make the decision on the project's significance as they find appropriate. It is difficult for the national safety authority to intervene, even if it had a differing view of the change's significance.

The infrastructure projects of the Finnish Transport Infrastructure Agency (FTIA), which is the manager of the state-owned rail network, contain changes, some of which are considered to be significant and some not significant. The FTIA considers its largest projects as significant changes. It is at times difficult for Traficom to evaluate if assessing a change as not significant is justified, for example if a change to a safety device is technically complex. The FTIA carries out the risk assessment of changes that are not significant following almost the same procedure as in the risk assessment of significant changes, with the difference that the former does not contain the input of an independent assessment body. The projects carried out by managers of private sidings include a higher number of not significant changes. Very small-scale projects on private sidings are not required to apply for an authorisation for placing in service.

When an operator considers a change to be significant, the Common Safety Method for risk management is applied correctly. The operators prove that they have applied the method by submitting to Traficom a safety assessment report and a hazard record prepared by an independent assessment body.

In 2018, rolling stock was required to have an authorisation for placing in service instead of the current railway vehicle authorisation for placing on the market. This section discusses the application of the Common Safety Method for risk assessment in the context of the process used in 2018 for granting authorisations for placing in service. Operators applying for an authorisation for the placing in service of modified rolling stock had to assess the significance of the modification. If the modification was significant, the applicant had to carry out a risk assessment compliant with the Regulation and submit an assessment report and a hazard record to Trafi as attachments to the service permit application. The applicants sometimes considered the changes as not significant, even if in Trafi considered them to be significant. In that case, Trafi returned the application to the applicant for complementation. When the applicants considered the changes to be significant and applied the Common Safety Method to the risk assessment, the risk assessments were carried out in compliance with the Regulation.

No changes in the national guidelines or processes related to the Common Safety Method for risk assessment were introduced in 2018.

## 7.3 Application of the Common Safety Method for monitoring

Traficom has published guidelines on preparing safety reports for new operators (TRAFICOM/89239/03.04.02.01/2019). The guidelines contain a short description of what the report should contain in terms of monitoring. In keeping with this guideline, the operators should describe:

- the organisation’s experiences of applying the Common Safety Method for monitoring, including internal audits of the safety management system and internal investigations of incidents and accidents
- the planned priority areas for monitoring
- actual targets covered by monitoring
- monitoring findings
- actions taken on the basis of monitoring in order to improve safety and safety management
- results of measuring the effectiveness of measures taken.

Almost all of the 84 operators who submitted a safety report also reported on monitoring at some level. However, the descriptions given by different operators varied greatly. Some operators followed the guidelines quite closely, whereas others included a single sentence noting that monitoring had been carried out in 2018. Only one operator completely failed to report on monitoring.

Approximately one operator out of three who included a description of their monitoring reported on its results using a table prepared in a specific format, which lists the management reviews and internal audits carried out, followed by the

operator's monitoring priorities, targets and findings, any further actions and an assessment of effectiveness. Some operators describe these aspects in their own words.

Most operators described their key monitoring priorities, while some included no information on their priorities in the descriptions of their monitoring activities. The monitoring priorities of those operators who used the table template for reporting on their monitoring were very similar. Some operators omitted the description of their monitoring priorities, noting that they are listed in a separate monitoring plan. Among infrastructure managers, the most common monitoring priorities cited by the operators were risk management, effectiveness of internal audits of the safety management system, documentation, railway network maintenance and achievement of safety targets. For railway operators, the most common priorities included monitoring driver activities, qualifications, work ability and traffic communication.

Approximately one third of the operators had described the monitoring targets quite clearly, even if their targets were very similar, as was also noted in case of the priorities. Key target areas for infrastructure managers' monitoring cited in the reports included checking the completion of a maintenance folder, maintaining the hazard record, examination of the track's operability, management reviews and compliance with the maintenance plan, which is supervised by spot checks. The areas on which rail transport operators focused their monitoring included shunting operation, work ability or complementary certificates/licences. Some operators had described their monitoring targets as part of the specified priorities, while others noted briefly that the targets could be found in a separate monitoring plan. Little information was provided about the indicators applied to the monitoring targets. In the case of many operators, it also remained unclear how the monitoring had been carried out, for example if it had been entrusted to sub-contractors, and what the targets of internal audits were if the operator had included them as monitoring actions.

Variation can also be seen in descriptions of monitoring findings. Those operators who used the table template for reporting on their monitoring also provided the clearest descriptions of the findings. The most common monitoring finding was that the hazard record had not been maintained, risk assessments had not been updated, or the maintenance folder had not been completed as agreed. However, full clarity of the monitoring findings could not be obtained in the case of all operators, as their reports only described the numbers of audits or checks that had been carried out. The monitoring findings described by the operators suggest that the indicators used to monitor the targets are more likely to be qualitative than quantitative.

The clearest descriptions of actions and their evaluation were provided by those operators who used the table template for describing the monitoring activities in their safety reports. Some operators had noticed that monitoring had promoted the development of safe work practices.

To sum up, the safety reports indicate that some of the operators understand, plan, implement and report on methodical monitoring in the spirit of Regulation (EU) No 1078/2012. Based on the descriptions in the safety reports, however, it is possible to identify some operators who have only partly carried out monitoring as required under the Regulation. Some operators also appear to struggle with understanding the concept and role of monitoring in their operations. Observations

on monitoring based on the safety reports also support audit findings regarding the heterogeneous nature of the monitoring.

On the basis of the descriptions of monitoring in the safety reports, we can further note that Traficom should continue its efforts not only to verify that operators' descriptions of their monitoring activities are compliant with the Regulation but also to ensure that operators have genuinely understood the purpose of monitoring and that they plan and carry it out as required under the Regulation.

# 8 Safety culture

## 8.1 Safety culture evaluation and monitoring

VR Group has commissioned an assessment of its safety culture. The assessment was conducted and the assessment method developed by the Finnish Institute of Occupational Health based on a method prepared for aviation and maritime transport. Other operators will in the coming years prepare a safety culture strategy as required by the assessment criteria for safety management systems.

## 8.2 Safety culture initiatives

Traficom participated as an expert in the process of developing a safety culture model led by the European Union Agency for Railways (ERA). All aspects of the model have been piloted at Traficom in 2018 and 2019. We have used the ERA model to assess the safety culture of three volunteer operators. The pilot project included a part of a large railway undertaking, a small railway undertaking and a maintenance undertaking. All pilot organisations have a valid safety certificate.

The ERA safety culture model has been developed in part based on Traficom's experiences.

In our assessment, we used a safety climate survey, analysed documents, gathered information on the experiences of Traficom officials responsible for oversight and supervision, gathered information from self-assessments by operators' contact persons and conducted individual interviews. The results will be reported to the operators in the autumn of 2019.

We will further develop the safety culture assessment model in early 2020 based on the experience gained.

## 8.3 Safety culture communication

The ERA safety culture assessment model has been presented to and discussed within the network on human and organisational factors in rail transport facilitated by Traficom.

The Finnish pilot has also been presented at EU level on several occasions.

The largest Finnish railway conference (RATA2020) to be organised next in January 2020 will also include a presentation on the assessment of safety culture and the results achieved.

# ANNEX: Progress with Interoperability

Please provide the following information as it is at the 31st December of the reporting year.

Please refer to the Appendix for definitions.

**1. Lines excluded from the scope of IOP/SAF Directive (end of year)**

| | | |
|---|---|---|
| 1a | Length of lines excluded from the scope of application of the IOP Directive [km] | 17 |
| 1b | Length of lines excluded from the scope of application of the SAF Directive [km] | 17 |

Please provide the list of lines excluded: Olli-Porvoo (Line used only for heritage traffic)

**2. Length of new lines authorized by NSA (during the reporting year)**

| | | |
|---|---|---|
| 2a | Total length of lines [km] | 0 |

**3. PRM adapted stations (end of year)**

| | | |
|---|---|---|
| 3a | PRM TSI compliant railway stations | 27 |
| 3b | PRM TSI compliant railway stations - partial TSI compliance | 2 |
| 3c | Accessible railway stations | 2 |
| 3d | Other stations | 163 |

**4. Train driver licenses (end of year)**

| | | |
|---|---|---|
| 4a | Total number of valid European licenses issued in accordance with the TDD | 2606 |
| 4b | Number of newly issued European licenses (first issuance) | 798 |

**5. Number of vehicles authorized under the interoperability Directive (EU) 2008/57 (during the reporting year)**

| | | |
|---|---|---|
| 5a | **First authorization - total** | |
| 5aa | Wagon | |
| 5ab | Locomotives | |
| 5ac | Hauled passenger vehicles | |
| 5ad | Fixed or pre-defined formation | |
| 5ae | Special vehicles | |
| 5b | **Additional authorization - total** | |
| 5ba | Wagon | |
| 5bb | Locomotives | |
| 5bc | Hauled passenger vehicles | |
| 5bd | Fixed or pre-defined formation | |
| 5be | Special vehicles | |
| 5c | **Type authorization - total** | |
| 5ca | Wagon | |
| 5cb | Locomotives | |
| 5cc | Hauled passenger vehicles | |
| 5cd | Fixed or pre-defined formation | |
| 5ce | Special vehicles | |
| 5d | **Authorizations granted after upgrade or renewal - total** | |
| 5da | Wagon | |
| 5db | Locomotives | |
| 5dc | Hauled passenger vehicles | |

| | | |
|---|---|---|
| 5de | Fixed or pre-defined formation | |
| 5df | Special vehicles | |

**6. ERTMS equipped vehicles (end of year)**

| | | |
|---|---|---|
| 6a | Tractive vehicles including trainsets equipped with ERTMS | |
| 6b | Tractive vehicles including trainsets – no ERTMS | |

**7. Number of NSA staff (full time equivalent employees) by the end of year**

| | | |
|---|---|---|
| 7a | FTE staff involved in safety certification | 9 |
| 7b | FTE staff involved in vehicle authorization | 3 |
| 7c | FTE staff involved in supervision | 9 (same people do safety certification and supervision |
| 7d | FTE staff involved in other railway-related tasks | 14 |