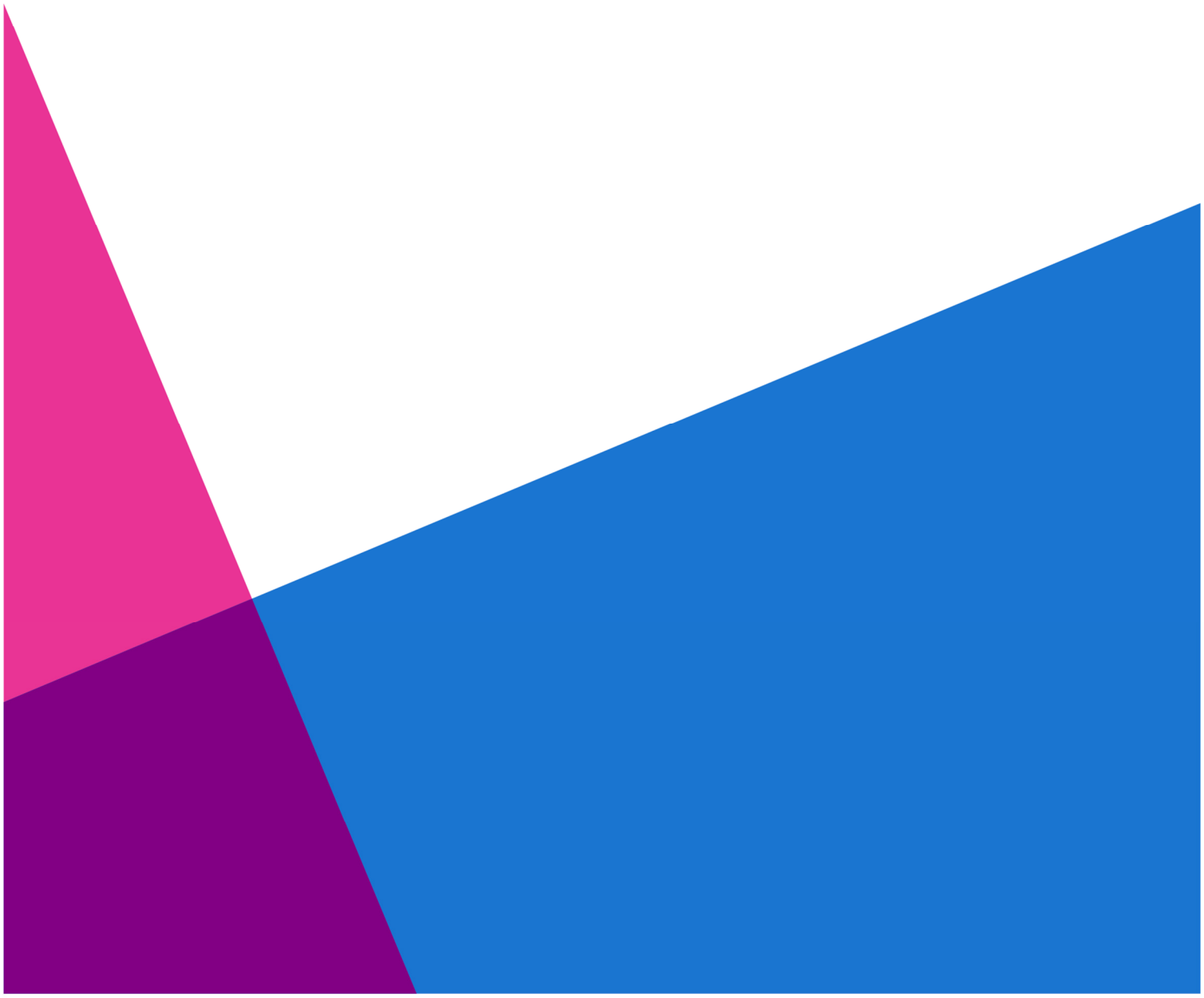
TRAFICOM
Liikenne- ja viestintävirasto
Transport- och kommunikationsverket
Finnish Transport and Communications Agency

Annual Railway Safety Report 2019

NSA Finland



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Finnish Transport and Communications Agency
Traficom
Transport- och kommunikationsverket Traficom
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1 Introduction

1.1 Purpose of the Annual Railway Safety Report

This Annual Railway Safety Report 2020 of the Finnish Transport and Communications Agency Traficom describes the status of railway safety in Finland in 2019. The Annual Railway Safety Report also describes key points related to the Agency's authorisations, supervision and regulatory functions related to railways in 2019.

The Annual Railway Safety Report is an annual report on Traficom's railways referred to in section 17 of the Railway Act 1302/2018. Under the Railway Act, Traficom shall 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 Railway Agency (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. As sources of information on Traficom's operations have been used interviews with its public officials as well as documents relevant to 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 2019, 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 Summary of the safety situation in 2019

The status of railway safety was good in Finland in 2019 and the level of passenger safety, in particular, was excellent. When examined over a longer term, the safety of rail traffic has improved clearly, and serious accidents are extremely rare. In 2019, one significant derailment and one significant collision occurred in rail traffic[1]. There were no significant fires in rail traffic in 2019. Regardless of the low number of accidents, serious incidents occur in rail traffic every year, including routing failures and passing of signals at danger.

[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 environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.

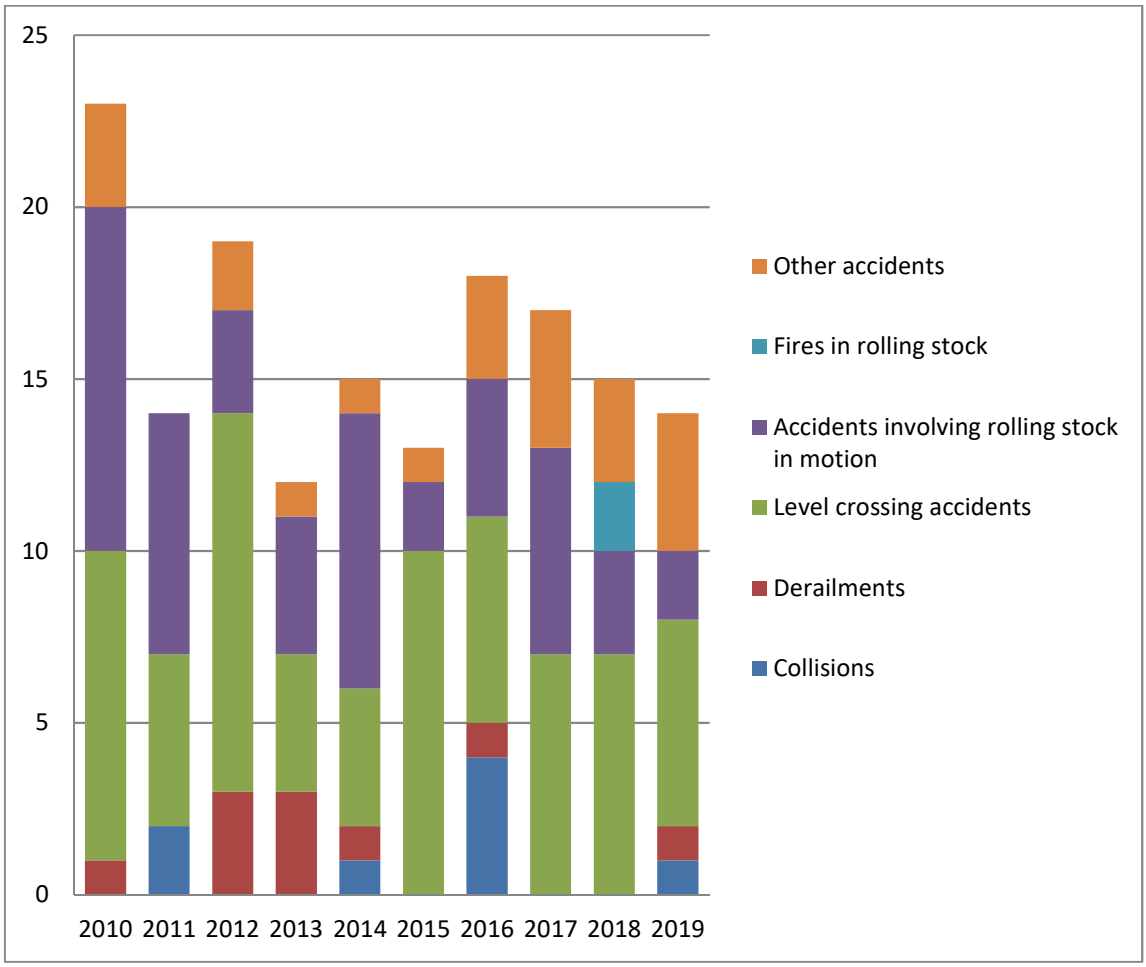

Figure 1. Significant railway accidents in Finland in 2010–2019

Most casualties on railways are caused by accidents to persons involving 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 accident type that claims several lives annually is level crossing accidents. In 2019, a total of 26 level crossing accidents resulted in two fatalities. The numbers of both injuries and fatalities are slightly below the averages recorded in recent years. While the annual number of level crossing accidents has declined significantly in Finland in the 2000s, the safety situation of level crossings in Finland remains clearly worse than in such countries as Sweden and Norway.

While there has been a clear improvement in shunting safety in Finland in the 2010s, many accidents and incidents continue to occur in this work. In 2019, four significant accidents occurred in shunting, and there was no significant change in the numbers of accidents and incidents compared to the previous year. The precursors of shunting accidents and incidents are often associated with the shunting foreman’s or driver's incorrect practices.

Safe coordination of track work and train traffic has been a key challenge to rail safety for a number of years. While minor improvements have been achieved in the safety situation of track maintenance work, the pace of this change remains excessively slow. 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 maintenance workers. The factors in the background of safety incidents in track maintenance work often include shortcomings in skills and safety culture.

A great deal of work has been done recently to improve competence and the safety culture in the rail sector. While bringing about changes takes time, through sustained work sufficient competence can be ensured across the sector, and the evolution of a good safety culture can be supported. A good safety culture promotes the sharing of safety information, which further facilitates learning and positive safety development across the sector.

2 Traficom's safety operations and organisation

2.1 Safety strategy and plans

Traficom produced its first Railway Safety Programme in 2019. In spring 2020, this document was extended to also include urban rail traffic and updated to cover the period between 2020 and 2022. The work programmes of the European Commission and the European Union Agency for Railways (ERA), the special features and needs of the Finnish rail network as well as the views of operators in the field and the Ministry of Transport and Communications were taken into account when developing and updating the programme. Traficom monitors the Safety Programme's implementation on a quarterly basis and also reports on progress made with it to the Ministry of Transport and Communications.

The Safety Programme documentation describes the operators in the rail sector, their areas of responsibility and the legislative framework applicable to the railways. While the documentation has changed little since the year before, the actions of the actual programme have been re-grouped to clarify it. The Railway Safety Programme now comprises eight overall themes and around 30 more detailed actions in total, through which Traficom strives to improve rail safety together with the railway sector operators. The themes to be developed are:

1) Exerting a strong and diverse influence on trends in rail safety
2) Improving safety in the carriage of dangerous goods
3) Creating an operating culture of reliability in rail traffic
4) Developing the cyber security of rail traffic comprehensively
5) Enhancing the efficiency of Traficom's supervisory measures
6) Helping stakeholders understand their responsibilities in rail traffic
7) Bringing the use of accident and incident data up to a new level
8) Encouraging discussion on safety impacts of regulatory changes and bringing development proposals up for discussion

Most of the Railway Safety Programme actions were already contained in last year's programme, and they will also continue to be developed in the years to come. Im-

proving reliability and developing cyber security, on which society is placing increasing demands, come up as themes that have clearly increased their importance in the programme.

Responsibilities for implementing Safety Programme actions have been assigned to Traficom'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 Traficom'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 pilot project aimed to investigate how the model could be used to improve railway operators' safety culture, to find out if the evaluations are 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 Actions taken on the basis of safety recommendations

Table 1 below lists the safety recommendations issued to Trafi/Traficom by the Safety Investigation Authority in recent years as well as the actions taken on the basis of the recommendations.

Table 1. Actions taken by Trafi/Traficom on the basis of the Safety Investigation Authority's recommendations.

Safety recommendation	**Actions taken**	**Status of implementation**
2019-S47 The Finnish Transport and Communications Agency defines the approval process of level crossing risk assessments and supervises the implementation of corrective actions.	In Traficom's view, infrastructure managers assess the risks in their own processes. The risks associated with level crossings are assessed together with other risks.	Not completed
2019-S1 Railway operators, the Finnish Transport Infrastructure Agency and the competent authorities must develop ways of preventing backlogs in the carriage of dangerous goods arriving from Russia. The acquisition and exploitation of anticipation data should be improved, in particular.	Traficom's information system associated with the rolling stock used for the interconnecting traffic is being upgraded, and an attempt will be made to integrate in it a tool which would enable better exploitation of existing rolling stock information.	Partially completed
2018-S14 When approving examiners and railway operators' safety management systems, the Finnish Transport Safety Agency should ensure that their	Trafi applies EU level criteria for approving safety management systems.	Not completed

procedures for verifying competence are adequate and that competence verification is reported on comprehensively.	Evaluation has been harmonised in the EU area. In its audits, Trafi supervises that activities are compliant with the operators' safety management systems in observance of EU Regulations. Competence and competence management are a priority area in Trafi's supervision activities.	
2018-S18 The Finnish Transport Safety Agency should supervise the practical implementation of safety management systems.	Supervising the implementation of safety management system procedures in practice is a specific target of Trafi's audits. However, with the current resources it is not possible to cover the entire safety management system in every audit.	Implemented
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.	Not completed
2018-S4 The Finnish Transport Safety Agency should specify in greater detail the checks to be carried out as part of rail worthiness inspections and the criteria for the competence and independence of the party carrying out the inspection.	The rail worthiness inspection is part of rolling stock maintenance procedures. The rolling stock maintenance procedures are described in the operator's safety management system, which Trafi supervises by means of audits. Rolling stock maintenance is included in Trafi's audit plan.	Not completed

2.3 Other safety measures

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

2.4 Organisation of railway operations in central government administration and the Finnish Transport and Communications Agency

The ministry responsible for transport issues in Finland is the Ministry of Transport and Communications. It drafts the policies, strategies and legislation related to the transport sector. Traficom serves as the national railway safety authority. The Rail

Regulatory Body, which oversees a well-functioning market and the fair and non-discriminatory treatment of operators, also operates in conjunction with Traficom.

The Finnish Transport Infrastructure Agency is the infrastructure manager of the state-owned rail network and also assumes responsibility for roads and waterways. Traffic management services are provided by Traffic Management Finland Oy, a state-owned special task company, whose 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.

In early 2019, Trafi's organisation was integrated with Traficom almost in its entirety, and no changes were made to the organisation of tasks related to railways. In 2019, Traficom had two units whose duties focused on railway sector tasks. The Railway Operators unit was responsible for processing safety authorisations and certificates as well as the supervision of railways. The Rail Infrastructure unit was responsible for approvals for rolling stock and rail infrastructure. Traficom also had a railway sector headquarters responsible for the overall coordination of railway issues. A few persons in other Traficom units also worked with tasks related to the regulation of railways and safety monitoring. In late 2019, an organisational change was prepared in Traficom, as a result of which some rearrangements were also made in railway functions from the beginning of 2020.

Traficom has more than 900 employees, and it operates in 15 localities. Around 30 Traficom employees work exclusively with railway matters.

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

3 Status of railway safety

3.1 Safety of train traffic

The safety of train traffic remained at a good level in Finland in 2019. 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 accidents with typically less severe consequences that at times occur in train traffic include fires in rolling stock and collisions with an obstacle.

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, situations occur every year in which inadequacies related to one or several protective factors leads to serious incidents.

Accidents in train traffic

According to statistics compiled by the Finnish Transport Infrastructure Agency, there were a total of 326 cases in which a train collided with an obstacle in 2019. The number of collisions increased by one third compared to the average for years 2015–2018. Most of these cases are collisions with animals, and an increase in the number of such accidents also explains a large part of the increase in collisions. While collisions with animals rarely have any railway safety impacts, they have major negative effects on the punctuality of train traffic. Other typical obstacles causing collisions include fallen trees on the tracks.

In VR Group's systems, collisions with animals are not included in the collision category, and the contents of VR Group's collision category are also more limited in other respects than the corresponding category of the Finnish Transport Infrastructure Agency. VR Group reported three collisions with obstacles in 2019. In 2014–2018, VR Group has reported on average 5.2 collisions with obstacles in its train traffic every year.

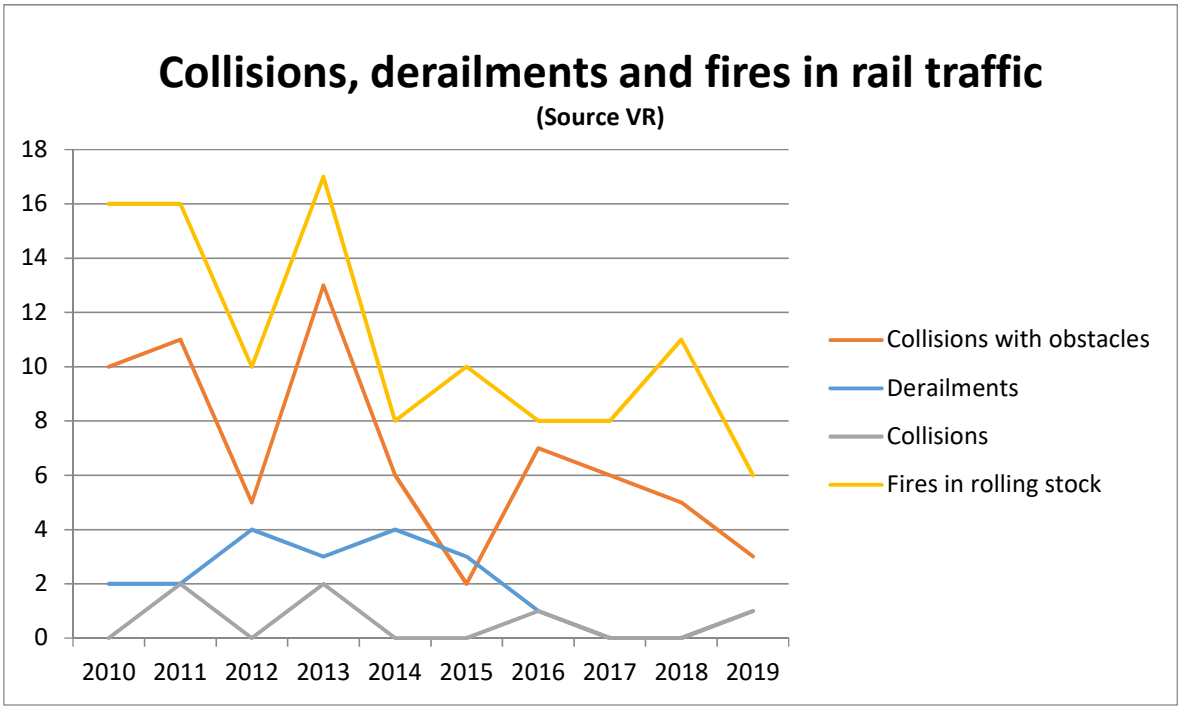

Figure 2. Collisions, derailments and fires in VR Group's train traffic in 2010–2019.

One collision with an obstacle classified as a significant accident occurred in 2019. A train collided with trees that had fallen across the tracks on the Ii-Myllykangas section on 11 January 2019. Damage to the electric track system interrupted traffic for more than 6 hours, which is why the accident is classified as significant. In 2014–2018, collisions with obstacles classified as significant accidents have occurred on average 0.8 times a year.

A collision between a train and another railway vehicle occurred in 2019, as a passenger train collided with the bucket of an excavator that was clearing snow on a

parallel track in Parkano on 3 February 3019. The engine driver sustained minor injuries as a result of this accident. The collision damaged the engine and the excavator. The accident took place as the excavator operator extended the bucket away from the track maintenance site and breached the safety clearance area of the parallel track, which carried traffic. Collisions between trains and railway vehicles have been rare in recent years, and only one case placed in this category occurred in 2014–2018.

One derailment occurred in rail traffic in 2019, as the last wagon of a freight train was derailed in Imatra on 21 May 2019. The damage to the track caused by this accident amounted to over EUR 150,000, which is why it is classified as significant. The accident was caused as a stop block left under the train derailed the wagon. The previous derailment classified as a significant accident in Finland took place in 2016. The cause of that derailment also was a stop block left on the track. In 2014–2018, on average 1.6 derailments occurred every year, also including cases with minor consequences.

While there were six fires in rolling stock in 2019, none of these is classified as a significant accident. In 2014–2018, on average nine of such fires have been reported yearly. Typically, fires in rolling stock start in locomotive engine rooms or passenger carriages' heating equipment.

Incidents in train traffic

As accidents in train traffic are rare and random variations play a major role in their yearly numbers, over the short term the trend in accident numbers is not the best indicator for safety level development. 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 changes 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 maintenance work resulted in a number of incidents in 2019. For more information about these incidents, see under Safety of track maintenance work.

According to the statistics of the Finnish Transport Infrastructure Agency, there were 49 cases of passing a signal at danger in 2019 (Figure 3). In 2014–2018, there have been an average of 49.2 cases of passing a signal at danger, and this figure has consequently not changed from previous years. Two of these cases caused an immediate collision risk in 2019. They occurred 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.

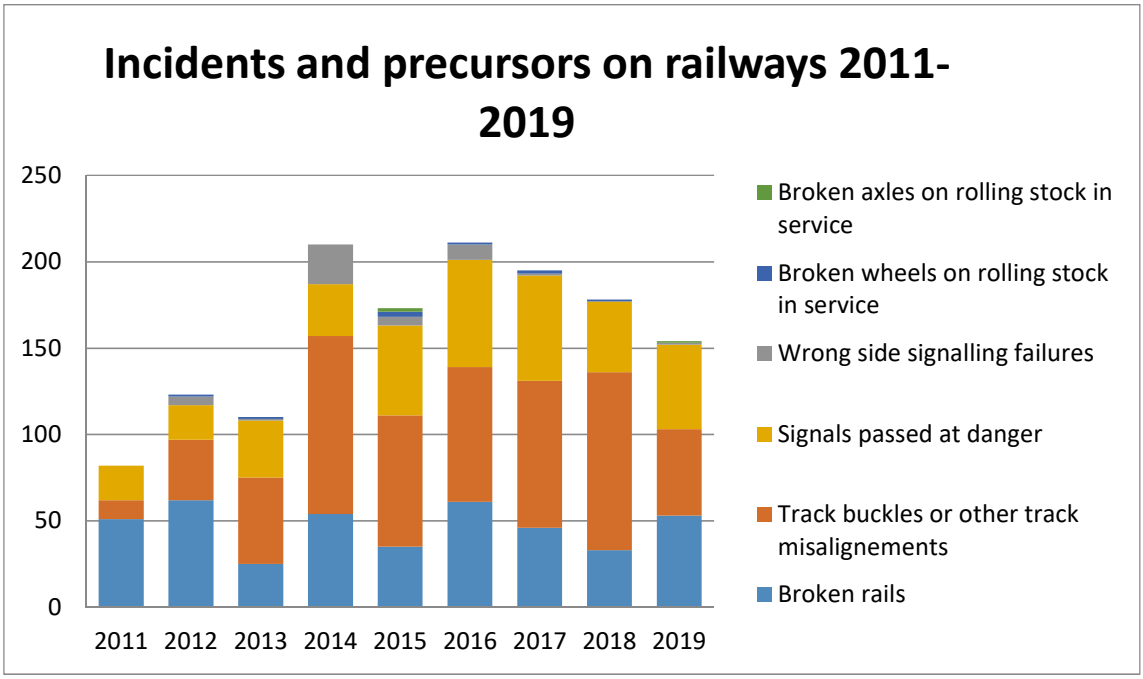

Figure 3. Incidents and precursors on railways according to the Common Safety Indicators in 2011–2019.

In 2019, 147 routing failures occurred. In seven cases, rolling stock was erroneously routed to tracks with an obstacle, and in the remaining 140 cases the rolling stock was routed to tracks with no obstacles. According to the Finnish Transport Infrastructure Agency's statistics, the number of routing failures in proportion to train-kilometres went down slightly compared to 2016–2018. The most typical consequence of a routing failure is that a train is routed to the wrong track, but these cases may also result in serious risks.

The state-owned rail network has a number of rail sections and marshalling yards which have no safety equipment and in which manoeuvres are based on communication between traffic management and engine drivers. Many of these yards are using an operating model for traffic management in marshalling yards, which was commissioned in 2016. While these marshalling yards have not emerged as significant problem areas in statistics, they are associated with risks as the operations in them exclusively rely on human actions. Of the seven routing failures in which there was an obstacle on the tracks, two occurred in marshalling yards covered by these traffic management systems.

A wrong side signalling failure refers to a situation arising from a technical defect where the signalling information given to the train is less restrictive than what would be required. One wrong side signalling failure was reported in 2019. In previous years, the number of these cases has varied between zero 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.

There was a clear downward trend in the annual number of broken rail cases in 2016–2018, but in 2019 their number increased compared to previous years. In 2019, 53 broken rail cases were reported, and the average in 2014–2018 was 45.8. The Finnish Transport Infrastructure Agency has started collecting data on broken

rails more systematically, and damage analyses have been conducted in individual cases. These analyses have revealed needs to improve welding quality. In the worst case, a broken rail may result in derailment.

The Finnish Transport Infrastructure Agency focused particular attention on traffic safety of bridges in 2019. The greatest problems were associated with movement in the structures of Saimaa canal railway bridge observed in spring 2019. The bridge was found to be unsteady as a passenger train was crossing it. Fractured rails and damage associated with the bridge structure were observed in the bridge. Traffic across the bridge was suspended on a temporary basis, and after repairs, normal operation resumed with a low speed limit. The building of a new bridge to replace the old, damaged one had already started before these problems emerged. The new bridge is due for completion in 2020.

The safety equipment of the rail network consists of systems which were built in different decades and which represent a wide range of technologies. There have been challenges associated with replacing and repairing safety equipment, which have resulted in postponements in deploying machines and long repair times. Safety incidents and faults have also been found in the systems. Safety equipment failures increase the safety risks when they result in a need to rely on oral communication. Arrangements for upgrading safety equipment are on the horizon, but it will be necessary to make do with the current systems for a number of years. This is why maintaining the current system is crucial in order to ensure safety and smoothly running traffic. The Finnish Transport Infrastructure Agency is working on a risk assessment of the safety equipment as a whole.

Incidents involving rolling stock

No cases of broken wheels in rolling stock were reported in 2019. Between 2014 and 2018, an average of 1.4 such cases were reported each year. Last year, one case of a broken axle in rolling stock was reported. The previous case was reported in 2015. In the worst case, a broken axle or wheel may result in derailment.

The number of cases with open doors in rolling stock increased in 2018 and 2019. In 2019, there were 25 reported cases of doors being left open in rolling stock, and in 2018, this number was 27. The annual number of open doors in rolling stock cases reported in 2013–2017 was 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 due to a fault in the door control or because the door is not locked.

Twelve cases in which wagons became uncoupled were reported in 2019. The average number of these cases reported in 2014–2018 was 12.4. 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.

In 2019, three leaks of dangerous goods were observed in rail traffic. The average of these cases observed in 2014–2018 was one a year.

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 work than in train traffic because, unlike in train traffic, technical safety systems play only a minor role in shunting, and

the shunting staff is mainly relied on to ensure 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. Because of the great masses of the vehicles and the potential of dangerous goods being present, however, extremely serious accidents may also occur in shunting.

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 contributed to better working conditions and reduced the number of derailments occurring in shunting work. In recent years, the decreasing trend in the number of shunting incidents appears to have stalled.

The causal factors 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. Factors in the background of incorrect work practices often include the feeling of being in a rush, tiredness, a poor level of alertness or challenging winter conditions.

In 2019, two derailments and two collisions classified as significant accidents occurred in shunting. In Sorsasalo on 5 January 2019, a shunting engine was derailed in points, interrupting traffic for over six hours and causing material damage amounting to more than EUR 150,000. In Ilmala on 14 October 2019, a railway vehicle performing shunting work collided with stationary wagons, causing material damage of approx. EUR 300,000. A shunting collision took place in Ykspihlaja, Kokkola on 20 October 2019, resulting in material damage of over EUR 150,000. In Ylöjärvi, a timber wagon was derailed during shunting work on 22 October 2019, resulting in traffic failure of approx. 10 hours.

According to VR Group’s statistics, 72 derailments occurred in shunting work in 2019 (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 was slightly higher than the average in 2014–2018 (62 cases a year).

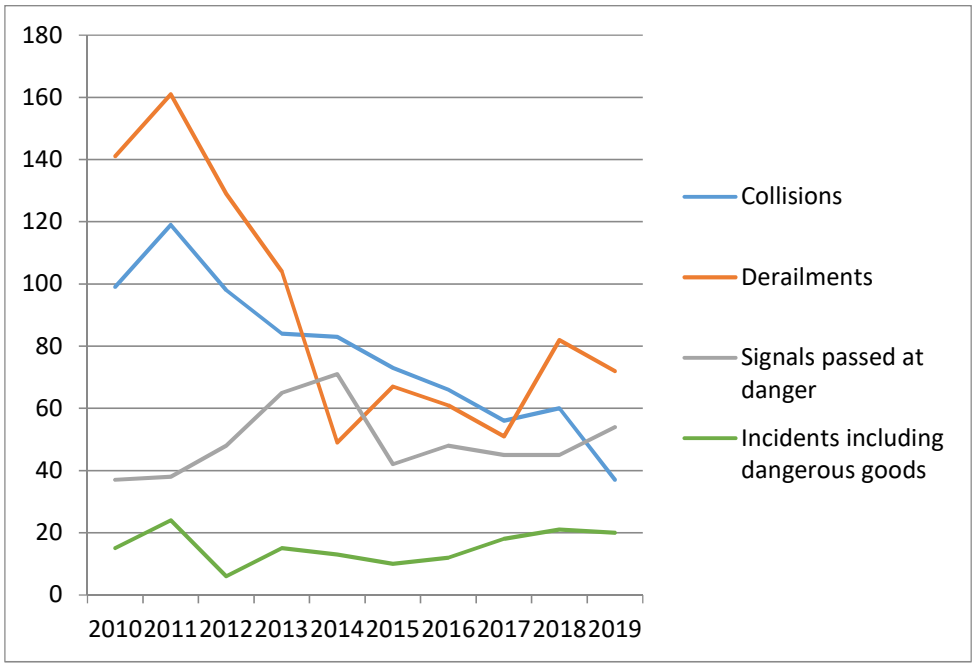

Figure 4. Shunting occurrences in VR Group's statistics in 2010–2019

According to VR Group's statistics, there were a total of 37 collisions in shunting work in 2019. In 2014–2018, an average of 67 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 during shunting work are typically caused by errors in shunting, including excessive speeds or keeping insufficient lookout.

VR Group reported 54 cases of passing a signal at danger in shunting work in 2019. In 2014–2018, an average of 50.2 incidents where signals were passed at danger in shunting were reported each year.

Occurrences related to the carriage of dangerous goods in shunting, or derailments, collisions and leaks, numbered 20 according to VR Group's statistics for 2019. The number of these occurrences increased somewhat compared to the average for 2014–2018, which was 14.8.

Systematic efforts have been made to improve shunting safety, among other things by promoting the development of a positive safety culture and attempting to ensure that safe work practices are used in shunting. While some improvements have been achieved in shunting safety in recent years, the high number of incidents shows that a great deal still remains to be done.

3.3 Safety of carriage of dangerous goods

The volumes of dangerous goods carried by rail in Finland have remained more or less the same in recent years (approx. 5.0 million tons a year), however dropping somewhat 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% 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 traffic on

the Finnish railways, and the remaining quarter is comprised of internal domestic traffic. Services for the chemical industry account for a majority of the dangerous goods carried by rail. In 2017, 55% 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.

The most comprehensive statistics on accidents and incidents related to the carriage of dangerous goods by rail currently 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 carriage of dangerous goods.

Apart from leaks, accidents related to the carriage of dangerous goods are rare, whereas incidents occur from time to time. A majority of the incidents related to the carriage of dangerous goods occurs during shunting.

Leaks have in recent years been the most common occurrence category in shunting associated with the carriage of dangerous goods. Most of the leaks of dangerous goods occurring during shunting have concerned liquids. Collisions have been the second most common shunting occurrence type related to the carriage of dangerous goods in recent years. Most of the collisions in shunting took place as an engine was pushing the wagons. Typically, shunting collisions related to the carriage of dangerous goods have resulted from a human error made by a shunting worker.

The most serious accident relating to the carriage of dangerous goods by rail in recent years took place at Kinni traffic operating point in Mäntyharju on 7 April 2018. 50 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 approx. 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 environment.

No clear trend can be observed in the total number of occurrences in the carriage of dangerous goods by rail. The consequences of a typical occurrence related to the carriage of dangerous goods by rail are minor; derailments do not usually result in leaks, and any leaks are mainly minor ones through valves. 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, or inflammable liquids, corrosive substances and gases.

3.4 Safety of track maintenance work

Track maintenance work refers to work carried out on the tracks or in their vicinity that may affect traffic safety. Safe coordination of track work and train traffic has been a key challenge to rail 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 maintenance workers.

Most track maintenance work is carried out on the state-owned rail network managed by the Finnish Transport Infrastructure Agency. The Finnish Transport Infrastructure Agency gauges the development of the safety situation in track maintenance work by incident frequency, in which the number of accidents, incidents and human errors is examined in proportion to the number of track work permits. In 2019, the incident frequency in track maintenance work decreased slightly compared to 2018 (Table 2). Compared to 2017, there has been a significant reduction in the incident frequency.

Table 2. Incident frequency in the Finnish Transport Infrastructure Agency's track maintenance work in 2017–2019.

Year	Incidents/100,000 track work permits
2017	189
2018	151
2019	144

The Finnish Transport Infrastructure Agency's figures indicate that the number of accidents has gone down in recent years, whereas the number of incidents has gone up. This increase is partly influenced by more accurate classification and improved reporting coverage. The safety situation in track maintenance work has not improved as could be hoped, and the risks have not been eliminated comprehensively.

The number of errors in the securing of track work made by traffic management has increased in recent years. Clear common precursors have not been identified for these cases. The threshold for reporting the cases has become lower, which partly explains the increase in their number.

A few dozen errors in the opening of a track work site to traffic have occurred annually in recent years, and no clear change has taken place in their number. As errors in opening a track work site to traffic are classified incidents in which track work has been completed without the track being available for normal operation, and without notifying traffic management of this. In the most serious cases, the track work permit was concluded even if a machine was still on site. These cases are often associated with ambiguities and assumptions in communication between the site manager and traffic management.

The number of unauthorised passing of the track work boundary cases increased slightly compared to previous years. In 2019, 50 of such cases were reported. The average number of unauthorised passing of the track work boundary cases reported in 2015–2018 was 41.5. The number of cases of working without a track work permit has gone down slightly. In 2019, 35 of these cases were reported, and the average in 2015–2018 was 54.25 cases a year. The number of track work location errors went down clearly in 2019. In 2019, four of these errors were reported, and the average figure for 2015–2018 is 13 cases a year. The reduction in the number of site location errors and cases of working without a track work permit is partly explained by the commissioning of RUMA, a mobile platform for railway contractors, in 2018. RUMA mobile application digitalised site locations and track work notices, reducing the role of the human factor in the track work permit process.

In recent years, almost 200 cases of damage caused by track work to the rail system have been recorded annually. Most of these cases have concerned broken cables and different types of trackside equipment breakages that have a direct bearing on railway safety. Cases have also been reported in which a machine has swung close to an overhead contact line, causing an electric arc or breaking the line.

A few dozen cases of breaches of safety instructions in track work have been reported annually. In 2019, 83 of these cases were reported, which is clearly higher than the average for 2015–2018 (40.5). In this category are recorded failures to comply with track maintenance safety guidelines or other safety instructions.

An analysis of safety incidents produced by the Finnish Transport Infrastructure Agency indicates that there is scope for improvement in the competence of track maintenance service providers and their personnel regarding the requirements and practices of the rail environment. Errors associated with a failure to comply with practices and carelessness have also been observed in track maintenance. Efforts have been made on the railways to reduce the risks related to oral communication by means of training and by replacing oral communication with electronic tools. Regardless of these measures, errors continue to occur in oral communication on railways, causing considerable risks. Some new operators have joined the track maintenance subcontracting chain and new workers have entered the sector, whose skills and safety culture sometimes have room for improvement. A great deal of work has been done by the Finnish Transport Infrastructure Agency and the entire sector to improve the safety culture. The Finnish Transport Infrastructure Agency strives to support improvement in the safety culture of track maintenance by such means as safety targets, bonuses and penalties as well as by processing safety incidents and developing their analysis. The challenge in track maintenance lies in extending the positive development of the safety culture along the subcontracting chain all the way to the persons carrying out the practical work on the track.

3.5 Level crossing safety

In the light of the key figures, 2019 was very similar to previous years in terms of level crossing safety. 26 level crossing accidents occurred in 2019, which is slightly below the average for 2014–2018, or 29.8. 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 2000–2019, there were an average of 42 level crossing accidents each year. Figure 5 illustrates the declining trend in level crossing accidents.

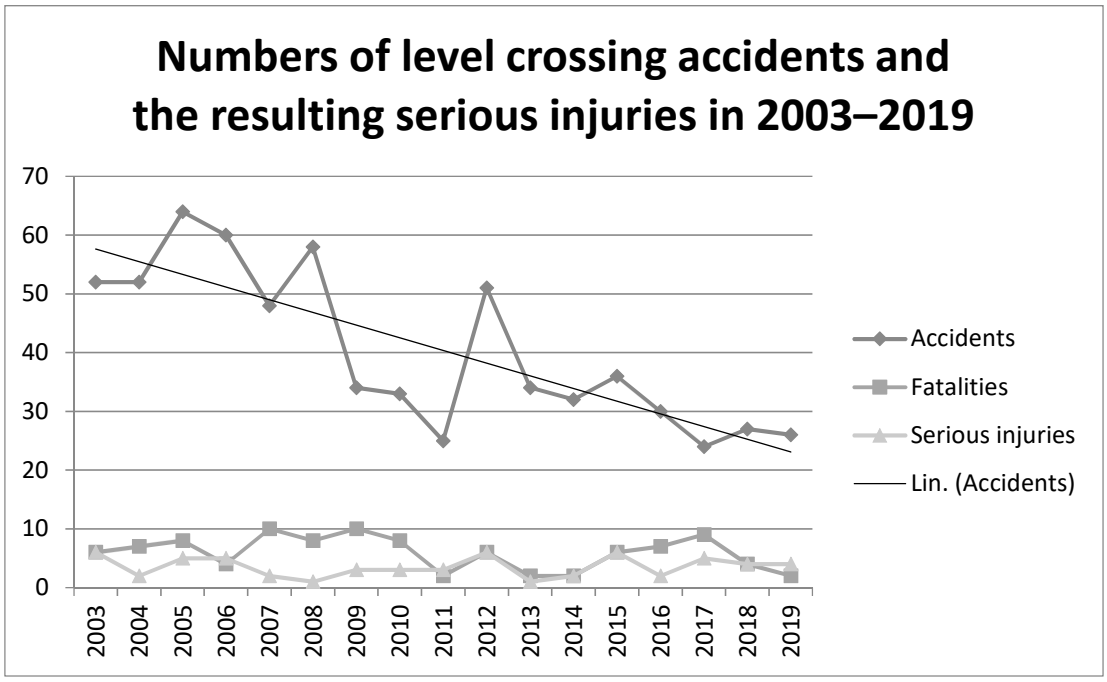

Figure 5. Numbers of level crossing accidents and the resulting casualties in 2003–2019.

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

In 2019, level crossing accidents resulted in two fatalities, and four persons sustained serious injuries. Between 2013 and 2017, there were an average of 5.6 fatalities in level crossing accidents each year, while 3.8 persons sustained serious injuries. Six of the level crossing accidents that occurred in 2019 are classified as significant accidents on the basis of the casualties resulting from them. In 2014–2018, there were an average of 6.8 such cases each year. One of the significant level crossing accidents in 2019 took place at a crossing equipped with half barriers. The remaining five significant level crossing accidents occurred at passive level crossings. No level crossing accidents resulting in several deaths occurred in 2019.

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.

As the manager of the state-owned rail network, the Finnish Transport Infrastructure Agency has drawn up a programme for improving level crossing safety for 2018–2021. Level crossing safety will be improved by eliminating level crossings and by technical means (increasing the number of level crossings with half barriers, improving visibility etc.). 2019 was the second year of this programme. The main emphasis of the actions is on year 2020. In October 2019, the programme comprised 273 level

crossings in total. Work to improve 56 level crossings has been completed. Based on accident predictions produced by the level crossing risk model, the actions that have already been completed will prevent around 13 level crossing accidents over the next 10 years.

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% 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 funding level allocated to rail network and level crossing maintenance is clearly higher, as a consequence of which we may presume that the 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 the level crossings are found are also different. No information is available on any differences in drivers' traffic behaviour between the countries.[2]

3.6 Safety of private sidings

Private sidings are tracks owned by industrial plants, ports and municipalities that connect to the state-owned rail network. There are about 120 private siding managers in Finland. The length of private sidings varies from less than a hundred metres to networks of dozens of track kilometres. In practice, traffic on private sidings is always 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, rail infrastructure managers have understood their responsibilities associated with managing the network better and invested in track maintenance, which has improved the safety situation of private sidings.

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 private siding managers do, however, give a good idea of the type of occurrences seen on private sidings.

Clearly the most common accident type reported on private sidings is derailment. Common causes of derailments are factors related to the conditions as snow, ice or

[2] Tasoristeysturvallisuus Pohjoismaissa. Traficom publications 18/2019. Marika Karhu & Jarkko Voutilainen. Helsinki 2019. <*https://www.traficom.fi/sites/default/files/media/publication/Tasoristeysturvallisuus%20Pohjoismaissa.pdf*>. Retrieved on 27/08/2019.

litter accumulate in the rail channel (lifting the railway vehicle off the rails) and stop blocks left on the rails.

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 collided with 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, private siding managers also report to Traficom on safety development in their annual safety reports. A safety report for 2019 was submitted to Traficom by 78 managers of private sidings. Most private siding managers who submitted a safety report noted that no accidents or incidents occurred on their rail network in 2019. Based on the safety reports, the most common occurrences on private sidings are level crossing incidents and derailments.

A majority of the private siding managers 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 development in safety management had improved the safety situation of the private siding as a result of clearer division of responsibilities and raised risk awareness, among other things.

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.

3.7 Casualties in railway accidents

In 2019, three persons lost their lives in railway accidents, while five sustained serious injuries. The number of fatalities in 2019 was smaller than the average for 2014–2018 (7.6). The number of those who sustained serious injuries was also slightly below the average for the period 2014-2018 (7). Deliberate trespasser fatalities are discussed separately at the end of the section, and they are not included in the above figures.

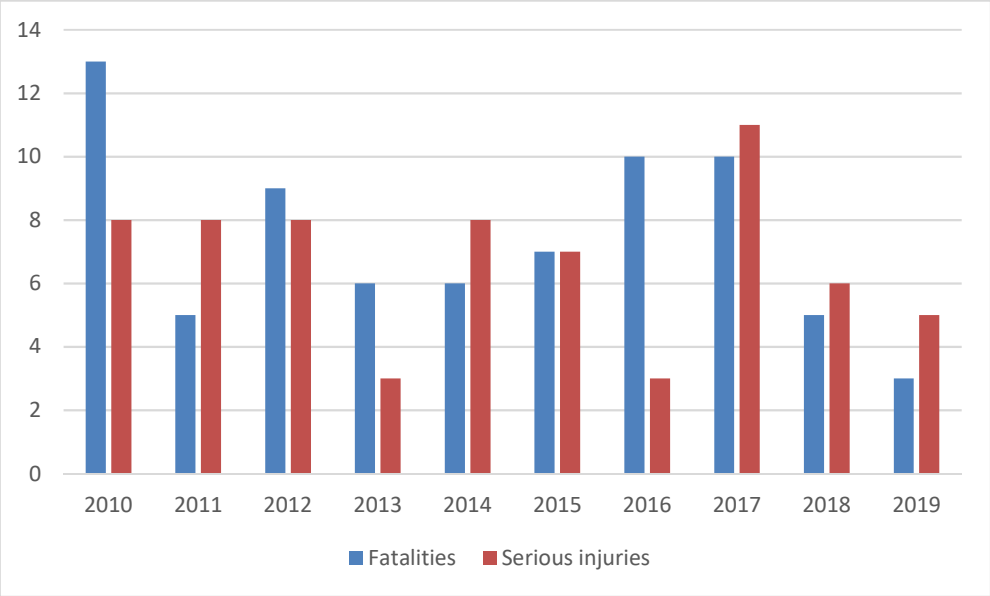

Figure 6. Fatalities and serious injuries in railway accidents in 2010–2019

A declining trend can be seen in the number of fatalities and serious injuries caused by railway accidents in 2010–2019 (Figure 6). Factors of uncertainty are associated with the casualty numbers, however, in terms of the seriousness of the injuries and the deliberateness of trespass, among other things. Additionally, 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.

Two of those who died in 2019 lost their lives in level crossing accidents and one as a consequence of accidents involving rolling stock in motion. Two thirds of those who lost their lives in rail accidents in 2010–2019 were level crossing users (Figure 7).

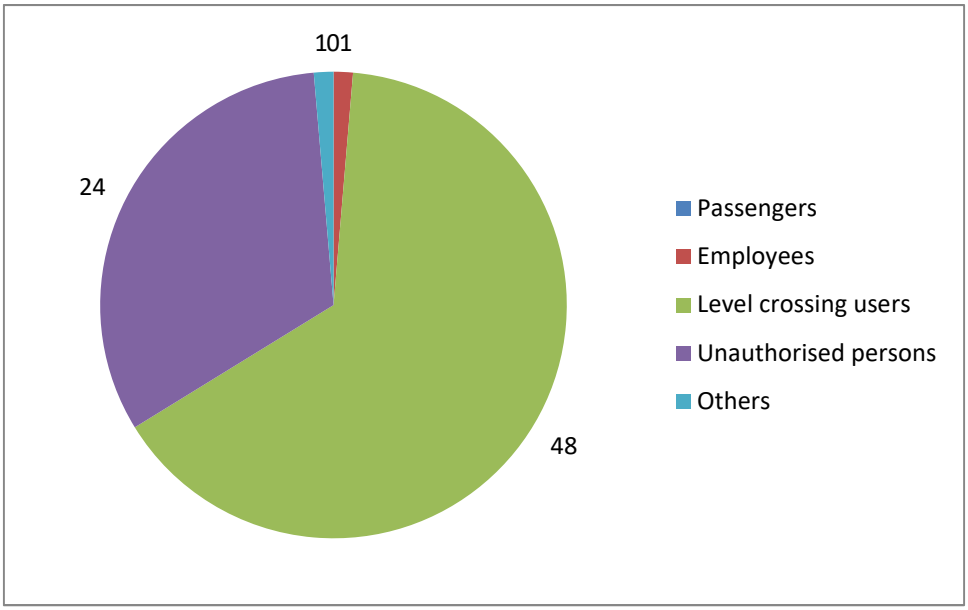

Figure 7. Fatalities in railway accidents by group in 2010–2019

Of the serious injuries sustained in 2019, four were caused by level crossing accidents. One train passenger also sustained serious injuries in 2019 from falling in between the train and the platform while trying to board a moving train. In 2010–2019, slightly over one half of those who sustained serious injuries in rail accidents were level crossing users, and one quarter were trespassers (Figure 8).

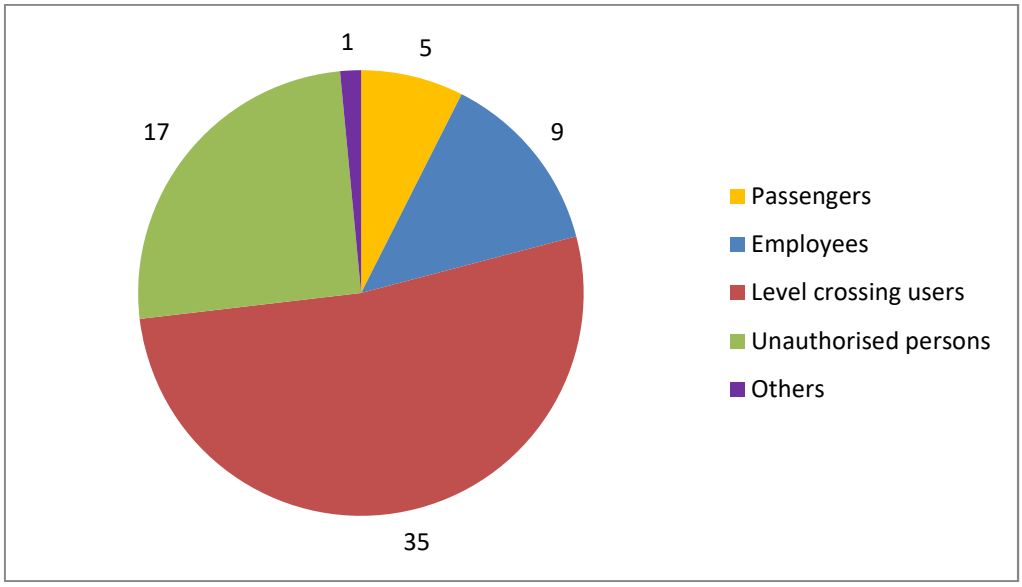

Figure 8. Serious injuries sustained in rail accidents by group in 2010–2019

There were a total of 58 deliberate trespasser fatalities in 2019. In 2010–2018, there were an average of 50.8 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.

Deliberate trespasser fatalities account for 87% of fatalities caused by all rail accidents in Finland in 2010–2019. At EU level, these cases represented 73% of all fatalities in rail accidents in 2012–2016.

Accident to persons involving rolling stock in motion are a complex problem, and their consequences concern a broad range of different operators and authorities. A cooperation group for reducing accidents to persons involving rolling stock in motion, which was convened by Traficom, started operating in 2019. The objectives of this cooperation 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.

A study produced as part of the Safe Traffic 2025 research programme aiming to investigate the most cost-effective ways of reducing the suicide rate on Finnish railways was completed in 2019[3]. In this study, experts assessed the suitability of actions used or identified internationally for the Finnish railway environment. As actions with the greatest potential, the study identified training rail personnel to recognise

[3] Cost-effective ways to reduce suicides on Finnish railways. Finnish Transport and Communications Agency Research Reports 3/2019. Silla, Anne. Helsinki 2019. <*https://www.traficom.fi/sites/default/files/media/publication/Raideliikenteen%20allej%C3%A4%C3%A4nnit_3_2019.pdf*> Retrieved on 11 June 2020.

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. The cooperation group for reducing accidents to persons involving rolling stock in motion has started promoting the implementation of a personnel training measure.

Track maintenance work refers to work carried out on the tracks or in their vicinity that may affect traffic safety. Safe coordination of track work and train traffic has been a key challenge to rail 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 maintenance workers.

Most track maintenance work is carried out on the state-owned rail network managed by the Finnish Transport Infrastructure Agency. The Finnish Transport Infrastructure Agency gauges the development of the safety situation in track maintenance work 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 as a figure proportionate to track work permit numbers went down slightly 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 dropped slightly compared to the two previous years. 41 cases of unauthorised passing of the track work boundary were reported in 2018, and the casualty accident frequency 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 went down compared to the two previous years. On the other hand, the frequency of errors in the lookout man procedure went up.

Based on the Finnish Transport Infrastructure Agency'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 situation of 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 sector varies greatly from one organisation to another, but also within organisations. Examples of a good safety culture evidenced by an active approach to development and open sharing of safety information can be found in the sector. The backdrop to shortcomings in the safety culture often is failing to follow safety instructions or inadequate induction training and skills.

The opening up of track maintenance to competition brought about a major change in the sector's operating environment. The number of companies operating in the sector and the volume of subcontracting have gone up significantly. 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. As a key challenge in the sector can thus be regarded broad-based development of the safety culture and competence among all persons working with track maintenance.

The Finnish Transport Infrastructure Agency 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 Finnish Transport Infrastructure Agency has also continued developing the operation of the learning centre for track construction and maintenance opened in Kouvola in 2017. At this centre, 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 sector that entered into force in summer 2018, the qualification requirements for persons overseeing track maintenance work are no longer laid down in the law. The Finnish Transport Infrastructure Agency’s safety management system now contains a description of the qualification requirements and methods of verifying competence for track maintenance tasks critical for safety. The learning centre for track construction and maintenance plays a key role in training track maintenance workers and verifying their competence.

Other actions taken by the Finnish Transport Infrastructure Agency include updating the safety guidelines for track maintenance based on the observed shortcomings and developing its procurement and contract models to ensure subcontractors’ ability to focus on safety.

4 Changes in legislation

The most significant regulatory change in 2019 was the Rail Transport Act (1302/2018), which entered into force at the beginning of the year and replaced the old Railway Act and the Urban Railway Traffic Act. The Rail Transport Act also implements the EU’s 4th Railway Package in Finland; the relevant sections of the Act entered into force on 16 June 2019.

Additionally, Traficom issued a number of regulations relating to either regulatory development or the objective of reducing the number of national rules in 2019. Among other things, regulations on rolling stock and control-command and signalling subsystems of the railway system were updated due to developments in EU legislation. The regulation on the safety of the railway system was similarly updated as required by the entry into force of the 4th Railway Package. The regulations on the Register of Infrastructure and safety reports were repealed to reduce national regulation.

Similarly to 2018, the year 2019 also brought major legislative changes, and consequently Traficom continued its close cooperation with rail transport operators. Among

other things, Traficom organised cooperation group meetings, an information session on legislation and different training events to, among other things, facilitate the transition to the new regulatory framework of the 4th Railway Package as far as possible. Traficom finds that the cooperation worked well, and the experiences of operation within the new regulatory framework were mainly positive in the first year.

5 Certificates and authorisations

5.1 Safety certificates and authorisations

Traficom issued two safety certificates to railway undertakings in 2019, one of which was processed by the One Stop Shop in compliance with the new regulatory framework. One of these certificates was renewed, while the other was amended. Additionally, one new application for a safety certificate was submitted in 2019, as well as two applications for safety certificate renewals. In August 2020, 28 railway operators held a valid safety certificate in Finland, of which three were railway undertakings with commercial rail traffic operations. The largest groups among safety certificate holders are shunting operators, track maintenance companies and operators of rolling stock in historical use. No safety certificates were revoked in 2019.

On 16 June 2019, an information system maintained by the European Union Agency for Railways was introduced for processing safety certificate applications. Since that date, applicants have submitted their safety certificate applications to the One Stop Shop, and they can choose to have their applications processed by either ERA or Traficom. If the applicant operates in more than one Member State, ERA will be automatically selected. No applications in which the operating area was Finland were addressed to ERA in 2019.

Traficom did not engage in cooperation concerning safety certificates with the safety authorities of other EU Member States in 2019.

Experiences of using the One Stop Shop show that plenty of scope for improvement remains in the system. While no major barriers to issuing safety certificates caused by the system came up, numerous minor bugs and problems with usability hampered the processing of applications at times. On a positive note, the ERA service point responded quickly to reports and requests.

The quality of safety certificate applications continues to vary greatly. However, there has been a clear improvement in safety management systems in recent years. Traficom continued to pay particular attention to operators' monitoring and risk management when processing safety certificate applications, as shortcomings in these areas have come up in audits.

No safety authorisations were revoked in 2019. 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 safety authorisations in compliance with EU legislation, as they can now use a lighter national procedure. Eight infrastructure managers transitioned to the national notification procedure in 2019. As private siding managers are required to submit a notification of each separate set of tracks, these operators submitted a total of 16 notifications of private siding management.

Three safety authorisations expired in 2019, and the infrastructure manager chose not to renew their authorisation or transition to the notification procedure.

At the end of 2019, 89 infrastructure managers had a valid safety authorisation in Finland. By the end of last year, 24 notifications by private siding managers had been submitted in compliance with national legislation.

Delays have occurred in the processing of safety authorisation applications in 2019 and 2020. The main reason for this is that rail infrastructure managers, or the consultants assisting them, have not identified sufficiently well the requirements created by the safety management system process and updated assessment criteria, which changed on 16 June 2019. The requirements placed on the safety management system have been experienced as complicated, in particular by private siding managers. In many cases, rail infrastructure managers have not updated their old safety management systems to meet the new requirements as they submit their applications. The documentation submitted in connection with the safety authorisation application often does not correspond to the rail infrastructure manager's actual safety management procedures; in particular, this is evident in applications prepared by consultants on commission from rail infrastructure managers.

The safety authorisation of the Finnish Transport Infrastructure Agency, which manages the state-owned rail network, was renewed in 2019. This was the first authorisation issued by Traficom on the basis of the new criteria. The assessment of the Finnish Transport Infrastructure Agency’s safety management system was based on discussions, and the system was changed as necessary. This way, a mutual understanding of the requirements entailed by the assessment criteria was reached with the Finnish Transport Infrastructure Agency.

5.2 Authorisations for placing in service or on the market of rolling stock

Due to a change regarding the rolling stock authorisation process which entered into force on 16 June 2019, Traficom started issuing authorisations for placing on the market referred to in the new Directive, rather than the old authorisations for placing in service. Additionally, the authorisations are now mostly processed in the European OSS system.

Traficom issued an authorisation for placing in service and on the market to 736 units in 2019. Most of these authorisations were for revamped rolling stock. The first authorisations for placing in service and on the market were issued to new engines and track work machines, among other things. Renewed authorisations mainly concerned modifications to locomotives (TETRA cab radio equipment).

Traficom is responsible for the FI verifications of rolling stock subsystems, which is why Traficom is actively involved in the authorisation for placing in service process from the start. Traficom engages in active and instructive interaction with applicants throughout the authorisation process. Consequently, few problems have come up in the actual permit applications, and none have been rejected.

5.3 ECMs

A total of 33 ECMs have been entered in the Register of Rolling Stock maintained by Traficom. Two of these (VR Kunnossapito Oy and Teräspyörä Oy) have been issued with ECM certificates for freight wagon maintenance.

The EMCs in Finland are railway operators' internal actors or separate undertakings. Excluding two certified EMCs, the activities of maintenance units are small in scale, and their clients mainly consist of a single operator. By virtue of derogations granted under the ECM Regulation and section 74 of the Rail Transport Act, most of these operators will also not be within the scope of mandatory certification in the future, even if the EU Regulation extends the ECM certification obligation to all rolling stock in 2022.

A large part of the operation in Finland is rail traffic between Finland and Russia, which takes place within the framework of an agreement on a direct international rail link between the two countries. Under this agreement, the freight wagons used in traffic between the countries are inspected at the border crossing before being used on the Finnish rail network. As rolling stock approved and registered in Russia does not have an EMC determined under EU regulation, two railway undertakings (VR Group and Fenniarail Oy) have been granted a derogation from the ECM obligations under Article 15 of the Railway Safety Directive.

5.4 Train driving licences

The number of train driving licences issued by Traficom in 2019 was 130. Four duplicates were issued, one licence was updated, one was renewed, and 89 were cancelled. The reasons for the cancellations were the driver's retirement, moving to other tasks and, in a few cases, failure to meet the health requirements. Five applicants withdrew their applications for a train driving licence in cases where the applicant failed to meet all the licence conditions. In total, 2,736 train driving licences had been issued in Finland by the end of 2019, and 2,674 licences were valid at year end.

5.5 Authorisations for placing structural subsystems in service

In 2019, Traficom issued 33 authorisations for placing structural subsystems in service. This figure is similar to the numbers of authorisations issued in previous years. The scope and complexity of railway projects issued with authorisations for placing in service vary greatly from comprehensive track improvement projects to smaller-scale sites limited to individual tracks.

Authorisations for placing structural subsystems in service are processed as set out in the Interoperability Directive (2016/797/EU) and the national railway legislation. The applicant proves the compliance of the subsystem by means of an EC or FI declaration of verification. The authorisation to place a compliant subsystem in service is issued by Traficom. No changes were made to the application and handling processes of authorisations for placing subsystems in service in 2019.

The projects carried out by managers of private sidings include a higher number of not significant changes. An authorisation for placing in service is usually not required for minor maintenance projects on private sidings.

5.6 Information exchanges between the authorities and 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 an operator's representative. Traficom holds regular one-to-one cooperation meetings with the largest operators, at which topical issues are discussed. 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. An increased number of meetings with individual operators, including operators of rolling stock in historical use and private siding managers, were also organised last year.

On operators' request, Traficom coordinated such cooperation forums as the Network for human and organisational factors in rail traffic, Rail traffic safety and analysis group and Group for reducing accidents to persons involving rolling stock in motion.

The discussions between Traficom and the stakeholders in 2019 concerned actions of the Railway Safety Programme and the ways in which they can be promoted. The questions discussed included the responsibilities and risk management of rail system operators as well as developing the effectiveness of operators' safety management systems and the practical impacts of the 4th Railway Package. Discussions on practical issues related to safety authorisations, safety certificates and authorisations for placing in service were also continued.

6 Supervision

6.1 Supervision plan

Each year, Traficom prepares a supervision plan for the railways. Following this plan, Traficom supervises rail sector operators by means of audits, inspections and assessments and by such other means as safety discussions and consultations. The primary focus of supervision is on auditing railway operators' and infrastructure managers' safety management systems. The operations of ECMs are also audited. Inspections refer to inspections focusing on practical activities and mainly target private siding managers within the scope of the notification procedure as well as yards handling dangerous goods.

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

Traficom carries out quarterly reviews of the supervision plan for the railways. 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.

In 2019, particular focal areas of supervision were legislative changes and their implementation, operators' monitoring and indicators, railway operators' competence

management, maintenance (infrastructure and rolling stock management), traffic operation and traffic management procedures as well as safety culture evaluations. As a result of the extensive change of the legal basis in 2019, operators have to identify the changes and take action to implement them. Operators' monitoring was also selected as a focal area due to shortcomings found in it. Competence management was chosen due to the regulatory changes of 2018, while maintenance was chosen because it has not previously been targeted by systematic supervision. Traffic operation and traffic management procedures, on the other hand, have a key role in safety management. As Traficom participated in an ERA pilot project on safety culture in 2019, this was selected as the last focal point of audits.

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 when 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

Traficom audited the safety management systems of 18 railway operators and rail infrastructure managers in 2019. In addition, one ECM audit was carried out. Six training centres were audited as part of auditing the safety certificates of operators with rolling stock in historical use. Three marshalling yards used for the carriage of dangerous goods were inspected. With a thematic approach, Traficom audited almost all operators of rolling stock in historical use in summer 2019, and the monitoring carried out by these operators was analysed more comprehensively on this basis. Traficom piloted inspections of private siding managers within the scope of the notification procedure.

Most of the deviations found in the audits were classified as minor, and serious deviations were clearly less frequent. In 2019, 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. Several shortcomings were also found in competence management and incident management.

Traficom's interaction with the larger operators, including the Finnish Transport Infrastructure Agency and VR Group, has been more or less continuous. Issues related to supervision are also discussed at one-to-one cooperation meetings between Traficom and operators. The discussions concern topical issues, including the implementation of supervision, its targets and its findings and, for example, changes related to safety. In 2019, topical discussion subjects related to supervision included risk management in the carriage 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 Cooperation with other EU Member States' national safety authorities related to supervision

Trafi did not engage in cooperation related to supervision with other Member States' national safety authorities in 2019 as no railway operator operated in Finland and in another EU Member State under a single safety certificate in 2019. 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 an 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

7.1 Application of the Common Safety Method for safety management systems

As the sizes of Finnish railway operators vary greatly, these variations also affect the operators' inputs in and resources available for safety management. This is why the level of safety management competence and maturity of safety management vary significantly between organisations. While we can say that the level of safety management has improved clearly in recent years overall, areas in need of development remain.

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 their inputs in human and organisational factors and risk management, for instance, have been great. On the other hand, the challenge faced by larger operators is implementing the safety management practices at the level of those carrying out the practical work, especially if these parties are subcontractors.

A significant part of Finnish railway operators has 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.

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

An infrastructure manager or a railway operator applying for a service permit for 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 402/2013). If the change is not significant, the risk assessment should be carried out following the applicant's safety management system. If the change is not significant, the risk assessment should be carried out following the applicant's safety management system.

The infrastructure projects of the Finnish Transport Infrastructure Agency, 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 Finnish Transport Infrastructure Agency uses the procedure laid down in Regulation 402/2013 to assess whether or not a change is significant.

When an operator applying for an authorisation for placing a structural subsystem in service considers the change to be significant, they submit to Traficom a safety assessment report prepared by an independent assessment body as proof of having applied the Common Safety Method.

The operators sometimes have a rather high threshold for considering changes to be significant, as with the involvement of the independent assessment body, risk management following the Common Safety Method is more expensive to implement. A majority of the changes are considered to be not significant. The six criteria for deciding whether or not a change is significance are rather brief and non-specific, enabling operators to make the decision on the project's significance as they find appropriate.

The infrastructure projects of the Finnish Transport Infrastructure Agency, 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 largest projects of the Finnish Transport Infrastructure Agency are assessed as significant changes. It is at times difficult for Traficom to evaluate if assessing a change as not significant is justified, for example when a change to a safety device is technically complex. The Finnish Transport Infrastructure Agency 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 a service permit.

In 2019, the European 4th Railway Package has been applied to the rolling stock in rail traffic. Authorisations for placing in the market are issued to rolling stock, and only rolling stock in historical use is excluded from the scope of application of the 4th Railway Package.

No changes in the national guidelines or processes related to the Common Safety Method for risk assessment were introduced in 2019.

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 actions.

- 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 operators who submitted a safety report also reported on monitoring. This may be due to the fact that the deadline for submitting safety reports was brought forward by a month. The coronavirus situation may also have influenced the matter. There were major variations between the descriptions of different operators, however. Some operators followed the guidelines quite closely, whereas others included a single sentence noting that monitoring had been carried out in 2019.

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. 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, rail network maintenance and achievement of safety targets. For railway operators, the most common priorities included monitoring driver activities, qualifications, work ability and traffic communication.

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 traffic operators focused their monitoring included shunting operation, work ability or complementary certificates/licences. Little information was provided on the indicators used to monitor the targets. In the case of many operators, it also remained unclear how the monitoring had been carried out or what the targets of internal audits were if the operator had included them as monitoring actions.

Those operators who used the table template for reporting on their monitoring also provided the clearest descriptions of the findings. Based on the monitoring results reported by the operators, the indicators used to monitor the targets were qualitative rather than quantitative.

The clearest descriptions of actions and their evaluation were also 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 1078/2012. Based on the descriptions in the safety reports, some operators only partly carried out monitoring as required under the Regulation. It is also likely that

some operators struggle to understand 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.

The descriptions of monitoring in the safety reports suggest 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 understood the purpose of monitoring and that they plan it and carry it out as required under the Regulation.

8 Safety culture

8.1 Evaluation and monitoring of safety culture

The Finnish Transport Infrastructure Agency (manager of the state-owned rail network) is conducting an extensive, multi-annual project on including human and organisational factors and positive safety culture in the safety management system and implementing this in practice at the Agency. In the years to come, smaller actors will prepare safety culture strategies required under the safety management system's assessment criteria.

Traficom has commissioned VTT Technical Research Centre of Finland and Lilikoi Consulting to produce an evaluation aiming to promote the safety culture in transport sector organisations. Needs for further research will also be mapped.

8.2 Safety culture development projects

Traficom participated in an ERA project aiming to develop a model for safety culture in an expert role. The model was piloted on a full scale by Traficom in 2018–2020, during which period Traficom evaluated the safety culture of three volunteer operators using the first version of the ERA model. The results were reported in autumn 2019 and early 2020. A feedback event was held for the operators' management, an evaluation report was produced, and a PowerPoint presentation was prepared on its basis. A feedback event on the progress of the evaluation and the way the results were presented will be held in 2020.

Traficom participated in developing ERA's safety culture model and drawing up a safety climate survey based on it.

The operators that participated in the pilot project on safety culture evaluation will develop their positive safety culture on the basis of the assessment results. VR Group is conducting a multi-annual project to promote a positive safety culture.

8.3 Communication about safety culture development projects

Version 2 of ERA's safety culture evaluation model was presented to the Network on human and organisational factors in rail traffic coordinated by Traficom, and it has been discussed online. Presentations on the Finnish pilot have also been given at the EU level. A presentation on the safety culture evaluation and its results was delivered at the Rata 2020 seminar in January 2020.

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

5dc	Hauled passenger vehicles	See OSS
5de	Fixed or pre-defined formation	See OSS
5df	Special vehicles	See OSS

6. ERTMS equipped vehicles (end of year)

6a	Tractive vehicles including trainsets equipped with ERTMS	26[4]
6b	Tractive vehicles including trainsets – no ERTMS	653[5]

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

[4] ETCS equipment installed, but locomotives are used in B Class system using STM. Only short test track available trackside.
[5] Official stat is not published yet for 2019, but this a close estimate.