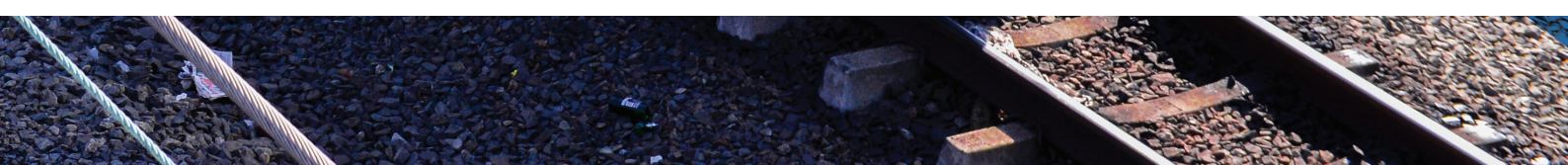
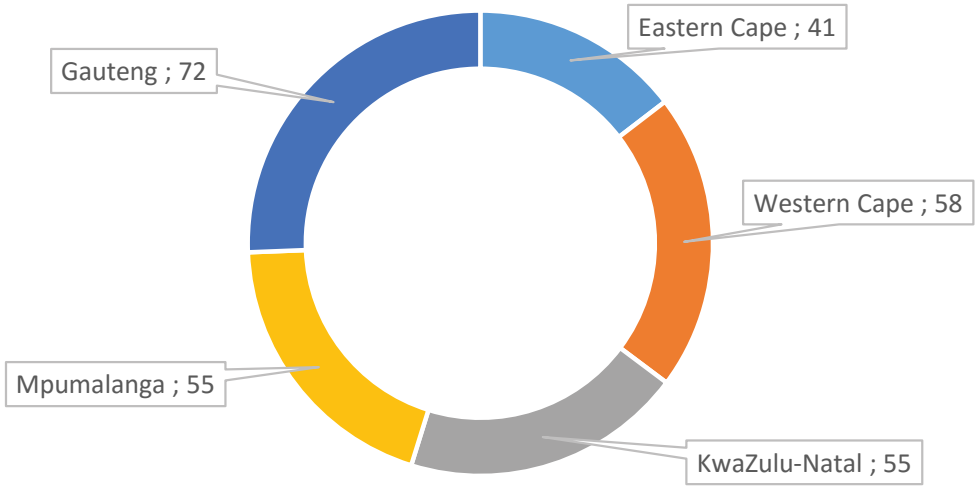
STATE OF SAFETY REPORT 2015/16

RSR Railway Safety Regulator

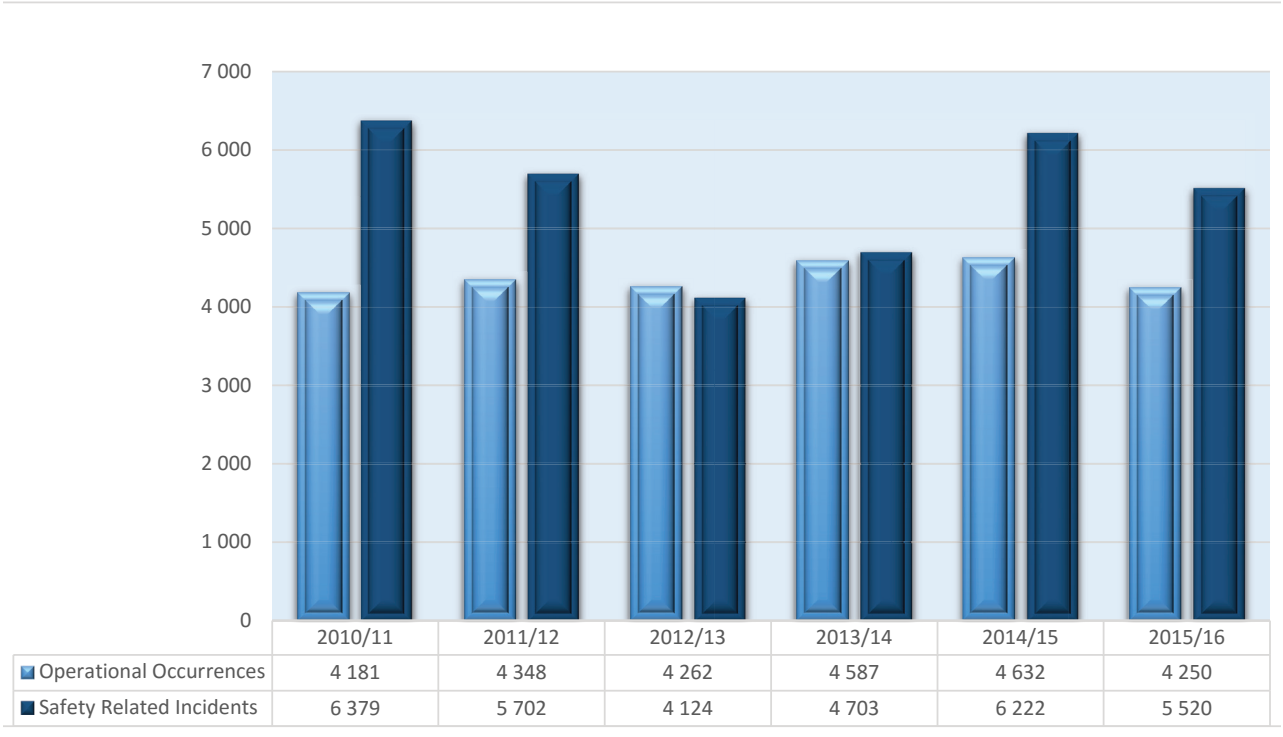
10-YEAR ANNIVERSARY EDITION



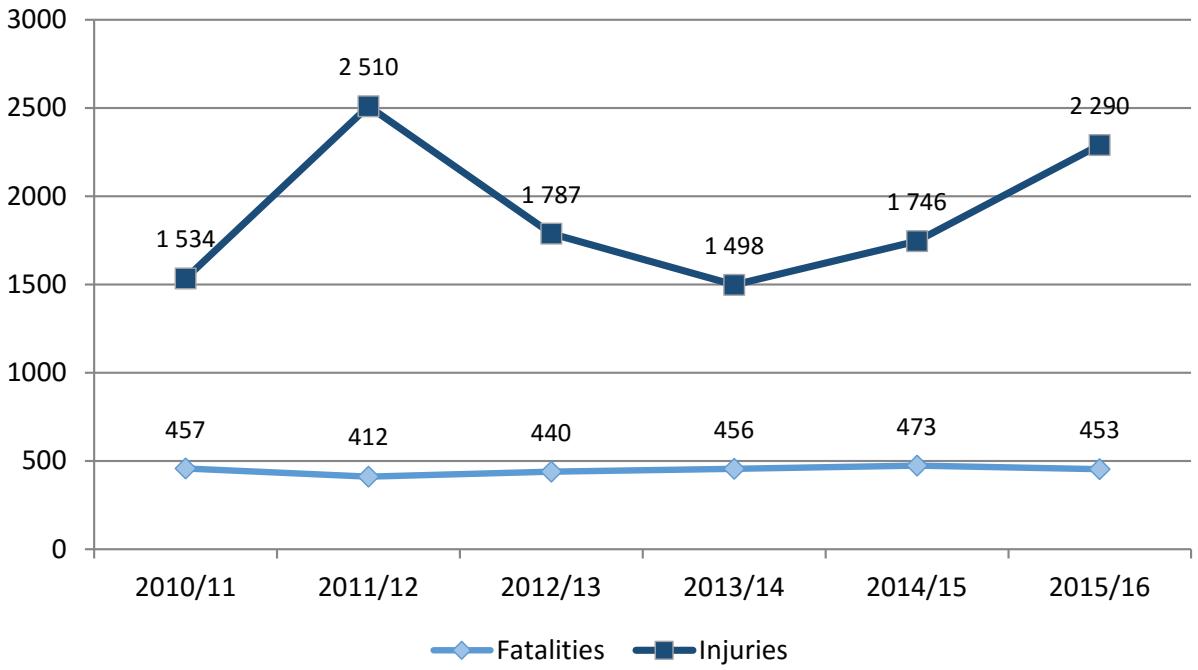
At a glance



Permits issued in 2015/16



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Operational Occurrences	4 181	4 348	4 262	4 587	4 632	4 250
Safety Related Incidents	6 379	5 702	4 124	4 703	6 222	5 520



Cost Type	2013/2014	2014/2015	2015/2016
Derailments	R 260 742 139,34	R 298 026 301,58	R 444 741 332,57
Level Crossing Accidents	R 47 160 043,36	R 73 320 014,94	R 13 483 510,27
Collisions	R 75 491 339,42	R 67 386 575,24	R 129 542 118,00
Theft & Vandalism	R 52 694 483,93	R 73 773 249,67	R 92 431 167,80
Train Fires	R 106 362 432,17	R 79 479 461,00	R 209 463 457,00
Grand Total	**R 542 450 438,22**	**R 591 985 602,43**	**R 889 661 585,64**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List of Abbreviations

The Act	National Railway Safety Regulator Act No 16 of 2002, as amended
BOC	Bombela Operating Company
BOI	Board of Inquiry
DoL	Department of Labour
DOT	Department of Transport
GDP	Gross Domestic Product
GVA	Gross Value Add
MOU	Memorandum of Understanding
NDP	National Development Plan
PRASA	Passenger Rail Agency of South Africa
RRP	Rapid Rail Police
RSR	Railway Safety Regulator
SADC	Southern African Development Community
SANS	South African National Standard
SAPS	South African Police Service
SMS	Safety Management System
SPAD	Signal Passed at Danger
TCO	Train Control Officer
TE	Transnet Engineering
TFR	Transnet Freight Rail
TNPA	Transnet National Port Authority
TPT	Transnet Port Terminals

Foreword

The National Development Plan highlights the key role transport needs to play in order for South Africa to realise its vision for 2030. Together with electricity, water and education, transport is critical in ensuring economic development and social upliftment. Investments in transport infrastructure will enable all South Africans to have access to safe, affordable and reliable public transport. In addition, railway infrastructure investments will stimulate economic growth by linking the points at which goods are produced with the points of consumption.

Railway transportation should, therefore, operate as a service and be sustainable. Even though the annual State of Safety Report is produced in accordance with the National Railway Safety Regulator Act No 16 of 2002, as amended, it is much more than just a compliance document. It measures the pulse of railway safety in South Africa and, therefore, provides a foundation to guide research into new solutions. The Report also enables operators to accurately address those areas of risk that hamper safe railway operations.

In view of the current large scale policy developments and economic restructuring of South Africa's transportation sector, it has become imperative to review the RSR's regulatory framework and approach. When considering the country's need to position rail transportation as a major contributor and facilitator in addressing socioeconomic growth and development challenges and needs, railway safety takes centre stage. It was with this is mind that the RSR conducted the 2015/16 RSR Regulatory Impact Assessment, which resulted in the design of an accurate Cost of Risk profiling model.

The Cost of Risk model succeeded in measuring the percentage risk-rated costs per railway corridor, based on the Gross Domestic Product (GDP) value of freight goods and the Gross Value Add (GVA) value of commuters per million kilometres. The RSR is now able to accurately identify high-risk areas for further investigation and analysis, as well as allow the relevant operators to align their Safety Management Systems to include risk mitigation plans to address the identified areas of concern.

In an era in which resources have become very constrained while safety remains paramount, it is vital to ensure that all efforts yield maximum results. This Cost of Risk model will provide a business-case approach to risk management within the South African railway industry to assist the operators with designing the most cost-effective approaches to safety, while expanding the economic benefits.

It is with some relief that I note a decrease in the number of occurrences and incidents during this reporting period, along with a decrease in injuries and fatalities. During the period, we have endeavoured to direct our actions at significantly reducing the number of occurrences with the aim of ultimately reaching our vision of Zero Occurrences. We have significantly increased the number of technology reviews, audits and inspections, as well as investigations and have also broadened our scope and reach into communities, schools and the general public.

The audits and inspections provide an opportunity for the Regulator and operators to proactively identify systemic challenges, which when addressed could prevent future occurrences. Our focus on education and awareness aims to inculcate a safety culture among learners, commuters, communities and those who live within close proximity of the railway environment.

It is with great pride that we publish this 10th edition of the State of Safety Report in a new and exciting format. It supports our risk-based outlook and it will set the tone for future trend-identification and risk profiling.

Mr. Nkululeko Poya

Chief Executive Officer

Executive summary

The South African rail transportation landscape has been changing at a rapid rate in recent years, with even more drastic and far-reaching changes in the form of new rolling stock and revitalised infrastructure on the horizon. Massive investments in commuter rail infrastructure and new rolling stock over the next few years place the sector at the centre stage of the rapidly expanding transportation network.

The RSR has, therefore, been redefining its regulatory design and approach over the past year, opting for a collaborative, outwards-focused results-based approach to enable the Regulator to realise its revised strategic purpose of working towards zero occurrences. It is within this new risk-based approach that the RSR embarked on a Regulatory Impact Assessment during 2015/16, which among other initiatives, delivered a Cost of Risk model. The model will enable the RSR to evaluate the impact of operational occurrences and safety-related incidents on the railway industry in South Africa. The role of the RSR can be described as two-fold. The primary role is to provide safety oversight and to ensure safety in railway operations, while the secondary role is to play a supporting role in overseeing security matters as well as supporting occupational health and safety matters that impact or may have an impact on safe railway operations.

As part of the primary regulatory function, the RSR issues railway safety permits to railway operators. On a national level, during the 2015/16 Financial Year, 281 active safety permits were issued to operators who complied with the regulatory requirements. During 2015/16 FY, an average of 91% operators complied with the reporting requirements as per the Act. The noted increase in compliance to requests for submissions since the 2011/12 reporting period may be influenced by operators being more familiar with the RSR's requirements and obligations as a result of the Regulators Technical Workshops, which provide training on regulations and standards.

The RSR is required to report on the safety performance of the railway industry in the annual State of Safety Report. This Report contains the analysis of occurrence and incidents data reported by railway operators as prescribed by Section 37 of the NRSR Act. Unless specifically referenced, all data and analyses contained in this Report is based on present and historic data as reported and published by the RSR. Analysis of the data reported and verified with the relevant operators, indicates a marked decrease in operational occurrences as well as in safety-related incidents during the period under review. The total number of 4 250 operational occurrences in comparison with 4 632 in the previous reporting period indicates an 8% decrease. In the same manner, the 5 520 security-related incidents recorded in the 2015/16 reporting period indicate an 11% decrease from 6 222 incidents recorded during the 2014/15 reporting period. Transnet and PRASA account for 97% of all operational occurrences reported to the RSR. In terms of provincial distribution, the majority of operational occurrences took place in Gauteng (31%), KwaZulu-Natal (26%) and the Western Cape (17%).

Harm to our people, being either members of the public, commuters, railway employees or contractors, who are either injured or killed within the railway environment remain a grave concern for the RSR. Though there has been a 4% decrease in the number of people killed in the

railway environment, the number of injuries have seen a steep increase over the past three reporting periods.

Copper cable theft remains a global problem and South Africa is no exception. Theft of assets impacting on railway operational safety has been reduced in the 2015/16 reporting period, however, this type of criminal activity constitutes 65% of the total number of security related incidents. The majority of these incidents involve theft of electric cables and train control equipment (signalling equipment). Though a decrease in the number of security related incidents was recorded, an increase in the number of fatalities as a result of security related incidents has been noted; from 12 in the 2014/15 period to 14 in 2015/16. However, a marked decrease in the number of injuries from 606 in the previous period to 466 in the current 2015/16 period provides some relief.

During the 2013/14 FY, the RSR realigned its strategic objectives and interventions towards significantly reducing the number of railway occurrences. To achieve this outcome, the following five key focal areas, were identified, using a combination of time-series and collective risk (where appropriate) analytical techniques.

The selection was based on those operational occurrences, with the exception of level crossings, which contributed to 80% of the risks in the external environment, either in terms of costs incurred by the relevant operator, or in terms of injuries and loss of life. During the 2015/16 reporting period, a 50% reduction in train-on-train collisions on a running line was reported and a 24% increase in derailments on a running line was recorded with 114 occurrences reported during 2015/16 versus 97 occurrences during the previous 2014/15 period. The distribution in terms of provinces is dominated by the main TFR lines in Gauteng, Mpumalanga and KwaZulu-Natal. Though no fatalities were recorded, and a low number of injuries occurred, the direct costs involved are in excess of R450-million.

Mainline level crossing occurrences decreased by 5% during the 2015/16 reporting period, building on the 6% decrease reported during the 2014/15 period. Though a 6% decrease in the number of occurrences has been recorded, the majority of fatalities were in Category E, people struck by trains during movement of rolling stock. The risks of passengers falling between the train and the platform or falling on the platform, when entering or exiting a train, have steadily increased during the current period. Issues such as overcrowding, as well as the distance between the train and platform, play a big role in such occurrences.

Over the 2010 to 2015 period, 70% of all occurrences and incidents reported as theft and vandalism, consistently lead all categories. However, in terms of the costs attributed to the occurrences and incidents, derailments are the most costly with 57% of costs attributed to this category over a six-year period. In terms of the costs associated with these events, train fires have seen a sharp increase during the 2015-16 period, with theft and vandalism still below the 2010/11 levels, though increasing steadily since 2011/12 period. The level of occurrence costs have remained relatively stable since the drop in 2011/12, showing a very moderate increase. During 2015/16 the costs associated with

train fires dominated the Western Cape. In KwaZulu-Natal, costs associated with derailments were more significant. Gauteng shows a more even distribution of cost categories. The costs in these three provinces were all in the same order of magnitude for 2015/16.

The Gross Value Add of PRASA passengers per 1 000 trips is used as the Passenger Rail Benefit Denominator. Eleven metropolitan and district municipalities were analysed and divided into two groups of municipalities with more than 70 000 passenger trips per annum or less than 20 000 trips per annum. The cities of Cape Town, Tshwane and Johannesburg are all in the high risk, high value category.

For the freight cost-benefit analysis, the total occurrence and incident costs per tonne transported as declared by TFR serves as the Freight Rail Cost Numerator. The value of freight per tonne transported is used as the Freight Rail Benefit Denominator. The Natal, Cape, Maputo and Manganese export corridors fall into the high risk, high value quadrant, while the coal and iron ore export corridors fall in the low value, low risk quadrant, all relative to each other for 2015/16.

Analysis of investigation findings is grouped according to the category it addresses in order to determine the number of findings for a specific category, for example, perway, rolling stock and signalling. During the analysis, it was determined that the human factors element was by far the largest contributor to railway accidents. Human factors contribute to 60% of all the findings in the 2015/16 FY.

The second category with high percentages of accidents were derailments caused by failure of the operator to maintain worn out wheels. The underlying cause of worn out wheels can be attributed to operators failing to conduct planned maintenance as scheduled. It could be that operators have adopted a “run to failure” maintenance approach.

The occurrence and incident costs as a function of tonnes transported, value of freight, and revenue have all steadily increased to more than double the levels of the 2011 base year. The average cost per occurrence or incident has also increased albeit at a slower rate relative to the other indicators.

Introduction

The RSR was established in 2002 with the enactment of the National Railway Safety Regulator Act No 16 of 2002, as amended, henceforth referred to as "the Act". With the enactment of the Act, the National Department of Transport (DoT) has, in clear and unambiguous terms, recognised and acknowledged the importance of safe railway operations in the Republic of South Africa. In terms of the Preamble of the Act, safe railway operations are fundamental to the safety of all persons and the environment and aims to promote the use of railways as a mode of efficient transportation.

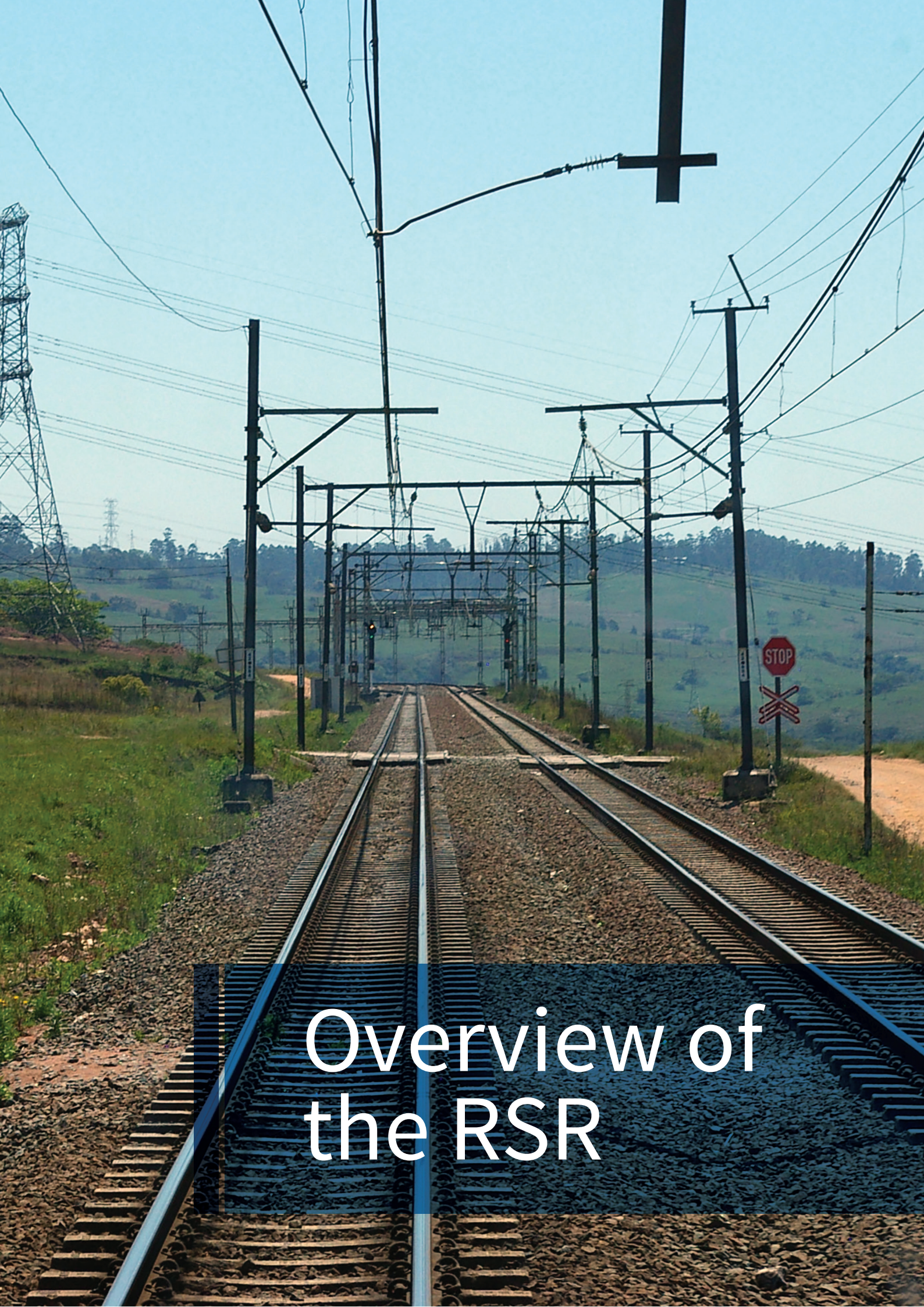
As the custodian of the Act, the RSR, in terms of Section 5 of the Act, is entrusted with the responsibility of overseeing the safety of railway transport, thereby playing a vital role in ensuring that all those who operate, travel by, or are in the vicinity of railway operations within South Africa, are doing so in a safe and reliable manner. Since the RSR came into existence, its primary focus has been to ensure that operators comply with the various regulations and standards that have been put into effect over the years, in an attempt to prevent loss of life and damage to property as a result of unsafe actions.

The South African rail transportation landscape has been changing at a rapid rate in recent years, with even more drastic and far-reaching changes in the form of new rolling stock and revitalised infrastructure on the horizon. Massive investments in commuter rail infrastructure and new freight and passenger rolling stock over the next few years, place the sector at the centre stage of the rapidly expanding transportation network.

For the RSR, this radical transformation in the railway landscape also calls for a regulatory approach that not only enables the Regulator to identify and mitigate the risks associated with such enormous upgrades and expansions, but is vibrant enough to cater for such changes in the rail environment while ensuring continuous improvements in safe railway operations. The RSR has been redefining its regulatory design and approach, opting for a collaborative, outwards-focused results-based approach to enable the Regulator to realise its revised strategic purpose, which is to work towards zero occurrences. The move from a compliance-driven to a risk-based approach will enable the RSR to have meaningful impact in order to significantly reduce railway occurrences.

It is within this new risk-based approach that the RSR embarked on a Regulatory Impact Assessment during 2015/16, which among others, delivered a Cost of Risk model, which will enable the RSR to evaluate the cost-related impact of operational occurrences and safety-related incidents in the railway industry in South Africa. This State of Safety Report signifies a shift in focus in the evaluation of the safety performance over the period of 1 April 2015 to 31 March 2016 and is produced in accordance with Clause 20 (1) of the Act, which stipulates that the RSR shall produce an annual report on the safety of workers, the public and the environment associated with railway operations.

In addition, the RSR will continue to monitor and ensure compliance with the Act and promote the harmonisation of the railway safety regime of South Africa with the objectives and requirements for safe railway operations within the Southern African Development Community (SADC).



Overview of the RSR

Rail transportation features prominently in the NDP, and has been earmarked to ensure that investments in transport infrastructure enable all South Africans to have access to affordable, reliable and safe public transport. In addition, railway infrastructure investments should aim to stimulate economic growth by linking the points at which goods are produced with points of consumption.

The RSR, therefore, has a critical role to play by ensuring that the provision of rail transport is done with safety at the forefront of all operations. In line with this mandate, the mission of the RSR is to oversee and promote safe railway operations through appropriate support, monitoring and enforcement guided by an enabling regulatory framework.

This, therefore, places the RSR's mission central to the Department of Transport's (DoT) vision of Transport, the heartbeat of South Africa's economic growth and social development.

The role of the RSR is two-fold. The primary role is to provide safety oversight and to ensure safe railway operations. In order to oversee railway safety, the RSR establishes and enforces a regulatory regime through the development of regulations and standards and by the issuing of safety permits to operators who demonstrate the existence of an appropriate Safety Management System (SMS). In addition, the RSR ensures the safe introduction of new rolling stock and infrastructure through technology reviews.

The secondary role of the RSR is to play a supporting role in overseeing security matters as well as supporting of occupational health and safety matters that impact or may have an impact on safe railway operations. The supporting role in occupational health and safety and security is fulfilled through cooperation with relevant organs of state and other stakeholders through implementation of Memoranda of Understanding with, among others, the Rapid Rail Police and the National Department of Labour (DoL).

Overview of the railway industry

Railway operator numbers

During the 2012/13 FY, the RSR implemented its decentralisation program and established three regional offices overseeing the KwaZulu-Natal Region (covering KwaZulu-Natal and the Eastern Cape), Western Cape Region (covering the Western Cape, Northern Cape and Free State) and Gauteng Region (covering the North West, Limpopo, Mpumalanga and Gauteng).This has since been expanded, resulting in a regional presence in the Eastern Cape, Western Cape, KwaZulu-Natal, Mpumalanga and Gauteng with each office having its own autonomy to regulate the railway industry within its jurisdiction.

One of the primary regulatory functions of the RSR is the issuing of railway safety permits to railway operators. Transnet Freight Rail (TFR) and the Passenger Rail Agency of South Africa (PRASA) are the two largest railway operators in South Africa. The Bombela Operating Company (BOC), trading as Gautrain, joined these two operators in Gauteng as another significant operator in the country. It is important to note that Gautrain is the only current standard gauge passenger operation in South Africa. The balance of the operators comprises rail entities within tourism, cross-border and surface operators on mines; rail operators at the ports; municipal sidings and service lines which provide access from the national network to private sidings for numerous operators in the agricultural, manufacturing and petro-chemical sectors.

On a national level, during the 2015/16 FY, 281 active safety permits were issued to operators who complied with regulatory requirements. The number of permits issued are regionally distributed as follows:

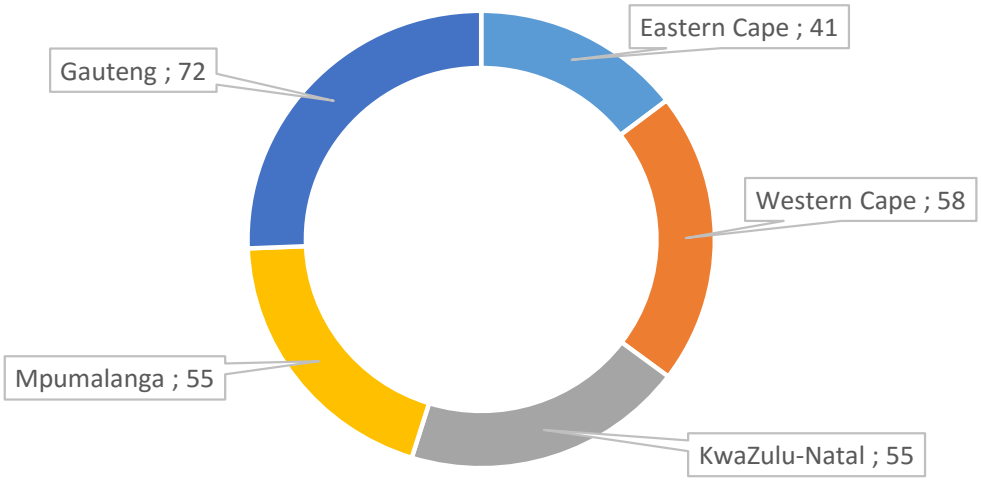


Figure 1: 2015/16 Permits issued per RSR region

Railway traffic volumes

As the primary role players within the railways in South Africa, the RSR requested TFR, PRASA and Gautrain to submit their respective traffic volumes for the 2015/16 reporting period. The figures submitted indicate that there have been a decrease in TFR and PRASA traffic volumes, while Gautrain experienced an increase when compared to the previous reporting period. These figures can be presented as follows:

OPERATOR /YEAR	10/11	11/12	12/13	13/14	14/15	15/16
TFR (million train km's)	45.9	46.3	46	46.9	47.03	39.04
TFR (billion ton km's)	117.9	126.5	132.4	134.6	144.7	138.4
PRASA (Million train km's)	26.3	19.9	24.53	24.97	23.9	22.2
PRASA (million passenger km's)	12 232	13 651	16 735	14 269	13 670	11 854
Gautrain (million train km's)	0.3*	1.43	4.07	4.4	4.6	6.5
Gautrain (million passenger km's)	11.5*	119.2	340.8	419.8	493.9	504.92

Table 1: Traffic volumes for the five-year period from 2010/11 to 2015/16

(Note* Last two quarters of 2010/11 only)

Measuring safety and security in the South African railway industry

Section 37 of the Act stipulates that "an operator must report to the Chief Executive Officer (of the RSR) the category and type of all railway occurrences in the manner and form prescribed by the Minister (of Transport)". In order to ensure a common understanding as well as provide for analysis of data, clearly defined categories for recording and reporting of data has been defined in the South African National Standard (SANS) 3000-1 (2009) – Railway Safety Management, Part 1: General. Each of the operational occurrences and the security-related incidence categories are divided into a number of sub-categories. Table 2 below provides a description of the two reporting types as well as the main categories:

Operational occurrences happen as a result of unsafe or system faults within railway operations. The RSR fulfils a primary role in preventing or at least significantly reducing such occurrences	
Operational Occurrence Category	
A	Collisions during movement of rolling stock
B	Derailments during movement of rolling stock
C	Unauthorised movements such as signal pass at danger
D	Level crossing occurrences
E	People struck by trains during movement of rolling stock
F	People-related occurrences: trains in section
G	Passenger-related: travelling outside train
H	People -related: platform- train interface
I	People related occurrences: station infrastructure
J	Electric shock
K	Spillage/leakage, explosion or loss of dangerous goods
L	Fire as result of electric or other operational reason

Security-related incidents are criminal in nature and primarily fall within the mandate of the Rapid Rail Police. The RSR plays a supportive and advocacy role	
Safety- Related Incident Category	
1	Theft of assets (impacting on operational safety)
2	Malicious damage (vandalism) to property including arson
3	Threats to operational safety
4	Hijacking of trains
5	Crowd-related incidences
6	Industrial action
7	Personal safety on train
8	Personal safety on stations
9	Personal safety outside station platform area (including yards, sidings and depots)

Table 2: SANS categories for operational occurrences and safety-related incidents

Railway industry compliance to occurrence and incidents reporting

The RSR is required to report on the safety performance of the South African railway industry in its annual State of Safety Report. This report contains the analysis of occurrence and incidents data reported by railway operators to the RSR as prescribed by Section 37 of the Act. Unless specifically referenced, all data and analyses contained in this report are based on present and historic data as reported and published by the RSR. It is important to note that all railway occurrences that result in injury, death or significant damage to property or involves dangerous goods, should be recorded and reported to the RSR immediately.

During 2015/16, an average of 91% of operators complied with the reporting requirements as per the Act. The noted increase in compliance to requests for submissions since the 2011/12 reporting period may be influenced by the operators being more exposed to the RSR requirements and obligations presented to them through the RSR Technical Workshops pertaining to regulations and standards. The annual average submission percentage data may be presented below:

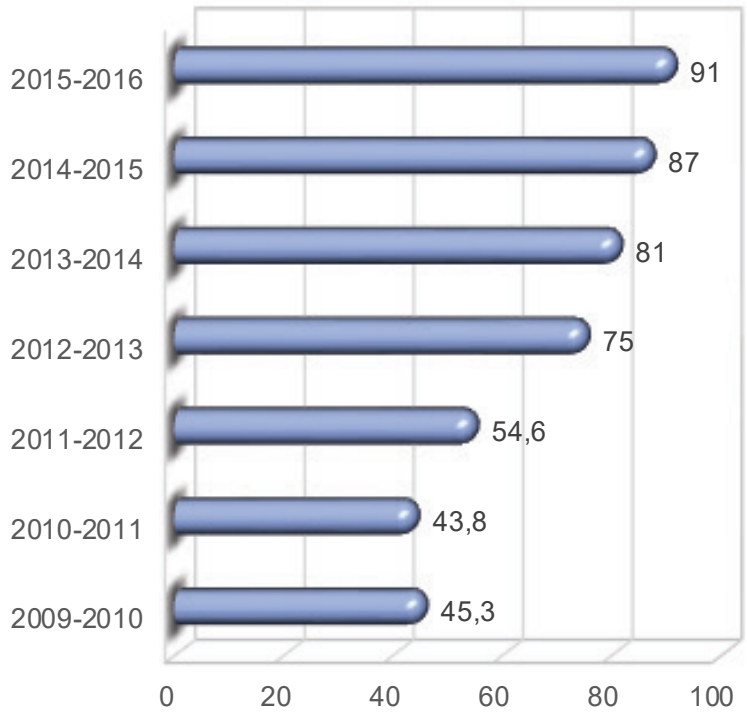


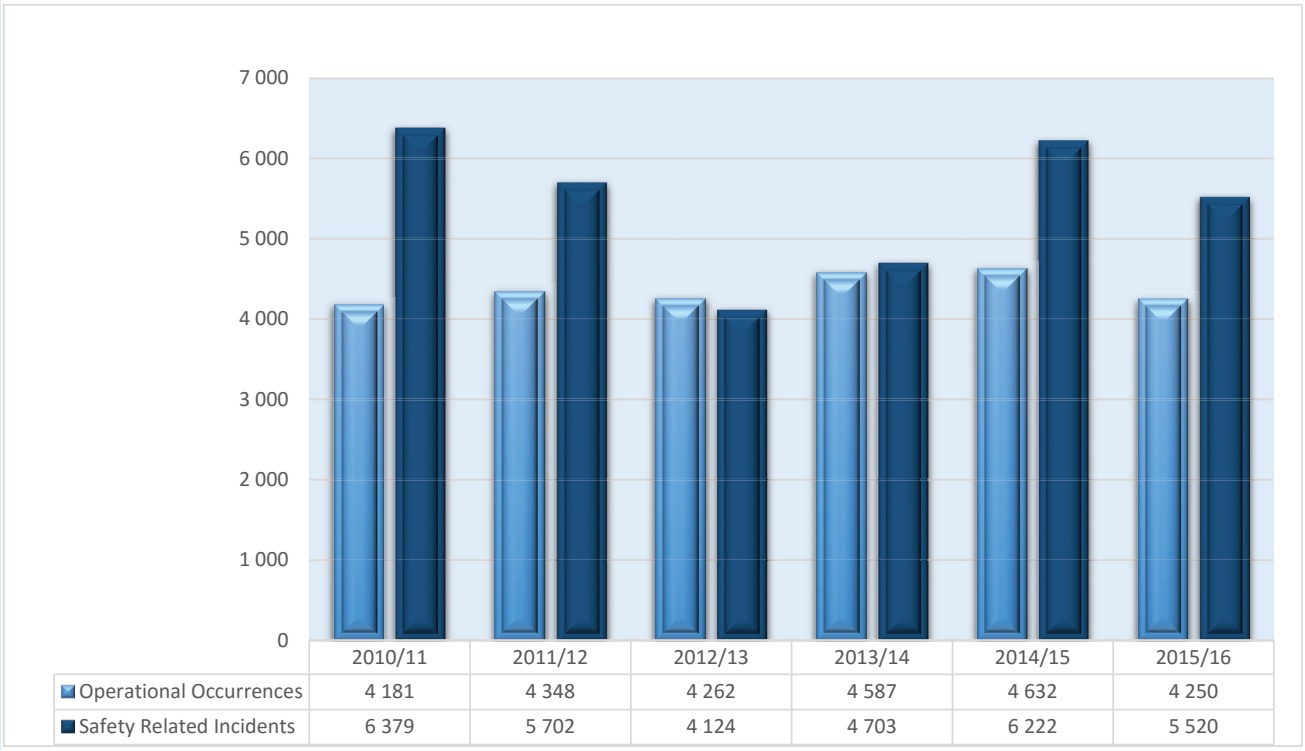
Figure 2: Occurrence reports submission percentage trend from 2009/10 to 2015/16

The submission of quarterly reports to the RSR by railway operators issued with safety permits forms part of the conditions of the operators' railway safety permits. Operators who failed to comply are liable for any corrective action the RSR deems appropriate to encourage compliance. The RSR is thus mandated to issue non-compliance directives or penalties in accordance with the RSR Penalty Regulations 2011, as amended, as provided for in the Act in order to achieve a 100% submission rate.

Railway safety performance comparison

This section contains a high-level analysis of the operational occurrences and safety related incidents of all operators during the 2015/16 reporting period. It includes a geographic distribution, as well as information pertaining to fatalities and injuries. The focus is on the five main strategic occurrence categories as identified and on important security incidents such as vandalism (including train fires) and theft. Analysis of the data reported and verified with the relevant operators indicates a marked

decrease in operational occurrences and safety-related incidents. The total number of 4 250 operational occurrences in comparison with 4 632 in the previous reporting period indicates an 8% decrease. The 5 520 security-related incidents recorded indicates an 11% decrease from 6 222 incidents recorded during the 2014/15 reporting period. The graph illustrates the overall safety performance of the South African railway industry since 2010/11.



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Operational Occurrences	4 181	4 348	4 262	4 587	4 632	4 250
Safety Related Incidents	6 379	5 702	4 124	4 703	6 222	5 520

Figure 3 : Overall railway safety performance since 2010/11

Operational occurrence trends

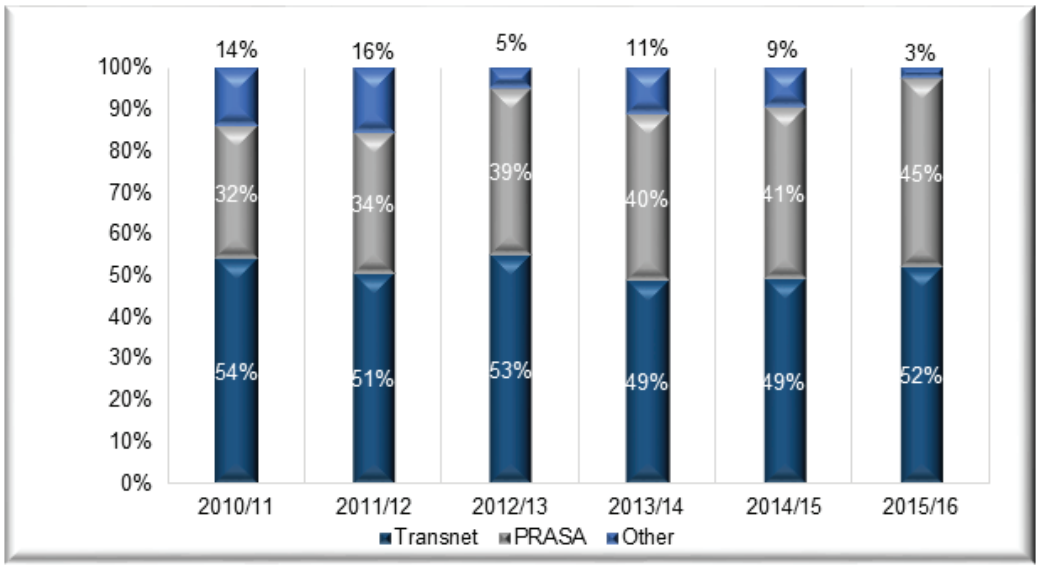


Figure 4: Distribution of occurrences per operator

In line with previous years, the two main operators, namely Transnet and PRASA account for 97% of all operational occurrences reported to the RSR. This is a significant rise from the previous period (92%), which when read together with the increase in reporting, could indicate increased levels of safety among other operators in lieu of the decreased number of occurrences. The data also indicates that there are some operators who recorded zero occurrences during the same period which is commendable. As mentioned, the total number of operational occurrences during 2015/16, declined by 8% to a total number of 4 250 occurrences in comparison to the previous reporting period total of 4 632.

Sadly, an increase is noted in Category A (Collisions) and Category H (Platform-train interface). The increase in collisions can largely be attributed to a sharp increase in Sub-category A-b, being collisions with obstacles on a running line, where trains collide with, for example, livestock, debris or rocks. This is as a result of the unrestricted and open nature of the rail network. It is, however, encouraging to note a marked decrease in the other categories, especially Category B (Derailments), Category D (Level Crossings), Category E (People struck by train), Category K (Spillage of dangerous goods) and Category L (Fires as a result of operational faults). Refer to Appendix B for details per category and sub-category. The table below provides a three-year comparison from 2013/14 to 2015/16:

Reporting Year	2013/14	2014/15	2015/16			
South African National Standards (SANS) Category	All	All	TFR	PRASA	Other	All
A: Collisions during movement of rolling stock	980	1059	1018	66	15	1099
B: Derailments during movement of rolling stock	718	592	293	45	83	421
C: Unauthorised movements including rolling stock movements exceeding limit of authority	121	93	56	31	7	94
D: Level crossing occurrences	119	109	67	11	9	87
E: People struck by trains during movement of rolling stock	588	643	163	378	0	541
F: People-related occurrences: trains outside station platform areas or in section	209	338	5	332	0	337
G: Passenger-related occurrences: travelling outside designated area of train	94	163	0	130	1	131
H: People related occurrences: platform- train interface	715	612	0	658	0	658
I: People related occurrences: station infrastructure	190	166	0	130	0	130
J: Electric shock	35	34	8	19	0	27
K: Spillage/leakage, explosion or loss of dangerous goods	250	265	223	0	0	223
L: Fires	568	558	387	115	0	502
TOTAL	**4 587**	**4 632**	**2 220**	**1 915**	**115**	**4 250**

Table 3: Operational occurrences per annum from 2013/14 to 2015/16

The top five contributing categories in terms of the number of occurrences are:

- Category A – Collisions during movement of rolling stock; 26%
- Category B – Derailments during movement of rolling stock
- Category E – People struck by trains during movement of rolling stock
- Category H – People related occurrences: platform-train interchange
- Category L – Fires, including operational electrical faults, "veld fires" and hook-ups

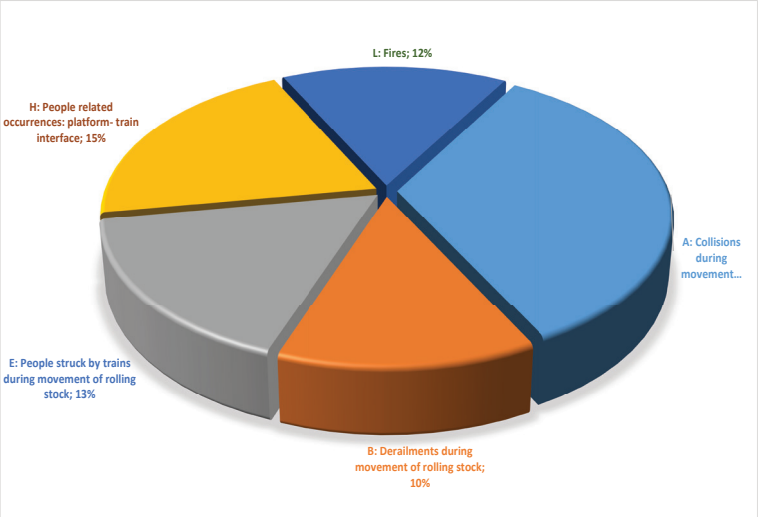


Figure 5 : Top five contributing operational occurrences 2015/16

In terms of provincial distribution, the majority of operational occurrences took place in Gauteng (31%), KwaZulu-Natal (26%) and the Western Cape (17%). The single occurrences reported for Swaziland and Lesotho are related to occurrences involving cross-border freight transport, which is attributed to a South African operator. The graph and map below indicates the provincial distribution of operational occurrences during 2015/16

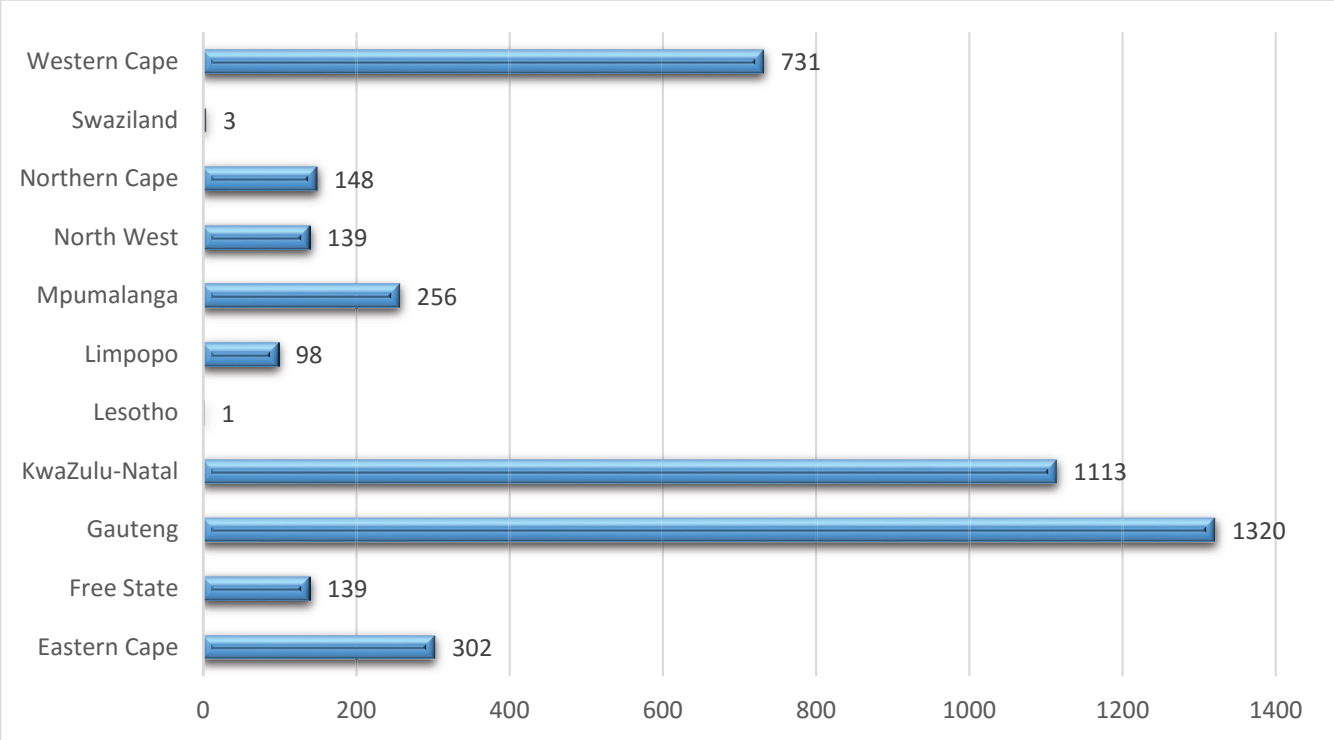
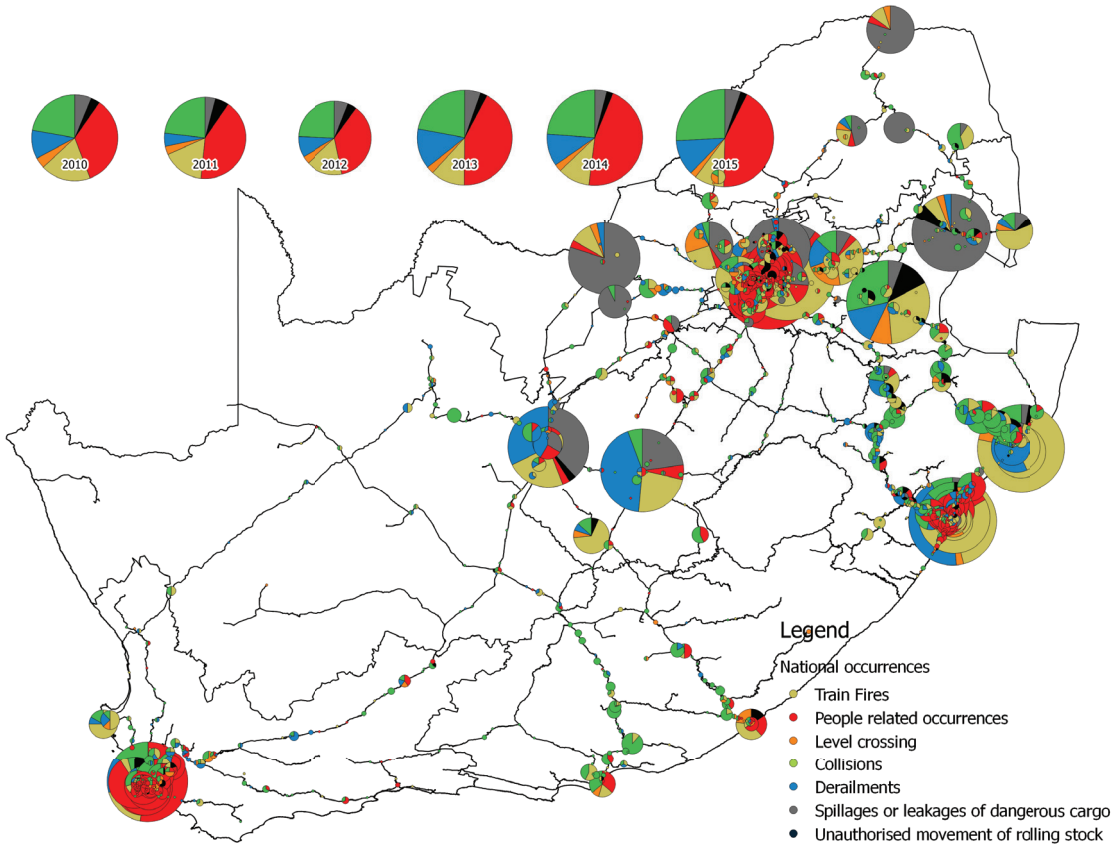


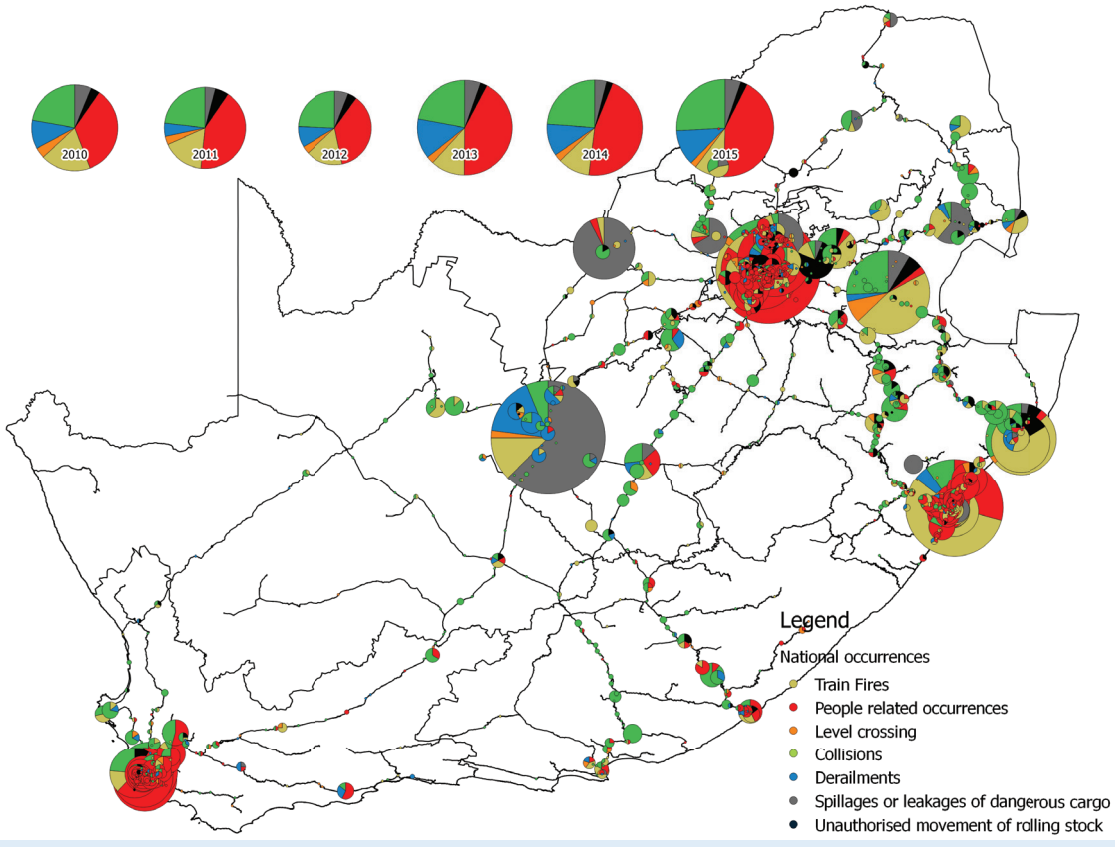
Figure 6: Operational occurrences provincial distribution

The maps below indicate the geographic distribution of all occurrences for each of the five historic years from 2010/11 to the current reporting period.

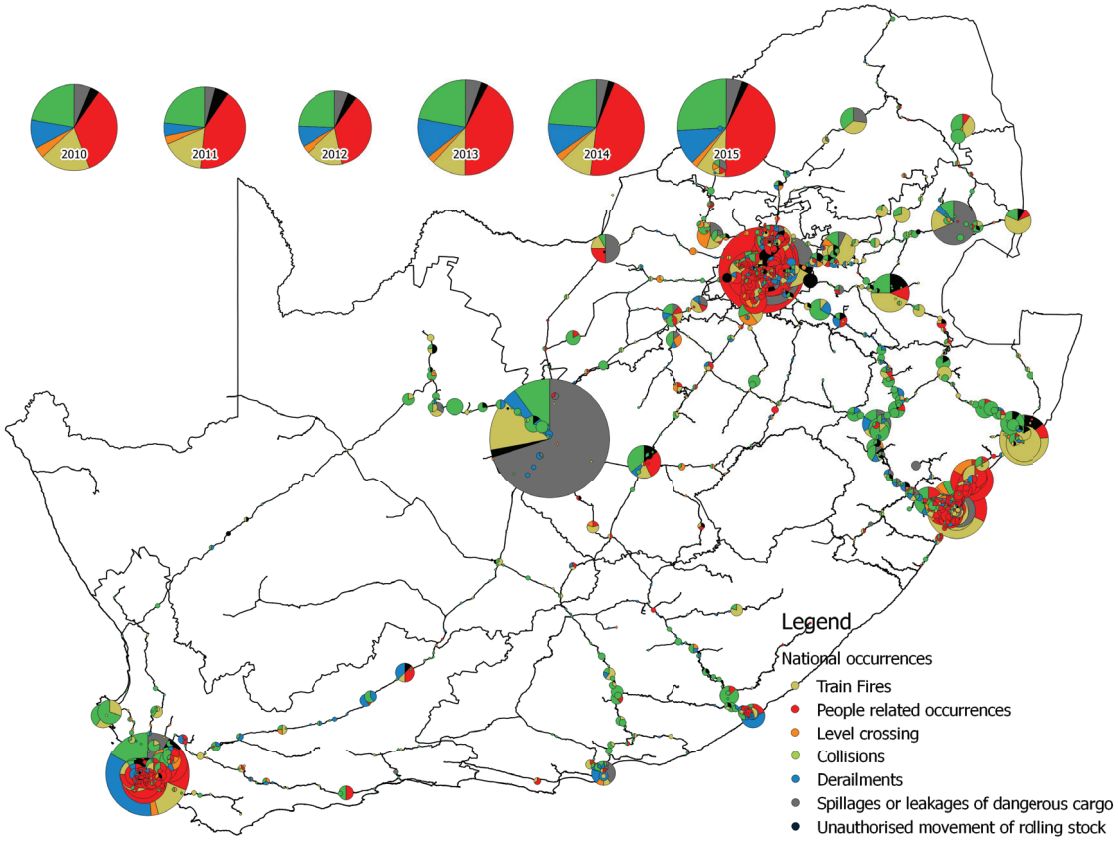
National - Number of occurrences 2010



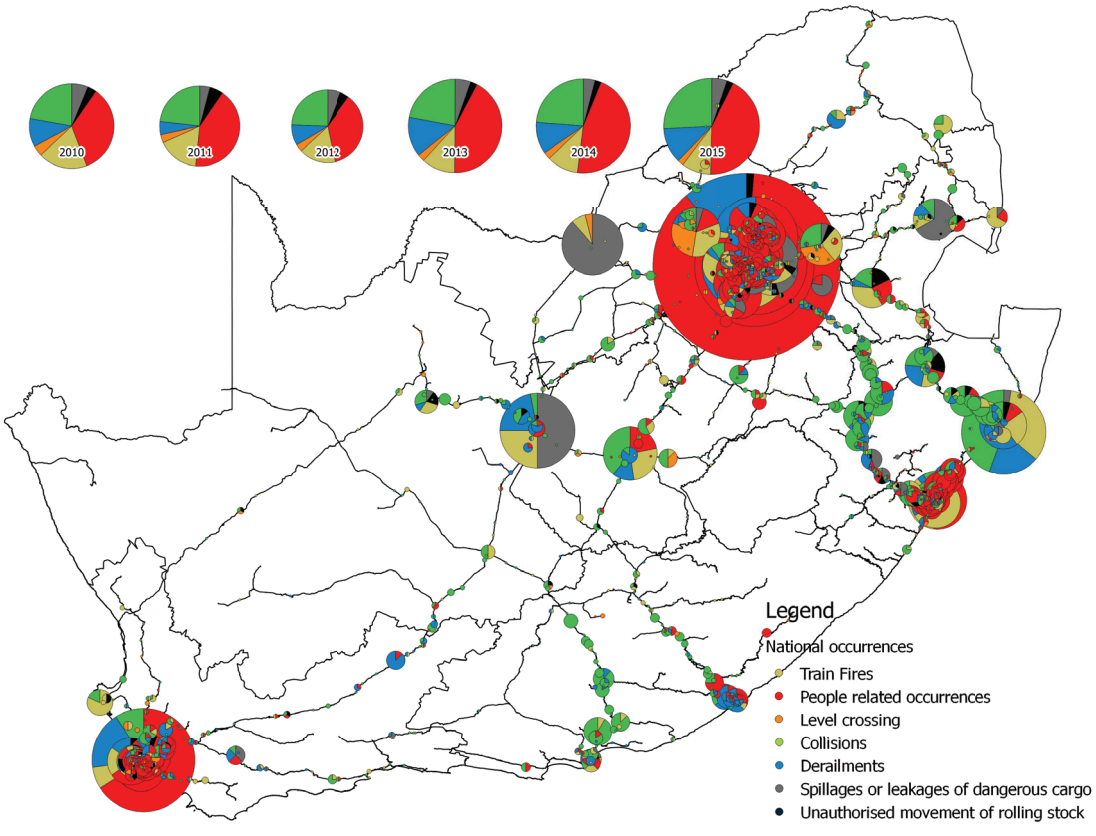
National - Number of occurrences 2011

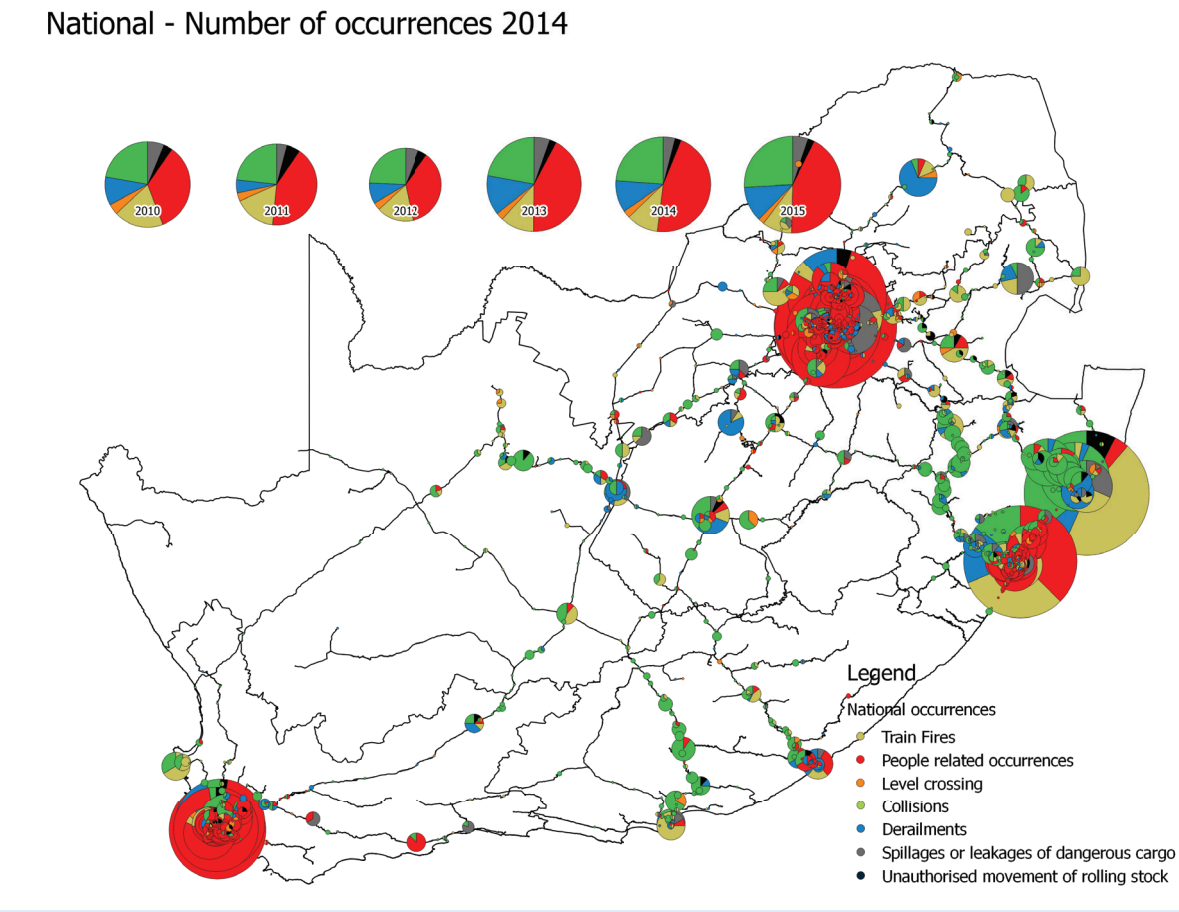


National - Number of occurrences 2012



National - Number of occurrences 2013





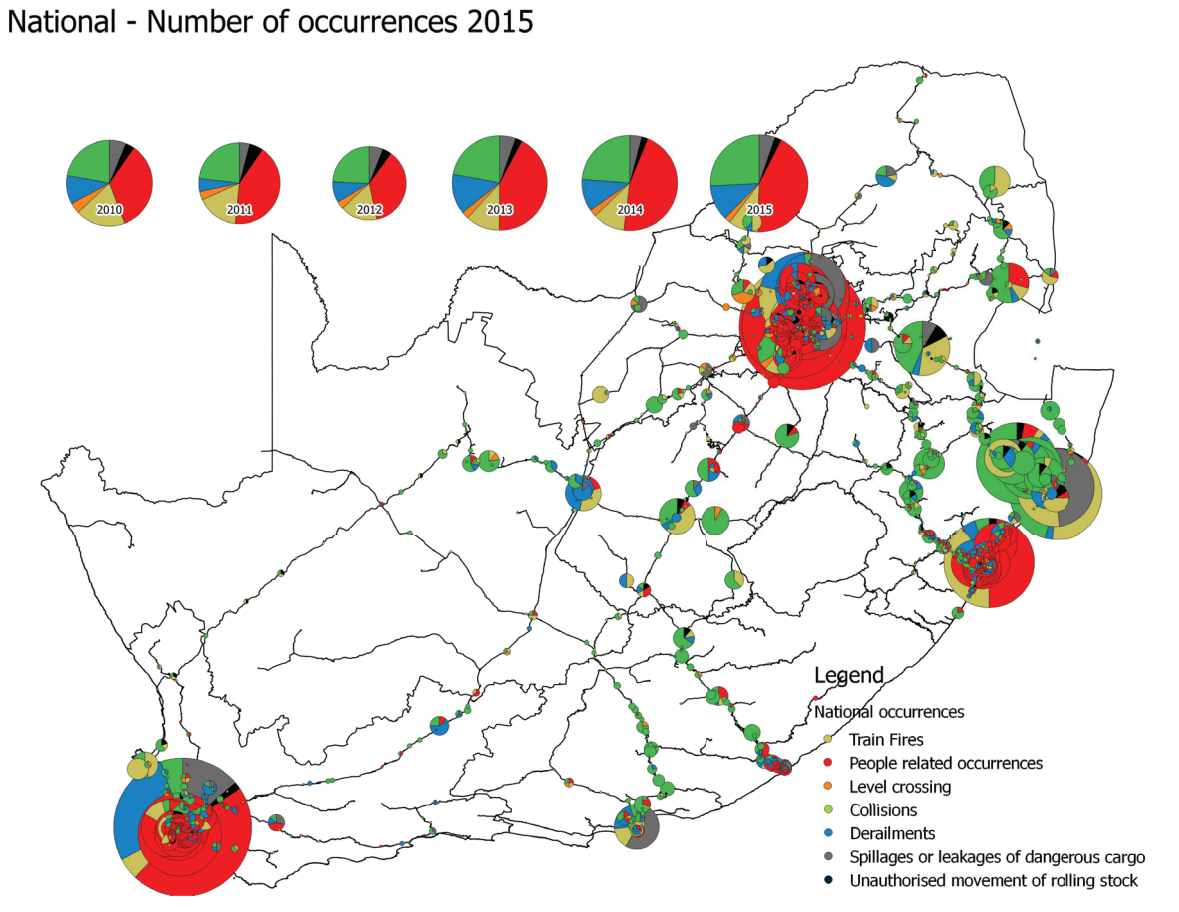
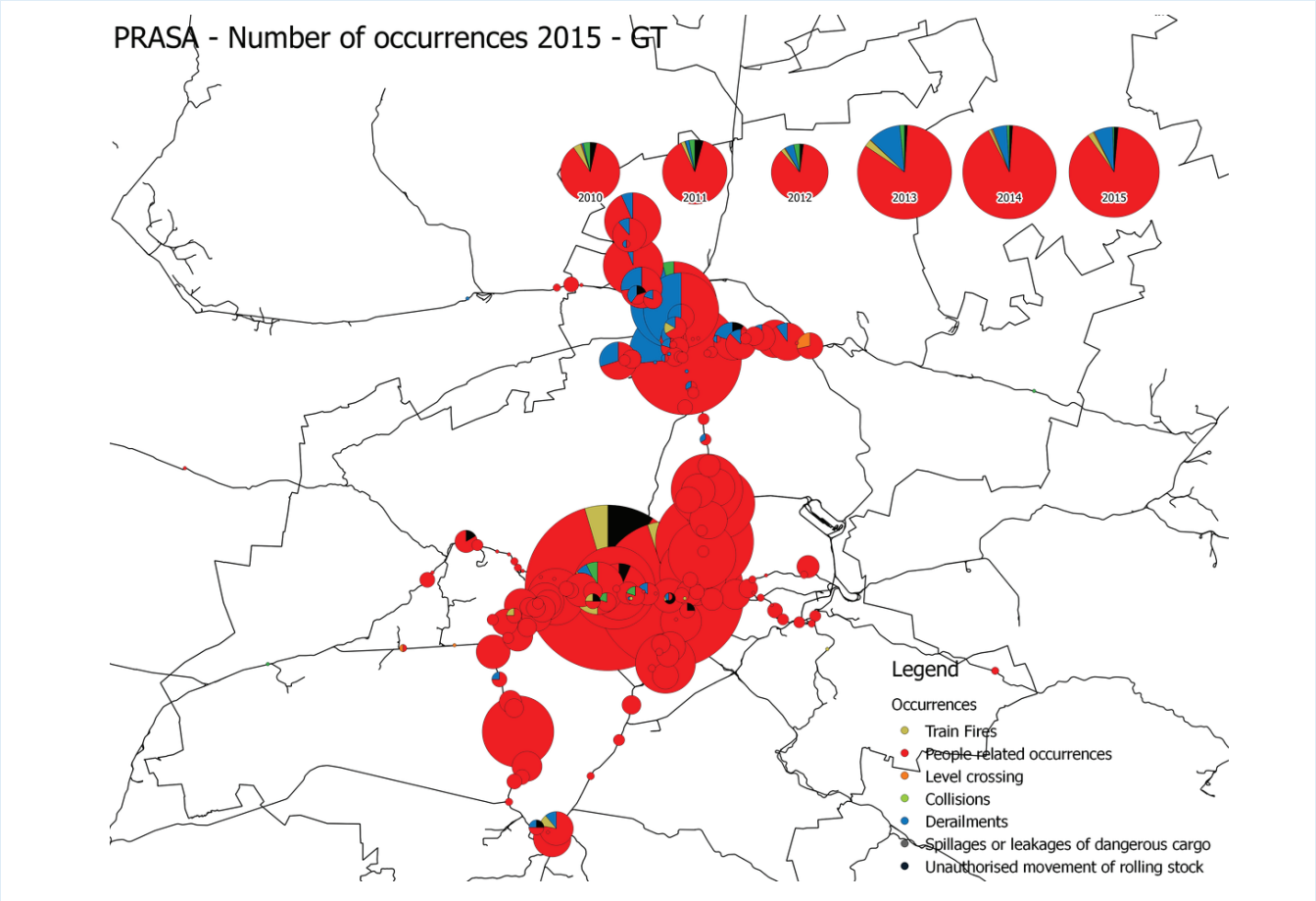
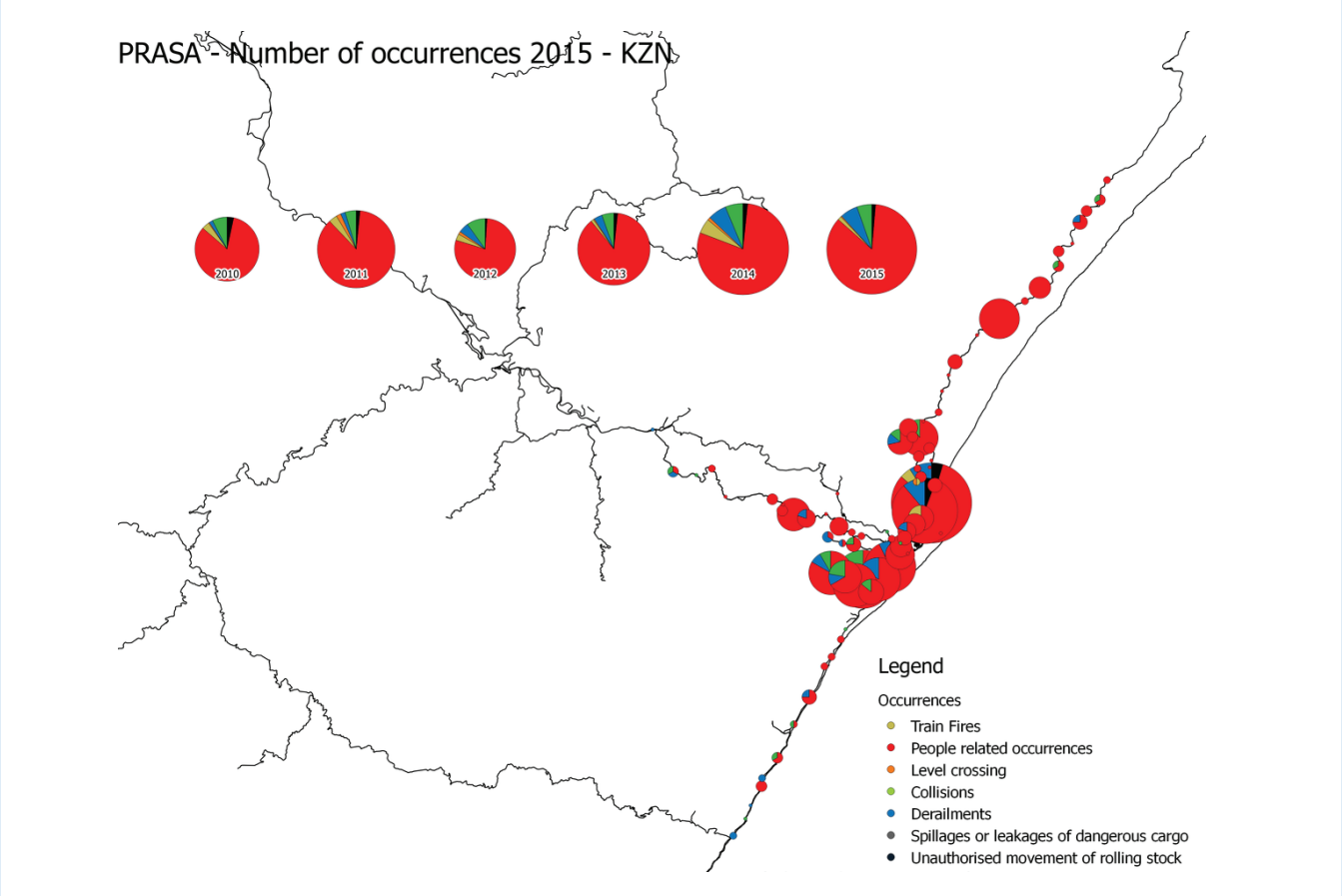
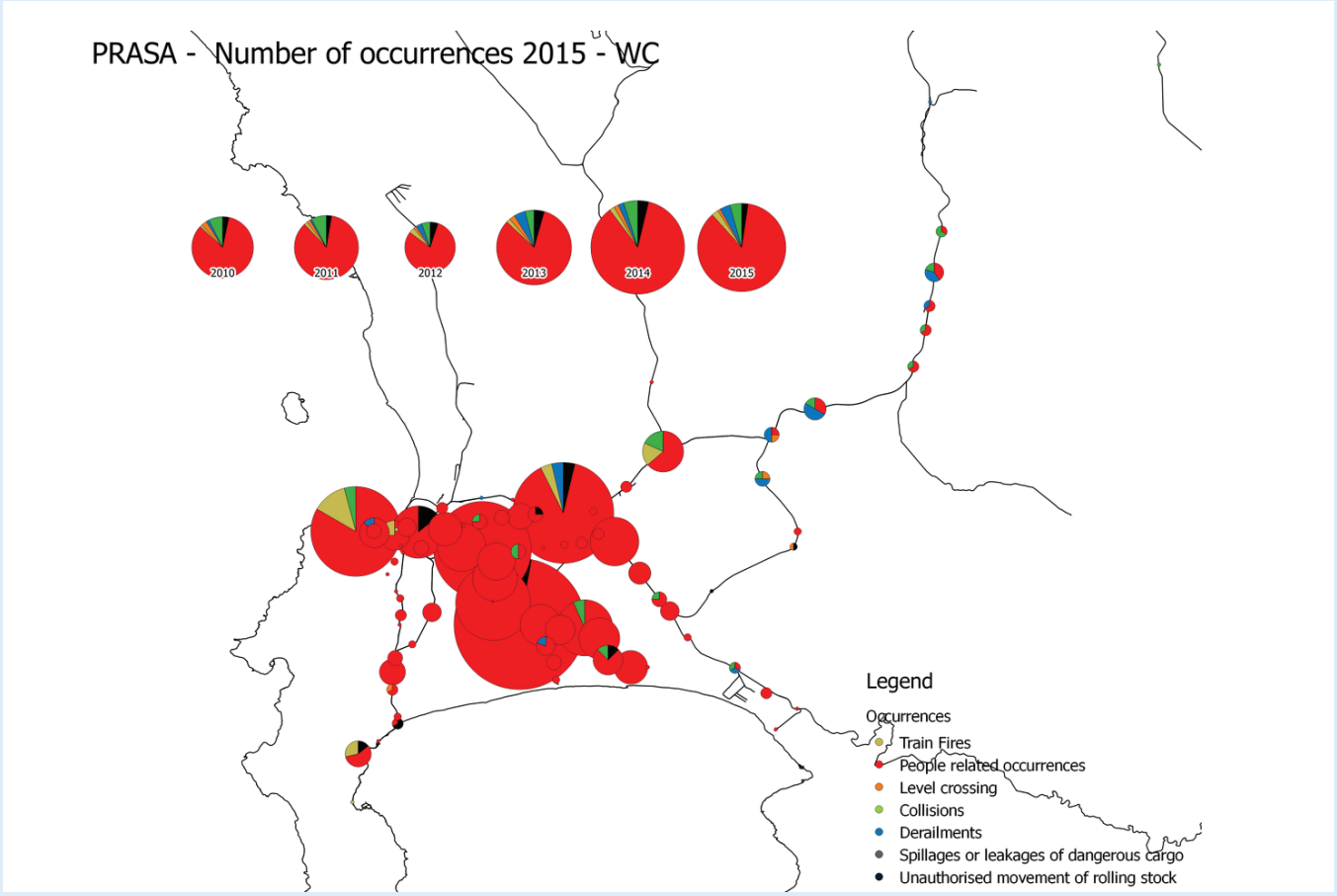


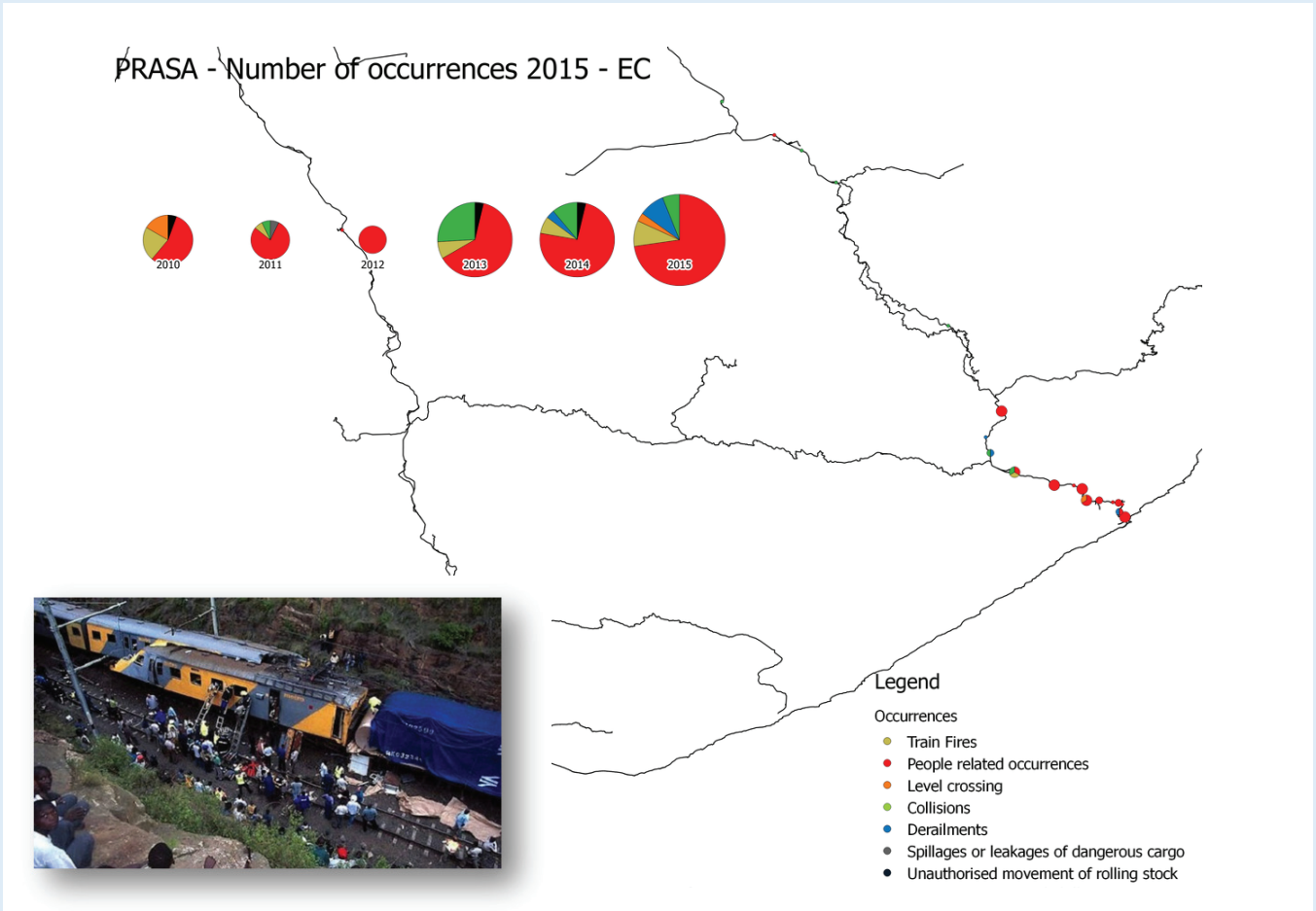
Figure 7: Geographic Distribution of occurrences 2010/11 - 2015/16

The maps below illustrates the geographic distribution of PRASA operational occurrences during 2015/16









Credit: Dynamic Emergency Medical Services

Figure 8: Geographic display of all operational occurrences – PRASA

The geographic distribution below for all Transnet subsidiaries during the 2015/16 reporting period highlights the number of occurrences at depots, especially the coal line from Mpumalanga to Richards Bay, as well as the NatCor line between Johannesburg and Durban.

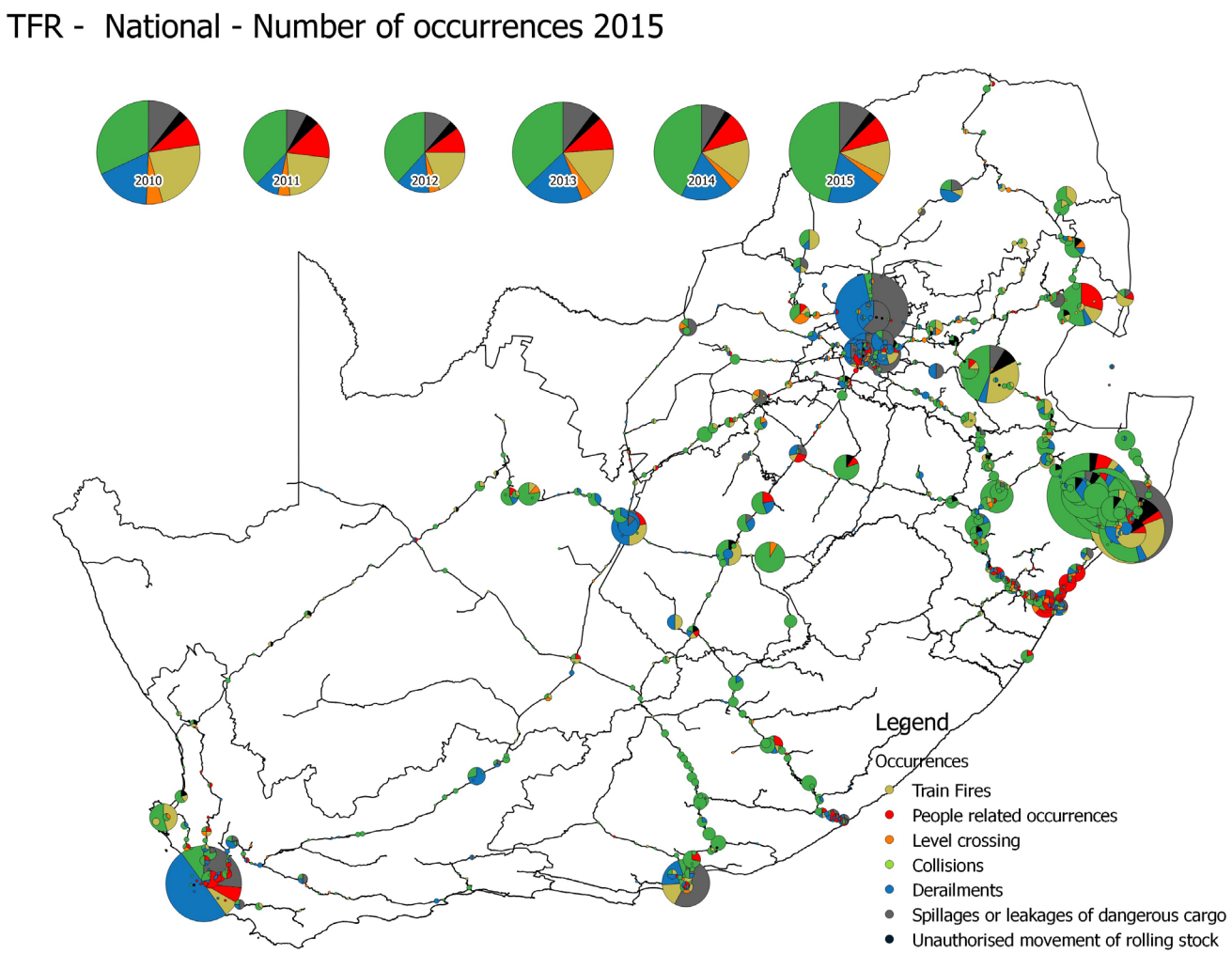


Figure 9: Geographic display of all operational occurrences - Transnet

Credit: ER24

Fatalities and injuries as a result of operational occurrences

Members of the public, commuters, railway employees and contractors, who are either injured or killed within the railway environment, remain a grave concern for the RSR. The chart below indicates the types of operational occurrences that resulted in such harm or death. Information like this is useful for making decisions about where to focus effort, taking into account that a number of factors will influence these decisions. Considering business or reputational risk may lead to focus on the risk from collisions. Looking at how people are most likely to be fatally injured would lead to focus on the interface between the platform and trains or track, whereas looking at the total level of risk would lead to a focus on illegal entry into the railway environment. The railway industry needs to take these factors into account, as well as the costs and benefits of potential ways of reducing risk when making decisions about its management. Though there has been a 4% decrease in the number of people killed in the railway environment, the number of injuries has seen a steep increase (24%) over the past three reporting periods. The economic and social impact of fatalities and injuries have not been assessed in this Report, however, it could be assumed that it aggravates the impact.

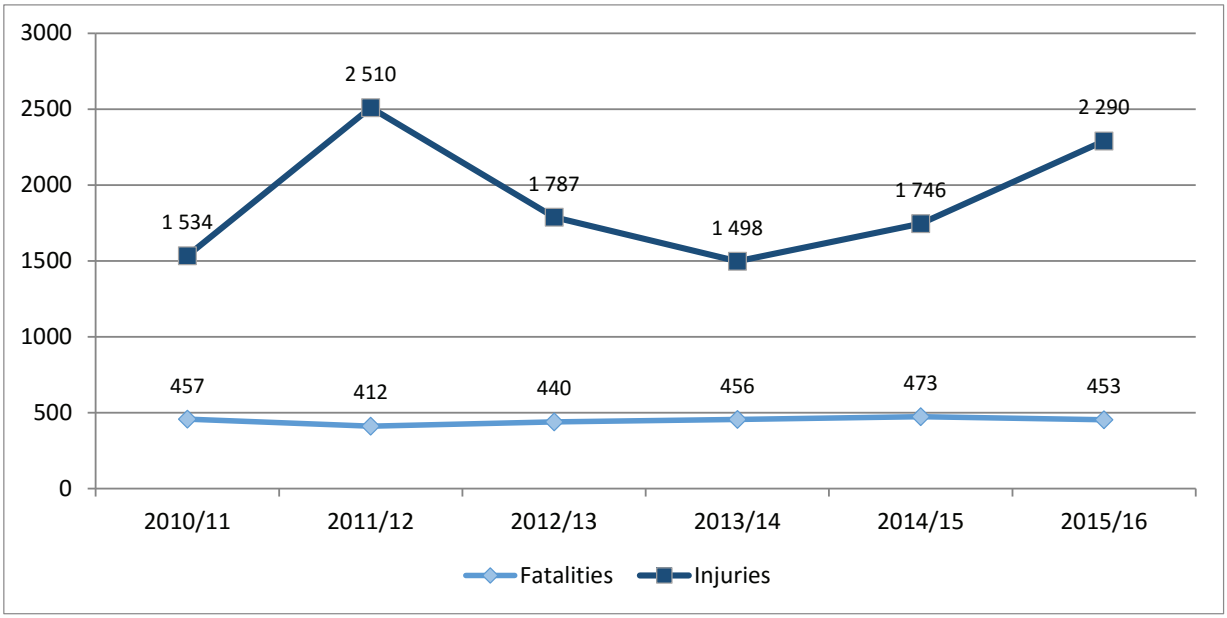


Figure 10 : Fatalities and injuries from 2010/11 to 2015/16

Though Category E (people struck by trains) remains the highest contributing occurrence, of concern is the number of people harmed during collisions on a running line, either between trains or with a road vehicle. One such example occurred on 17 August 2015 in the vicinity of Umhlali (KwaZulu-Natal), when PRASA Metro Train 0263 collided with a minibus, which crashed onto the running line. During the accident, 15 taxi passengers were fatally injured, while five sustained injuries, a majority of which were less serious.

Credit: Netcare 911.

The occurrence types contributing to fatalities and injuries are illustrated in the two pie-charts below:

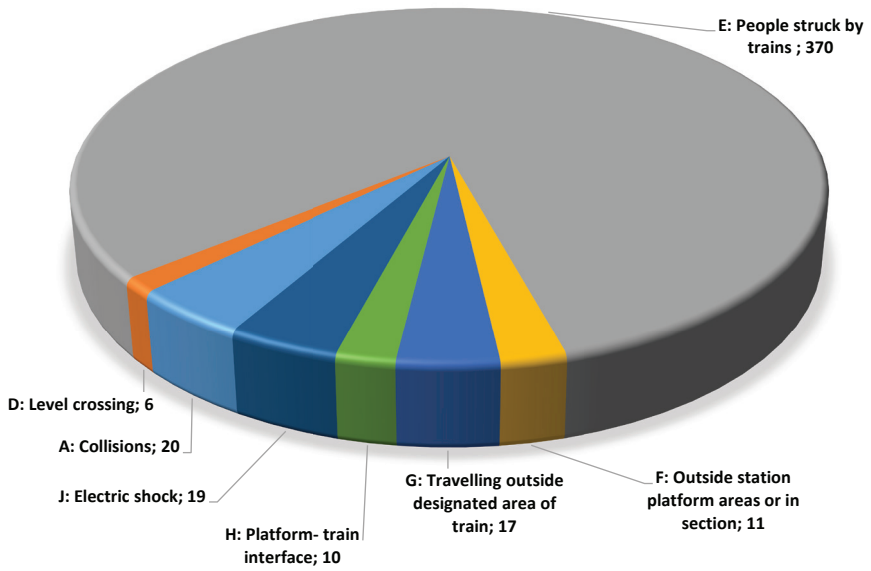


Figure 11: 2015/16 Fatalities per Operational Occurrence Category

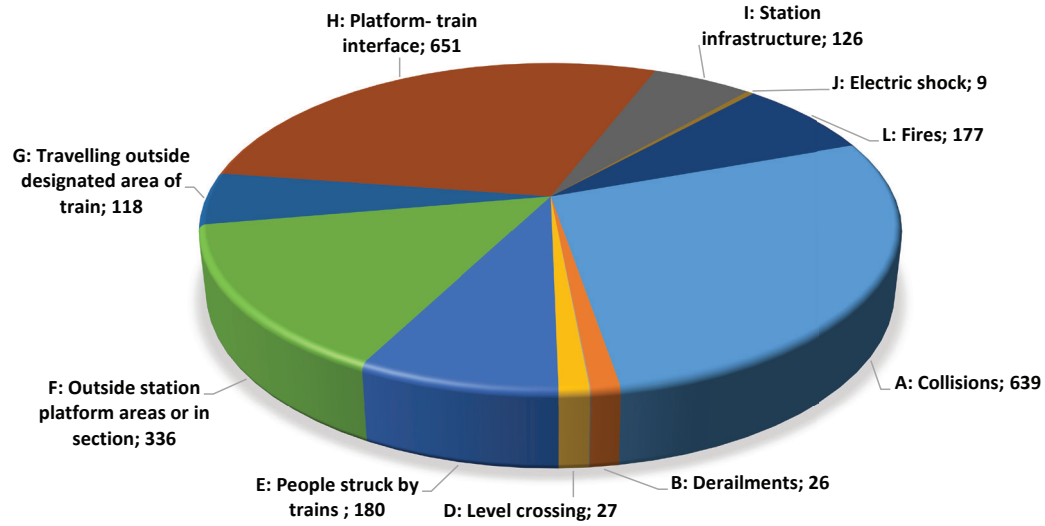


Figure 12: 2015/16 Injuries per Operational Occurrence Category

As indicated in the graph below of the geographic distribution of operational occurrences, the majority of fatalities (40%) and injuries (66%) were recorded in Gauteng, while 24% of fatalities were recorded in KwaZulu-Natal and the Western Cape. The Western Cape reported 15% of the total number of injuries, while KwaZulu-Natal recorded 12%. Figures 15 and 16 indicate the distribution between TFR and PRASA in terms of fatalities and injuries sustained in their areas of responsibility.

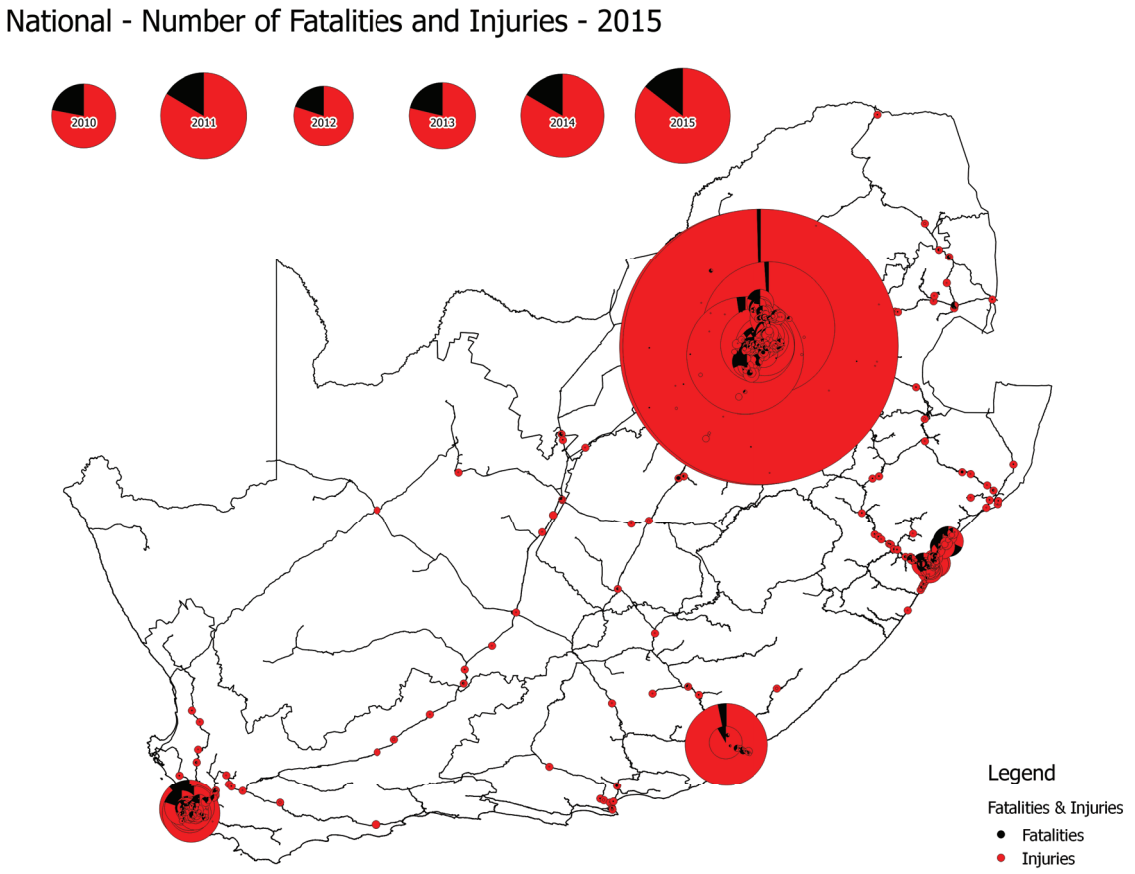


Figure 13 : 2015/16 Geographic distribution of Fatalities and Injuries

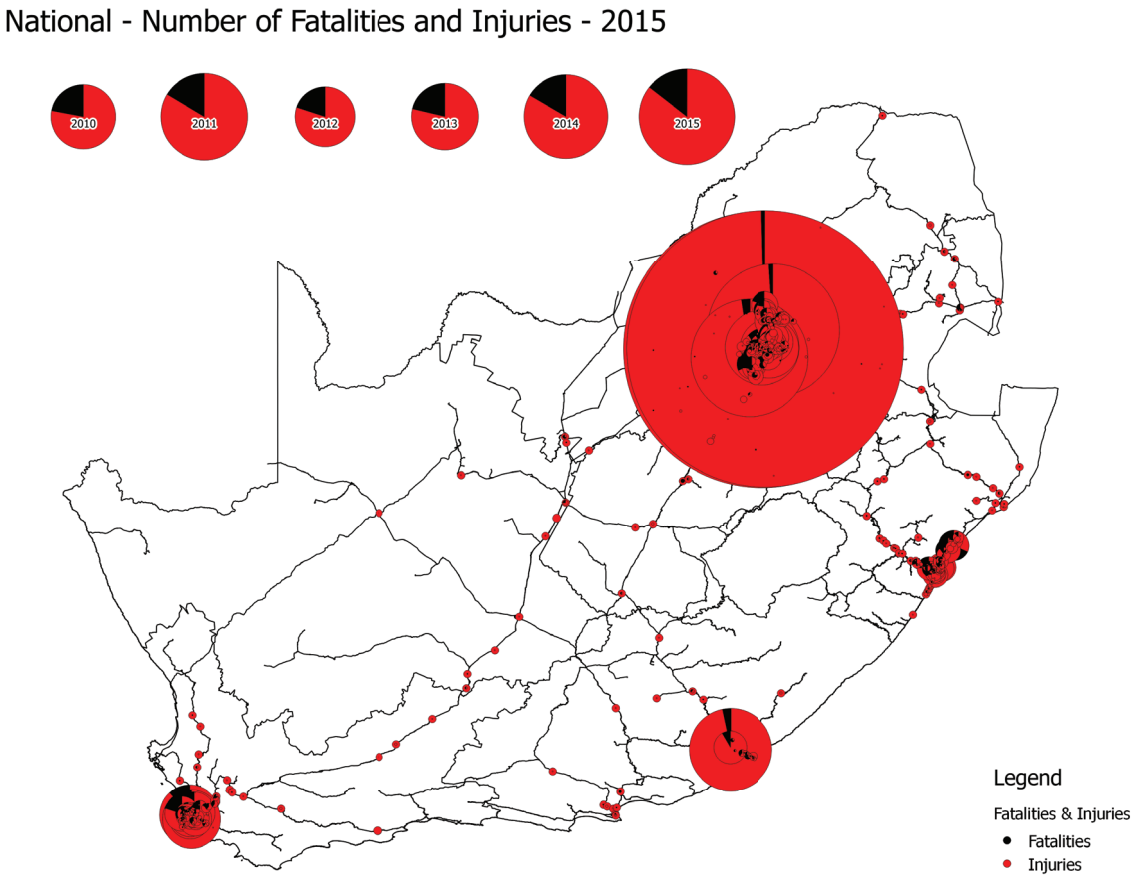
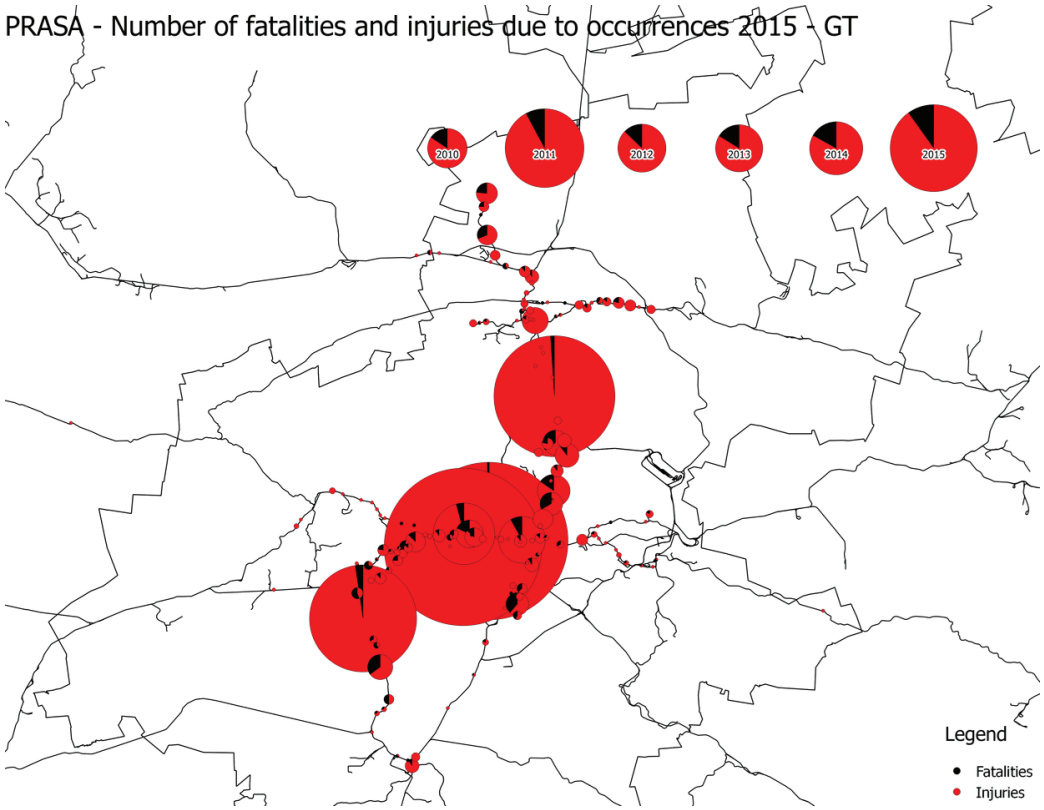
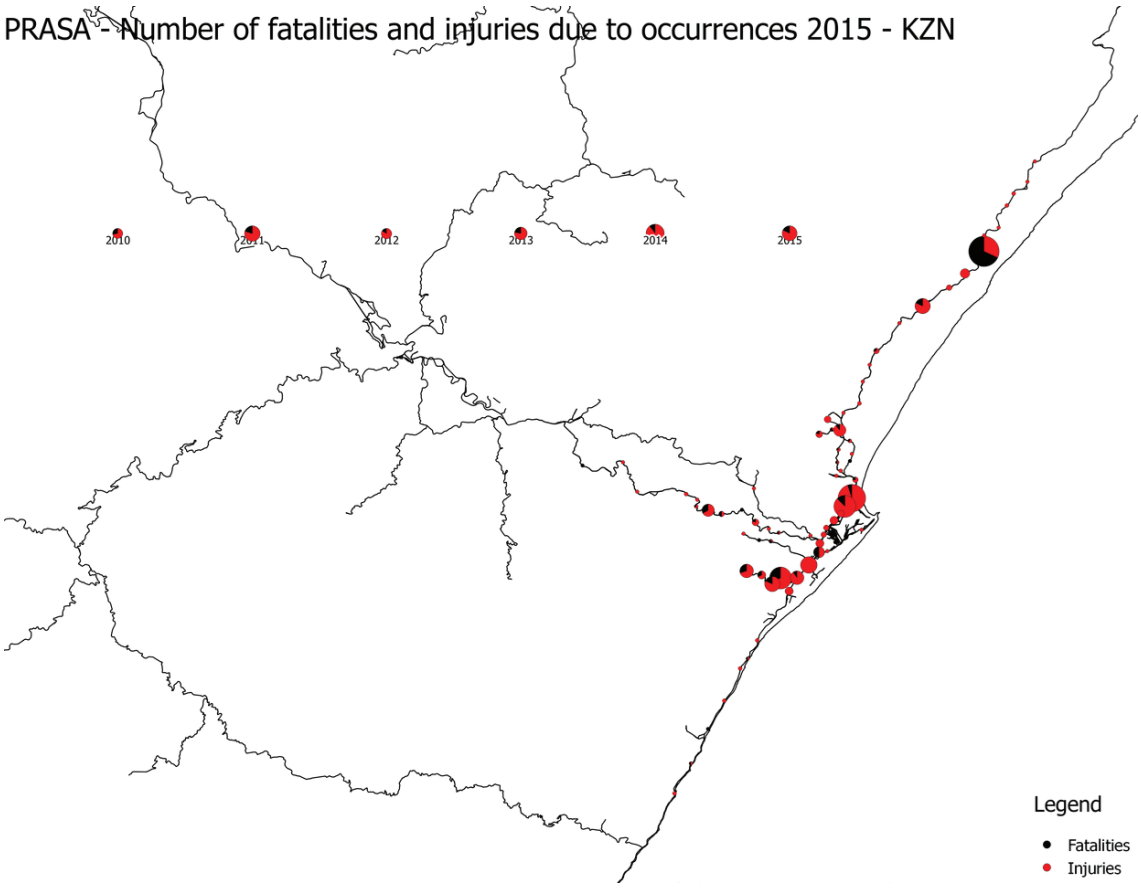
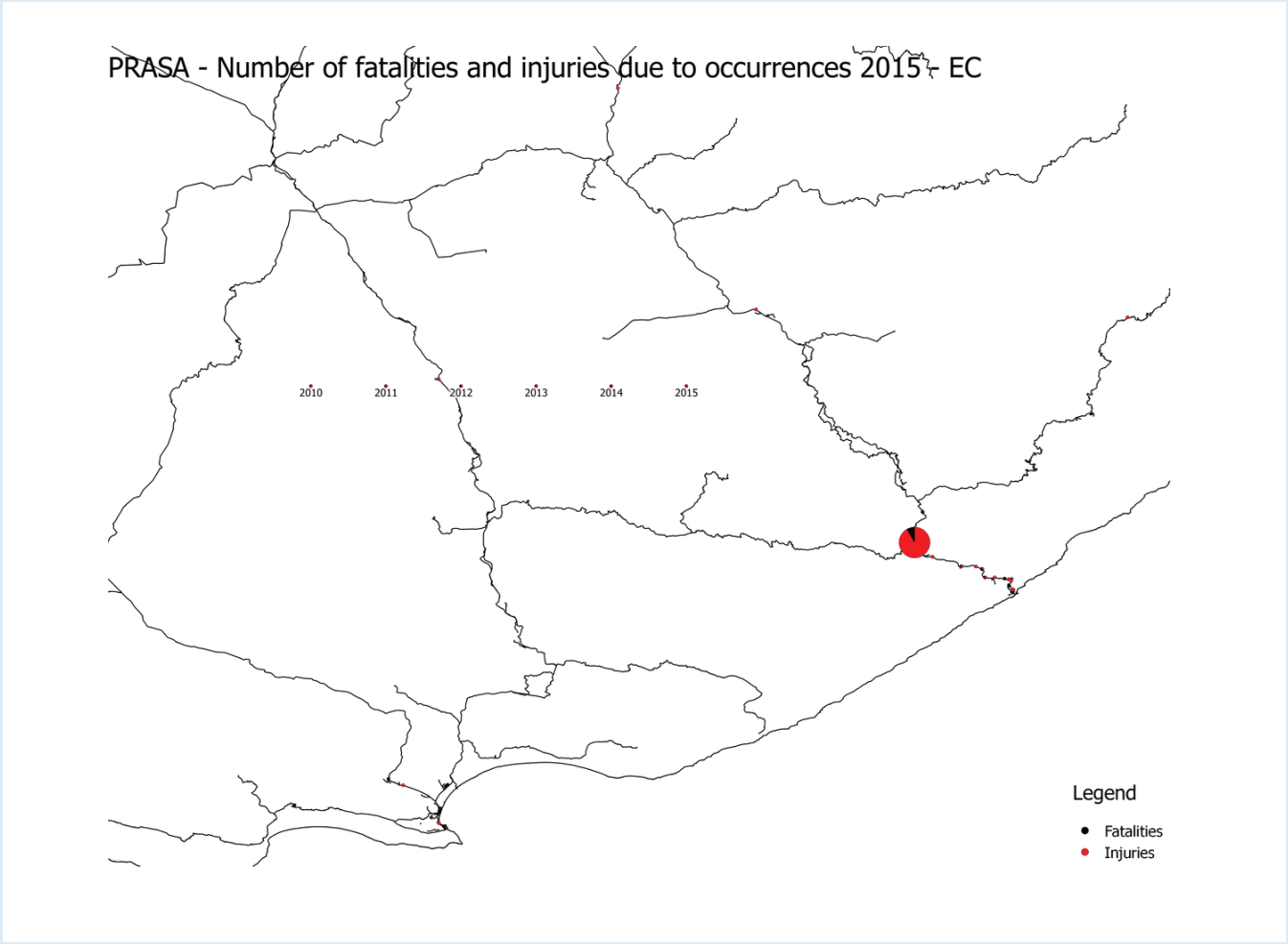


Figure 14 : 2015/16 Geographic distribution Fatalities and Injuries - TFR


PRASA - Number of fatalities and injuries due to occurrences 2015 - GT
2010
2011
2012
2013
2014
2015
Legend
Fatalities
Injuries


PRASA - Number of fatalities and injuries due to occurrences 2015 - KZN
2010
2011
2012
2013
2014
2015
Legend
Fatalities
Injuries


PRASA - Number of fatalities and injuries due to occurrences 2015 - EC
2010
2011
2012
2013
2014
2015
Legend
Fatalities
Injuries

Security-related incidents

Security-related incidents are within the regulatory mandate of the Rapid Rail Police (RRP), a unit of the South African Police Service. However, in instances in which crime-related activities in the railway environment may have a negative impact on operational activities, the RSR tracks such and advises the RRP and/or operators accordingly. Examples of such are incidents in which theft of electric cables, signalling or infrastructure equipment could lead to abnormal railway operational circumstances, which ultimately could lead to operational occurrences such as collisions or derailments. The RSR is informed of security-related incidences by its operators in compliance to SANS 3000-1 (2009), however, some incidents are only reported to the RSR or the RRP depending on the nature of the crime, as well as the reporting entity involved. In order to ensure alignment between the data of the RSR and RRP, annual comparative verification is performed. During the 2015/16 reporting period, as confirmed with the RRP, an 11% decrease in security-related incidents was recorded with 5 520 incidents compared to 6 222 recorded in the previous reporting period.

Reporting Year	2013/14	2014/15	2015/16			
South African National Standards (SANS) Category	All	All	TFR	PRASA	Other (BOC)	All
1: Theft of assets	3 068	4 213	2 069	1 521	10	3 600
2: Malicious damage (vandalism)	1 019	1 094	334	770	54	1 158
3: Threats of operational safety	6	0	0	1	1	2
4: Train kidnapping or hijacking	0	0	0	0	0	0
5: Crowd-related occurrences	7	2	0	0	0	0
6: Industrial action	4	4	0	1	0	1
7: Personal safety on trains	283	516	0	368	0	368
8: Personal safety on stations	247	278	0	297	8	305
9: Personal safety outside station platform area	69	115	30	56	0	86
TOTAL	**4 703**	**6 222**	**2 433**	**3 014**	**73**	**5 520**

Table 4: Security related Incidents from 2013/14 to 2015/16

Copper cable theft remains a global problem and South Africa is no exception. Theft of assets impacting on railway operational safety has been reduced in the 2015/16 period, however, this type of criminal activity constitutes 65% of the total number of security-related incidents. The majority of these incidents involve theft of electrical cables and train control equipment. Delays as a result of these actions also give rise to community dissatisfaction, which in turn leads to acts of vandalism, some of which involve deliberate acts of arson. In this regard, a 6% increase in malicious damage to property, which could have an operational impact has been noted. Not only does this further aggravate delays, but it also results in major financial losses for operators. This aspect will be discussed further in the Cost of Risk Section. In addition, commuters are severely affected, in terms job security, income and personal safety.

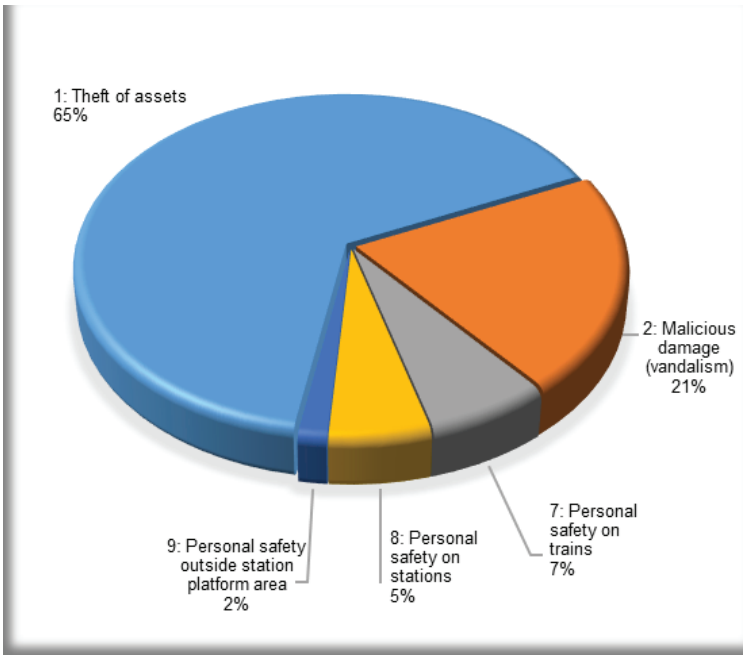


Figure 16: 2015/16 Top five security-related incidents

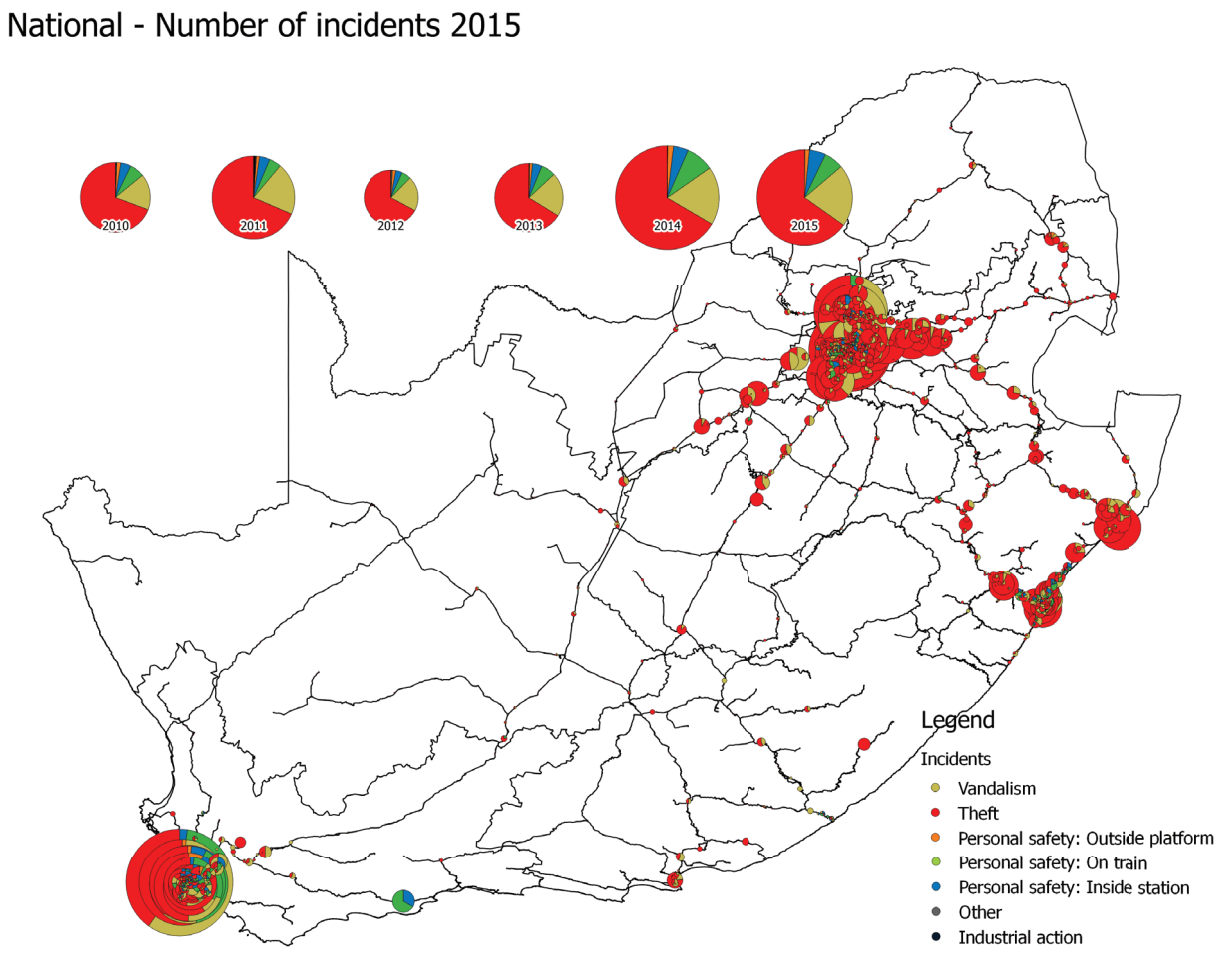
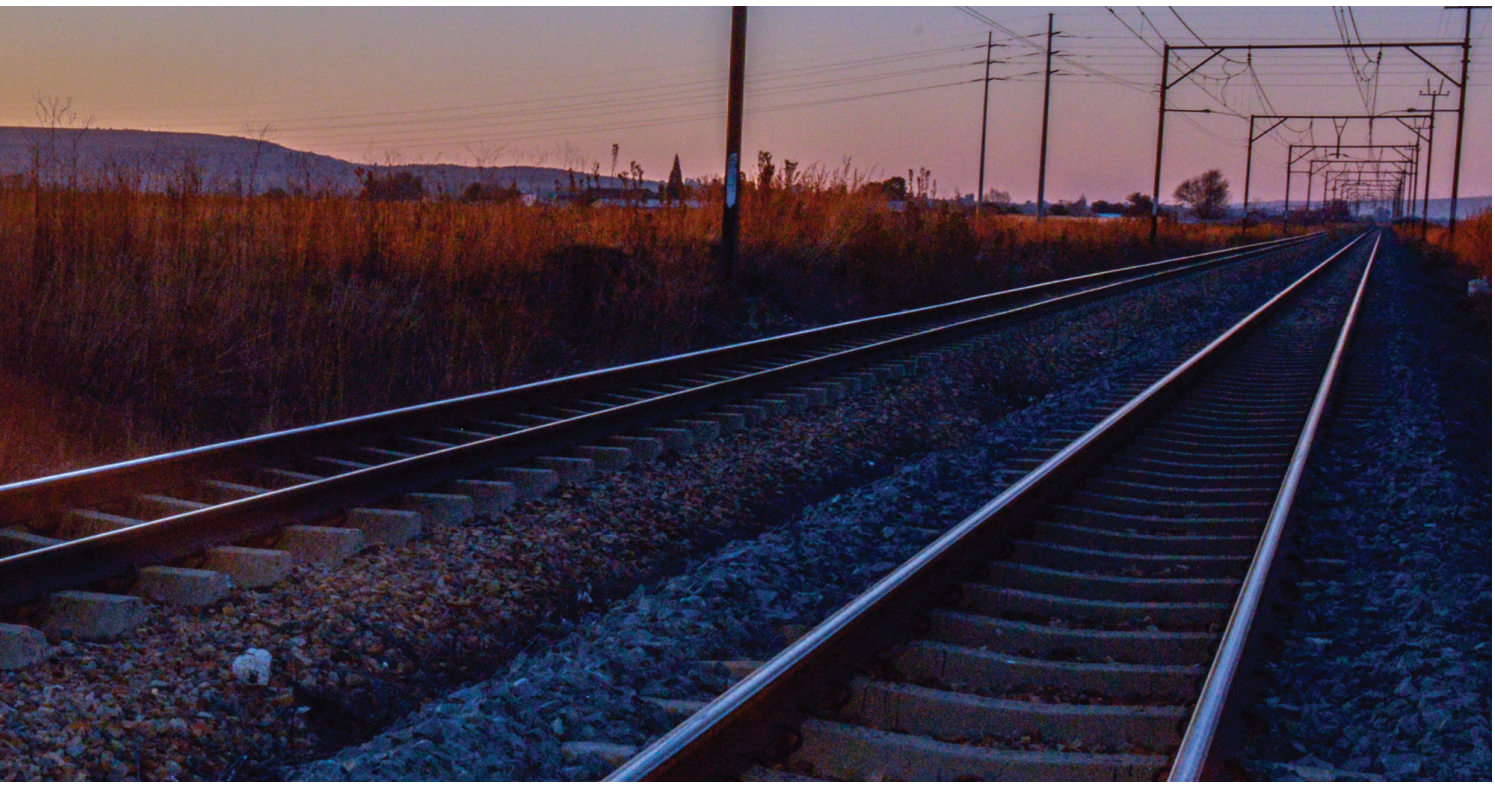


Figure 17: Geographic distribution of security-related Incidents 2015/16



Fatalities and injuries as result of security related incidents

Though a decrease in the number of security-related incidents was recorded, a slight increase in the number of fatalities as a result of such actions has been noted from 12 in the 2014/15 period to 14 in 2015/16. However, a marked decrease in the number of injuries from 606 in the previous period, to 466 in the current 2015/16 period provides some relief.

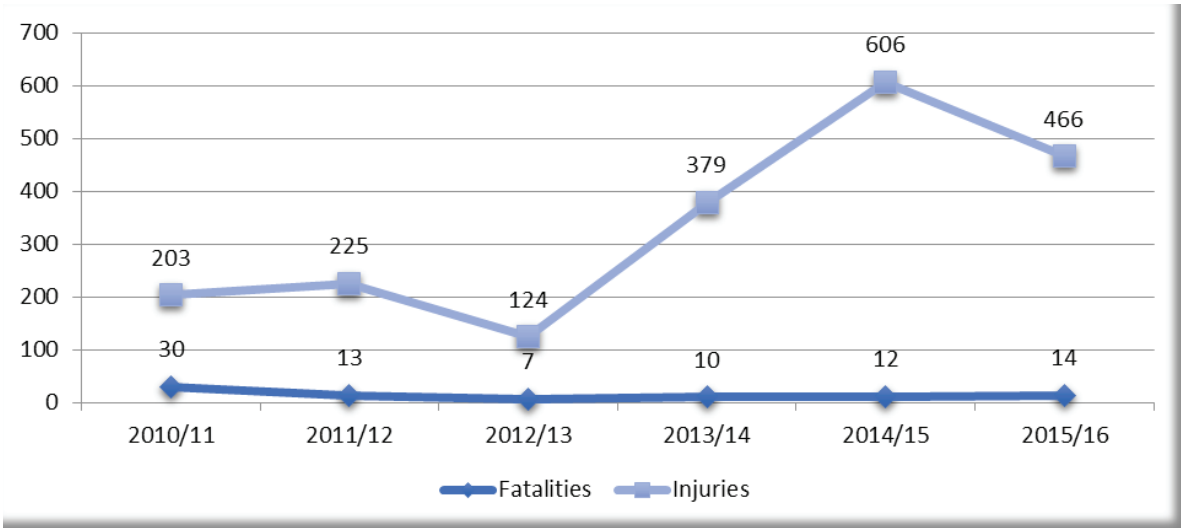


Figure 18: 2015/16 Fatalities and injuries as a result of security related incidents

As can be expected, the majority of fatalities and injuries are related to personal security on trains, at stations or in areas beyond the station platform.

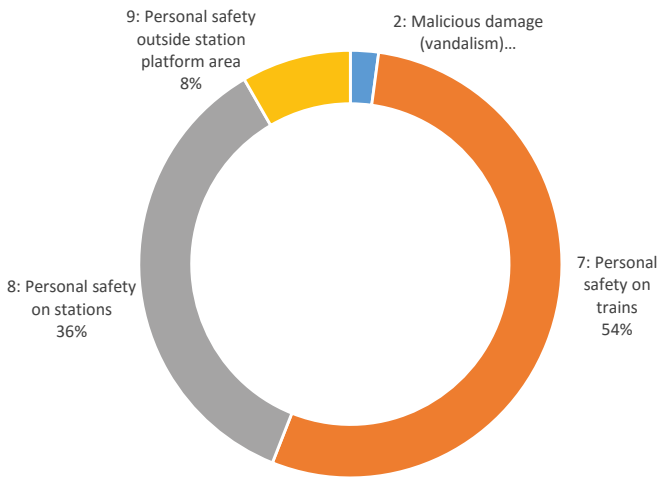


Figure 19: 2015/16 Injuries per security-related category

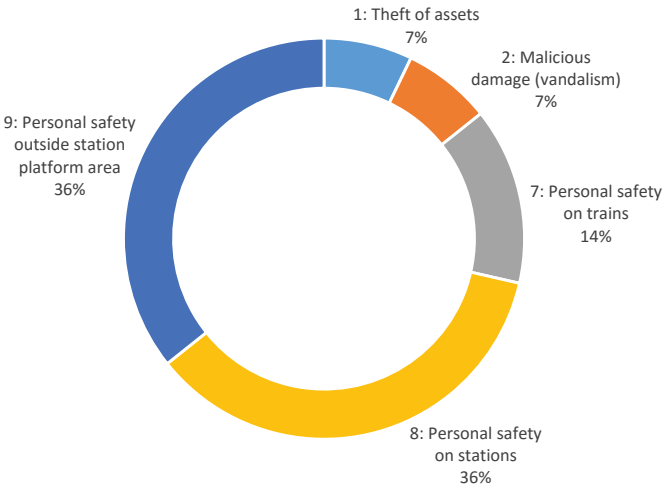


Figure 20: 2015/16 Fatalities per security-related category

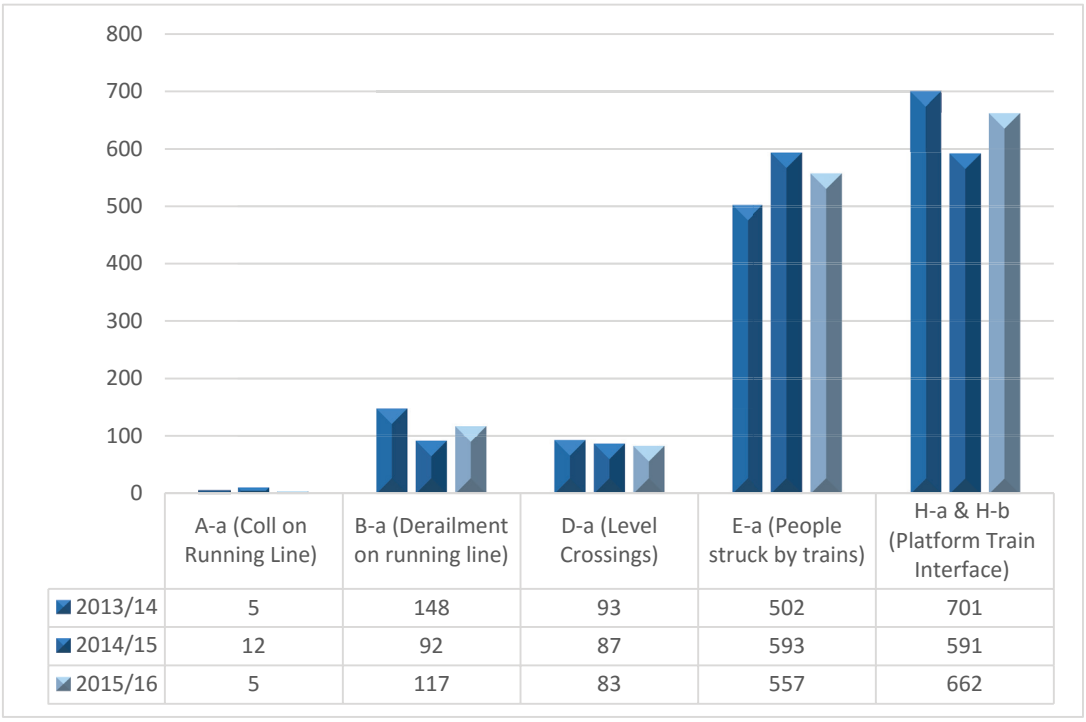
RSR key strategic focus areas

During the 2013/14 FY, the RSR realigned its strategic objectives and interventions towards significantly reducing the number of railway occurrences. To achieve this outcome, the following five key focus areas were identified using a combination of time-series and collective risk (where appropriate) analytical techniques:

- Category A-a : Collisions on a running line
- Category B-a : Derailments on a running line
- Category D-a : Level crossings on a running line
- Category E-a : People struck by train on a running line
- Categories H-a and H-b : Platform train interface

The selection of the key strategic focus areas was based on those operational occurrences, with the exception of level crossings, which contributed to 80% of the risks in the external environment, either in terms of costs incurred by the relevant operator or in terms of injuries and loss of life, as indicated in Figure 5. Level crossings were included in the selection because, in a number of instances, many lives, including those of school children, were lost during a single occurrence. In most instances, these could have been averted. All the occurrences selected will, if significantly reduced, contribute in a major way towards promoting rail as a safe and reliable mode of transport, for either freight or commuters.

The graph below illustrates a comparison in operational occurrences for the period 2013/14 to 2015/16, the period the RSR has been focusing on the above top five operational occurrence categories:



	A-a (Coll on Running Line)	B-a (Derailment on running line)	D-a (Level Crossings)	E-a (People struck by trains)	H-a & H-b (Platform Train Interface)
2013/14	5	148	93	502	701
2014/15	12	92	87	593	591
2015/16	5	117	83	557	662

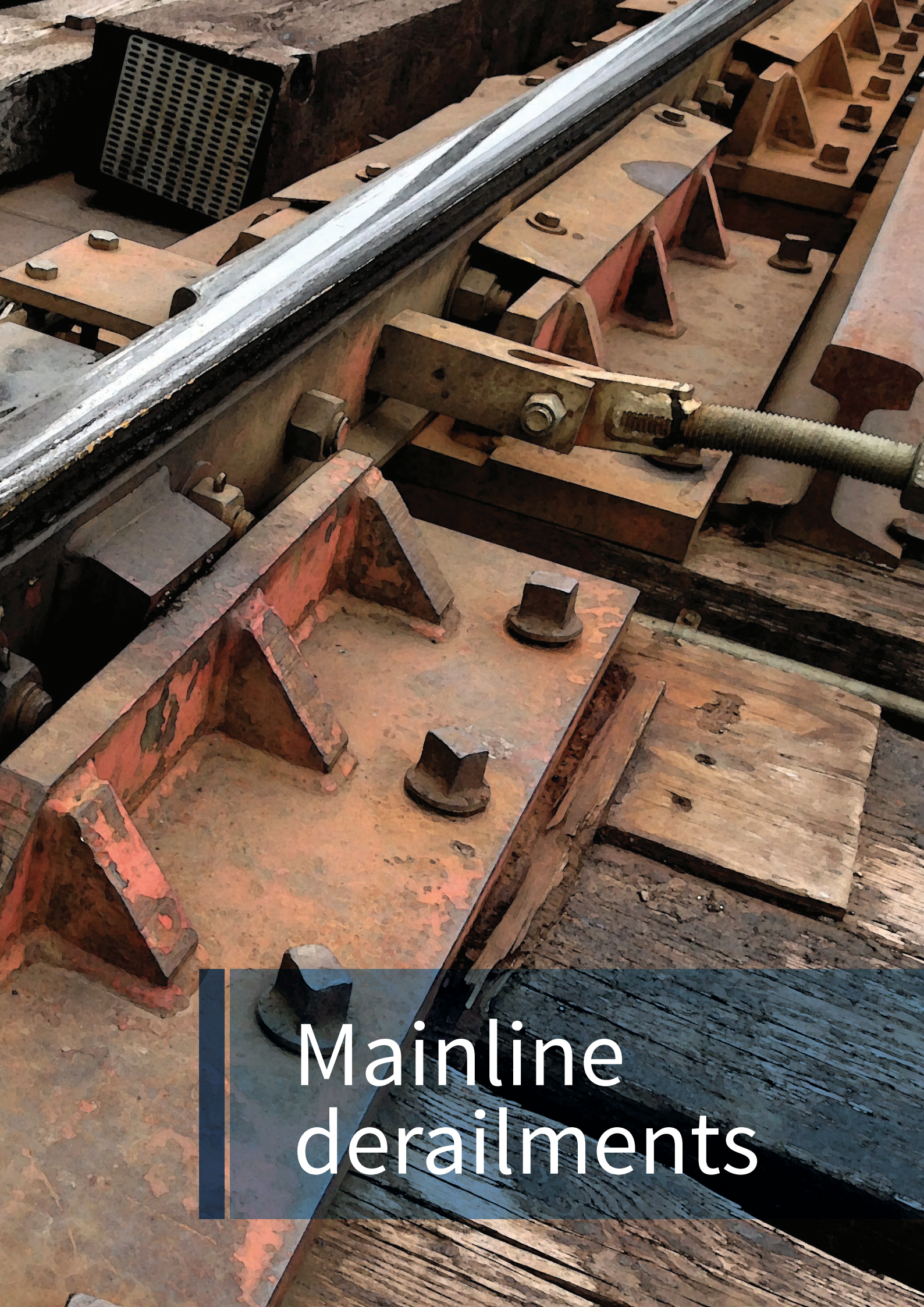
Figure 21: Strategic focus annual occurrence totals comparison from 2013/14 - 2015/16

Mainline collisions between rolling stock

During the 2015/16 reporting period, a 50% reduction in train-on-train collisions on a running line was reported. This is commendable, however, the same cannot be said about the number of fatalities and injuries. Five occurrences resulted in 3 fatalities and 629 injuries. The table below provides the locations of the collisions. It is important to note that the two major collisions in Booysens and Denver involved passenger trains during morning or afternoon peak hours. The cause of these occurrences is discussed later in this Report in the RSR Intervention's section. However, it is important to note that leading indicators such as SPAD's, cable theft and theft of signalling equipment were present in all these instances. Furthermore, direct costs incurred as a result such occurrences amount to more than R100-million, not taking opportunity costs and costs to commuters into account.

Province	Place	Fatalities	Injuries
Eastern Cape	Blaney - Southdown	2	58
Eastern Cape Total		**2**	**58**
Gauteng	Booysens	0	328
	Denver	1	240
Gauteng Total		**1**	**568**
Mpumalanga	Argent - Arbor	0	2
	Numbi - Hazyview	0	1
Mpumalanga Total		**0**	**3**
Grand Total		**3**	**629**

Table 5: 2015/16 Mainline collisions per province



Mainline derailments

Mainline derailments

A 24% increase in derailments on a running line was recorded during the current reporting period, with 114 occurrences reported during 2015/16 versus 97 during the previous period. The distribution in terms of provinces is dominated by the main TFR lines in Gauteng, Mpumalanga and KwaZulu-Natal. Though no fatalities were recorded and a low number of injuries (10) were incurred, the direct costs involved are in excess of R450-million. Detailed analysis will be discussed in the Cost of Risk analysis section

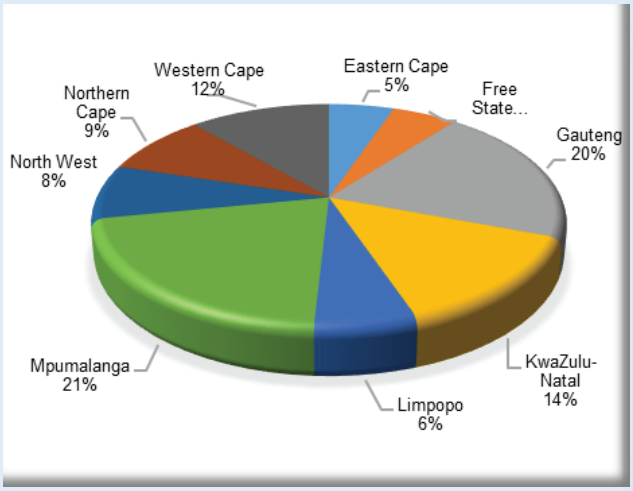


Figure 22: 2015/16 Mainline derailments per province

Mainline level crossings

A 5% decrease in the number of mainline level crossing occurrences has been noted during the 2015/16 reporting period, which builds on the 6% decrease reported during the 2014/15 period. The main causes of such occurrences remain lack of law enforcement at level crossings, which together with unlawful vehicle driver behaviour, which comprises predominantly of disregard for signage and/or traffic laws, have resulted in five fatalities and 27 injuries during 83 level crossing occurrences.

The majority of occurrences occurred in North West (Rustenburg area), Western Cape (Stellenbosch and Cape Town), Gauteng (Pienaarspoort, Zuurbekom and Westonaria) and Mpumalanga (Witbank and Ermelo).

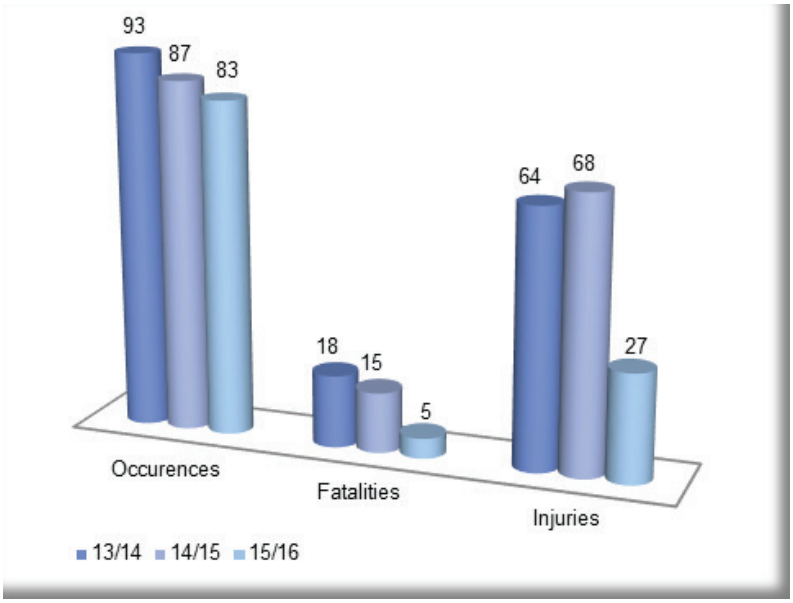


Figure 23: Level crossing occurrences from 2013/14 to 2015/16

People struck by trains

Though a 6% decrease in the number of occurrences has been recorded, the majority (80%) of fatalities were in Category E-a in which people are struck by trains during movement of rolling stock. The reasons for these occurrences are closely linked to among others, socio-economic circumstances which place people close to railway operations, but also due to a lack of safety awareness. The primary cause of these fatalities can be assigned to poor town planning, increasing urbanisation and invasion of rail reserves or open spaces close to rail reserves by informal settlements, as well as people who venture into the railway reserve for various reasons. Some of the people are forced to cross the railway lines to access their day-to-day amenities, while others find themselves there due to residential areas being within close proximity of the railway reserve. Of grave concern is the increasing tendency of children to play within the railway lines as well as scholars who use railway lines to walk towards a station or nearby school. All these are done without due consideration of the dangers of train movements, as well as the possibility of being struck by trains.

The graphs below indicate that the majority of occurrences where people are struck by trains happen in Gauteng (34%), Western Cape (31%) and KwaZulu-Natal (24%). This is mainly because of the close proximity of highly populated formal and informal settlements to railway lines. It can also be attributed to the use of railway lines to gain access to passenger railway stations. When analysing the time frames, it becomes clear that the majority of people are struck during the period 18:00 to 20:00, or between 06:00 to 08:00, which are in both cases peak times when people travel to and from their places of work.

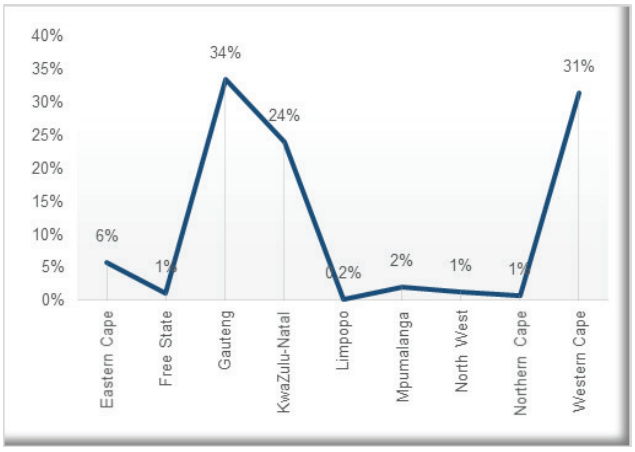


Figure 24: Provincial Distribution: people struck by train

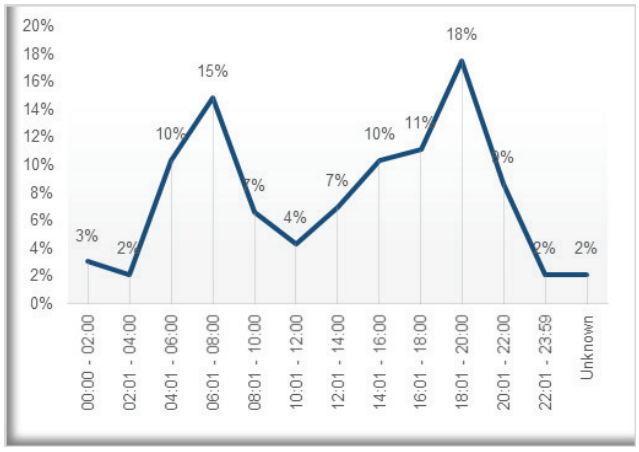


Figure 25: People struck by train time frame distribution

The continued efforts of the RRP to increase the level of safety within the railway environment has resulted in 38 504 people arrested for crossing the railway without authorisation. This is a 125% increase compared to the 17 145 people arrested during the 2014/15 reporting period. In addition, cable to the value of R R7 221 059.45 and 224 firearms were recovered during RRP operations.

Platform train Interface

The risks for passengers when entraining or detraining to either fall between the train and the platform or fall on the platform, has steadily increased by 11% during the current period. Issues such as overcrowding and the distance between the train and platform play a huge role in such occurrences. One of the major design aspects that can affect safety at the platform-train interface (PTI) is the gap size influenced by the track infrastructure. Commuter rail systems quite often share track with freight and thus the station platforms need to be set back further from the track to comply with freight car clearances.

The table below contains stations where the number of PTI occurrences during 2015/16 were high and these stations are, therefore, classified as high-risk stations. The list below contains 20 stations where more than five occurrences were recorded and also indicates whether these stations are on the PRASA Modernisation List of stations currently being upgraded (15 out of 31 stations)::

Station	Occurrences	Fatalities	Injuries	Prasa Upgrade
Bellville	11	1	9	X
Berea Road	6	0	6	X
Cape Town	7	1	6	X
Doornfontein	7	0	7	
Duffs Road	7	0	7	X
Elandsfontein	7	0	7	
Germiston	18	0	18	X
Isando	6	0	6	
Johannesburg	26	0	25	X
Kaalfontein	7	0	7	
Kempton Park	8	1	7	X
Kopanong	10	1	9	X
Mabopane	7	0	7	
Merebank	9	0	9	X
New Canada	8	0	9	
Philippi	10	0	9	X
Pretoria	15	1	15	X
Pretoria-North	7	0	7	
Tongaat	6	0	6	
Tshiawelo	8	0	9	

Table 6 : Stations with high level of platform-train interface occurrences 2015/16

International research has indicated that the increase in urbanisation will continue to rise at an alarming pace. The current patterns in South Africa indicate an outflow of people from the Eastern Cape, Northern Cape, Free State, KwaZulu-Natal and Limpopo over past 10 years, with a resulting increase in inflow of people to Gauteng (highest) and the Western Cape. This has resulted in an increase of one million people in Gauteng. This has had a significant impact on PRASA Services:

- Increased demand for services in Gauteng and Western Cape.
- Eastern Cape commuter services feasibility reduced.
- Increased need for travel to “home”.
- Increased urbanisation has led to the need for expansion of rail services to underserved areas, and will have a major impact on PRASA Services.

Analysis of the time frame of platform-train interface indicates that peak travelling times are the most problematic. This could be attributed to large numbers of commuters arriving at the station simultaneously, which in some instances leads to overcrowding as train delays cause uncertainty

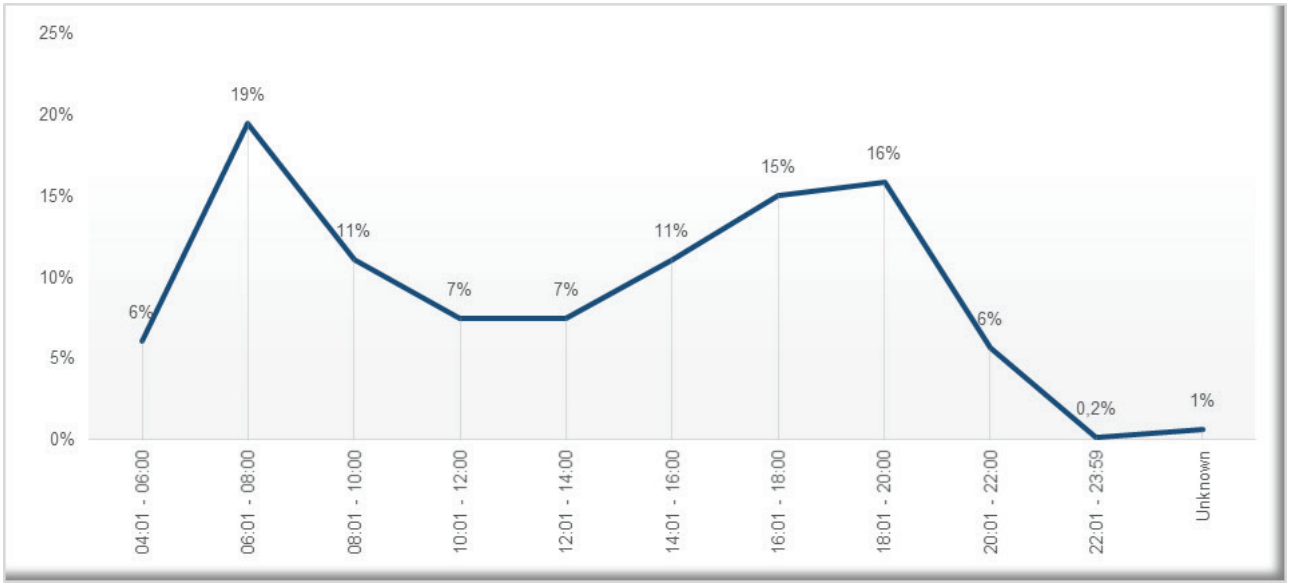


Figure 26: Platform-train interface time frame distribution

Costs associated with operational occurrences and security-related incidents

Costs associated with operational occurrences and security related incidents

This section provides high-level results of a cost-benefit analysis conducted for the 2015/16 reporting period, with the aim of tracking the impact of tools and techniques available to the RSR in regulating safety and security in the South African rail system. This particular analysis was limited to the reported direct economic costs of operational occurrences and security-related incidents by railway operators. It could, however, be expanded in future to include social, environmental and health and safety costs or benefits. The long-term goal is to provide a Regulatory Impact Assessment (RIA) tool that informs and sustains the mandate of the RSR by sound data-driven research and industry benchmarking.

The occurrence and incident data and costs are summarised into five main categories, namely three operational occurrence categories (derailments, level-crossing accidents and collisions) and two security-related incidents (theft and vandalism are categorised together with train fires, though there is a technical distinction between train fires caused by operational malfunction [occurrences] or those caused by arson attacks [security-related incidents]). Presently the reported operator data does not consistently distinguish between the various causes of train fires.

Over the 2010 to 2015 period, 70% of all occurrences and incidents were reported as theft and vandalism, consistently leading all other categories. However, in terms of the costs attributed to the occurrences and incidents, derailments are the most costly, with 57% of costs attributed to this category over the six-year period.

Cost Type	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Derailments	R 835 686 762,90	R 154 341 594,97	R 314 287 267,21	R 260 742 139,34	R 298 026 301,58	R 444 741 332,57
Level Crossing Accidents	R 3 156 127,00	R 1 261 289,00	R 8 709 501,31	R 47 160 043,36	R 73 320 014,94	R 13 483 510,27
Collisions	R 49 708 740,83	R 114 579 031,03	R 54 822 649,34	R 75 491 339,42	R 67 386 575,24	R 129 542 118,00
Theft & Vandalism	R 83 629 531,86	R 28 389 135,38	R 31 062 946,08	R 52 694 483,93	R 73 773 249,67	R 92 431 167,80
Train Fires	R 92 503 487,39	R 133 311 788,00	R 147 121 274,85	R 106 362 432,17	R 79 479 461,00	R 209 463 457,00
Grand Total	**R 1 064 684 649,98**	**R 431 882 838,38**	**R 556 003 638,79**	**R 542 450 438,22**	**R 591 985 602,43**	**R 889 661 585,64**

Figure 27: Cost of operational occurrences and security-related incidents from 2010/11 to 2015/16

The graphs below illustrate the number of occurrences costed (Figure 28) as well as the costs incurred for each of the categories as indicated (Figure 29):

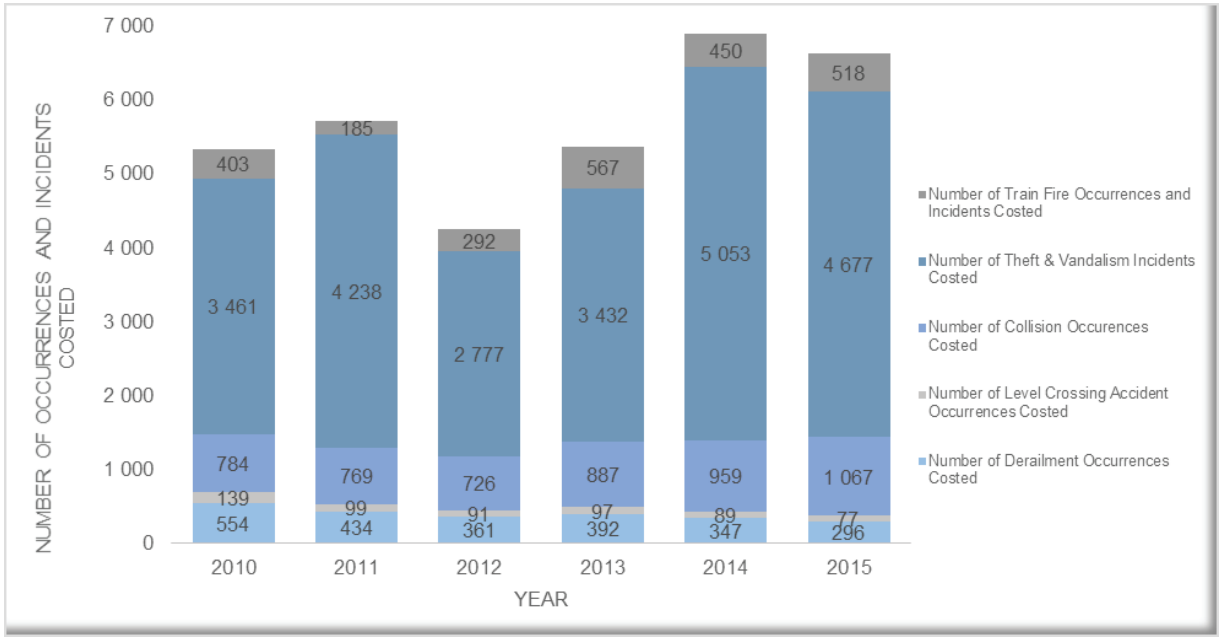


Figure 28: Total number of occurrences and incidents costed per category type (2010-2015)

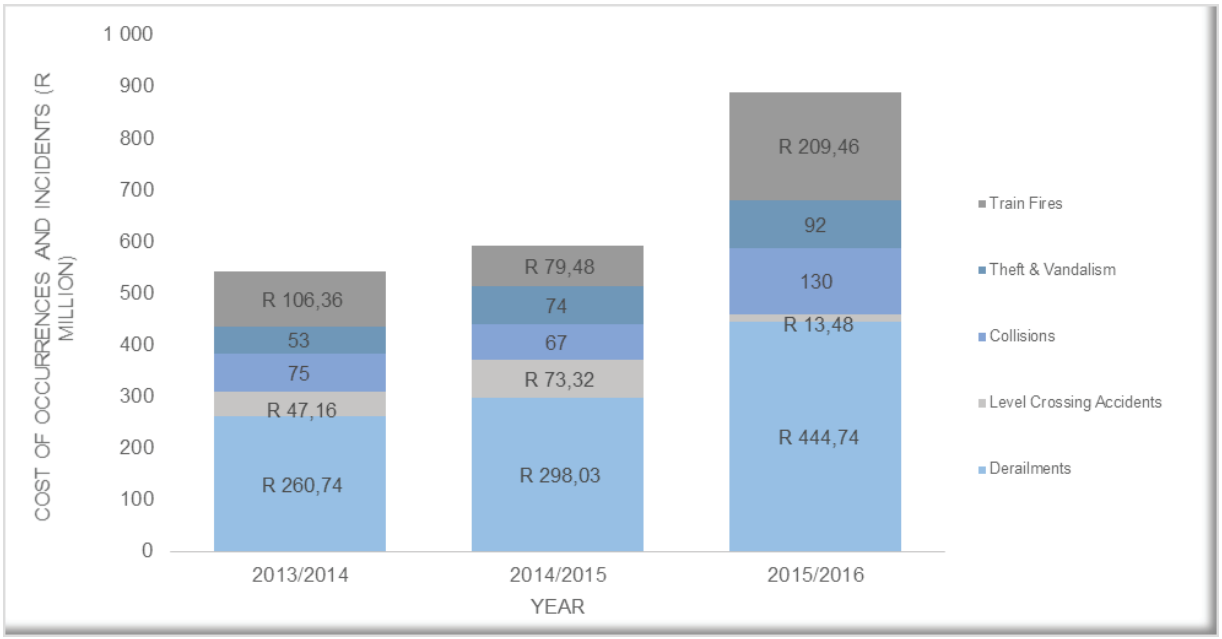


Figure 29 : Total nominal cost associated with occurrences and incidents per category type (2010-2015)

The Figure 30 below provides an indexed trend of the number of occurrences and incidents reported for each year between 2010 and 2015. The three operational occurrences are grouped together, but train fires as well as theft and vandalism are shown separately.

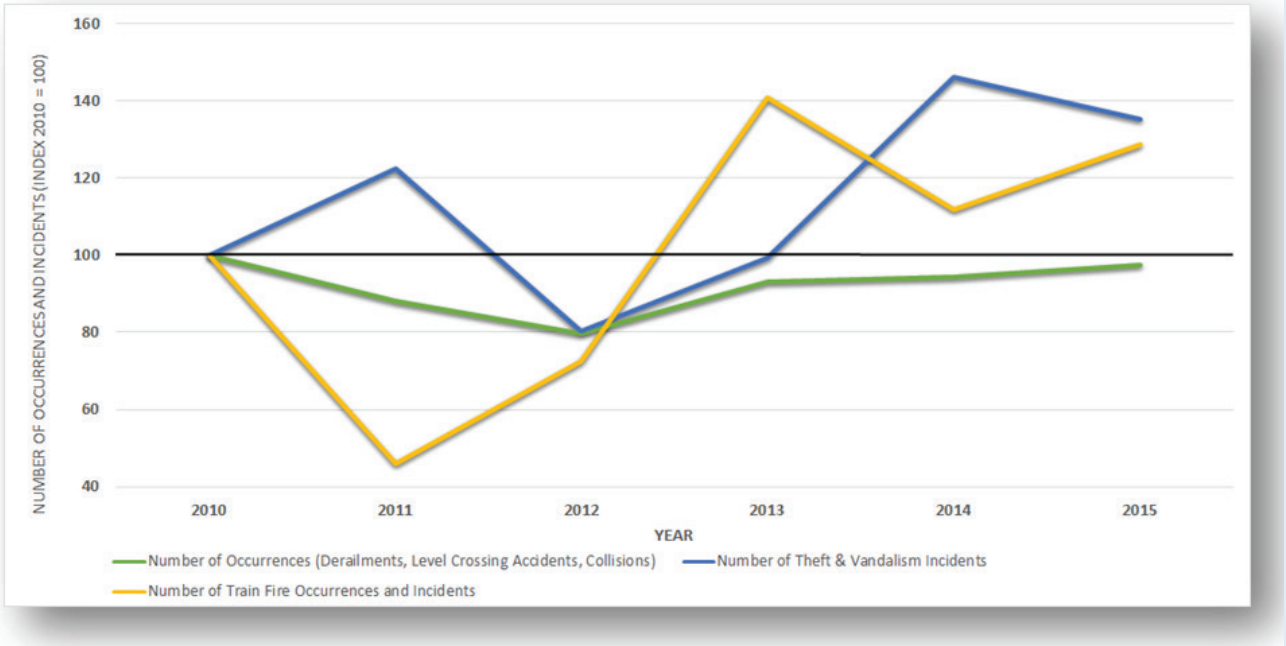


Figure 30: Indexed number of occurrences and incidents per year (2010-2015)

The graph as contained in Figure 31 below shows the indexed trend of the reported costs for occurrences and incidents over the 2010 to 2015 time period deflated to 2010 costs. Note that since the 2010 base year contains a significant derailment cost, the indexed real cost of occurrences and incidents per year using deflated 2010 prices, appears very favourable from 2011 to 2015.

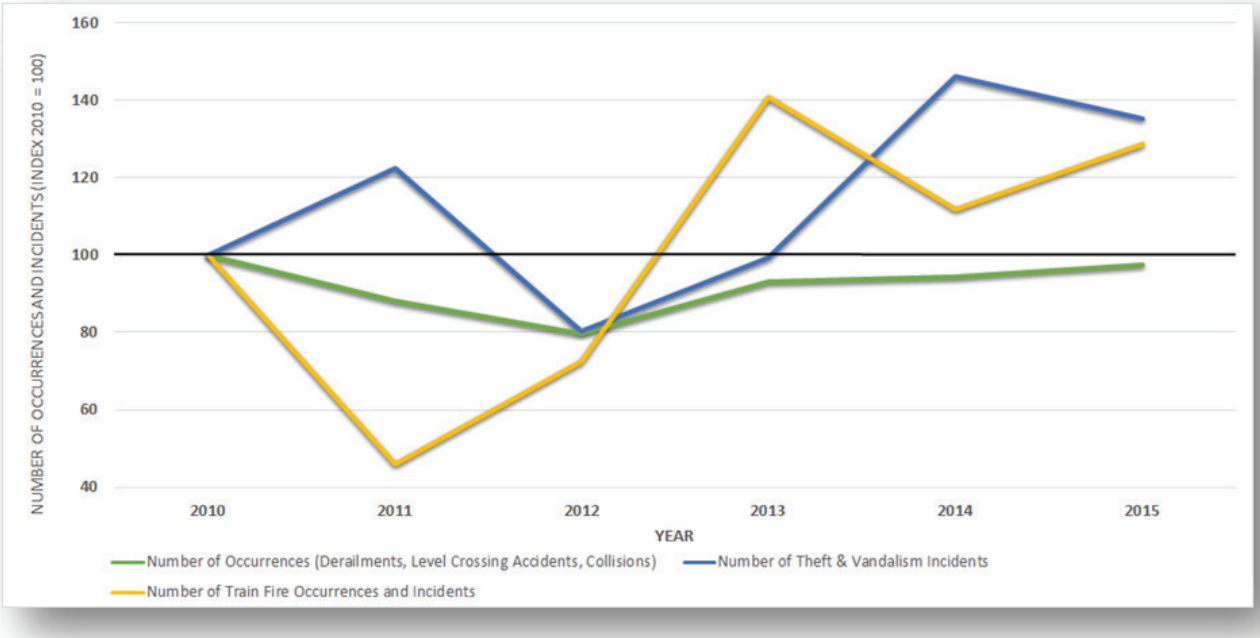


Figure 31 : Indexed real cost of occurrences and incidents per year (deflated to 2010 prices)

As can be inferred from these two figures, the number of security-related incidents have shown an upward trend since 2010 with the number of occurrences remaining below the 2010 baseline. In terms of the costs associated with these events, train fires have seen a sharp increase during 2015 with theft and vandalism still below 2010 levels, though increasing steadily since 2011. The level of occurrence costs have remained relatively stable since the drop in 2011 showing a very moderate increase.

Visualising the costs of operational occurrences and incidents

This section provides a visual analysis of the occurrence and incident direct costs for PRASA and TFR for 2015. The magnitude of costs and the location of incidents and occurrences are presented as reported by these operators and the locations are assigned to the closest railway station.

The national railway maps below represents a national view of all recorded costs per occurrence or incident category for 2015 with a summary of total costs for 2010 to 2015 for benchmarking purposes.

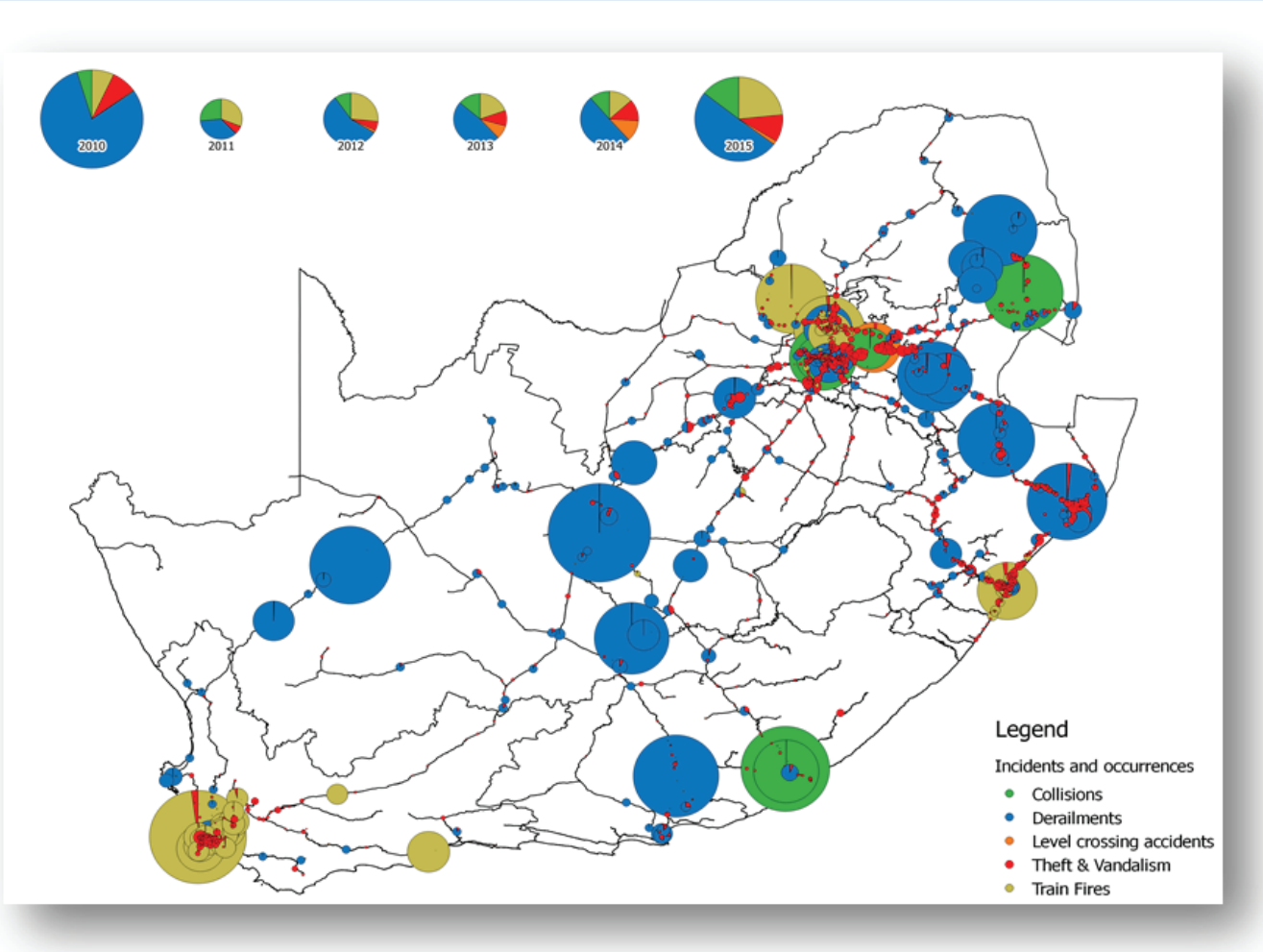


Figure 32: All occurrence and incident costs mapped on a national scale for 2015

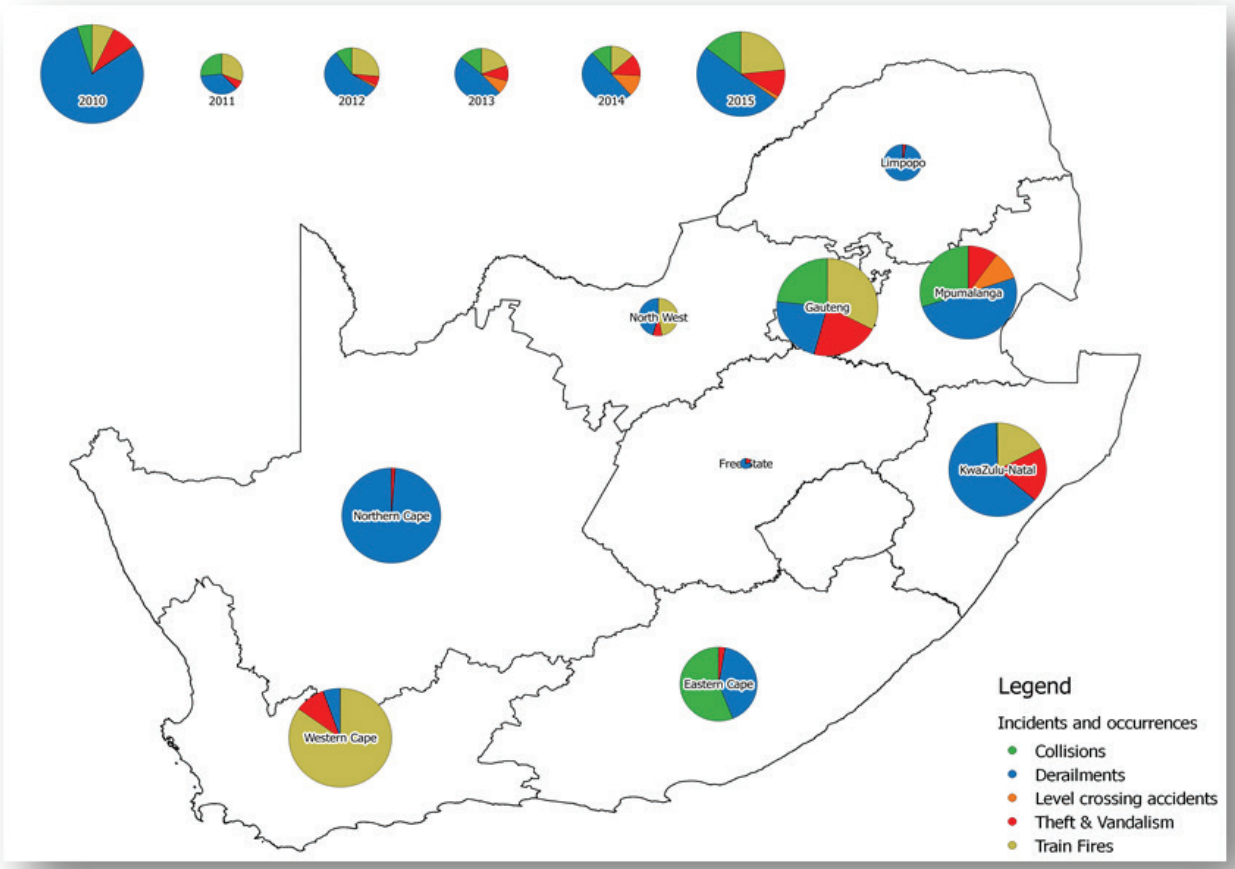


Figure 33: Occurrence and incident costs aggregated on a provincial level for 2015

During 2015, costs associated with train fires dominated in the Western Cape. In KwaZulu-Natal, costs associated with derailments were more significant. Gauteng shows a more even distribution of cost categories. The costs in these three provinces were all in the same order of magnitude for 2015. The Northern Cape and Mpumalanga provinces are also significant.

PRASA operational and safety-related costs

Figure 34 presents a national view of all costs associated with occurrences and incidents for PRASA in 2015. Figure 35 presents all the costs associated with occurrences and incidents in greater detail for the four provincial areas in PRASA (Gauteng, Eastern Cape, KwaZulu-Natal and Western Cape).

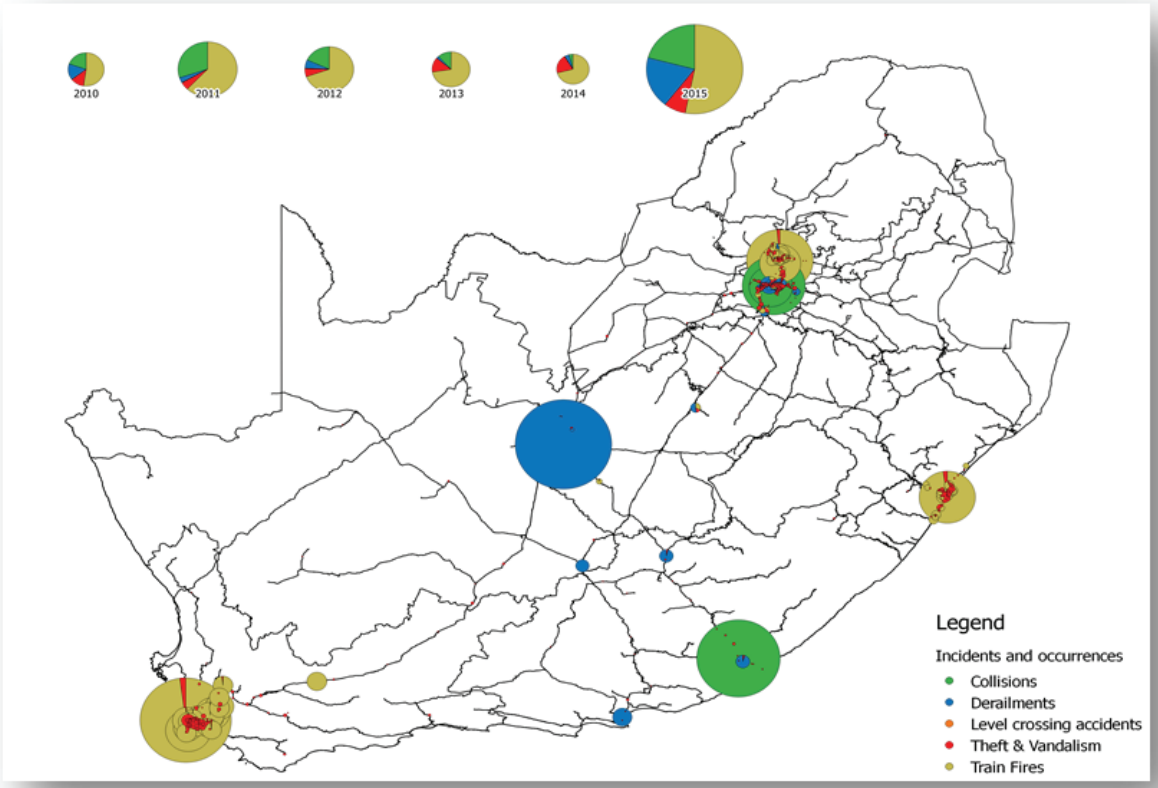


Figure 34: Mapping of all occurrence and incident costs for PRASA in 2015

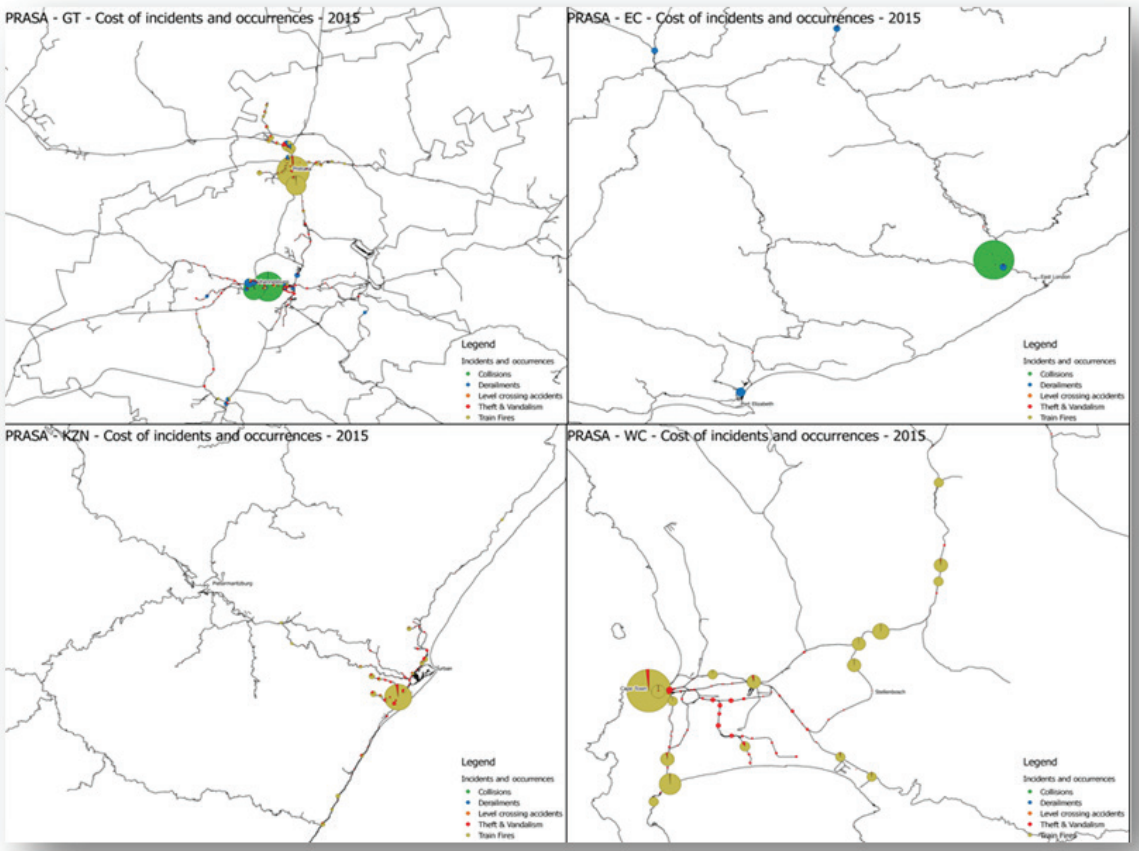


Figure 35: Cost of occurrences and incidents for major PRASA metropolitan districts during 2015

The total cost associated with occurrences and incidents for PRASA in 2015 equalled R331-million at an average cost per incident or occurrence of R131 263. If the top 10 occurrences and incidents totalling R221-million in direct costs are removed, the average cost per occurrence and incident reduces to R43 702.

Province	Costs for incidents and occurrences		Costs for incidents and occurrences excluding top 10	
	Total cost (R)	Average Cost (R)	Total cost (R)	Average Cost (R)
Gauteng	91 860 527	75 793	29 103 146	24 092
Eastern Cape	42 500 000	1 370 968	5 000 000	166 667
KwaZulu-Natal	27 304 430	74 807	11 164 197	30 671
Western Cape	119 411 259	134 776	64 411 259	73 029

Table 7: Breakdown of costs associated with PRASA occurrences and incidents per province for 2015

The derailment of a Shosholoza-Meyl train near Modderrivier station in the Northern Cape was the most costly single occurrence (R50-million) reported by PRASA during 2015, but overall the costs associated with train fires represented 53% of all occurrence and incident costs.

TFR operational and safety-related costs

Figure 36 presents a national view of all reported direct costs associated with occurrences and incidents for TFR during 2015.

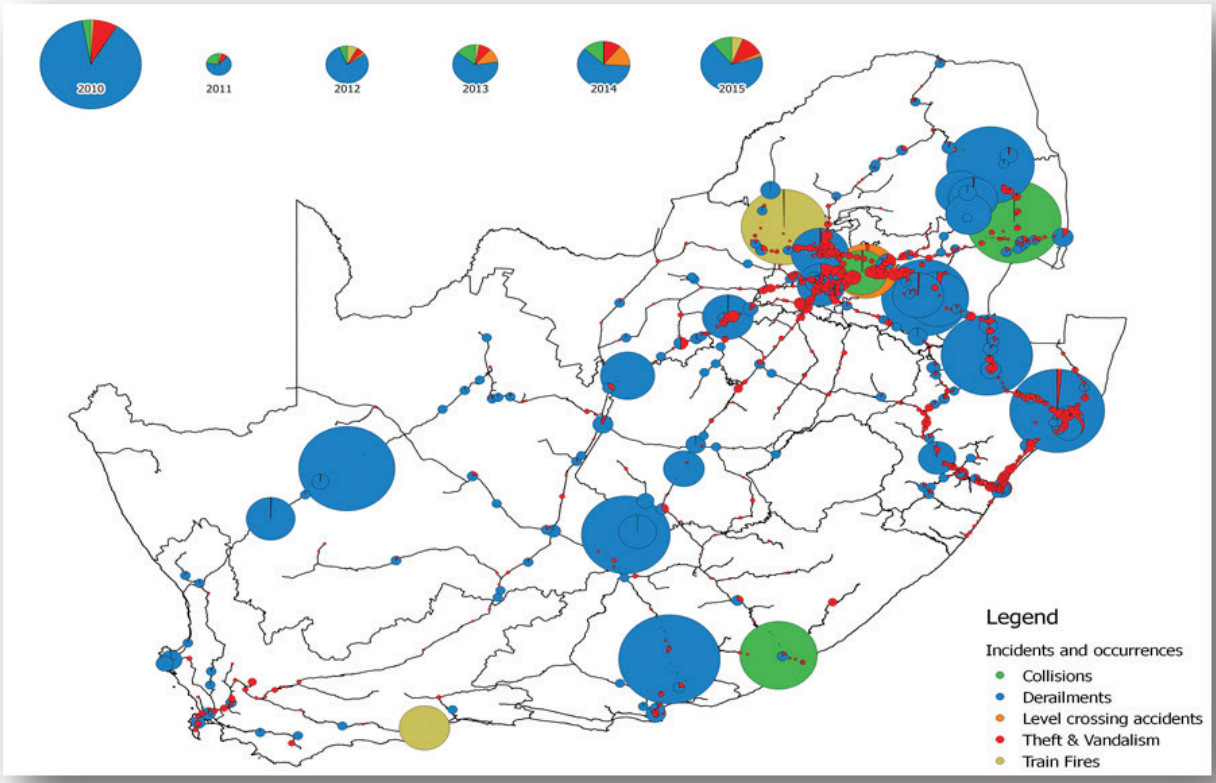


Figure 36: Mapping of all occurrence and incident costs for Transnet in 2015

The total cost associated with occurrences and incidents for TFR in 2015 equalled R559-million at an average cost per occurrence or incident of R135 818. If the Top 30 occurrences and incidents (totalling R410.67-million) as reported by TFR are removed, the average cost per occurrence or incident reduces to R36 177.

Corridor	Costs for incidents and occurrences		Costs for incidents and occurrences excluding top 30	
	Total cost (R)	Average Cost (R)	Total cost (R)	Average Cost (R)
Natal corridor	16 883 353	39 447	12 113 353	28 369
Cape corridor	28 049 278	102 745	9 274 499	34 223
Maputo corridor	8 915 338	49 806	8 915 338	49 806
Coal export	109 274 177	183 346	16 482 055	27 841
Iron ore export	45 677 319	761 289	6 192 327	106 764
Manganese export	42 581 885	181 200	7 770 522	33 207

Table 8: Breakdown of costs associated with TFR occurrences and incidents per corridor for 2015

Figure 37 presents a breakdown of costs associated with occurrences and incidents for three main economic rail corridors in South Africa connecting Gauteng with KwaZulu-Natal, Western Cape and the Mozambican port of Maputo.

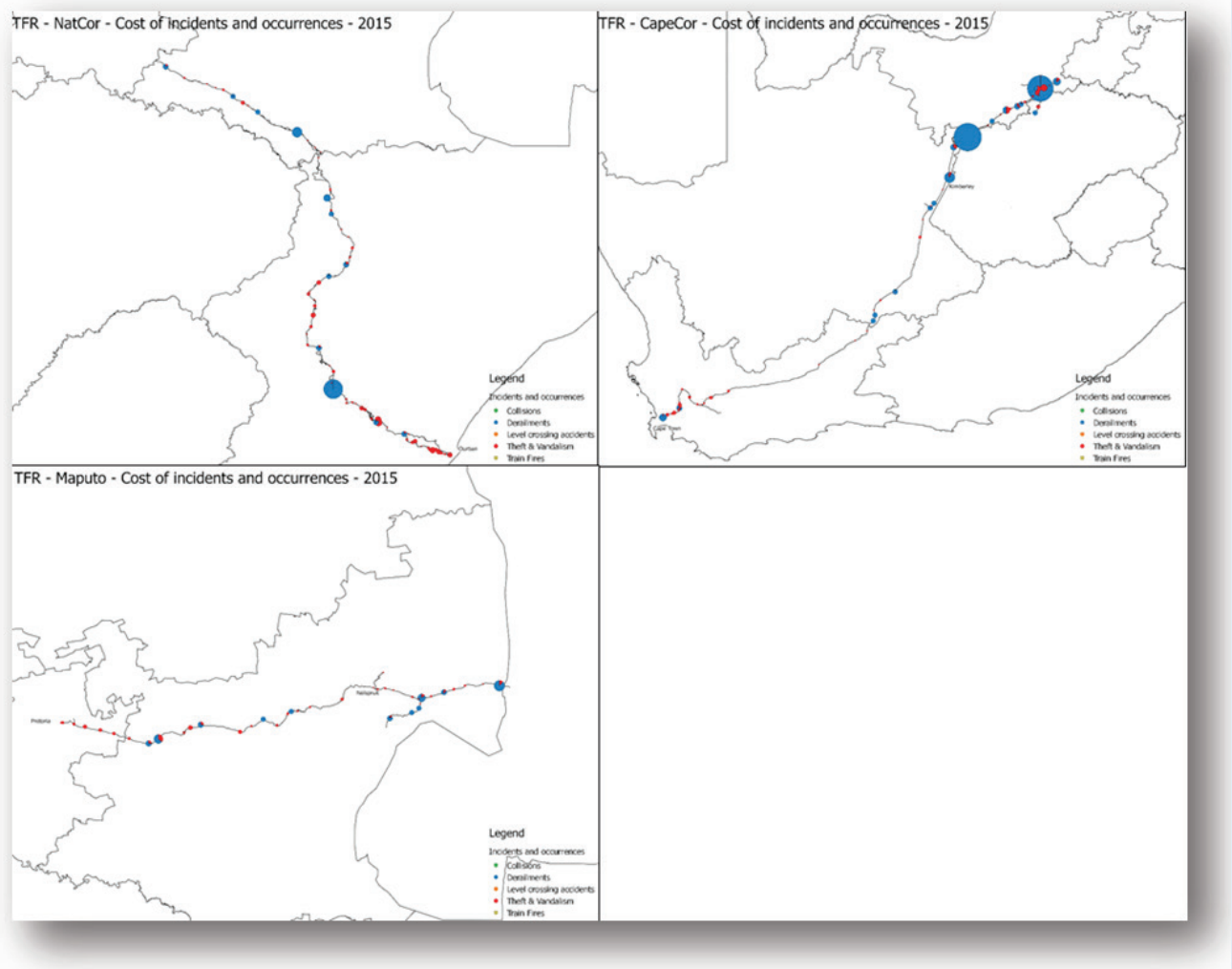


Figure 37: TFR occurrences and incidents per main economic corridor for 2015

The costs associated with derailments represents 72% of all occurrence and incident costs on the three major economic corridors.

Figure 38 presents a breakdown of the costs associated with occurrences and incidents for three TFR main bulk commodity rail export corridors in South Africa (the Richards Bay coal export line, the Sishen-Saldanha iron ore export line and the manganese export line to Port Elizabeth).

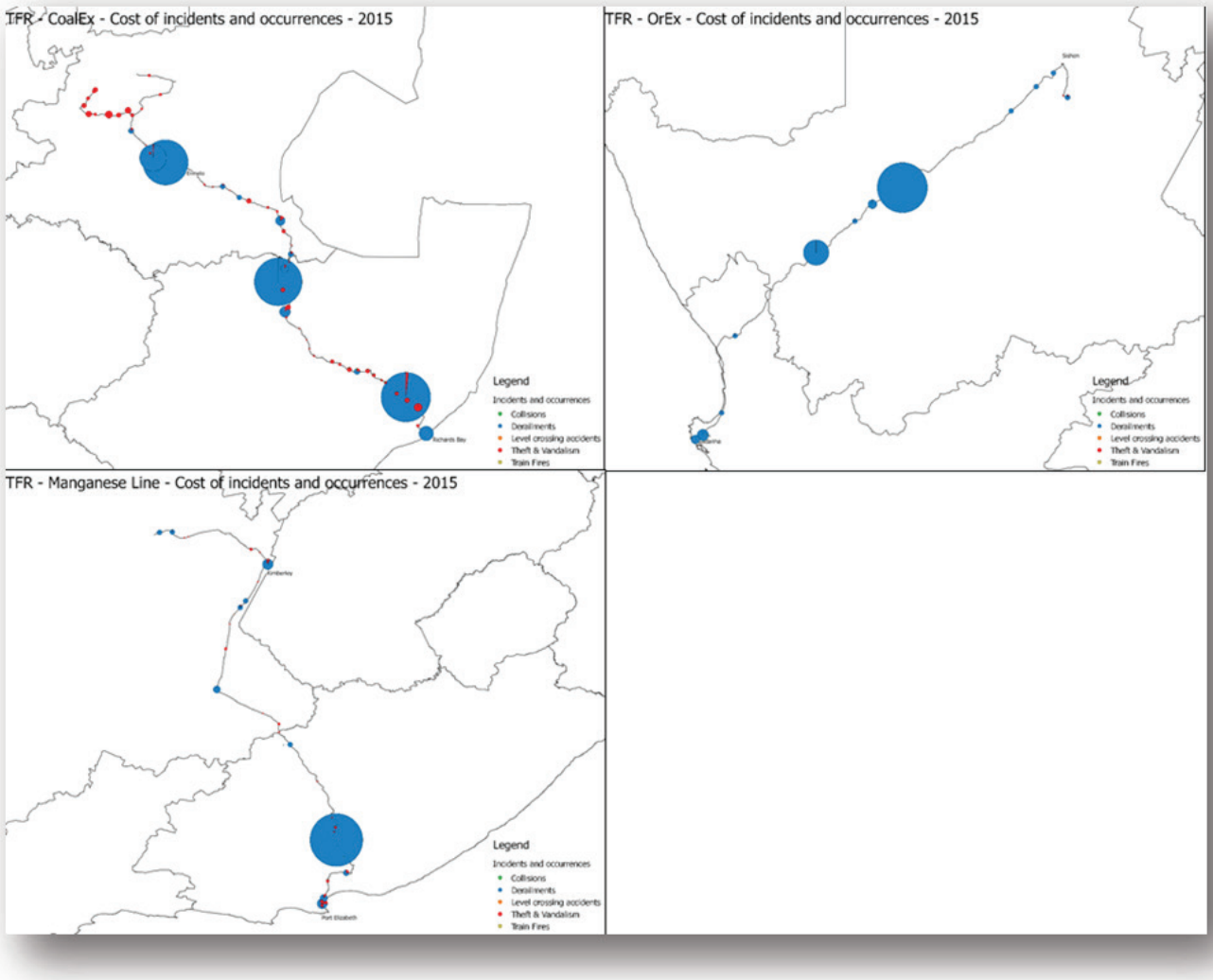


Figure 38: TFR individual occurrences and incidents per main export corridor for 2015

The costs associated with derailments represents 94% of all occurrence and incident costs on the three TFR bulk export corridors for 2015.

Normalisation of occurrence and incident costs

The question arises whether these visualisations in the previous section indicate an acceptable level of risk for the operators. Therefore, by contextualising the cost data relative to economic activity for 2015, it provides an indication of the level of risk per region for PRASA and corridor for TFR. In future, it will be possible to provide more extensive cost-benefit analyses based over time for specific regions or corridors.

Passenger costs

For the passenger cost-benefit analysis the total occurrence and incident costs per 1 000 passenger trips as declared by PRASA serves as the Passenger Rail Cost Numerator. The Gross Value Add (GVA) of PRASA passengers1 per 1 000 passenger trips is used as the Passenger Rail Benefit Denominator. The GVS is based on the average potential economic value per person in specific metropolitan or local municipality. Eleven metropolitan and district municipalities were analysed and divided into two groups of municipalities with more than 70 000 passenger trips per annum or less than 20 000 trips per annum.

Figure 39 presents the cost-benefit analysis for the five metropolitan municipalities, with ridership of more than 70 000 trips per annum, relative to each other. Evident is that the cities of Cape Town, Tshwane and Johannesburg are all in the high risk, high value category. EThekwini falls into the low risk, high value category and Ekurhuleni into the low risk, low value category.

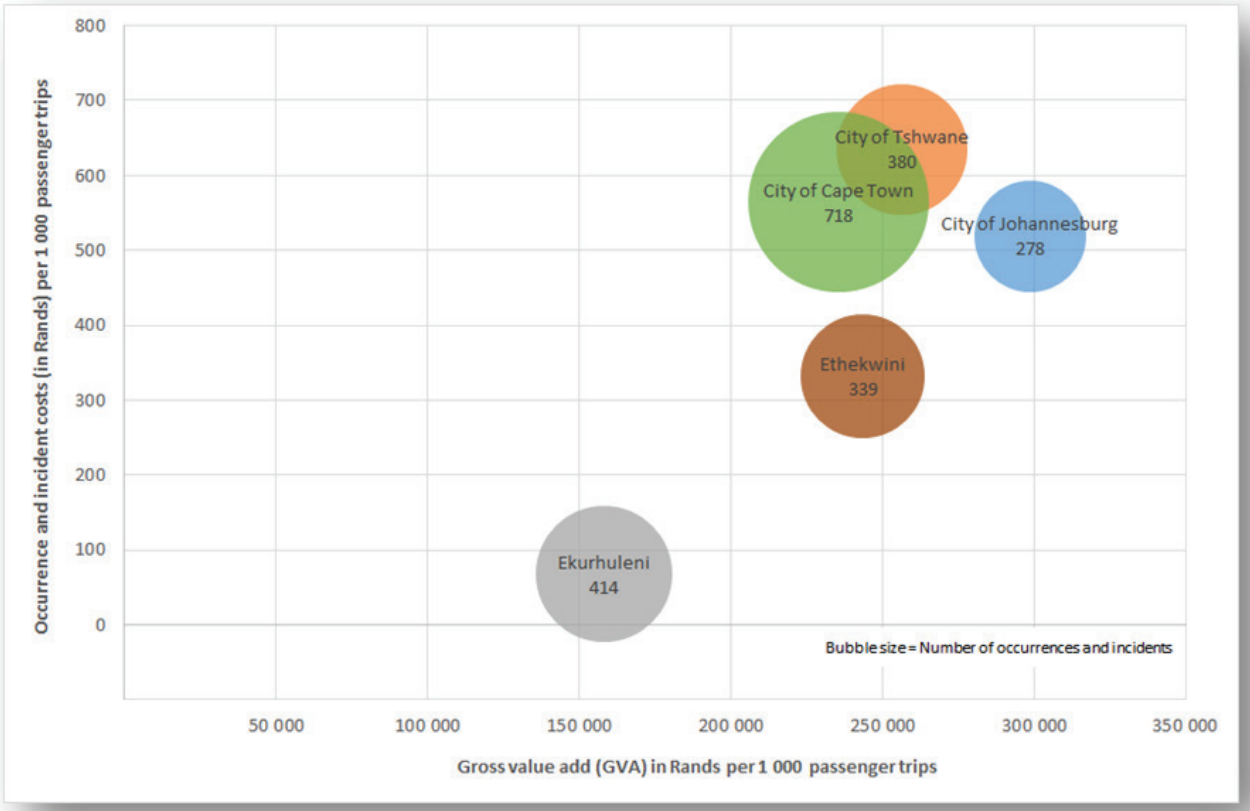


Figure 39 : PRASA cost-benefit analysis for five major metropolitan municipalities in 2015

1 GVA per district municipality for 2011 obtained from Harrison P. 2013. *South Africa's "cities of hope": Assessing the role of cities in creating opportunity for young people.* Centre for Development and Enterprise. Johannesburg, South Africa and adjusted for 2015 by using the published consumer price index (CPI) as per Statistics South Africa (StatsSA) publication P0141.

Figure 40 presents the cost-benefit analysis for the five metropolitan and district municipalities, with ridership of less than 20 000 trips per annum.

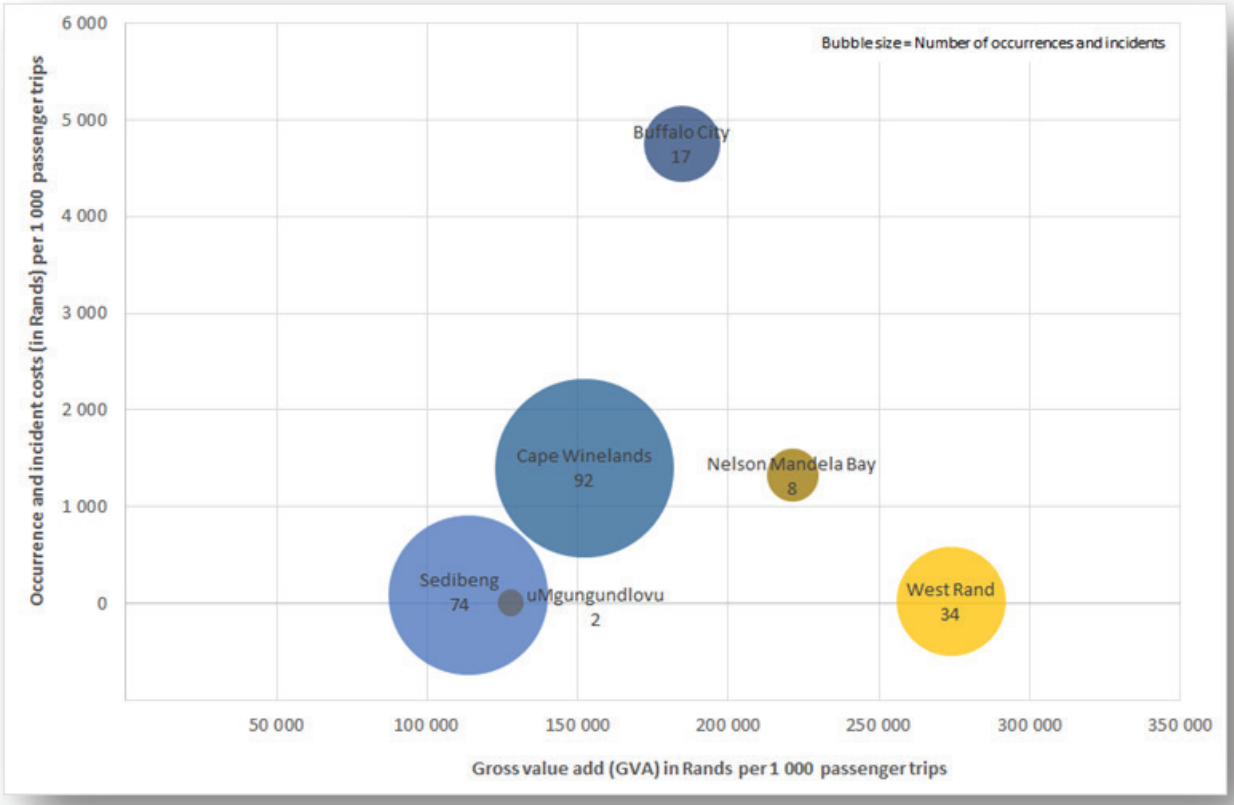


Figure 40: PRASA cost-benefit analysis for six district and metropolitan municipalities in 2015

The graph in Figure 40 shows that Buffalo City district municipality sits on the boundary of the high risk, low value category with Nelson Mandela Bay and West Rand occupying the low risk, high value quadrant. The municipalities of Cape Winelands, Sedibeng and uMgungundlovu are in the low risk, low value category, all relative to each other for 2015.

Freight costs

For the freight cost-benefit analysis the total occurrence and incident costs per tonne transported as declared by TFR serves as the Freight Rail Cost Numerator. The value of freight per tonne transported is used as the Freight Rail Benefit Denominator. Six corridors were included in the analysis and are shown relative to each other in Figure 41.

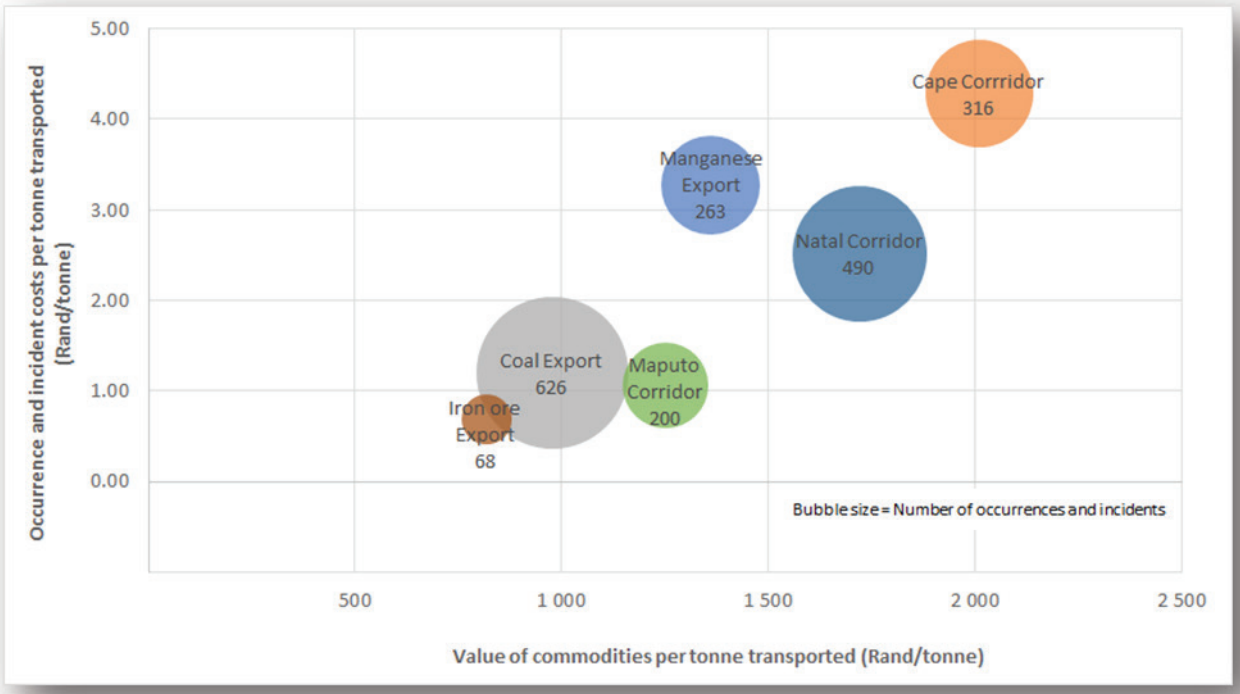


Figure 41: TFR cost-benefit analysis for major corridors and export lines in 2015

The Natal (Natcor), Cape (CapeCor), Maputo and Manganese export corridors fall into the high risk, high value quadrant, while the coal and iron ore export corridors fall in the low value, low risk quadrant, all relative to each other for 2015.

The RSR regulatory framework

In terms of Section 5 of the Act, the objectives of the RSR are to give effect to its oversight function; promote improved railway safety performance; monitor and ensure compliance; and develop regulations. A review of the RSR's oversight role established that the term "oversight" functionally implies managing, directing, controlling and guiding (Railway Safety Regulator, 2009). The RSR is, therefore, legally responsible for overseeing the management, control, guidance, and direction of safe operations within railways, thereby making train operators directly accountable to the RSR regarding their safety performance and management rules, policies, procedures and systems.

To this effect, the RSR has developed a range of regulations and National Standards which are designed to ensure that a minimum level of safety is maintained during all rail-related activities. These regulatory prescripts are further supported by the RSR's activities such as inspections, audits and investigations which ensure that operators remain in compliance with their Safety Management System (SMS), which they submit to the RSR as part of their permit obligation. Standards adopted by the RSR Board in compliance with the prescribed procedure become binding on all persons authorised under the Act to conduct railway operations. However, the RSR Board may grant exemption from compliance (Railway Safety Regulator, 2016). The graph in Figure 42 indicates the increase in regulatory instruments of the RSR.

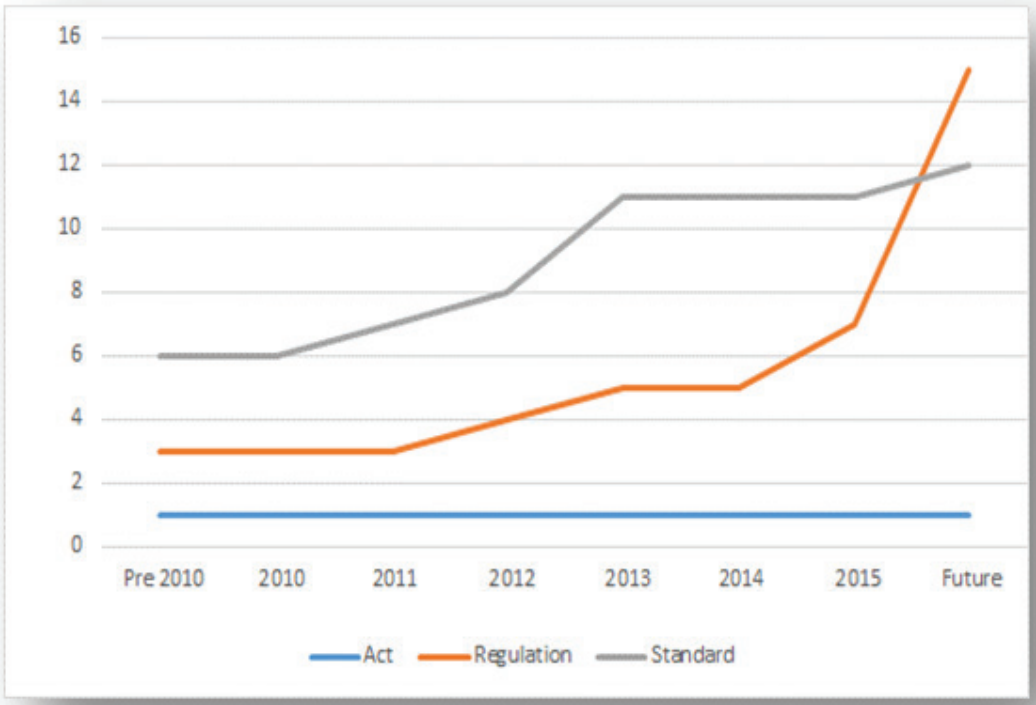
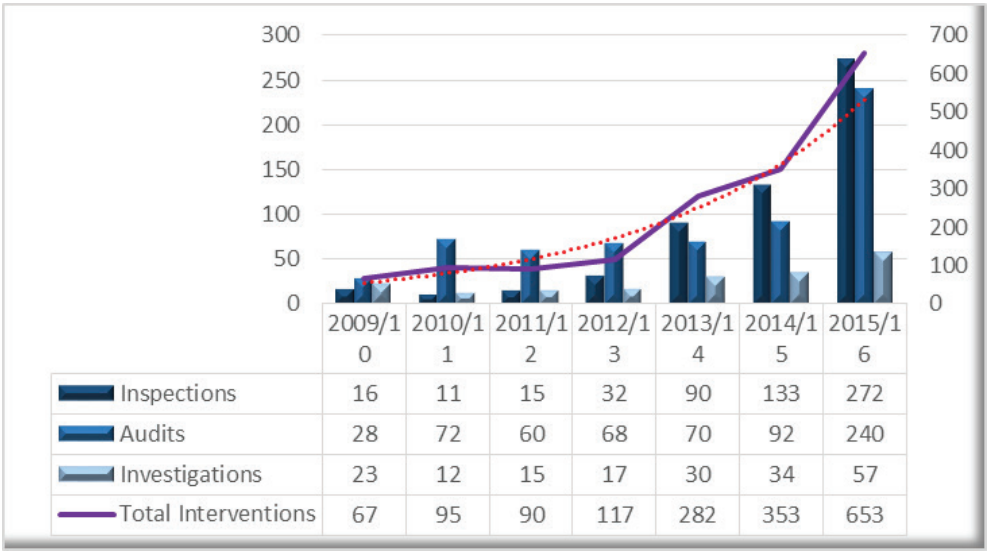


Figure 42 : RSR Regulatory Framework Development Trajectory

RSR risk and compliance interventions

The Act has several provisions empowering the appointment of inspectors and the inspection of activities authorised under a railway safety permit. The Regulator may also – on its own accord or upon receipt of a directive from the Minister of Transport – be obliged to investigate any railway occurrence for the purposes of preventing similar occurrences in the future. In performing the investigation, the Regulator has wide powers of inspection, calling witnesses and producing reports and recommendations (Railway Safety Regulator, 2016).

The red trend line in the graph illustrates the steady increase of such interventions during the five-year review period.



	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Inspections	16	11	15	32	90	133	272
Audits	28	72	60	68	70	92	240
Investigations	23	12	15	17	30	34	57
Total Interventions	67	95	90	117	282	353	653

Figure 43 : RSR compliance and risk interventions from 2010/11 to 2015/16

RSR investigations

Analysis of investigation findings is grouped according to the category it addresses in order to determine the number of findings for a specific category, for example, perway, rolling stock and signalling. During the analysis, it was determined that the human factors element was by far the largest contributor to railway accidents. It contributed 60% of all the findings in the 2015-16 FY.

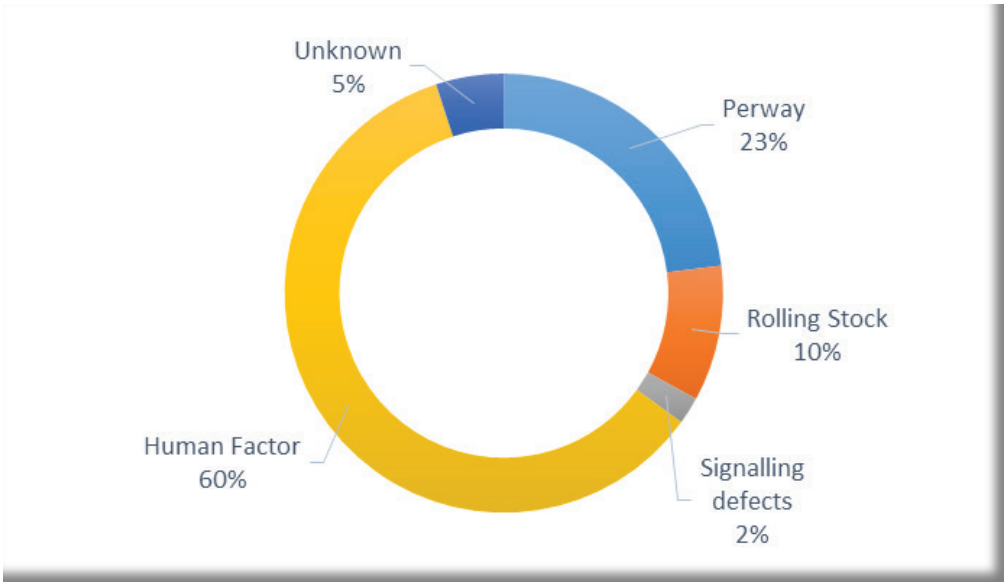


Figure 44: Root causes as identified during RSR investigations

Looking deeper into human factors, it can be established that the highest contributing element within Human Factors is a lack of supervision at ground level, for example, the failure of management to ensure

compliance to Train Working Rules (TWR). The second category with a high percentage of accidents were derailments caused by failure of the operator to maintain worn out wheels. The underlying cause of worn out wheels is the fact that most operators do not conduct planned maintenance as scheduled. It could be that operators have adopted a “run to fail” maintenance approach. As a result, scheduled maintenance is not conducted, which contributes to the high number of worn out wheels which are a cause of most derailments.

Perway, on the other hand, contributes to 23% of the derailments in rail operations. Most perway defects cause derailments if they are not attended to. Most mainline tracks are designed on an “A standard", excluding those rail lines that are within train yards. Kick outs and slacks were the primary cause of the derailments during the 2015-16 FY. Other contributing factors to rail accidents include defects of signalling equipment (hot box detectors malfunctioning).

In other circumstances, mostly in level crossing accidents, the root causes could not be determined. This can be attributed to the fact that the RSR does not conduct interviews with motorists in order to ascertain the reasons why they acted in that manner (refer to Annexure B for detailed investigation findings).

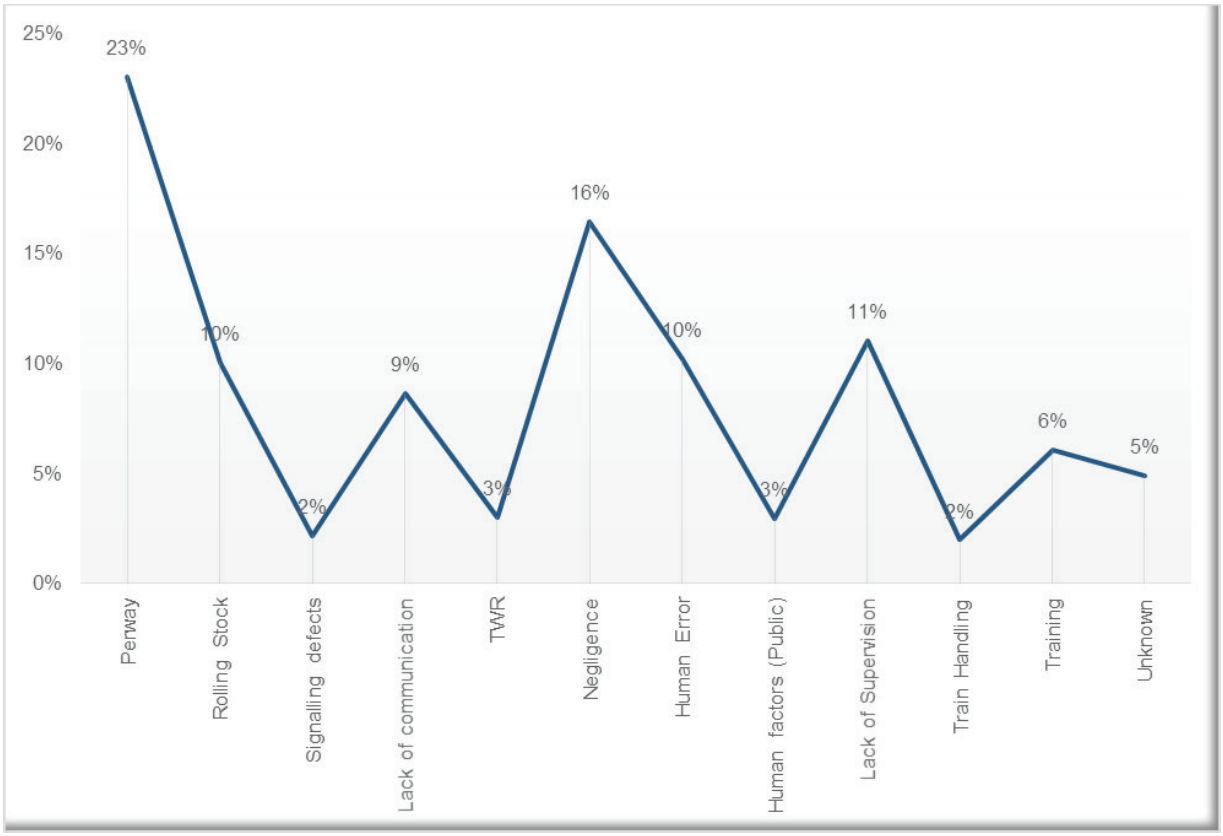


Figure 45: Detailed root causes as identified by RSR investigations

RSR audit and inspections

The SANS 3000: 1 2009 Standard for Railway Safety Management, Part 1: General, so that there could be uniformity in the management of railway safety both as a general principle and with specific reference to the issuing of safety permits to railway operators. The SANS further specifies that "*key to railway safety management is an appropriate risk management system that aims to ensure that railway operators identify their technical and operational hazards and manage the resultant risks to people, property and the environment to a level that is as low as is reasonably practicable*" (SABS, 2009).

In accordance with SANS 3000: 1 2009, adequacy and effectiveness audits were carried out to determine the adequacy and effectiveness of each element and sub-element of the SMS as part of an integrated process for managing and improving operational safety. This audit component of the SMS included periodic reviews of the system to ensure the continued suitability, adequacy and effectiveness of the SMS. These reviews took into account the changing circumstances, including the results and recommendations of risk assessments, occurrence investigations and safety performance analyses.

The RSR audits and inspections were conducted with a focus on compliance to SANS 3000: 1 2009, with emphasis on the following elements:

- Element 12: Human factors management
- Element 13: Procurement of goods and contracted services
- Element 14: Safety standards for engineering and operational systems
- Element 15: Interoperability, interface and intraface management

The audits and inspections also included compliance to other Acts and Standards as indicated below, because such Standards fortified the said SANS 3000: 1 2009

- National Railway Safety Regulator Act No 16 of 2002, as amended
- Occupational Health and Safety Act No 85 of 1993, as amended
- SANS 3000-4: Human Factors Management (HFM) Standard
- SANS 3000: 2-1 Electrical Distribution and overhead traction systems
- SANS 3000-2-2: Railway safety management – Part 2-2: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure
- 3000-2-3: Railway safety management – Part 2-3: Technical requirements for engineering and operational standards – Rolling stock

The pie-chart indicates the areas of non-adherence to the respective SANS standards used, as identified during audits. The major focus was on SANS 3000: 1 2009 and SANS 3000-4: 2011. In some instances, the seriousness was of such nature that prohibition directives and improvement directives were issued along with the audit report, while in other cases non-confirmative and/or non-compliance findings were noted for purposes of corrective action.

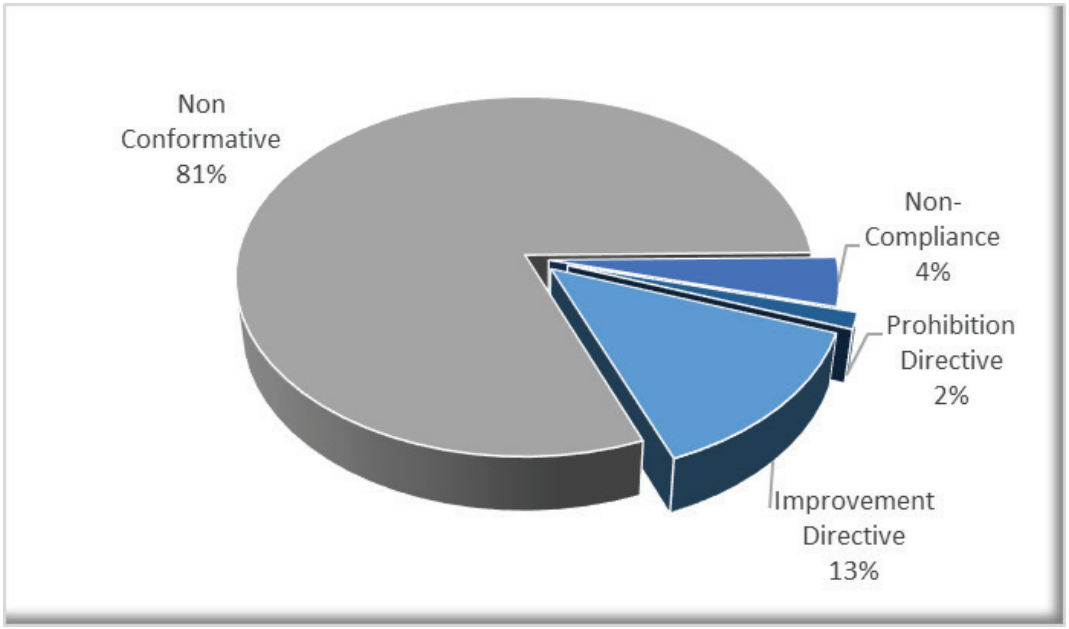


Figure 46: The RSR's audit outcomes 2015/16

Given that the main focus of audits and inspections was to determine the level of compliance against SANS 3000: 1 2009, specifically in terms of sections 12, 13, 14 and 15, it is important to note that the overall level of compliance appears to be poor against these elements. The graph in Figure 49 illustrates the distribution of non-adherence, whether in the form of directives or non-conformities or non-compliances.

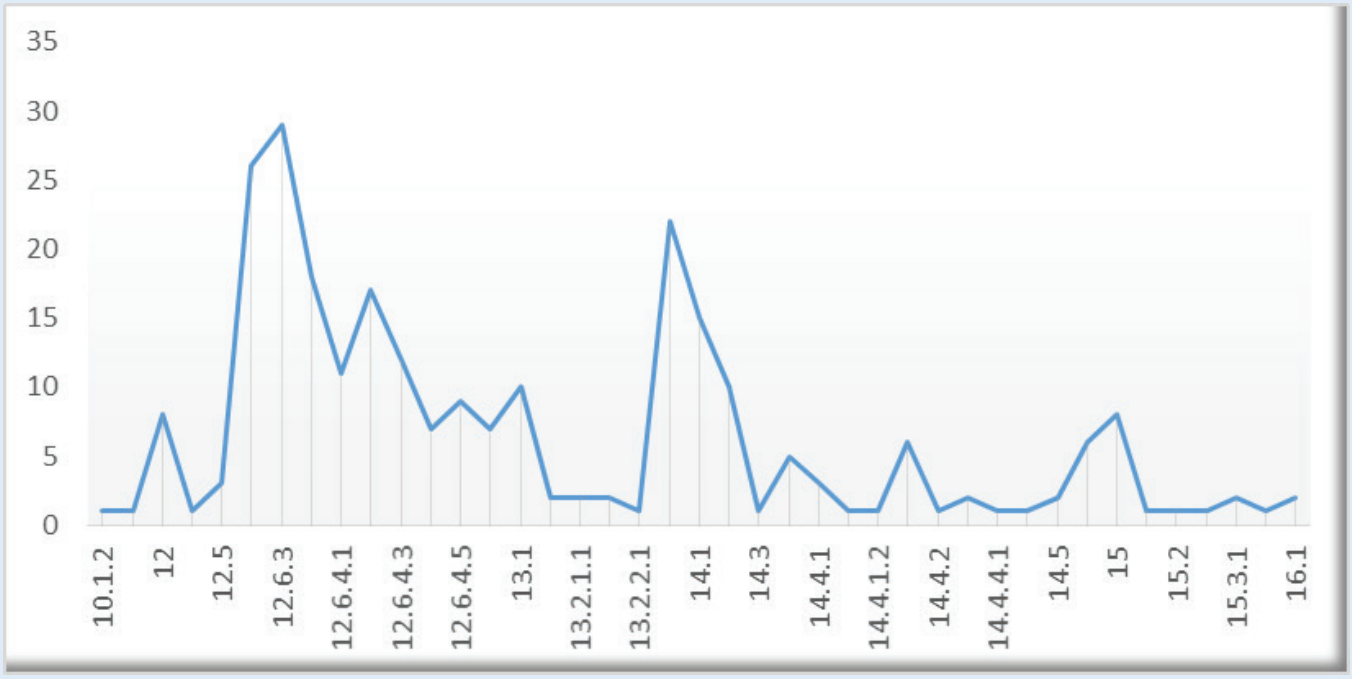


Figure 47: SANS 3000: 1 2009 findings per element

In addition to the findings as per SANS 3000: 1 2009, matters of non-adherence to human factors requirements in terms of the SANS 3000: 4 2011 were also noted. In terms of human factor audits, the results are noted as per the graph below, which indicates major areas of non-conformance, especially to Element 6 of SANS 3000:4 2011.

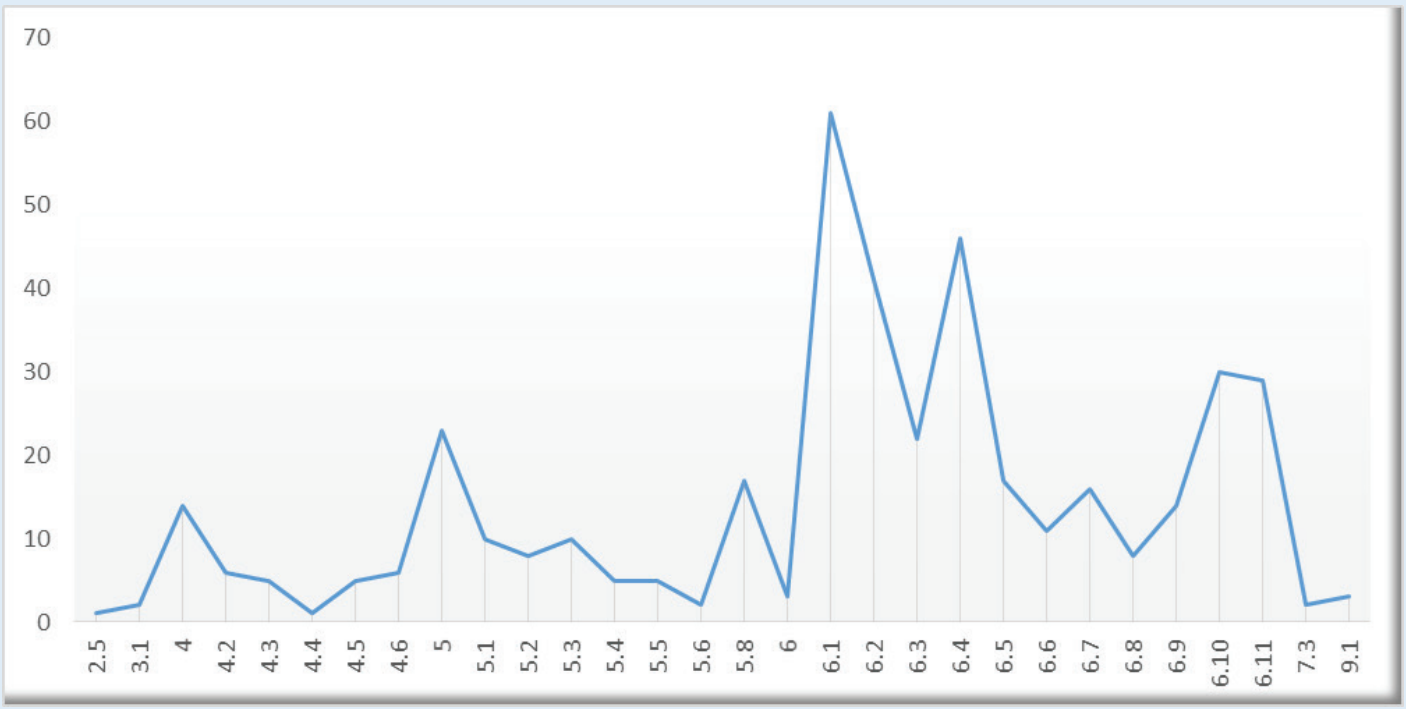


Figure 48: SANS 3000: 4 2011 findings per element

When taking into consideration that the RSR's investigations identified human factors as the root cause of 60% of all occurrences investigated, human factors audit findings are of grave concern. The major areas of concern as noted during human factors audits are as follows:

i. There was very little evidence provided of policies, processes or procedures for Human Factors in Design, Fitness for Duty and Fatigue Management.
ii. Lack of adequate psychological, psychometric and functional capacity assessments conducted at pre-employment for all category 1 personnel as well as following an incident or illness.
iii. Evidence provided indicated that the review dates of several human-factor related policies and procedures had lapsed, or did not include intervals at which the monitoring, evaluation and review of the procedures and processes related to the procedures must occur.
iv. Evidence provided indicated that in various instances ergonomics surveys had not been conducted since 2012.
v. Evidence provided indicated where physical stressors surveys have been conducted by the RSR previously, recommendations had not yet been implemented.
vi. Very little evidence was provided indicating that the number of hours worked was tracked or that the roster was managed adequately.
vii. In various instances, no evidence was provided to indicate that employees were being scheduled for follow-up medical assessments as requested by the Occupational Health Practitioner.
viii. With the exception of substance abuse testing training, limited evidence could be provided to show that supervisors that are responsible for overseeing the fitness for duty processes received any training on fitness for duty declarations, the verification of employees' declarations and the procedures that are in place to handle declarations.
ix. Supervisors do not always sign to verify fitness for duty of employees.
x. In certain cases, there is no provision for the declaration of medication and pregnancy on some of the declaration forms that were observed.
xi. The recruitment and selection process is generally managed in accordance with the recruitment and selection policy. However, certain aspects of the assessment processes are not conducted in the manner required by the standard (i.e. medical and psychological fitness examinations, psychometric and physical assessments based on job demands).
xii. The practical test has some strenuous tasks which may lead to injur,y if not performed correctly or if individuals do not have the capacity to meet the physical demands. The fact that no determination of the candidates' level of fitness or abilities prior to requiring them to perform these tasks (e.g. lifting a 240kg sleeper) and that no training on correct techniques is done is a high risk.
xiii. The suitability of applicants with regards to physical capabilities (e.g. physical strength tests) is only tested for entry-level grades (i.e. infra workers) during the recruitment and selection process, despite the fact that a large part of the tasks performed by higher grades are also physically demanding.
xiv. There are several safety related and critical grades with open vacancies. The open vacancies have several negative consequences on employee safety and wellness by affecting, among other factors, rostering practices.

RSR awareness campaigns

RSR awareness campaigns

As part of its annual activities, the RSR conducts media and awareness activities in identified communities. The aim of these interventions is to educate communities about railway safety, specifically regarding occurrences which are prevalent in the identified areas, such as level crossings, people truck by trains or challenges pertaining to commuter behaviour. The table below contains activities conducted during the 2015/16 reporting period.

Awareness campaign	Area	Focus area
Boshoek Level Crossing	Rustenburg	Level crossing
Minister's Train Trip	Germiston - Park - Tembisa (Stations)	Commuter engagements
Suurbekom level crossing	Suurbekom	Level crossing
Kaalfontein Safety Awareness	Kaalfontein	Engaged and educated commuters on safe rail practice (People struck by trains and train surfing)
Dr Moroka Level Crossing	Rustenburg	Level crossing
New Brighton Station and JB Umnyanda Primary School	Port Elizabeth	Educated the community on safe ways to utilise level crossings as well as train stations
East London Station and Hemmingways Mall	East London	Educated the community on safe ways to utilise level crossings as well as train stations (platform-train interface)
Soweto Church Campaign on Rail Safety	Orlando East Methodist Church	People struck by trains and train surfing
Orlando High School Debate	Orlando	Unsafe behaviour inside and around trains and train stations is uncool
Birch Acres	Tembisa	Engaged with the community and raised awareness regarding railway safety (people struck by trains and train surfing)
Hombakazi Combined Primary and High School	Port Elizabeth	Created awareness of the RSR's role and railway safety
Chris Hani Crossing Mall	Vosloorus	People struck by trains and railway reserves
Rondebult Level Crossing	Randfontein	Created awareness of the RSR's role and promoted railway safety
Provincial Transport Awareness Campaign	Cape Town	Created awareness of the RSR's role and promoted railway safety
Rondebult Level Crossing	Germiston	Level crossing
Hammanskraal Awareness Campaign	Hammanskraal	Level crossing
Maponya Mall	Soweto	Created awareness of the RSR's role, people struck by trains and train surfing

Regulatory impact assessment

This section provides a basic analysis of the regulatory impact of the RSR over the past six years by plotting indices of different Passenger and Freight Rail Cost Numerators. With only six years of sample data, the statistical significance of the indices should be accepted with caution. Once the sample size reaches eight years of data, interpretation of the data can be viewed as statistically significant.

Passengers

Figure 49 shows the indexed regulatory impact for passenger rail from 2010 to 2015. Evidently the average cost of occurrences and incidents have again increased to 2010 levels in 2015 after declining between 2012 and 2014. Occurrence and incident costs as a function of passenger GVA and trips have shown a sharp increase in 2015.

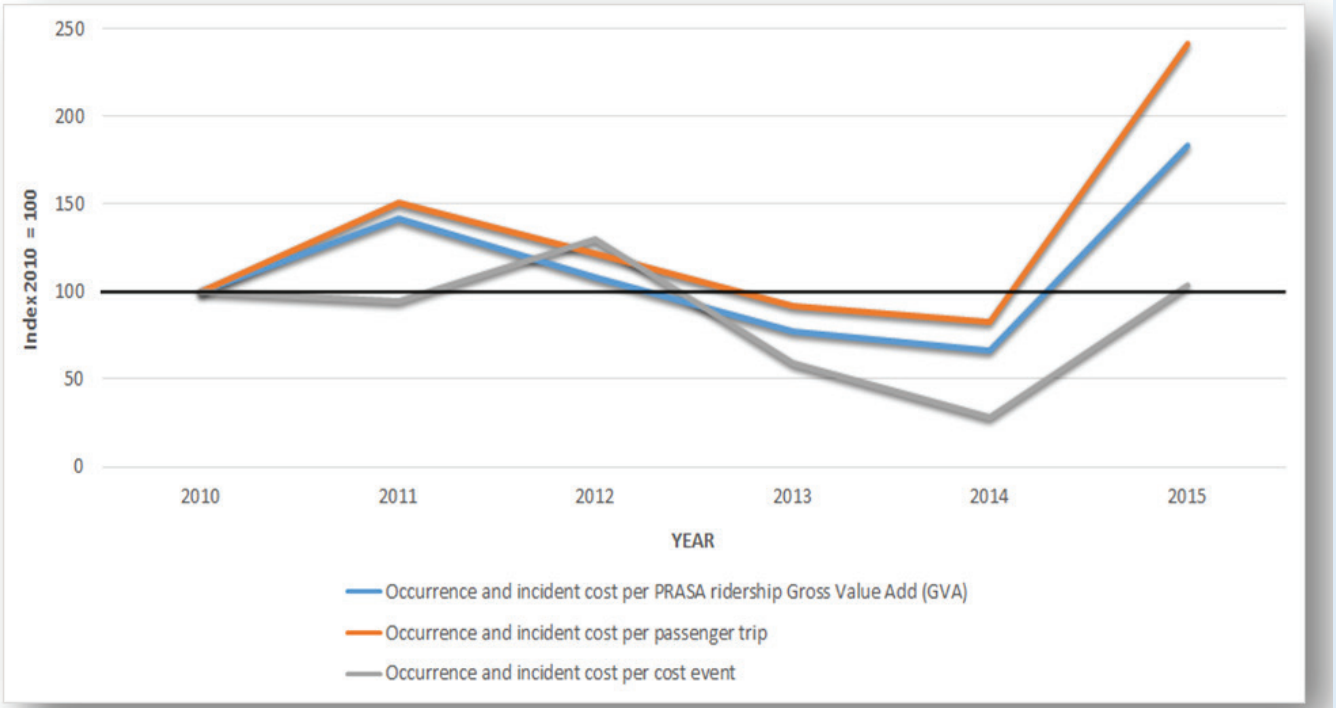


Figure 49: Regulatory Impact Assessment (RIA) for passenger rail from 2010 to 2015 (Index 2010 = 100)

Freight

Figure 50 shows the indexed regulatory impact for freight rail from 2011 to 2015. The 2010 year was removed as the magnitude of the costs associated with derailments in 2010 relative to the other years made comparative analysis nonsensical.

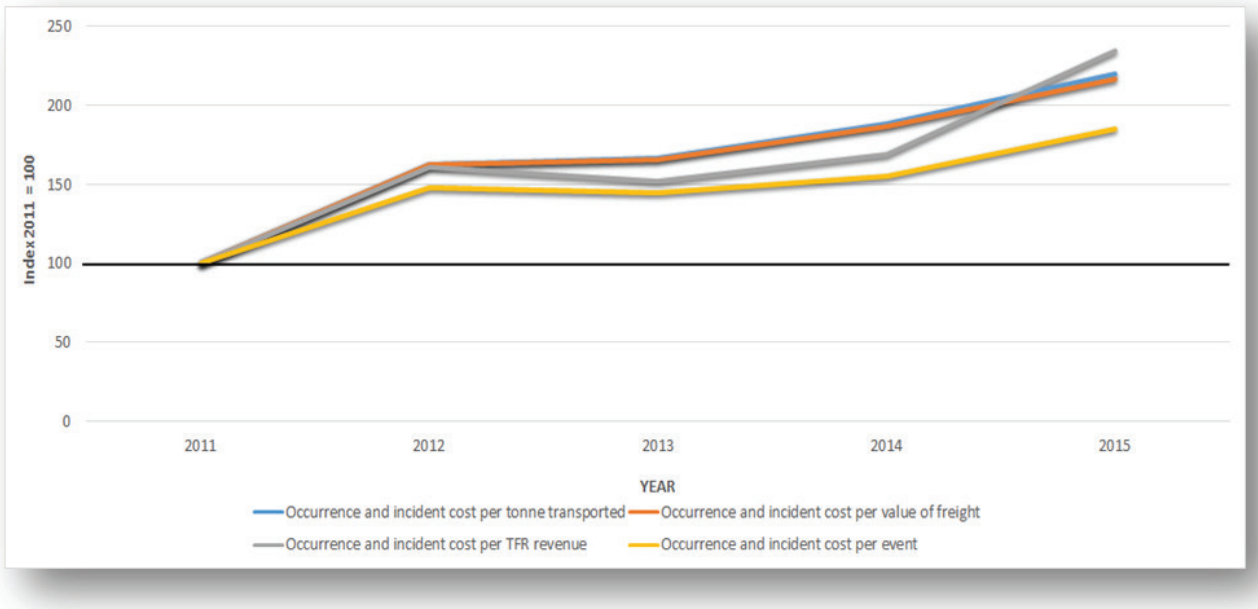


Figure 50 : Regulatory Impact Assessment (RIA) for freight rail from 2011 to 2015 (Index 2011 = 100)

The occurrence and incident costs as a function of tonnes transported, value of freight and revenue have all steadily increased to more than double the levels of the 2011 base year. The average cost per occurrence or incident has also increased albeit at a slower rate, relative to the other indicators.

Conclusion

The declines in operational occurrences and safety-related incidents is noted and applauded, however, caution should be applied when assessing these declines. The cost-benefit analysis provided a precursory glance into the regulatory impact that the RSR has on the South African rail system and the visual output provided calls into question the acceptable level of risk to ensure ongoing operational readiness of the rail system. The question that remains is whether the major costs associated with train fires on the passenger rail side and the costs associated with derailments on the freight rail side can be classified as intrinsic or systemic.

Initial analysis would suggest that though the largest costs can be attributed to derailment occurrences, the magnitude of the reported security-related incidents could lead to indirect consequential costs. Evidence exists that costs of occurrences and incidents are systemic due to issues in the overall rail system. More analysis is required to determine if the current levels of risk are acceptable. Given the scarcity of data (especially in terms of ridership data for PRASA and the cause of train fires to distinguish between operational occurrences and security-related incidents) and the short time-period of statistical analysis, care should be taken when interpreting results and, therefore, domain-based knowledge is a prerequisite in providing a deeper understanding of the data.

In addition, the continued loss of life cannot be ignored. The openness of the railway environment, which allows for unchecked access, also allows for continued theft of valuable and vital equipment. Though security within the railway environment does not fall within the primary mandate of the RSR, we cannot allow it to negatively affect operational safety. The RRP figures indicates that 38 504 people were arrested for crossing the railway without authorisation. This is an increase of 125% when compared to the 17 145 people arrested during the 2014/15 reporting period. In addition, cable to the value of R7 221 059.45 and 224 firearms were recovered during RRP operations.

The RSR will therefore be expanding its regulatory framework to address such, and will also continue to work in close cooperation with law enforcement entities to ensure that our railways are safe, reliable and economically efficient. Emphasis on education and training will be broadened to reach even further into communities and schools, though collective efforts and campaigns with other entities within government as well as private role-players where identified. Areas of cooperation with other government entities will be explored further in regards to addressing the systemic challenges such as encroachment into the rail reserve and acts of vandalism and theft to not only decrease the number of operational occurrences and safety-related incidents, but also decrease the economic burden on operators, commuters and the South African public.

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Appendix A: SANS 3000: 1 (2009) operational occurrence and safety-related incidents detailed categories

Operational occurrence categories

Category	Description
A	Collisions during movement of rolling stock
A-a	Collision between rolling stock on a running line
A-b	Collision of rolling stock with an obstruction on a running line (including road vehicles colliding with rolling stock)
A-c	Collision with a stop block on a running line
A-d	Collision of rolling stock other than on a running line
A-e	Collision of rolling stock with an obstruction other than on a running line
A-f	Collision with a stop block (other than on a running line)
B	Derailments during movement of rolling stock
B-a	Derailment of rolling stock on a running line
B-b	Derailment of rolling stock on a line other than a running line
B-c	Derailment during tippler activities
C	Unauthorised Movements (Rolling stock movement exceeding the limit of authority)
C-a	Signal passed at danger (SPAD) on a running line
C-b	Signal passed at danger (SPAD) on any other line
C-c	Physical token passed on a running line
C-d	Physical token passed on any other line
C-e	Verbal authority exceeded on a running line
C-f	Verbal authority exceeded on any other line
C-g	Written authority exceeded on a running line
C-h	Written authority exceeded on any other line
D	Level crossing occurrences
D-a	Collision between rolling stock and a road vehicle(s) (including motor vehicles, bicycle or animal-drawn vehicles) at a recognised level crossing on a running line
D-b	Collision between rolling stock and a road vehicle(s) (including motor-powered, bicycle or animal-drawn vehicles) on any line other than a running line (including yards, sidings and private sidings) at a recognised level crossing
D-c	A person(s) struck by rolling stock at a recognised pedestrian level crossing
D-d	A person(s) struck by rolling stock at a recognised road level crossing
E	Persons struck during movement of rolling stock (other than at level crossings)
E-a	Occurrence where a member of the public is struck by rolling stock on a running line
E-b	Occurrence where an employee is struck by rolling stock on a running line
E-c	Occurrence where a contractor or contractor's employee is struck by rolling stock on a running line
E-d	Occurrence where a member of the public struck by rolling stock on a line other than a running line
E-e	Occurrence where an employee is struck by rolling stock on a line other than a running line

Category	Description
E-f	Occurrence where a contractor or contractor's employee is struck by rolling stock on a line other than a running line
F	People related occurrences: Trains outside station platform areas (in section)
F-a	Occurrence where a person fell or was pushed from inside a moving or stationary train
F-b	Occurrence where an employee fell or was pushed from inside a moving or stationary train
F-c	Occurrence where a contractor or contractor's employee fell or was pushed from inside a moving or stationary train
G	Passenger related occurrences: Travelling outside designated passenger area
G-a	Category G occurrences covers the number of occurrences as a result of passengers travelling outside the designated passenger area of the train
H	People related occurrences: Platform-train interface
H-a	Occurrence where a passenger fell between the train and the platform whilst entraining/detraining a stationary or moving train
H-b	Occurrence where a passenger fell on the platform whilst entraining/detraining a stationary or moving train
H-c	Occurrence where an employee fell between the train and the platform whilst entraining/detraining a stationary or moving train
H-d	Occurrence where an employee fell on the platform whilst entraining/detraining a stationary or moving train
H-e	Occurrence where a contractor or contractor's employee fell between the train and the platform whilst detraining a stationary or moving train
H-f	Occurrence where a contractor or contractor's employee fell on the platform whilst entraining/ detraining a stationary or moving train
I	People related occurrences: Station infrastructure
I-a	Occurrence resulting in injuries and fatalities to public due to infrastructure defects in a public area of the station
I-b	Occurrence resulting in injuries and fatalities to passengers due to infrastructure defects in a passenger area of the station
I-c	Occurrence resulting in injuries and fatalities to an employee due to infrastructure defects in a public area of the station
I-d	Occurrence resulting in injuries and fatalities to an employee due to infrastructure defects in a passenger area of the station
I-e	Occurrence resulting in injuries and fatalities to a contractor or contractor's employee due to infrastructure defects in a public area of the station
I-f	Occurrence resulting in injuries and fatalities to a contractor or contractor's employee due to infrastructure defects in a passenger area of the station
J	Electric shock of people occurrences
J-a	Electrical shock to a member of the public on the network infrastructure
J-b	Electrical shock to an employee on the network infrastructure
J-c	Electrical shock to a contractor or contractor's employee on the network infrastructure
J-d	Electrical shock to the member of the public including passengers whilst on or in rolling stock
J-e	Electrical shock to an employee whilst positioned on or part of rolling stock
J-f	Electrical shock to a contractor or contractor's employee whilst positioned on or part of rolling stock

Category	Description
J-g	Electrical shock to the member of the public in the public area of a station
J-h	Electrical shock to an employee in the public area of a station
J-i	Electrical shock of a contractor or contractor's employee in the public area of a station
J-j	Electrical shock to the member of the public in the passenger area of a station
J-k	Electrical shock to an employee in the passenger area of a station
J-l	Electrical shock of a contractor or contractor's employee in the passenger area of a station
K	Spillage/leakage, explosion or loss of dangerous goods
K-a	Spillage or leakage of dangerous goods en route
K-b	Spillage or leakage of dangerous goods during shunting operations
K-c	Spillage or leakage of dangerous goods whilst staged
K-d	Missing consignment of dangerous goods
K-e	Theft of dangerous goods
K-f	Explosion of dangerous goods
L	Fire occurrences
L-a	Fires on a fixed operational asset
L-b	Fire of freight
L-c	Fire of rolling stock
L-d	Veld fires that threaten operational safety

Security related incident categories

Category	Description
1	Theft of assets impacting on operational safety
1-a	Theft of rolling stock components in section
1-b	Theft of rolling stock components in yards (staged)
1-c	Theft of civil infrastructure components in section
1-d	Theft of civil infrastructure components in yards and sidings
1-e	Theft of overhead traction equipment in section
1-f	Theft of overhead traction equipment in yards and sidings
1-g	Theft of train control equipment (signalling) in section
1-h	Theft of train control equipment (signalling) in yards and sidings
1-i	Theft of ancillary equipment including public address systems, information boards, CCTV
2	Malicious damage (vandalism) to property impacting on operational safety
2-a	Malicious damage (vandalism) of rolling stock components in section
2-b	Malicious damage (vandalism) of rolling stock components in yards and sidings (staged)

Category	Description
2-c	Malicious damage (vandalism) of civil infrastructure components in section
2-d	Malicious damage (vandalism) of civil infrastructure components in yards and sidings
2-e	Malicious damage (vandalism) of overhead traction equipment in section
2-f	Malicious damage (vandalism) of overhead traction equipment in yards and sidings
2-g	Malicious damage (vandalism) of train control equipment (signalling) in section
2-h	Malicious damage (vandalism) of train control equipment (signalling) in yards and sidings
2-i	Malicious damage (vandalism) of ancillary equipment including public address systems, information boards, CCTV
3	Threats of operational safety
3-a	A bomb threat to network
3-b	A bomb threat to station
3-c	A bomb threat to rolling stock
3-d	Threats due to electrical power outages
3-e	Threats other than bomb and power outage threats
4	Train kidnapping or hijacking
4-a	Kidnapping or hijacking of passenger trains
4-b	Kidnapping or hijacking of freight trains
4-c	Kidnapping or hijacking of other rolling stock
5	Crowd-related occurrences
5-a	Crowd related occurrence and includes stampede action
6	Industrial action
6-a	Industrial action that causes a threat to security or safe railway operations or to security
7	personal safety on trains
7-a	Murder
7-b	Attempted murder
7-c	Rape
7-d	Assault
7-e	Indecent assault
7-f	Aggravated robbery
7-g	Common robbery
7-h	Theft
7-i	Bomb explosion
8	Personal safety on stations
8-a	Murder
8-b	Attempted murder

Category	Description
8-c	Rape
8-d	Assault
8-e	Indecent Assault
8-f	Aggravated robbery
8-g	Common robbery
8-h	Theft
8-i	Bomb explosion
Category 9	Personal safety outside station platform area (in section between stations, including yards, sidings and depots)
9-a	Murder
9-b	Attempted murder
9-c	Rape
9-d	Assault
9-e	Indecent assault
9-f	Aggravated robbery
9-g	Common robbery
9-h	Theft
9-i	Bomb explosion

Appendix B: 2015/16 operational occurrences per category and sub-category

2015/16 Operational Occurrences					
Category	Q1	Q2	Q3	Q4	Full year total
A-a	3	1	0	2	6
A-b	240	238	276	246	1000
A-c	0	1	1	0	2
A-d	8	8	8	9	33
A-e	13	15	6	9	43
A-f	5	4	3	4	16
TOTAL	269	267	294	270	1100
B-a	24	29	31	31	115
B-b	73	69	68	75	285
B-c	6	9	3	3	21
TOTAL	103	107	102	109	421
C-a	24	30	11	19	84
C-b	1	2	4	3	10
C-c	0	0	0	0	0
C-d	0	0	0	0	0
C-e	0	0	0	0	0
C-f	0	0	0	0	0
C-g	0	0	0	0	0
C-h	0	0	0	0	0
TOTAL	25	32	15	22	94
D-a	15	24	19	25	83
D-b	1	2	0	0	3
D-c	0	0	0	0	0
D-d	0	1	0	0	1
TOTAL	16	27	19	25	87
E-a	128	151	127	125	531
E-b	0	1	0	2	3
E-c	2	0	0	1	3
E-d	0	0	1	0	1
E-e	0	1	1	1	3
E-f	0	0	0	0	0
TOTAL	130	153	129	129	541
F-a	84	80	83	88	335
F-b	0	0	2	0	2
F-c	0	0	0	0	0
TOTAL	84	80	85	88	337
G-a	22	18	34	57	131
TOTAL	22	18	34	57	131
H-a	32	22	23	24	101
H-b	130	136	137	153	556

2015/16 Operational Occurrences					
Category	Q1	Q2	Q3	Q4	Full year total
H-c	0	0	1	0	1
H-d	0	0	0	0	0
H-e	0	0	0	0	0
H-f	0	0	0	0	0
TOTAL	162	158	161	177	658
I-a	0	0	0	0	0
I-b	33	41	28	27	129
I-c	1	0	0	0	1
I-d	0	0	0	0	0
I-e	0	0	0	0	0
I-f	0	0	0	0	0
TOTAL	34	41	28	27	130
J-a	4	3	0	2	9
J-b	0	0	0	1	1
J-c	1	2	0	0	3
J-d	3	5	5	1	14
J-e	0	0	0	0	0
J-f	0	0	0	0	0
J-g	0	0	0	0	0
J-h	0	0	0	0	0
J-i	0	0	0	0	0
J-j	0	0	0	0	0
J-k	0	0	0	0	0
J-l	0	0	0	0	0
TOTAL	8	10	5	4	27
K-a	0	0	0	2	2
K-b	0	0	0	0	0
K-c	44	44	78	52	218
K-d	0	0	0	0	0
K-e	0	2	0	0	2
K-f	0	0	1	0	1
TOTAL	44	46	79	54	223
L-a	8	8	5	11	32
L-b	0	0	0	0	0
L-c	20	47	40	42	149
L-d	75	101	87	58	321
TOTAL	103	156	132	111	502
2015/16 Total	1000	1095	1083	1073	4251

Appendix C: 2015/16 investigations findings

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Apiesdoring Station Derailment	On 6 September 2015, Train 8471 was travelling from Lydenburg enroute to Steelpoort when it derailed on the mainline at KM point 191/15. The train consisted of two diesel locomotives (39 -24, 39 - 207) which were hauling 50 empty wagons.	No risk assessment was done on the points.	Lack of supervision
			The train crew was never trained to operate the new points.	Training
			The line is not patrolled regularly due to transport challenges.	Human factors
			The track quality index in the vicinity of the derailment is more than 12.	Perway
			TFR does not retrieve the chap keys from employees when they leave the company.	Negligence
			The task observations are not conducted as specified in the SANS 3000-4-2011 Human Factor Standard.	Human factors
			The train driver was not vigilant enough to ensure that the points were correctly set for the mainline. (Root cause)	Human factors
			The points were locked on the wrong position. (Root cause)	Human factors
Tar	Arthurs view Station Collision	On 21 February 2015 at approximately 21:45, a TFR (i.e. ECP Goods) Train 19464 collided with the rear end of Train 7472 on the mainline of Arthur's View Station at KM 179/5. Train 19464 was travelling from Thabazimbi enroute to Pyramid South, with Train 7472 destined for Rustenburg. The track warrant TCO in Pyramid South gave Train 19464 authority to enter the mainline, failing to recall that he had previously accepted another train (i.e. 7472) on the mainline.	The TCO's are not always utilising their reminders.	Human factors
			The visibility in the station is poor because lights are non-existent.	Perway
			The TCO tampered with the evidence by adding events on the train diagram after the incident had transpired.	Human factors
			The occurrence was due to train 19464, which was authorised by the TCO to enter the mainline of Arthur's View where train 7472 was still occupying the section.	Human factors
			The train crew of Train 19464 did not utilise the primary mode of communication (radios) due to poor strength of the radio signal in the area between Thabazimbi and Arthur's View.	Lack of communication
			The Section Manager who was monitoring Train 7472, failed to survey the location of the train for more than six hours.	Negligence
			The TCO forgot that another train had already been authorised for the mainline. (Root cause)	Human factors

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Birchleigh Station Platform-Train Interface Investigation	The RSR conducted an investigation into the circumstances that lead to PTI occurrences at PRASA's Birchleigh Station in Gauteng. This report will be based on the Birchleigh Station, as it was identified as one of the stations with a high percentage of the PTI occurrences.	PA system is not audible enough.	Lack of communication
			The platform is not user friendly for people living with disabilities.	Perway
			The platform level is out of specifications as per PRASA track manual.	Perway
			The announcements for the commuters at the station are not frequent enough.	Lack of communication
			There is not adequate access control at the station as commuters exit the station from platform ends.	Negligence
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			Train sets are not reliable due to faults.	Rolling stock
PRASA	Bergkelder Level Crossing Collision	On 17 January 2015 at approximately 06:50, Metro Train 3404 travelling from Muldersvlei enroute to Cape Town, collided with a private motor vehicle at the Bergkelder Level Crossing in Stellenbosch.	Trees obstruct motorists' view when they approach the level crossing.	Perway
			Failure by the motorist to observe all the road signs and stopping at the level crossing.	Human factors
			The risk assessment conducted prior to the accident did not take into consideration all the risks that arise when the booms are defective.	Lack of supervision
			No flagman was dispatched to the defective boom gates, therefore, contravening Metrorail train working rule 100 (2) and 105 (1).	Not adhering to TWR
			The boom fault was reported, but the repair was deferred to the next day. No proper plan was put in place alerting train drivers to the defective booms and lack of deployment of flagmen.	Negligence
			Failure by PRASA management to have a plan of how to protect the level crossing when the boom gates have failed. (ROOT CAUSE)	Human factors

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Berlin Station Collision	On 27 February 2015 at approximately 15:15, a Light Loco E7067 collided into a stationery load during a coupling process at Berlin Station. The locomotive had come into Berlin from East London a few moments earlier hauling plain trailers with passengers operating as Metro Train 0014. The train assistant as well as four passengers who were on the stationary train sustained injuries with minor damage caused to the locomotive and a few of the stationary coaches.	No written procedure for run-around task.	Lack of communication
			No substance abuse testing was conducted on the train driver or metro guard following the incident.	Lack of supervision
			Coupling is conducted with passengers on board the train; this poses a risk to passengers should something go wrong.	Negligence
			Maintenance records reveal that during regular inspections, it was discovered that some gauges had passed their calibration date, but was not taken for recalibration.	Perway
			It was recorded in the fault log book that the B1 braking system was not working properly 10 days prior to the accident. Although the technician signed off the snag, there were no records of what was fixed.	Rolling stock
			The incident was initially wrongly classified and reported (hard coupling), hence all the investigation procedures were flouted. (Responsible personnel were not on site at the time of the accident. The TFR representative did not assume role of the RIC).	Negligence
			A lack of clearly defined working procedure for turning trains around at both Berlin and East London stations (ROOT CAUSE)	Human factors
PRASA	Braamfontein Smely Yard Derailment	On 6 August 2015 at approximately 13:40, Locomotive 34 857 derailed with 1 bogie consisting of 6 wheels at 1A Road in the siding at Braamfontein Shosholoza yard. The locomotive derailed as a result of a substandard rail condition and facing points that were not set correctly.	No risk assessment conducted pre and post in the siding	Lack of supervision
			Train driver operated the facing points for himself, while the train assistant was present, contravening TWR no 7.	Not adhering to TWR
			The train driver and train assistant abandoned the locomotive during a shunting movement.	Negligence
			Insufficient supervision of train operations personnel. Train driver and assistant abandoned their duties and their supervisors did not notice.	Lack of supervision
			PRASA management failed to conduct a comprehensive internal investigation into the occurrence soon after it occurred.	Lack of supervision
			PRASA Perway Management failed to ensure safe working conditions by allowing the perway to deteriorate to the current condition. There is inadequate evidence of perway maintenance performed in the siding.	Perway
			Substandard perway conditions on the line.(ROOT CAUSE)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Brackenfell Station Derailment	On 29 January 2015, Train 3522 departed from Wellington enroute to Cape Town Station. The train driver proceeded beyond the clearance mark, which led her to drive through the points that were half cocked and derailed. The train derailed with the leading motor coach only.	The train driver has no training on pilot work.	Training
			The train driver failed to read the pilot ticket.	Human factors
			The train driver failed to adhere to rule 235 of train.	Not adhering to TWR
			The signal technician failed to adhere to rule 103 of train working rules and 11004.2.1 of general operating instructions.	Not adhering to TWR
			Many attempts were made for PRASA to submit the training of the train driver to no avail. Subsequently it was assumed that the train driver has no training on pilot work.	Negligence
			The technician's failure to protect the points according to rule 103 of train working rules and 11004.2.1 of general operating instruction.	Not adhering to TWR
Glencore Mine	Boshoek Yard Derailment	On 5 February 2015 at approximately 18:20, a Glencore Mine train consisting of 1 locomotive and 5 wagons loaded with ferrochrome derailed at theTransnet exchange yard while shunting. The 2 wagons (61420026 and 61506966) which were positioned behind the locomotive derailed, but remained in an upright position.	The track condition in the yard is substandard.	Perway
			The responsible personnel failed to lock the switching point.	Human factors
			The Glencore mine personnel do not inspect the switching points in the TFR exchange yard.	Lack of supervision
			Glencore mine management failed to prepare and refresh shunters regularly about observing crossing points.(Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Cape Town Station Derailment	On 20 April 2015 at approximately 08:06, PRASA Train 9903 derailed two coaches as it was leaving Cape Town Station enroute to Paardeneiland. The train consisted of two motor coaches and two plain trailer coaches. The derailment occurred over facing points 147A.	The perway condition in the entire Cape Town Station complex is substandard.	Perway
			No alcohol testing equipment was available at the site of derailment since they had not been returned after calibration due to payment issues.	Lack of supervision
			The train started its movement from rest and accelerated at the maximum speed of 36km/h in 25 seconds while it was required to have been travelling at 15mm/h in that section.	Negligence
			From previous and post incident wheel readings, it was apparent that wheel number 2 on motor coach 10M51508M has decreased below the limit of 19mm in terms of flange width.	Rolling stock
			The station speed has been reduced to 15km/h. Most speed restrictions imposed at the station are a way of mitigating the affected bad track conditions.	Perway
			According to the maintenance schedule, the IM2000 is meant to be run on all Cape Town lines every four months. However, this schedule is not being followed by PRASA.	Perway
			The vertical and horizontal platform clearance are out of specification in accordance with track manual Annexure 1, Sheet 3 of 5.	Perway
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			There is a clear shortage of train sets as most of the trains are overcrowded, especially during peak hours.	Rolling stock
			There is a shortage of security personnel at Cape Town Station.	Training
			The platforms are not user friendly for people living with disabilities.	Perway
			There are no boards or stickers on the platform or coaches that will make the commuters aware of gaps between the train and platform.	Lack of communication
			The risk assessment does not address the risk of people falling on the platforms.	Lack of communication
			Failure by PRASA management to ensure that the perway meets the minimum requirements of maintenance the track manual. (ROOT CAUSE)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Cape Town Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Cape Town Station. This report is based on Cape Town Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	The vertical and horizontal platform clearance are out of specification in accordance with track manual Annexure 1, Sheet 3 of 5.	Perway
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			There is a clear shortage of train sets as most of the trains are overcrowded, especially during peak hours.	Rolling stock
			There is a shortage of security personnel at Cape Town Station.	Training
			The platforms are not user friendly for people living with disabilities.	Perway
			There are no board or sticker on the platform or coaches that will make the commuters aware of gaps between the train and platform.	Lack of communication
			The risk assessment does not address the risk of people falling on the platforms.	Lack of communication
Transnet Freight Rail	Colesburg Station Derailment	On 11 October 2015 at approximately 13:55, Train 8928 consisting of three locomotives (34401, 34030 and 34909) and 48 loaded car wagons derailed between Noupoort and Colesburg. The train derailed with twenty nine wagons at KM Point 101, 5.	Task observations are not being conducted at the Rossmead depot.	Negligence
			Symposiums and safety talks are not being conducted at the Rossmead Depot.	Negligence
			The train crew only checks the fire extinguisher for the expiry date, and that it is still sealed but do not record the information. It was also noted that the TE personnel that service the fire extinguishers do not keep the records.	Negligence
			Insufficient tightening of bolts resulted in the initiation of the reverse bending fatigue that caused the counter weight bolts to fail. (Root cause)	Perway
			Lack of maintenance processes. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Dal Josefat Station Derailment	On 8 April 2015 at approximately 10:46, PRASA Train 3513 derailed at Dal Josefat Station. The train derailed on the down main line at the facing points, between mast poles 110/7A and 110/9. The train derailed at the points after it was authorised to pass a home signal DJT 34 at danger.	Points 25 at Dal Josefat were not set correctly.	Human factors
			The TCO had no point's indication when she authorised Train 3513 to pass the signal at danger.	Signalling
			The train data logger had technical problems, hence, the speed of a train was not recorded.	Rolling stock
			Critical task analysis did not include train authorisation as one of the critical tasks a TCO has to perform.	Human factors
			Before the train driver is authorised to pass the signal at "danger" the operator must, in all cases, satisfy him/herself that the points concerned are correctly set.	Negligence
			The last inspection results of points 25 shows signs of wear on the blade and it is recommended that the blade be replaced in 12 months pending further condition assessments.	Perway
			The TCO failed to comply with the train working rules 7029.3 when authorising Train 3513 to pass the home signal at danger.	Not adhering to TWR
			Failure by TFR management to regularly prepare and refresh TCOs on authorising trains under all fault conditions. (ROOT CAUSE).	Training
			Failure by PRASA Management to regularly prepare and refresh train drivers on the drive on sight rule when they are authorised to pass signals at danger. (ROOT CAUSE)	Training

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Denver Station Rear-End Collision	On 28 April 2015 at approximately 07:10, Business Express Train 1602, collided with the rear-end of Metroplus Express Train 0600. The collision occurred at Denver Station. Around 240 injuries from both trains were reported. The driver of Business Express Train 1602 was seriously injured and is reportedly still in a critical condition in hospital. The Metro Guard in Metroplus Express Train 0600 sustained fatal injuries.	The investigation revealed numerous organisational system deficits within PRASA.	Lack of supervision
			The 801 also noted that maintenance of the current infrastructure is performed at a very low level.	Perway
			The system deficits poses a very dangerous risk to the wellbeing of those who use PRASA on a daily basis.	Perway
			The BOI found that the brakes in Business Express Train 1602 were applied very late.	Human factors
			The BOI concluded that the driver of Business Express Train 1602 was over speeding at the time of the accident.	Negligence
			The driver of Business Express Train 1602 passed a signal at danger.	Negligence
			The BOI concluded that there was a delayed communication on the date of the incident.	Lack of communication
			Metroplus Express Train 0600 may not have properly seen signal DN 11 due to the impaired vision from the sun.	Human factors
			All signals except one signal at Jeppe Station was clearly visible.	Signalling
			Human factor or error was the major contributor to the incident. (Root cause)	Human factors
			The driver of Metroplus Express Train 0600 was not tested for substance abuse and his fitness for duty was, therefore, not properly established. (Root cause)	Lack of supervision
PRASA	Doornfontein Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Doornfontein Station in Gauteng. This report is based on Doornfontein Station, as it was identified as one of the station with a high percentage of PTI occurrences.	No visible security personnel at the station platforms areas to safeguard commuters.	Lack of supervision
			Commuters access the station at platform ends instead of using the normal access way.	Negligence
			The PA system is non-functional.	Lack of communication
			The existing fencing between Doornfontein Station and Johannesburg Station is frequently vandalised.	Human factors (Public)
			Platform clearance measurements submitted by PRASA for platform 3 and 4 do not specify the vertical and horizontal clearance design standard measurements.	Lack of communication

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Dr Moroka Level Crossing Collision	On 9 August 2015 at approximately 17:00, TFR Train 9405 travelling between Kgalestad Station and Rustenburg Station collided with a private vehicle on Dr Moroka Level Crossing at KM 113/15 on the single rail line. The train consisted of three 7E class locomotives, hauling 75 wagons loaded with containers. The driver of the vehicle suffered serious injuries and was admitted to a nearby hospital.	The train driver failed to adhere to the speed restriction of 30 km/h in the section.	Negligence
			The driver of the motor vehicle failed to obey the road signs.	Negligence
			Inadequate or no traffic law enforcement interventions at the level crossing at the time of the incident.	Lack of supervision
			The RTMC traffic officers neglected their primary duties.	Negligence
			The two way radios issued to the RTMC officers are not reliable.	Lack of communication
			There is no documented procedure or instruction from RTMC that governs how the traffic officers are supposed to control the level crossing.	Training
			There is poor or no supervision of the RTMC officers in the Rustenburg area.	Lack of supervision
			Failure by the driver of the vehicle to obey the level crossing signage. (Root cause)	Negligence
PRASA	Eerste River Station Averted Collision	On 6 July 2015 at approximately 10:05, Train 3414 consisting of 3 motor coaches (17641, 13010 and 17641) set 20, passed destination signal EER 120 (i.e. Home Signal) at danger. This resulted into an averted collision between Train 3414 and Train 3211.	Train driver was not alert and vigilant while performing driving duties.	Negligence
			PRASA Signalling Department's inability to rectify signalling defects led to occurrence happening.	Signalling
			PRASA Management's failure to ensure safe working conditions by allowing signalling failure for a prolonged period of over year.	Lack of supervision
			PRASA Signalling Department's unwillingness to provide reasons to train operations for their inability to rectify the signalling defects.	Negligence
			Train driver's disregard of Train Working Rules by not observing a signal at danger and acting accordingly.	Not adhering to TWR
			Non-compliance to operating instructions. (Root cause)	Not adhering to TWR

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Eerste River Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Eerste River Station in Cape Town. This report is based on Eerste River Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	No evidence provided of the last tamping operations performed, ballast screening or two monthly inspections and the bi-weekly inspections.	Perway
			The vertical and horizontal platform clearances are out of specifications in accordance with track manual Annexure 1, Sheet 3 of 5.	Perway
			Yellow markings on the platforms that indicate the safety clearance between trains and commuters are faded.	Perway
			Trains operate with open, faulty doors while carrying commuters.	Rolling stock
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			There is a clear shortage of train sets as most of the trains are overcrowded especially during peak hours.	Rolling stock
			Commuters are crossing the railway line instead of using the subway and the normal access way.	Negligence
			The platforms are not user friendly for people living with disabilities.	Perway
			No evidence of the risk assessments that were previously conducted.	Negligence
Tar and PRASA	Elsburg Station Derailment	On 25 February 2015, Train 8918 was travelling from Danskraal enroute to Kaserne Depot when it derailed at Elsburg Station. The train consisted of three electric locomotives hauling 50 loaded containers.	The switch blade bolts were loose.	Perway
			The train driver did not call the TCO to inform him about the movements of the points.	Lack of communication
			The train crew proceeded in moving the train over the points even when unstable.	Negligence
			The train derailed due to switch blade that was not properly closed against the stock rail.	Negligence
			The TCO received an indication on the panel that the points are set correctly, though the switch blade was not properly closed indicating a technical fault.	Signalling
			The system's failure due to inadequate maintenance.(Root cause)	Signalling

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Faure Station Derailment	On 17 January 2015, TFR goods Train 5261 from Bellville enroute to Caledon derailed in the loop line at Faure Station. The TFR goods train consisted of 4 x 35 class locomotives and 22 FGLJ wagons fully loaded with malt. Extensive damage was caused to the rail infrastructure as two of the wagons were dragged from the POD for a distance of approximately 200 metres. Substantial damage was caused to the derailed wagons. The train driver and assistant did not sustain any injuries	Trolley inspections are not run on the loop lines.	Perway
			IM 2000 machine is never run on the loop lines.	Perway
			The train derailed due to track geometry deficiencies.	Perway
			The track geometry on the loop line was not to standard.	Perway
			The current inspection method is not sufficient for detecting track deficiencies.	Perway
			The standard of the track on the Faure Loop line has deteriorated below a C standard. All the sleepers are tightened by two bolts as opposed to four. Ballast was also inadequate.	Perway
			Lack of investment into the rail infrastructure. (Root cause)	Perway
			Poorly maintained railway track. (Root cause)	Perway
PRASA	Fish Hoek Station Derailment	On the 08 April 2015 at approximately 12:09, a train derailed at about 600m from Fish Hoek station. The train was traveling from Cape Town enroute to Fish Hoek. The train comprised of seven coaches, two motor coaches and five plain trailer coaches. There were no injuries or fatalities. Damage was caused to the sleepers, rail clips and the second bogie of the plain trailer 18491.	The Track Master was under the influence of alcohol.	Human factors
			There was no protection for the work site, no detonators or flagman.	Human factors
			The train driver had no knowledge of the track work that was taking place on the up line No2.	Lack of communication
			The Track Master and his team did not inform the TCO that track work was taking place on up line No2.	Lack of communication
			Poor condition of the railway line between Fish Hoek and Duisenberg.	Perway
			The Track Master was not tested for substance abuse when he reported for duty in the morning. He was only tested after the derailment and the results came back positive.	Negligence
			The Acting Safety Manager was not aware of the emergency work that was taking place on up line No.2.	Lack of communication
			Failure by PRASA Management to ensure that safety critical procedures were deployed. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA/ Shosholoza Meyl	Gaika Crossing Station Derailment	On 24 January 2015 at approximately 10:30 Shosholoza Meyl Train Number 74013, which was travelling from Johannesburg to East London derailed a second locomotive number E7010 at Gaika Crossing Station at or between kilometre point 72/05 and 72/06 facing East London. A passenger was injured and taken to hospital.	The derailment was as a result of over speeding.	Negligence
			There is a shortage of suitable qualified personnel within TFR to conduct track maintenance.	Training
			Track inspection and maintenance by TFR is not done in accordance with the track maintenance manual.	Perway
			Train drivers work extended hours in order to cover for the shortfall of staff.	Human factors
			Employees from both PRASA and TFR do not partake in regular Refresher Training.	Training
			Poor communication channels between stakeholders i.e. PRASA and TFR on unsafe conditions which have been experienced on the track.	Lack of communication
			The train crew were engaged in a conversation instead of focusing on the risk ahead.	Negligence
			Wheel geometry readings were out of tolerance in that the MiniProf measurements conducted.	Rolling stock
			The culture of deficiency or sub-standard action and/or risk behaviours or unsafe conditions was, inter alia, the root cause of the incident. (Root cause)	Perway
			The railway line was not safe. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Germiston Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Germiston Station in Gauteng. This report is based on Germiston Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	The platform is not user friendly for people living with disabilities.	Perway
			Trains operate with open, faulty doors while carrying commuters.	Rolling stock
			The last time tampering was done at the Germiston Station was approximately eight years ago.	Perway
			Service disruptions, such as train cancellations and train delays, result in overcrowded trains.	Rolling stock
			The vertical and horizontal platform clearance are out of specifications as per track manual Annexure 1, Sheet 3 of 5.	Perway
			Instead of using the subway that leads to the right platforms, commuters are crossing the railway line.	Negligence
			Yellow markings on the platforms that indicate the safety clearance between trains and commuters are faded.	Perway
			The last risk assessment conducted by PRASA at the Germiston Station was done on 10 September 2013, and does not address all the risks.	Lack of supervision
			PRASA does not have any indication of how many people bought tickets from a specific point to specific destination in a month. This leads to overcrowding.	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Engineering	Germiston Tokkie Siding Derailment	On 06 July 2015 at approximately 21:10, 14 wagons ran away from a Tokkie Siding at Transnet Engineering (TE) Germiston towards Keswick Road Level Crossing. The runaway led to a derailment of three wagons, which derailed on a set of catch points outside Tokkie siding, about 50m from Keswick Road Level Crossing.	Perway and rolling stock personnel that were involved in the preliminary investigation of the derailment did not produce any report to indicate their findings.	Negligence
			The current risk assessment developed by Transnet Engineering is generic; no risks relevant to Tokkie Siding were identified.	Lack of supervision
			There is no perway maintenance plan for Tokkie Siding.	Perway
			There is no evidence of regular yard/siding inspections, hence, wagons that were staged at the Tokkie Siding ran away.	Lack of supervision
			Yard personnel performing safety critical work at Tokkie Siding are not task observed.	Lack of supervision
			The Train Working Rules used as a SWP at the Tokkie Siding are generic; it does not specify the number of hand brakes and scotches to be applied and does not address wagons staged without brakes.	Human factors
			Out of 14 wagons that were staged at Tokkie Siding, only four wagons had functional braking system.	Rolling stock
			Safety induction was never conducted on the security guards working at Tokkie Siding.	Training
			The main lights at the siding were defective on the night of the occurrence.	Perway
			The cell phone that the security guards have for communicating with their supervisor was reportedly not working when the guards tried to get hold of their supervisor to report the incident.	Lack of communication
			Failure by the Germiston Management to provide a safe working procedure for staging and monitoring of scrapped wagons at the Tokkie siding. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Engineering	Germiston Yard Runaway	On 22 August 2015 at approximately 07:15, 9 wagons were staged at a down gradient on road No2 facing the paint shop. The wagons ran away, bumping into the Shot Blasting workshop door. There were minor damages to the Shot Blast workshop door. No injuries were reported.	The task observations for the yard officials' grades are generic and does not specify which tasks are being observed.	Lack of supervision
			Shot blasters are not receiving formal training on securing and uncoupling the wagons; they use their discretion.	Training
			On the day of the runaway, the derailer was not on the rail.	Human factors
			There was no communication or notification to the shot blaster supervisor about the wagons that were going to be placed at road No 2.	Lack of communication
			There is no evidence of regular wagons inspections done to monitor the securing of staged wagons at road no2.	Lack of supervision
			The Train Working Rule used as a SWP by the yard official is generic; it does not specify the number of hand brakes and scotches to be applied on wagons placed at road No2.	Lack of communication
			Poor supervision and enforcement of procedures by Transnet Engineering Management. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Gleincaim Derailment	On 5 May 2015 at approximately 17:05, Metro Train 0191 travelling from Cape Town enroute to Simonstown Station (D set) derailed at a curve with 7 coaches, five plain coaches and two plain trailers. The incident occurred between Sunny Cove and Glencairn Stations. The derailment occurred in the section between KM point JL32/791 and JL32/637. No injuries were reported, however, a number of sleepers were damaged.	The CPU's analysis indicate that the speed of the train was 20km/h prior to the derailment and the speed restriction at that particular section was 15km/h.	Negligence
			The last IM2000 results in April 2015 indicate that the gauge measurement of +38 i.e. 1103 exceeded the maximum tolerable limit of 1095.	Perway
			In the immediate vicinity, where marks of wheel climb are evident, clips of three successive sleepers were missing and two more were broken. This could have resulted in excessive gauge widening.	Perway
			Some employees have inaccurate information regarding the permissible tolerance limit above stipulated speed restrictions.	Lack of communication
			The measures put in place by the operator for objectively measuring and monitoring the condition of the Perway as well as indicating maintenance requirements (IM2000 and UMC) are not implemented as required.	Perway
			There is no written record of information indicating employees' state of fitness for duty as it pertains to an employee's status of fatigue.	Human factors
			Failure by PRASA Management to maintain and remove track defects in accordance with the track manual. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Groenenbloem Station Derailment	On 11 December 2014, Train 5537 was travelling from Mirage enroute to Kroonstad. The train consisted of three locomotives (34-906, 34-069 and 34-409) and 40 wagons, loaded with maize meal. The train derailed with 25 wagons. The train operators did not sustain any injuries, however, the driver was taken to hospital for shock.	The distressing maintenance is 2 months overdue.	Perway
			The leading loco was running with a non-functional OBC.	Rolling stock
			Insufficient ballast profile, particularly at the heads of the sleepers.	Perway
			The CPU report was not produced because the loco with operational OBC was switched off.	Rolling stock
			The train driver was involved in another incident earlier in the week.	Rolling stock
			The tamping was done in June 2014 and it was not done as per the Manual for Track Maintenance.	Perway
			The job cards provided did not prove any maintenance done related to the defects identified by IM2000 in April 2014.	Negligence
			A combination of twist and alignment defects were picked up by IM2000, but not fixed. (Root cause)	Negligence
			The distressing maintenance was overdue. (Root cause)	Perway
			Insufficient ballast profile. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Troutville Level Crossing Collision	On 6 January 2016 at approximately 08:29, Train T9693 collided with two motor vehicles, a VW Jetta and a bakkie, at the Groutville Level Crossing. They sustained injuries and were taken to hospital; no fatalities were reported.	The driver of the VW Jetta failed to observe both sides of the level crossing before entering the level crossing.	Human factors
			The speed boards on both sides of the tracks were erected approximately 3 meters higher than the requirements of the Standard.	Human factors (Public)
			There is poor maintenance at the level crossing.	Perway
			There are inadequate controls at the level crossing.	Perway
			No risk assessment was conducted.	Negligence
			There is no illumination at the level crossing.	Perway
			Vegetation was observed on the road on the Seaside of the level crossing; obstructing the visibility of the level crossing.	Perway
			The two whistle boards on both sides of the tracks were erected approximately 3 meters higher than the requirements of the Standard.	Human factors (Public)
			No medical assessments were conducted on the train crew after the incident.	Lack of supervision
			No evidence was produced that task observations were conducted on the train crew in 2016.	Training
			The motor vehicle driver failed to observe both sides of the level crossing before entering the level crossing. (Root cause)	Human factors
Transnet Freight Rail	Hamelfontein Station Derailment	On the 30 June 2015, train 431 was travelling from Bank mine en route to Ermelo on the No 1 line (Bank-Ermelo mainline) when it derailed at kilometre point 94/1. The train consisting of 4 electric locomotives (19-080, 19-095, 19-046 and 19-087) was hauling 10397 tons loaded jumbo wagons. None of the train crew personnel sustained any injuries.	The traction motor link bolt became loose and it was broken.	Rolling stock
			The 19E locomotive is not fitted with an automatic switch to cut off the locomotive in instances where there are repeated wheel slips.	Rolling stock
			Turnaround time of locomotive for maintenance is too long.	Rolling stock
			There was no safety bracket to block the traction motor if the bolts fail.	Rolling stock
			The train operators do not get enough rest.	Human factors
			The train driver was not well trained on the 19E locomotive.	Training
			The root cause is due to inadequate maintenance and design of the locomotive.	Rolling stock

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Impala Platinum Rustenburg	Impala Luka Level Crossing Collision	On 29 June 2015 at approximately 16:30, at Impala Platinum Refineries a train consisting of nine 8E locos, hauling 12 empty hoppers struck a private vehicle (VW Polo) at Luka level crossing.	The driver of the vehicle failed to stop at the Level Crossing.	Human factors
			There was no evidence of level crossings safety awareness campaigns.	Lack of communication
			There was no evidence as to how often task observations are conducted.	Lack of supervision
			There was no evidence of an employee assistance programme.	Training
			Speed humps at the Luka Level Crossing are positioned almost at the level crossing, after the stop sign, as a result motorists reduce speed at or on top of the level crossing. This creates a hazard of cars getting stuck while on top of the level crossing.	Perway
			Failure of motorists to follow and observe level crossing warning signs, road signs and pay attention when approaching rail crossings.	Human factors (public)
Impala Platinum Mine	Impala Rustenburg Yard Collision	On 24 November 2015 at approximately 04:15, Loco 8 collided with Loco 21 at Bin 1 at the Impala Rustenburg yard. The rolling stock incurred minimal damages.	The train crew was instructed to continue operating the train after the occurrence.	Negligence
			There is no SOP for Perway maintenance, which provide a guide in prioritising the track defects on the line.	Perway
			The Loco shunter failed to warn the driver that he was travelling in the wrong direction.	Human factors
			The condition of the track is substandard.	Perway
			Prior the incidents, the train driver had been working eight consecutive shifts with no rest in between.	Human factors
			The communication procedure is not comprehensive.	Lack of communication
			There is no formal declaration procedure; and no documented evidence of declarations being made to supervisors.	Lack of supervision
			The anti-collision and GPS systems within the locos have not been functional for approximately 3 years.	Rolling stock
			The loco driver had personal problems that may have negatively affected his fitness for duty. (Root cause)	Human factors
			No training was provided to the acting supervisor on fitness for duty requirements. (Root cause)	Training

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Johannesburg Park Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Johannesburg Park Station. This report is based on Johannesburg Park Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	No evidence provided of the last tamping operations performed, ballast screening or two monthly inspections and the bi-weekly inspections.	Perway
			The vertical and horizontal platform clearance are out of specifications in accordance with track manual Annexure 1, Sheet 3 of 5.	Perway
			Yellow markings on the platforms that indicate the safety clearance between trains and commuters are faded.	Perway
			Trains operate with open, faulty doors while carrying commuters.	Rolling stock
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			There is a shortage of train sets as most of the trains are overcrowded especially during peak hours.	Rolling stock
			The design of the platforms and access way into the platforms is not conducive for people living with disabilities.	Perway
			The daily safety announcement documents was last updated in 2008.	Lack of communication
			There is a shortage of train sets as most of the trains are overcrowded especially during peak hours.	Rolling stock

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Anglo American	K6 Level Crossing Collision	On 6 June 2015 at approximately 12:17, an Anglo American train consisting of 20 loaded hoppers, hauled by a 30 class diesel loco, collided with a private vehicle (BMW) at K6 Level Crossing. The vehicle was damaged and a passenger was injured.	The GPS on the loco was not working.	Rolling stock
			Road markings at the level crossing have faded.	Perway
			Vegetation obstructs the view of the level crossing occupation upon approaching.	Perway
			Failure by the motor vehicle driver to observe all the road signage and stop at the level crossing.	Human factors (public)
			AA does not conduct alcohol testing routinely. This is in contravention of the SANS 3000 - 4: 6.9.5.3 (f).	Negligence
			No alcohol and drug test was conducted after the incident. This is in contravention with the SANS 3000-4: 6.9.5.3.	Lack of supervision
			AA does not have a process for declaring fitness for duty before the commencement of duty as required by the SANS 3000 - 4: 6.4.4.1.	Lack of supervision
			There was no device installed on the train to give an objective measure of speed. As such, the speed of the train at the time of the incident could not be determined.	Rolling stock
			AA does not conduct risk-based medical surveillances on their safety critical and safety related grades.	Negligence
			The train crew was required to continue with their journey after the accident.	Negligence
			All employees classified as either safety critical or safety related, did not have training on vibration, fatigue management, stress management, human factors in design, chronic medical conditions and medication.	Training
			AA does not adequately control their documents; the direct supervisor of the train driver did not sign the locomotive checklist on the day of the incident.	Lack of supervision
			The root cause could not be determined.	Not determined

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Kaalfontein Station Derailment	On 27 February 2015 Rovos Rail Heritage Train R86100 left Capital Park Station at 15h30 on course to Cape Town. At point 107A, the driver prepared to turn onto the up slow when he heard a loud noise and the train jumped from side to side and derailed. Three leading locomotives were derailed and landed between point 107A and 107B, the length of about four coaches from point 107A.	The condition of the wooden sleepers in turnout 107A varies from fair to poor.	Perway
			If the turnout was replaced as planned, the derailment could have been prevented.	Perway
			This movement would cause the track gauge to widen beyond the acceptable standard.	Perway
			The System Deficiency or substandard actions.	Human factors
			Unavailability of data recording on 5E locomotives.	Rolling stock
			The calibration dates and records were not available on both locomotives.	Rolling stock
			Both teams from PRASA and Rovos Rail did not have the necessary equipment to measure the wheels.	Rolling stock
			Both operators did not comply with legislation.	Negligence
			The Track Manager was not aware of the level of compliance to written policies and procedures within his organisation.	Human factors
			Existing staff members are over-loaded and may not be able to adequately conduct their duties.	Human factors
			The substandard actions/conditions or risk behaviours led to the derailment. (Root cause)	Human factors

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Kaalfontein Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Kaalfontein Station in Gauteng. This report is based on the Kaalfontein Station as it was identified as one of the stations with a high percentage of PTI occurrences.	PA system is not audible enough.	Lack of communication
			The announcements for the commuters at the station are not adequate.	Lack of communication
			The platform is not user friendly for people living with disabilities.	Perway
			The train service appears to have been reduced.	Lack of supervision
			There is no adequate access control at the station as commuters exit the station from platform ends.	Negligence
			Trains get overcrowded when there are service disruptions, such train cancellations and train delays.	Rolling stock
			The train sets are not reliable, when a train starts a trip it might not complete as a whole set working due to faults and failures.	Rolling stock
			The last census on commuters using the train service was conducted in 2007.	Lack of supervision
			The average horizontal gap for platform1 is 1575mm, platform 2 is 1549mm, platform3 is 1576mm and platform 4 is 1518mm from the centre of the rail to the platform edge.	Perway
			The average vertical gap for platform 1 is 654mm, platform 2 is 643mm, platform 3 is 596mm and platform 4 is 637mm from the top of the rail to the platform edge.	Perway
Transnet Freight Rail	Kendal Collision	On 26 March 2015 at approximately 06:30, a Screening Machine (BCH900) collided into two sets of Stationary Track Maintenance Machines, which were staged in the section between Arbor and Kendal Stations. Substantial damage was caused to the machines with significant damage caused to the Perway. Seven people sustained injuries and were taken to hospital.	The pre-departure and brake tests were not properly done in the morning of the incident.	Human factors
			Operating procedures were not followed by both TFR and Plasser during their operation.	Negligence
			TFR Isando Depot did not have enough personnel with road knowledge to have carry out their maintenance work safely.	Training
			Non-adherence to the train working rules by ensuring that the pilot was on board the machine when the machine is moving in a section which the operator is unfamiliar with. (Root cause)	Not adhering to TWR

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Koelenhof Level Crossing Collision	On 17 May 2015 at approximately 09:45, Metrorail Train 0454 was travelling from Muldersvlei Station towards Vlottenburg Station when it collided with a motor vehicle at Koelenhof Level Crossing between KM point OG37/351 and OG37/125. The train composed of eight plain coaches and two 5M2A motor coaches. No injuries were reported.	Some of the road markings are starting to fade away.	Perway
			The immediate cause, was due to failure of the motorist to stop and observe if it was safe to cross the level crossing.	Human factors (public)
			The train driver was not relieved of his duties immediately after the incident; he was instead required to drive the train to Vlottenburg (the original planned destination).	Negligence
			On his medical certificate, the train driver was due to return for a follow-up audio testing appointment on the 15 April 2015 (as requested by the OHP). He, however, did not attend.	Negligence
PRASA	Langa Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences. This report is based on Langa and Eerste River Stations in the Western Cape, as it was identified as stations with a high percentage of PTI occurrences.	There is a shortage of security personnel at Langa Station.	Training
			The platforms are not user friendly for people living with disabilities.	Perway
			Trains operate with open faulty doors while carrying commuters.	Rolling stock
			No evidence of the risk assessment that was conducted at Langa station.	Negligence
			Yellow markings on the platforms that indicate the safety clearance between trains and commuters are faded.	Perway
			Commuters are crossing the railway line instead of using the subway and the normal access way.	Negligence
			There is a clear shortage of train sets as most of the trains are overcrowded, especially during peak hours.	Rolling stock
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			No evidence have been provided of the last tamping operations performed, no evidence of the latest ballast screening or two monthly inspections and the bi-weekly inspections at Langa Station is available.	Perway
			The vertical and horizontal platform clearance are out of specifications as per track manual Annexure 1, Sheet 3 of 5.	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Leballeng Station Rear- End Collision	On 13 March 2015, at approximately 20:15, Metrorail passenger Train 9558, full of commuters, travelling from Mabopane Station to Pretoria Station, collided with the rear-end of Metrorail Train 9712, which was stationery due to defects. The collision resulted in extensive damage to the rolling stock and 48 passengers were injured.	Train driver passing a signal a danger.	Negligence
			Lack of proactive maintenance and the lack of response to the malfunction signals.	Signalling
			A stationary train that failed and had no indicators.	Rolling stock
			Lack of key personnel in the signalling departments to deal with the workload.	Training
			Failure to report faults by employees.	Lack of communication
			Failure by PRASA to implement the recommendations rear-end collisions from previous RSR Board of Inquiries.	Negligence
			No reliable two-way communication radio in order to facilitate effective communication between train drivers and TCO at the CTC.	Lack of communication
			Failure of the train driver to adhere to train working rules. (Root cause)	Not adhering to TWR
PRASA	Leralla Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Leralla Station in Gauteng. This report is based on Leralla Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	PA system is not audible.	Lack of communication
			The last census was conducted in 2007.	Lack of supervision
			The overcrowding of the trains seems more challenging when trains are cancelled or have failed.	Rolling stock
			The latest risk assessment which was conducted on 28 July 2014 does not include the mitigation plan.	Human factors
			The commuters exit the station from the platform ends because the station does not have adequate access control.	Negligence
			Train sets are not reliable, when a train starts a trip it might not complete the whole set working due to faults and failures.	Rolling stock
			The average vertical gap for platform 1 is 853mm and for platform 2 is 810mm from the top of the rail to the platform edge. The vertical gap as per specification should be 860mm.	Perway
			The average horizontal gap is 1549mm for platform 1 and for platform 2 1512mm is from the centre of the rail to the platform edge. The horizontal gap as per specification should be 1520mm.	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA/ Shosholoza Meyl	Lower Adamson Station Derailment	On 5 June 2015 at approximately 7:35, Shosholoza Meyl Train 14257 was travelling from Springfontein to Queenstown when it derailed locomotive E7031 and five coaches namely 21054, 33075, 32034, 144 and 36298 at Lower Adamson Station at or between kilometre point 72/05 and 72/06 facing Queenstown.	Train working rules were not followed in that the train driver of TFR.	Not adhering to TWR
			Inadequate training also played a role in the derailment.	Training
			The driver of passenger Train 14257 travelled over half-cocked laying points.	Train handling
			The train was travelling at a high speed.	Human factors
			The driver of passenger Train 14257 failed to take precautionary measures by stopping the train as the signal was dead.	Human factors
			Train drivers were working extended hours in order to cover for the shortfall.	Human factors
			Employees from both PRASA and TFR do not partake in regular Refresher Training.	Training
			No speed monitoring device on trains.	Rolling stock
			Error in judgement was found to be the cause of the derailment. (Root cause)	Human factors
			The points were run through by the earlier train that travelled to the station. (Root cause)	Train handling
			The passenger Train 14257 was not driven at a safe speed and the driver failed to stop. (Root cause)	Train handling
Transnet Freight Rail	Magaliesburg Level Crossing Collision	On 26 July 2015 at approximately 00:20, TFR goods Train 7225 was travelling between Magaliesburg Station and Tarlton Station when it collided with a truck at Magaliesburg Level Crossing near KM point 30/5.	The road marking are starting to fade.	Perway
			The truck driver did not stop at the level crossing and tried to beat the train.	Human factors
			One side of the flashing lights was not working at the time of the accident.	Signalling

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Magogong Level Crossing Collision	On 07 July 2015 at approximately 10:20, a TFR train consisting of two Diesel Locomotives 34 106 and 34 111, travelling from Vryburg enroute to Warrenton collided with a private motor vehicle (Ford Fiesta) between Hartswater and Magogong Level Crossing at KM point 42/15. The collision resulted in two fatalities at the scene and the third one occurring on the way to hospital.	The locomotive was not fitted with a black box.	Rolling stock
			Risk assessment was not conducted at the level crossing in accordance with clause 6 of SANS 3000-2-2-1.	Human factor
			No training was undertaken by personnel who must conduct Risk Profile.	Training
			The driver of the Ford Fiesta failed to bring his motor vehicle to a standstill at the stop sign and single railway line crossing (W403); combination sign at the level crossing.	Human Factors
			The root cause could not be determined	Not determined
Bombela Operating Company	Marlboro Spad	On 2 February 2015 Train PK8121 was travelling from Pretoria Station enroute to Park Station. Upon the train driver's arrival at the Marlboro Station platform, signal MBS8 was at danger. He was given further authority to cross over from line 8-A, to pass the signal (MBS8) at danger so that he could proceed to the points (MBP2) ahead and crank them for the intended movement	The train driver does not have route knowledge.	Training
			The train driver was instructed to operate the train even after the incident occurred.	Negligence
			The train driver got confused with the authority given to him as he had to memorise it.	Human factors (Public)
			Cranking of the points does not happen frequently.	Signalling
			The train driver failed to adhere to his authority, subsequently driving through the points.	Human factors
			Train authorisation during degraded mode does not consider the limitations in terms of how much information the train driver can remember when working under abnormal working conditions.	Lack of communication
			The points are marked on the lid which is not visible from far.	Signalling
Transnet Freight Rail	Mica Siding Derailment	On 8 May 2015 at approximately 17:25, Train 8460 consisting of three locomotives (43132, 43036 and 43105) and 60 empty wagons derailed at Mica Siding during a shunting operation.	The train driver's train handling was poor.	Train handling
			The train driver seemed unclear about the standard manoeuvring procedure to follow when one is notching up after a train is at a standstill.	Train handling
			The train driver moved the train while the brakes were not fully released.(Root cause)	Train handling
			The train driver applied excessive power at low speeds. (Root cause)	Train handling

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Mica Siding Derailment	On 9 March 2015 at approximately 09:45, Train 8488 consisting of three locomotives (43055, 43002 and 43096) and 60 empty wagons derailed at Mica siding while shunting. The rolling stock incurred substantial damages.	The train driver's train handling was poor.	Train handling
			The train driver applied excessive power while travelling at low speeds. (Root cause)	Train handling
			The train driver failed to isolate two of the locomotives as per the SWP. (Root cause)	Not adhering to TWR
Secsa Mine	Middelburg Mine Collision	On 12 April 2015 at approximately 08:40, a loaded train from North yard collided with a stationery train in the South yard at Middelburg Mines. No injuries were reported and the damage to the rolling stock was minimum.	The rolling locomotives used in the mine are very old. 11,13	Rolling stock
			The train driver failed to report the fault on the train's brakes on the day of the incident.	Human factors
			The train driver's medical examination and drivers licence had expired on the same day the RSR was conducting interviews at the mine.	Lack of supervision
			The collision was as a result of lack of enforcement on procedures by management. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Bombela Operating Company	Midrand Depot Derailment	On 27 August 2015 at approximately 18:17, Train HF 4430 passed signal DES9 at danger. The train continued moving and derailed at approximately 18:27 on catch points DEP6. Significant damages was reported on DMOS 8 (10515) cab and Perway. No fatalities and injuries were reported.	The train driver passed signal DES9 at danger and was not aware that his train had derailed at catch points DEP6.	Negligence
			The design of catch point DEP6 contributed to the derailment of Train HF 4430 as the right hand side track in the direction towards the main line was too short.	Perway
			There is no evidence of the risk assessment conducted at the catch points DEP6 considering the implications on the risk rating if a driver exceeded the speed or the potential impact of the speed on braking distance.	Negligence
			The driver was not familiar with 11, 14 routes.	Training
			The train driver did not know what the purpose of the catch points was; he did not know that the train would automatically derail if it drove over the catch points.	Training
			There is no evidence of on-the-job task observations conducted by drivers in the yard.	Training
			The train crew and their supervisors were not clear on the exact way the ATP worked in the depot as opposed to how it worked on the mainline.	Training
			There is no evidence document of a safety talk conducted on the morning of the incident.	Lack of supervision
			Drivers are permitted to continue driving after an occurrence.	Negligence
			The maintenance report indicated that the train driver was over speeding before the SPAD occurred.	Negligence
			The driver did not check the train to verify or assess the condition before reversing.	Negligence
			The train driver did not observe the signal DES9 at danger.	Negligence
			The operator has no formal procedure or requirement for drivers to assess, inspect or protect the train post incidents.	Lack of communication
			Non adherence to operational instruction. (Root cause)	Negligence

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
African Explosives Limited	Modderfontein Derailment	On 17 August 2015 at approximately 12:30, an AEL locomotive driver was working in the storage yard when he was assigned a task to go to the exchange yard in a loco to fetch a shunter and then off to the Z100 (i.e. an explosives area) to collect a train set made up of 2 loaded runners and 8 wagons with explosives. The train derailed after passing a derailer point towards Z100.	The task observation for the shunter and the driver was overdue.	Lack of supervision
			The driver of the locomotive failed to stop at the clearance mark.	Human factors
			The drive failed to confirm the position of the points before he proceeded to the derailer.	Human factors
			The shunter failed to ensure that the tumbler is in the right position after he operated it.	Negligence
			Failure by both the loco driver and shunter to follow procedures and ensuring that the line was correctly set for the train to pass safely. (Root cause)	Human factors
PRASA	New Canada Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's New Canada Station in Gauteng. This report is based on New Canada Station as it was identified as one of the stations with a high percentage of PTI occurrences.	The fencing is vandalised between the Northern and Southern side of the station platforms.	Human factors (Public)
			The safety announcements standard document indicates that it was last reviewed on 8 September 2008.	Lack of communication
			The horizontal clearance is out of specification and the rest of the platforms are out of specification on the horizontal and vertical clearance as per track manual standard.	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Northern Cape Station; Loop 8 And 9 Derailment	On 12 August 2015 at approximately 06:12, an air braking Train 1015, consisting of 342 wagons loaded with iron ore derailed on a single line between Loop 8 and Loop 9 Station. Train 1015 was hauled from Halfweg en-route to Salkor by four locomotives. A total of 13 loaded CR wagons in C-consist derailed and sustained extensive damages, some iron ore spilled and about 250m of rail infrastructure including one OHTE mast pole was damaged as a result of the derailment.	The train crew was not referred for urine testing.	Negligence
			Excessive delay in relief of train crew involved in occurrence.	Perway
			No record of X-raying results were available for the failed weld.	Perway
			Theft and vandalism of electrical (solar) equipment is affecting the availability and functioning of the UBRD system.	Human factors (public)
			Condition monitoring equipment coverage on the ore line is insufficient to ensure risk elimination during a 1700km round trip.	Lack of communication
			The technology employed by the Ultrasonic Measurement Car has certain limitations, which prevented the lack of fusion defect in the rail that failed to be detected.	Perway
			There is no proper quality controls on welds casted by R&C or contractors. Only 10% of the joints casted by R&C are visually inspected, which poses a risk to the rest of the welds that are not checked.	Negligence
			Lack of fusion defect in the aluminothermy weld. (Root cause)	Perway
Transnet Freight Rail	Northern Cape Station; Loop 11 And 12 Derailment	On 28 July 2015 at approximately 08:04, an air braking Train 1007 of 342 wagons loaded with iron ore derailed on a single line between Loop 12 and Loop 11 Station. Train 1007 was hauled from Halfweg en-route to Salkor by four locomotives. A total of thirty five loaded CR wagons in C-consist derailed and sustained extensive damage. Some iron ore was spilled over the line and the rail infrastructure, including OHTE mast pole and signal equipment were damaged as a result of the derailment.	No Risk assessment was available on Lucchini wheels.	Rolling stock
			The CPL records for the train assistant were not provided.	Human factors
			The train driver did not handle the train according to the train driver's envelope.	Train handling
			No ultra-sonic inspection was performed on wheel webs.	Rolling stock
			The train crew completes the fitness for duty declaration form independently with little or no interaction with the Section Managers, apart from the alcohol testing.	Lack of supervision
			RIC witnessed that the evidence was removed from site without its original location and position being marked.	Human factors
			None of the technology installed on the IOL can detect cracked wheels, presumably the nature of the cracks.	Perway
			The cause of the failure was found to be a fatigue crack that initiated on the web high stressed area as defined by Lucchini FEA and the area of origin was suspected to have corrosion pits. (Root cause)	Rolling stock

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Hefei Derailment	On 04 January 2015 at approximately 13:20, PRASA Train 9317 travelling from Dube enroute to Phefeni Station derailed between the stations.	The trunk radios were not utilised by the train crew due to a shortage of handsets.	Lack of communication
			The metro guard sent two emergency bells to the driver to stop, but the driver did not stop.	Human factors (Public)
			The train driver failed to immediately report the incident to the TCO as guided by train working rules and Metrorail train operating procedures in Gauteng.	Not adhering to TWR
			The derailment is suspected to have been caused by wheel rail interaction disturbances. (Root cause)	Rolling stock
Transnet Freight Rail	Pienaarspoort Level Crossing Collision	On 6 December 2015 at approximately 04:25, an empty passenger train, Train 9913, collided with a vehicle at the Pienaarspoort Level Crossing.	The train was travelling at the speed of higher than 30km/h.	Negligence
			The risk assessment for the level crossing prior to the incident was not conducted.	Negligence
			The recommendations that were highlighted from the previous RSR report dated 14 December 2014 were not implemented.	Negligence
			The vehicle driver failed to stop at the level crossing.	Human factors (Public)
			The train crew was permitted to continue with their shift.	Negligence
			The Section Manager who attended the site did not have the equipment to test for substance abuse.	Negligence

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Port Elizabeth Station Derailment	On 5 July 2015 at approximately 10:40, a TFR air brake Train 3457 with 104 wagons loaded with Manganese derailed at the section on a single line between Middleton and Sheldon Station, while entering the Cutting at KM 25 mast pole 22.	The thermite joint at km 25 mast pole 22 was not X-rayed.	Perway
			Non adherence to SOP for IM2000 due to shortage of personnel.	Negligence
			Shortage of personnel in the CTC.	Training
			Thermite joints were not stamped at km 25 mast pole 22 (no welder code and date on the joint)	Perway
			Signal problem at various stations in the line that caused communication breakdown between train drivers and CTC.	Signalling
			Non adherence to trolley inspection and foot plate inspection as per track maintenance manual (2012)	Negligence
			Train driver was travelling at a speed of 75km/h on a 70km/h section; and the speed of 104 loaded manganese wagons is 60km/h.	Negligence
			The stress measurement results show that the reading on the delta was more than the allowable 5ºC at km 24, km 25 and km 26. The line was not distressed and there was no distressing plan.	Perway
			The aluminothermy weld failed in a brittle manner, the crack initiated from the flange toe on the field side of the rail. (Root cause)	Perway
			TCO failed to activate the track master on the 4 July 2015 when the driver reported a track defect. (Root cause)	Lack of communication
			A slack was reported in the vicinity of the POD. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Pretoria Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Pretoria Station in Gauteng. This report is based on Pretoria Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	There is mud-holes in platform 8, 4 & 3 which contribute to the clearance on the platform due to alignment and deflection.	Perway
			The vertical and horizontal platform clearance are out of specifications in accordance with track manual Annexure 1, Sheet 3 of 5.	Perway
			Yellow markings on the platforms that indicate the safety clearance between trains and commuters are faded.	Perway
			Trains get overcrowded when there are service disruptions, such as train cancellations and train delays.	Rolling stock
			There is a clear shortage of train sets as most of the trains are overcrowded, especially during peak hours.	Rolling stock
			Commuters are crossing the railway line instead of using the subway.	Negligence
			Platforms are not user friendly for people living with disabilities.	Perway
			The is no board or sticker on the platform or coaches that will make commuters aware of gaps between the train and platform.	Lack of communication
PRASA	Ravensklip Station PTI Investigation	The RSR constituted an investigation into the circumstances that lead to PTI occurrences at PRASA's Ravensklip Station in Gauteng. This report is based on Ravensklip Station, as it was identified as one of the stations with a high percentage of PTI occurrences.	PA system is not audible enough.	Lack of communication
			Platform level is out of specifications as per PRASA track manual.	Perway
			The platform is not user friendly for people living with disabilities.	Perway
			There is no access control at the station as commuters enter and exit the station from platform ends.	Negligence
			The platforms surface is cracked and uneven, it appeared as if work done on the platforms, but not completed.	Perway
			The last census on commuters using the train service was conducted in 2007	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Reeston Level Crossing Collision	On 28 March 2015 at approximately 17:05, an empty PRASA train, Train 2635, that was travelling from Berlin enroute to East London struck a private vehicle (i.e. a Toyota Tazz) at Reeston Level Crossing. The vehicle driver was the only occupant in the vehicle and did not sustain any injuries.	Road markings at the level crossing have faded.	Perway
			Vegetation obstructs the view of the level crossing occupation upon approach.	Perway
			Failure by the motorist to observe all the road signage and stop at the level crossing.	Human factors (public)
			Only an alcohol test was conducted after the incident. No testing for illegal or legal drugs was conducted after the incident.	Lack of supervision
Transnet Freight Rail	Reeston Level Crossing Collision	On 4 October 2015 at approximately 09:35, an MLPS Train, Train T47014, travelling on the Up Mainline from East London en route to Queenstown collided with a motor vehicle (i.e. a Toyota Avanza) at the Reeston Level Crossing at KM point 34/1. The motorist sustained minor injuries and was taken to hospital.	Motorists disregard the level crossing signage.	Negligence
			There are inadequate controls at the level crossing.	Perway
			No speed boards were observed on the road by motorist approaching the level crossing.	Negligence
			The local municipality personnel were invited to attend the risk assessment at the level crossing, but they did not attend.	Negligence
			The driver of the Toyota Avanza failed to bring his motor vehicle to a standstill at the stop sign and did not adhere to the road signage.	Negligence
			The two whistle boards on both sides of the tracks were erected approximately 3m higher than the required standard.	Human factors (public)
			Inadequate traffic law enforcement interventions at all level crossing	Lack of supervision
			The root cause could not be determined	Not determined
PRASA	Residential-Grasmere People Struck by Trains Occurrences	The RSR constituted an investigation into the circumstances that lead to PSBT occurrences. This report is based on the Residensia-Grasmere section in the Vereeniging corridor of PRASA, as it was identified as one of the sections with a significant percentage of People Struck by Trains occurrences.	The rail network in the Residensia-Grasmere section is not adequately fenced or protected, making it easy to encroach or access the rail space.	Perway
			There is no foot bridge to cross over at Residensia, close to Extension 1 and 2. This leads to pedestrians crossing at any place.	Perway
			PRASA's Infrastructure Department failed to avail themselves for investigation in order to clarify their plans to address the fencing around the rail reserve and infrastructure projects.	Negligence
			The railway line is not adequately fenced or protected. (Root cause)	Perway
			Lack of investment into the infrastructure. (Root cause)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Rooikop-Mapleton Derailment	On 22 May 2015 at approximately 21:30, a TFR Train, Train 8909, derailed on the single line between Mapleton and Rooikop Stations, while travelling from Danskraal en route to City Deep.	Rail clamps or springs were stolen/ vandalized.	Human factor (public)
			At the time of the derailment no foot patrollers were present.	Lack of supervision
			The security guards who were deployed to the area after the recommendations from previous investigations were removed without reassessing the risk.	Human factors
			The security contract between TFR and the service provider is not properly managed.	Lack of supervision
			The unsecured/unprotected rail reserve leading to theft and vandalism. (Root cause)	Human factors
SADC Bulk	SADC Bulk Collision	On 18 August 2015 at approximately 18:15, locomotive 3 was pushing 16 empty CMR wagons on line 2 coming from Fos Acid area and going to load at magnetite loading site. The shunter instructed the driver to stop, but the driver failed due to a communication breakdown, resulting in a collision with the stop block.	The train driver lost communication with the shunter.	Lack of communication
			The train crew was requested to continue with their journey after the incident.	Negligence
			Two-way radio communication system was faulty.	Lack of communication
			No procedure for loading and placing of wagons	Training
			The certificate of competence for both shunter and loco driver crew expired on the 14 April 2015.	Negligence
			Non-existence of safe working and standard operating procedure in the siding. (Root cause)	Not adhering to TWR
Transnet Freight Rail	Sandpan Derailment	On 10 May 2015 at approximately 10:33, Train 1472 consisting of three 18E locomotives (808, 724 and 841) was hauling 40 loaded wagons when it derailed at Sandpan Station. The train was travelling from Meyerton enroute to Warrenton. The derailment occurred when the train was crossing over from line 1 to line 2 at Points 651.	The train driver was speeding.	Negligence
			The task observations were not conducted at the intervals stipulated in SANS 3000-4.	Negligence
			The train driver may have been fatigued due to working extremely long hours on several days prior to the incident.	Human factor
			The train driver's non-adherence to speed restrictions over points. (Root cause)	Negligence
			Lack of supervision on speed monitoring, especially during abnormal working. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Sasol	Secunda Yard Derailment	On 05 May 2015 at approximately 12:15, a Sasol Secunda locomotive was scheduled to collect a load from fuel and chemicals loading rail 59 (LN45), when it derailed at the Switching Points T018.	The points were not properly closed.	Negligence
			The driver stopped too close to the points.	Human factors
			The SWP does not indicate the method on how to ensure that the point blades are locked.	Lack of communication
			Non-compliance by shunters to the operation of point's safe working procedure. (root cause)	Not adhering to TWR
PRASA	Simonstown Station Derailment	On 14 June 2015 at approximately 16:20, a Metro Train 0123 derailed when travelling from Cape Town enroute to Simonstown Station.	Curves are not lubricated.	Perway
			No formal training for patrol man.	Training
			Rail from Glencaim to Simonstown is corroded.	Perway
			No risk assessment for Simonstown Station.	Negligence
			PRASA's maintenance of their private siding is substandard.	Perway
			All the events after 04:54 on the day of derailment were not logged from motor coach 13542 and 13030 due to technical faults from the CPUs.	Rolling stock
			No drug test was conducted on the train driver and the train guard after the incident. This is in contravention with the SANS 3000-4: 6.9.5.3.	Negligence
			PRASA failed to effectively formulate and maintain a contingency plan to adequately control the sand build-up on the track.	Perway
			Several interviewed personnel indicated that they were not aware that platform 3 was closed.	Lack of communication
			Due to staff shortages and work overload, fitness for duty of safety critical personnel is not managed effectively.	Lack of supervision
			The track was covered by sand. (ROOT CAUSE)	Perway

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Soshanguve-Mabopane People Struck by Trains Occurrences	On 12 May 2015, a mother and her three children were struck by a Metro train in the section between Soshanguve and Mabopane Stations.	Insufficient prevention of illegal railway crossing.	Negligence
			The rail network in the Mabopane corridor is not fenced or protected, making it easy to encroach or access the rail space.	Perway
			Lack of fencing or protection of the railway network. (Root cause)	Perway
			Lack of investment to the infrastructure. (Root cause)	Perway
Glencore Operations Coal SA	South Witbank Derailment	On 24 August 2015 at approximately 11:40, a Sheltam Locomotive 34 derailed while en route to Saaiwater Station to fetch empty wagons at Tweefontein South Witbank Surface Operation.	Insufficient daily monitoring on the South Witbank line	Lack of supervision
			The speed of the locomotive prior to the derailment could not be established.	Rolling stock
			Insufficient Security on the South Witbank line. No protection available at night.	Training
			No drug test was conducted on the loco drivers after the incident.	Negligence
			Insufficient monitoring and security for the South Witbank railway line. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
PRASA	Stellenbosch Averted Collision	On 07 September 2015 at approximately 07:03, at Stellenbosch Station, an averted collision incident occurred between Train 3405 and Metro Train 3408.	Inadequate development of the procedure for the management of fitness for duty for operational personnel.	Training
			The train driver of Train 3408 was not tested for alcohol when he signed on duty.	Lack of supervision
			The train driver of Train 3408 was unsupervised when he signed on duty.	Lack of supervision
			The train driver of Train 3408 did not declare that he was taking medication while signing on duty.	Lack of communication
			The train driver of Train 3408 fell asleep while driving the train.	Human factors
			No evidence of a recent Task observation conducted on the driver of Train 3408.	Training
			The CPU was not retrieved in time to download and analyse the speed of the train.	Rolling stock
			Insufficient Section Managers to monitor fitness on duty.	Lack of supervision
			No evidence of pre and post occurrence risk assessment conducted.	Negligence
			Method of operation (i.e. single line Semaphore mechanical system) creates an unsafe condition.	Signalling
			Inadequate development of the Management of Fitness for duty procedure. (Root cause)	Training

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Thornwood People Struck by Trains Occurrences	The RSR constituted an investigation into the circumstances that lead to People Struck by Trains occurrences. This report is based on Thornwood and areas around the section, as it was identified as one of the sections with a significant percentage of the People Struck By Trains occurrences	The rail reserve is not fenced.	Perway
			Few safety campaigns and awareness involve community members.	Lack of communication
			The layout of Thornwood Station encourages the use of the railway line to walk as there is no consistent demarcation between the track and the pedestrian walkway.	Perway
			There was no readily visible signage warning pedestrians not to walk on or near the track.	Perway
			This station entrance is not adequately designed for passenger use.	Perway
			There is a bridge near Thornwood Station that is not used by the pedestrians.	Negligence
			Inadequate law enforcement interventions in the railway reserve.	Lack of supervision
Transnet Freight Rail	Westonaria Level Crossing Collision	On 17 December 2015 at approximately 15:57, a PRASA train, Train 0408 departed from Westonaria Station to Oberholzer. While enroute, the driver noticed a motor vehicle approaching the level crossing. The motorist did not stop and collided with train. One of the passenger was taken to hospital, the other passenger received medical attention.	The driver of the motor vehicle stopped at the level crossing and decided to beat the train and collided with the oncoming train.	Human factors (Public)
			The advance warning signs in the direction that the private motor vehicle was coming from was not in place.	Perway
			No level crossing safety awareness campaigns have been conducted.	Lack of communication
			Inadequate traffic law enforcement.	Lack of supervision
			The vegetation was obstructing the driver's visibility.	Perway
			No substance abuse test was conducted on the train driver and metro guard during sign on.	Lack of supervision
			No task observation was conducted on the metro guard and train driver for the past six months.	Training
			Inadequate traffic law enforcement interventions at the level crossing. (Root cause)	Lack of supervision

Operators	Investigation Name	Short Description	Findings Of Each Occurrence	Categories
Transnet Freight Rail	Westonaria Level Crossing Collision	On the 22 May 2015 at approximately 14:05, Metro Train 1505 traveling from Oberhozer to Midway, collided with a private vehicle at the Westonaria Level Crossing.	Height gauge from both sides of the crossing was missing.	Perway
			No advance warning signs (W318/ GS901) on the streets leading to the crossing.	Perway
			No level crossing safety awareness campaigns been conducted in the Westonaria area.	Lake of communication
			Motorist approached the crossing at a high speed and additionally failed to obey the road signs.	Negligence
			No risk assessments conducted previously at the Westonaria Level Crossing.	Human factors
			Inadequate traffic law enforcement interventions at the level crossing. (Root cause)	Lack of supervision

STATE OF SAFETY REPORT 2015/16

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