Transport Education Training Authority

Driven by Vision

DRAFT FINAL RESEARCH REPORT: INVESTIGATION INTO WESTERN CAPE HEAVY GOODS VEHICLE DRIVERS' SKILLS

8 December 2023

Western Cape Government
Mobility
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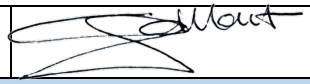
Signature		**Date**	8 December 2023	
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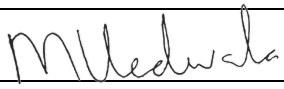
Signature		**Date**	8 December 2023	

REVISION AND ISSUE CONTROL SHEET

Rev	Status	Purpose of Issue	Originated	Checked	Authorised	Date
0.0	Draft	Draft for comments	CG	X		08/06/23
0.1	Draft	Returned for revision and collection of additional survey responses	ML	X		26/06/23
1.0	Draft	Draft for comments	CG	X		14/07/23
1.1	Draft	Returned for revision and collect additional survey responses	ML	X		18/07/23
2.0	Draft	Draft for approval	CG	X		02/08/23
2.1	Draft	Addendum requested on Survey efforts	ML	X		10/08/23
3.0	Draft	Draft for approval	CG	X		15/08/23
3.1	Draft	Draft approved by TETA	ML	X	X	24/08/23
4.0	Draft Final	Draft Final report for comment	CG	X		26/09/23
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5.1	Draft Final	Revisions accepted by TETA's Research Unit. Report to be prepared as final draft for submission to TETA's Research Chair	ML	X		30/10/23
6	Draft Final	Draft Final report for TETA Research Chair	CG	X		11/11/23
7	Draft Final	Report accepted by TETA's Research Chair and comment from TETA's Research Committee incorporated	CG	X		07/12/23
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ACRONYMS

AARTO	Administrative Adjudication of Road Traffic Offences
ATR	Annual Training Reports
CAIA	Chemical and Allied Industries Association
CBT	Computer-based training
CBRTA	Cross-Border Road Transport Agency
CTA	Commercial Transport Academy
CoCT	City of Cape Town
NaTIS	National Traffic Information System
DDWS	Drowsy Driver Warning System
DFM	Driver Fatigue Monitor
FET	Further Education and Training
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FOT	Field Operation Tests
HGV	Heavy Goods Vehicles
HVCBA	Heavy Vehicle Competency Based Assessment
GVM	Gross Vehicle Mass
ISO	International Standards Organisation
LMV	Light Motor Vehicle
LoS	Level of Service
LRA	Labour Relations Act
ITSJPO	Intelligent Transportation System Joint Program Office
MAM	Maximum Authorized Mass
MIC	Middle Income Country
NQF	National Qualifications Authority
NDP	National Development Plan
NHTSA	National Highway Traffic Safety Administration
NRTA	National Road Traffic Act (93 of 1996)
OEM	Original Equipment Manufacturer
PC	Personal Computer
PrDP	Professional Drivers Permit
POPIA	Protection of Personal Information Act
REC	Research Ethics Committee
RFA	Road Freight Association
RSPIs	Road Safety Performance Indicators
RTIA	Road Traffic Infringement Agency
RTMC	Road Traffic Management Corporation

RTMS	Road Transport Management System
RTSMS	Road Traffic Safety Management System
RTQS	Road Transport Quality System
SABS	South African Bureau of Standards
SAIDI	South African Institute for Driver Instructors
SANS	South African National Standard
SDA	Skills Development Act
SDG	Sustainable Development Goals
SSA	Safe Systems Approach
SETA	Sector Education Training Authority
SDL	Skills Development Levy
TETA	Transport Training and Education Authority
UN	United Nations
UNDoA	United Nations Decade of Action (for road safety)
VET	Vocational Education and Training
VTTI	Virginia Tech Transportation Institute
USA	United States of America
WCDM	Western Cape Mobility Department
WSP	Workplace Skills Plans

EXECUTIVE SUMMARY

Background

The number of road traffic crashes and the impact they have on the Country's economy is testimony to the fact that more needs to be done to curb this problem on South African roads. In South Africa, the high number of road traffic crashes and their associated consequences have had a significant impact on socioeconomic development and affect the well-being of South Africans.

Road freight crashes have a direct cost impact on society because of injuries, fatalities, and damage to transported goods and infrastructure. In most cases, heavy vehicle related crashes are more severe and affect other transport network users such as commuters and pedestrians.

Western Cape context

Between 2018 and 2022, South Africa reported 3 546 heavy vehicle crashes and 2 926 fatalities, with the average crashes severity rate in the region of 1.33. The Western Cape accounts for approximately 7% of the national heavy vehicle crashes and approximately 7% of fatalities. Secondary data that was analysed for logistic companies with Road Transport Management System (RTMS) certification, indicated that vehicles registered in the Western Cape generally have a lower number of crashes per million kilometres travelled than the rest of the Country.

The Western Cape Provincial Government has for the past decade been actively addressing road and transport management in the province, including road safety. Efficient and effective transport networks contribute significantly to reducing the cost of doing business in the country. The roadway constitutes a unique working environment and professional driving (or driving for work) span several industries which include transport and coordination companies, courier services as well as police and emergency services. Heavy vehicle driving is considered a skilled profession, and in many international countries requires skills training and certification. Efficient transport improves the competitiveness of products and operations across all industries and, as elsewhere in middle- and low- income countries, heavy goods vehicles (HGV) play a key role in achieving this objective and is an essential component to the South African economy. Reducing HGV crashes is important in achieving sustainable freight transport delivery in the Western Cape. In response, the Western Cape Government is currently implementing the Provincial Freight Strategy 2019, specifically Strategic Objective 5A that aims to reduce the number of freight-related, heavy vehicle crashes in the Western Cape to achieve a safer freight transport network.

Several issues contribute to the high number of heavy vehicle crashes. Among these is poor driver behaviour, partly because of inadequate training. Such behaviour includes speeding, drunk driving, and dangerous overtaking. Reducing these crashes is important in achieving sustainable freight transport delivery in the Western Cape. Crashes involving HGV are a result of systemic issues involving a network of interlinked contributory factors. A systematic approach to HGV driving, and road safety acknowledge that this is a shared responsibility, across the whole system or value chain, and that resources allocated to plan and manage a workplace, road safety should

be a focus across all levels of the system, and not solely on the behaviour and practice of the individual driver.

Driver education, training and development is essential in curbing the carnage on South African roads. For training programmes to have the desired effect, it is necessary to determine what the actual training needs for heavy goods vehicle drivers are. TETA uses the Workplace Skills Plans (WSP) across the different subsectors to inform the development of a Sector Skills Plan for the Sector Education and Training Authority (SETA). The purpose of the Sector Skills Plan includes the following:

- Inform supply-side planning in post school institutions.
- Determine funding priorities via the levy grant system.
- Support regional and employer plans.
- Inform allocation of resources to develop qualifications and learning programmes.
- Establish occupation specific skills priorities for the sector.
- Inform education and training institutions of demand needs in the labour market.
- Enable individuals to make informed career choices.
- Monitor skills development provision in the sector.

This research provides a reference point to the insight of the current skills and competencies of heavy vehicle drivers in the Western Cape. The research findings provide guidance in terms of recommendations in support of the development of future programmes to improve driver competencies in partnership with the private sector and the TETA.

Project objectives

For training programmes to have the desired effect, it is necessary to determine what the actual training needs for Heavy Goods Vehicle drivers are. The purpose of this project is therefore to conduct research that will provide insight into the current skills and competency levels of heavy goods vehicle drivers in the Western Cape.

The research aims to achieve the following objectives:

- Objective 1: understand current international best practices pertaining to heavy vehicle driver skills development and training.
- Objective 2: investigate and highlight current trends pertaining to heavy goods vehicle driver skills development initiatives.
- Objective 3: identify skills and competency gaps.
- Objective 4: make recommendations pertaining to future training and education interventions to address these gaps.

Research methodology

Chapter 2 of the research report provides an overview of the research design, approach, and the development of the research instruments. To achieve the research objectives a mixed methodology research approach was followed making use of both quantitative and qualitative

research methods to explore the issue of HGV drivers in the Western Cape. This study is exploratory with the aim of identifying current skills and competency levels of heavy goods vehicle drivers in the Western Cape.

Literature review: International and local best practices

A literature review, in support of **Research Objective 1 – understanding local and international driver training and education best practices** was conducted. The literature review considered local as well as international evidence to aid in understanding the causes of crashes, the role of skills development, education, and training as well as instruction and the role of workplace initiatives in addressing road safety.

In addition, this research is framed within the Safe System Approach and National Road Safety Strategy (Safer Vehicles and Safer Road users' pillars, with reference to Pillar 1 Institutional management). The review focusses on the consolidation of international and local best practices pertaining to heavy driver vehicle skills development; understanding existing driver skills and behavioural trends; as well as conducting primary research to inform the development of a future training framework that will support improved driver training and skills development for the heavy goods vehicle driver industry. The National Road Safety Strategy (NRSS) 2016 – 2030 states that there are four critical areas for interventions that need to be addressed to address road safety:

- **Promoting responsible road users' behaviour** which is seen locally and internationally as the greatest contributing factor to road crashes. Changing behaviour can only be affected by ensuring users are educated and aware of road safety, trained to behave appropriately and effectively discouraged from transgressing laws through enforcement. This includes the need to eliminate corruption.
- **Providing safer road infrastructure** with substantial proportion of deaths on the roads being pedestrian related, emphasis needs to be placed on developing and refining infrastructure design aimed at protecting vulnerable road users.
- **Delivering effective road safety management,** the entire strategy hinges on the effective leadership and governance to oversee that the implementation is completed, and operational requirements are effectively addressed.
- **Improving the quality of crash data and knowledge management** is an enabling element and a major shortcoming in the South African environment. Addressing shortcomings in this area will allow for greater efficiency in the application of resources and better tracking of progress against set targets.

Secondary data analysis

Secondary data was analysed in support of addressing **Research Objective 2** - **investigate and highlight current trends pertaining to heavy goods vehicle driver skills development initiatives.**

The secondary data analysis considered quantitative information from existing data for the Western Cape 2021 Driver Skills and Behaviour Survey as well as historical data for operators registered as RTMS certified in the Western Cape. The analysis provided insight into trends and

patterns for heavy goods vehicle drivers and companies, baseline information on driver behaviour, and existing training and education initiatives for HGV drivers in the Western Cape.

The results of the freight skills survey conducted by the Department in 2021 gave insights into the need for driver training skills programmes and potential skills or training gaps. Most respondents have done some type of road safety training, but the respondents acknowledged the need for different types of driver training (especially the need for advanced driving skills). Several respondents also highlighted the need for fatigue management training and some respondents expressed concerns regarding the frequency of breaks during trips given by the logistic companies i.e., not allowing them to rest or giving them insufficient time to rest. Further investigations are needed to obtain more details on logistic companies' current operations and working environment and its impact on the well-being of their drivers.

The secondary RTMS data analysis provided insight into historical trends pertaining to HGV driver crashes, travel patterns and training.

The RTMS trend analysis included quarterly monitoring data as submitted by RTMS-certified transport companies for the period January 2017 to December 2021. The data submitted by transport companies with registered vehicles in the Western Cape were analysed separately and then compared to RTMS transport operations in the rest of South Africa.

The main findings in this report can be summarised as follow:

- The registered RTMS vehicles in the Western Cape on average represents the following percentages of the total national RTMS operations per quarter: 15% of total number of operational vehicles; 9% of total number of trips made, and 8% of total kilometre distance travelled.
- 45% of transport operators with registered RTMS vehicles in the Western Cape have operational fleet sizes of between 100 to 500 vehicles. 46% of transport operators with registered RTMS vehicles in the rest of South Africa have operational fleet sizes of between 1 and 10 vehicles. Transport operators have larger fleet sizes registered in the Western Cape, when compared to the rest of South Africa.
- The top two commodities transported by registered RTMS vehicles in the Western Cape is palletised goods and fuel and gas, which respectively represents 20% and 19% of the total top 20-commodities kilometre distance travelled.
- Transportation of hazardous goods (fuel, gas and chemicals) comprised 42% of the total kilometres travelled. Coal and chrome are the top sectors or commodities transported by registered RTMS vehicles in the rest of South Africa and respectively represents 21% and 11% of the total kilometre distance travelled.
- Considering the number of crashes and fatalities per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average crash and fatality rates are 2.3 and 0.03 respectively per million kilometres travelled. The average crash and fatality rates per million kilometres travelled involving registered RTMS vehicles in the rest of South Africa are 3.3 and 0.06, respectively. Registered RTMS vehicles in the Western

Cape thus have a lower crash and fatality rate per million kilometres travelled compared to RTMS vehicles registered in the rest of South Africa.

- The recorded crash error indicates that 30% of all crashes involving registered RTMS vehicles in the Western Cape, are due to company errors. This is lower than the 44% recorded company errors involving registered RTMS vehicles in the rest of South Africa.
- Considering the number of traffic violations per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average traffic violation rate is 3.4 per million kilometres travelled. The average traffic violation rate per million kilometres travelled involving registered RTMS vehicles in the rest of South Africa is 7.1. Registered RTMS vehicles in the Western Cape thus have a lower traffic violation rate per million kilometres travelled compared to the vehicles registered in the rest of South Africa.
- Considering the number of corrective or disciplinary actions per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average number of corrective or disciplinary action rate is 9 per million kilometres travelled. The average number of corrective or disciplinary action rate per million kilometres travelled involving registered RTMS vehicles in the rest of South Africa is 8. Registered RTMS vehicles in the Western Cape thus have a higher corrective or disciplinary action rate per million kilometres travelled compared to the vehicles registered in the rest of South Africa.
- On average 66% of registered RTMS employed drivers in the Western Cape were trained per quarter and 39% of registered RTMS employed drivers in rest of South Africa were trained per quarter. A higher percentage of registered RTMS employed drivers in the Western Cape thus receive training per quarter compared to registered RTMS employed drivers in the rest of South Africa.
- Considering the different fleet sizes, smaller fleets had a lower percentage of employed drivers trained per quarter than the larger fleets.
- On average 88% of registered RTMS employed drivers in the Western Cape had medical fitness certificates and 13% had chronic medical conditions. Considering registered RTMS employed drivers in the rest of South Africa, 85% had medical fitness certificates and 10% had chronic medical conditions.
- A higher percentage of registered RTMS employed drivers in the Western Cape thus have medical fitness certificates and chronic medical conditions compared to registered RTMS employed drivers in the rest of South Africa. This RTMS trend analysis was supplemented by a survey study conducted through a questionnaire. The RTMS back-office was approached to send a letter on behalf of the CSIR to each of the Western Cape RTMS-certified companies, requesting permission to be contacted and to participate in this research study. The survey aimed to determine which strategies have been implemented successfully to achieve improved driver skills, attitude and motivation, general health, and a reduction in chronic illnesses.

Primary data collection and analysis

Primary data collection and analysis support the achievement of **Research Objective 3 which aims to identify skills and competency gaps** and forms the basis for **Research Objective 4 – recommendations.** The process of primary data collection involved the development of research instruments, determining appropriate sampling methodologies for each target group, and collecting the data by means of the research instruments.

Participant groups were identified through the stakeholder mapping exercise (described in section 2.3.3.1). The stakeholder mapping exercise aimed to identify all stakeholders that can benefit or contribute to heavy goods vehicle driver safety from the perspective of training and development. The stakeholder mapping exercise therefore considered stakeholders (their level of interest as well as ability to influence decision making) in terms of current and future heavy goods vehicle training, education practices as applicable to the Western Cape. The CSIR Transport Safety Lab data portal was utilised to collect and consolidate survey data conducted through online and in person questionnaires and semi-structured interviews.

Research Instruments

The development of the research instruments was informed by the literature review as well as the secondary data analysis. The research instruments took cognisance of the following information:

- Demographic information pertaining to the drivers' age, gender, type of license.
- Driver experience
- Education and training (formal and informal).
- Operating/driving hours, which refer to the number of hours that drivers drive for work.
- Quality control programmes
- Behavioural and vehicle monitoring
- Insurance schemes in support of behaviour modification
- Traffic and law enforcement considerations
- Management and implementation of workplace road safety initiatives

The research instruments are sector specific and were prepared for the following target audiences or groups:

Driver surveys: The survey conducted by the Western Cape in 2021–2022 served as the basis for the heavy vehicle drivers' questionnaire. The survey incorporated questions regarding demographics, health, training and education HGV drivers had received, and what skills they believed they lacked.

This survey was designed and approved as an in-person survey.

Logistic company surveys: Logistic companies with registered fleets in the Western Cape were deemed one of the most important stakeholder groups in this research study. The development of the logistic companies' questionnaire was influenced by the heavy vehicle drivers' questionnaire and sought to ascertain whether the logistic companies provide all the essential training before enabling its drivers to work as well as the assistance the drivers need while they are on duty.

This survey was designed and approved as an online survey.

RTMS Certified Logistic Companies: This survey was designed to capture and quantify the impact of RTMS accreditation on heavy vehicle drivers' skills, attitude, and health.

This survey was designed and approved as an online survey.

Focus groups guides: Focus groups are qualitative in-depth interviews with people who have the knowledge of the trucking and road freight industry. The following key stakeholders were consulted and interviewed:

- Current Training Providers
- Road Freight Associations
- Regulatory Authorities
- Logistics Companies and RTMS Certified Logistics Companies (were added to focus group discussion following the poor response rate to the online surveys).

The interview guide was informed by the literature review and inputs from the Western Cape Mobility Department. The interviews aimed to establish the skills gaps of heavy goods vehicles drivers.

Key expert and informant interviews: These interview guides were prepared and approved as personal interviews (both online and in-person).

Insurance companies are responsible for financial costs of crashes on insured vehicles, and many insurance companies have introduced campaigns for safe driving initiatives such as "good driver behaviour" incentives. The key informant interviews were aimed at understanding the behavioural and other drivers of incentive schemes.

Law and regulatory enforcement authorities play a role in the legislation and regulation of products and services, without which injury and death could occur as a direct result of non-regulation or even non standardisation. This questionnaire sought to solicit input regarding the legislation and regulations that govern heavy vehicle education and training. Furthermore, the management and treatment of heavy vehicle drivers, which if not appreciated, can curtail the competence of an experienced driver.

Road Authority data on infringements: A request was distributed to provincial and municipal traffic offices to solicit specific provincial and local road authority data. This data was scrutinised for information that can inform the study from a behavioural perspective including information related to infringements and moving violations.

Sampling methodologies

Stratified Sampling was used to determine the locations for the driver surveys.

Convenience Sampling was used in Phase 1 for the logistic companies and RTMS surveys as well as driver trainers.

Purposive Sampling was used in:

- Phase 2 and 3 for the logistic companies and RTMS surveys.
- The identification of insurance companies that are concerned with HGV driver behaviour and safety.

- The identification of regulatory entities responsible for policy and regulation including law enforcement and training.

Snowball Sampling was used to identify additional driver training providers.

Primary data collection and results

Quantitative and qualitative research processes were implemented concurrently. A concurrent approach assisted with answering the research questions from different perspectives.

Driver surveys were conducted at nine truck stops, strategically positioned on the Western Cape national road network (National route 1 and National route 2). Not all truck stops were equally busy. The sample size was 474, but the actual number of drivers interviewed was dependent on the number of drivers present at the time that the truck stops were being surveyed. In total, 357 heavy vehicle drivers in the Western Cape were approached to participate in the survey. 266 drivers gave permission to be interviewed, however, due to one participant who self-reported as underage and stated he was 16, only 265 responses were recorded.

RTMS surveys distribution was conducted for the CSIR by the RTMS-back office. The office sent an email on behalf of the research team requesting participation and permission to be contacted. The RTMS back-office is the central point for RTMS registrations and administration and was therefore the entry point to request participation from RTMS companies. The email was sent to all eleven RTMS-certified operators in the Western Cape (registered in the Western Cape) and companies with RTMS registered vehicles in the Western Cape. The latter includes companies with a national footprint (registered elsewhere in the country) that have depots in the Western Cape.

Logistic companies identified during the stakeholder mapping exercise (and through weighbridge data exercise described in section 2.3.3.3 of this report) were contacted with a request to participate in the surveys. Logistic companies only received the link to the survey upon completing the signed permission letters which was a requirement from the CSIR Research Ethics Committee (REC). Weighbridge data provided an indication of the Western Cape companies that were most frequently weighed at the province's weighbridges and thus assumed to have a Western Cape footprint. Companies with more representation at weighbridges are typically larger fleets, prevalent in the Western Cape, and will therefore have more representation at weighbridges than vehicles that are not from, or travelling within, the Western Cape. These companies, with larger fleets that frequent the Western Cape roads were also considered the most likely to have in-house driver training initiatives or company programmes that promote driver wellness and road safety. Larger companies tend to have driver trainers employed and the intent with focusing on the larger companies was to get access to and learn from the experience of the driver trainers as well as management of these companies.

The response rate from both RTMS operators and the logistic companies invited to participate in the study was poor. This resulted in extensive additional efforts, detailed in section 2.3.3.3 of this report to solicit inputs from these stakeholders.

During phase 1:

- 0 RTMS companies participated in the survey.
- 1 logistic company completed the survey.

During phase 2:

- 1 RTMS certified company completed the survey.
- 3 logistic companies completed the survey.

During Phase 3:

- 3 RTMS certified companies completed the survey.
- 4 additional logistic companies completed the survey.

In total, despite all additional efforts:

- 4 RTMS certified companies participated in the survey.
- 8 logistic companies participated in the survey.

Participation in interviews and focus groups were better. Twenty-one driver training providers were invited to participate in the research. Four driver training companies (three driver trainers and one industry representative) participated in the research. The nature of the qualitative interviews mitigated the low response rate from logistic companies and provided in-depth information as opposed to the online surveys. All the identified industry experts who were requested to participate, provided input. Industry experts are leaders or influential figures within the road freight and logistics industry who provided insight on driver behaviour and road freight skills pertaining to the HGV domain in the Western Cape. This included experts from industry associations, driver training institutions and experts in the compliance domain.

The regulatory authorities identified for participation and insurance industry companies with an interest in HGV driver behaviour were not well represented. Much effort went into soliciting participation from government as well as from private sector.

Research Findings

Chapter 5, Findings contributes to **Research Objective 3 - identify skills and competency gaps** and forms the basis for recommendations detailed in this chapter.

The secondary research findings indicated that although the Western Cape tends to be doing better than the rest of the country in terms of heavy vehicle driver safety, there is still a need for drivers to be upskilled to gain employment and to stay employed. Heavy vehicle operators and driver trainers indicated that companies tend to prefer experienced drivers (10 years or more experience) and indications are that in South Africa, this is a small cohort, which means that operators source drivers with more experience from elsewhere in the world and on the African continent. In addition, the findings indicated that there is a move towards practical skill and competency testing which has implications for driver training and skills development.

Fatigue was highlighted as a contributory cause of road traffic crashes in the secondary data analysis, which is supported by international and local literature. Long hours of driving without rest

lead to fatigue. International and local literature supports the notion that driving fatigued leads to slowed reaction time, poorer judgment as well as the missing important cues or signals from the road environment, inconsistent speed and lane position and a decreasing ability to identify excessive sleepiness. The RTMC indicated that nationally, heavy vehicle driver fatigue is a main contributor to crashes. The primary research findings from the insurance industry interview, and the responses from the logistic operators and from driver trainers, also indicated that fatigue is a major problem for heavy vehicle drivers. The secondary data analysis of the RTMS data indicated that, coupled with inexperience and poor health, the problem of driving fatigued is exacerbated. Yet, primary research findings for the heavy vehicle driver interviews showed that most HGV drivers stated that they do not drive while fatigued, and that they are required by their companies to rest. Drivers are aware that they need to stop frequently during long trips (200 km and more) to take resting breaks from driving. Drivers also indicated that they do rest and do make use of dedicated resting facilities such as truck stops.

Most of the HGV drivers who were interviewed, reported that poor driver behaviour from other road users or pressure from other drivers to behave unsafely, contributed to an unsafe road environment. Poor behaviour by other drivers (general driving public) was also cited to be the main cause of frustration for drivers. In addition, lack of implementation of defensive driving techniques, basic driving skills such as keeping a safe following distance, unfamiliar road environments as well as a lack of law enforcement were cited as contributory causes to crashes.

In terms of training funded by TETA, driver instructors indicated that a lack of funding for training programmes are hampering professional driver development and has an impact on socio-economic development since there is less opportunity for unemployed people to enter the labour market through heavy vehicle driver employment.

Professional driver qualifications and specialised training that can upskill HGV drivers in the Western Cape were highlighted as a priority. Road safety training and having basic mechanical knowledge were highlighted by drivers as important. In addition, soft skills training that include courses such as fatigue management and time management were highlighted. Indications were that there is a need for product specific or Original Equipment Manufacturer (OEM) training to assist drivers with understanding and operating vehicle with newer technologies.

The role of telematics and driver behaviour monitoring programmes were highlighted as essential by operators as well as driver trainers. Workplace road safety programmes, accreditation and incentive schemes also contribute positively to driver management.

Lastly findings from the road authority data provided indicated that the most common infringement types recorded across the different traffic departments are related to driver behaviour and documentation. The infringement data provided an indication of the law enforcement efforts as well as the type of transgressions that law enforcement officials need to address on Western Cape roads. Due to the small sample size, it was not possible to cluster the road authorities in terms of district and local road infringements. However, if in future a larger sample of road authority data is available it would be useful to cluster and compare HGV infringements according to type of road authority to get an indication of the law enforcement efforts across regions and to prioritise future law enforcement initiatives across the province.

Recommendations

Chapter 5 addresses **Research Objective 4 and make recommendations pertaining to future training and education interventions to address skills gaps.** The research findings informed recommendations in support of the development of future programmes to improve driver competencies in partnership with the private sector and the Transport Education Training Authority (TETA) which is a state entity established in terms of the Skills Development Act 97 of 1998 (SDA). Chapter 5 also provides baseline input as to how the research findings can support the development of Sector Skills Plans for Road Freight sub-sector in the Western Cape.

Several suggestions for types of training were put forward, however the emphasis is on practical training of skills rather than academic type training. Practical training is deemed the best method of instruction, while classroom or online training were not deemed effective. In future there might also be a role for virtual reality programmes to assist with the training of drivers. There is a need for interactive material and mediums to engage heavy vehicle drivers.

Recommendations toward skills development include practical training hours to be increased, practical training that relates to the specific type of vehicle, training that is manufacturer specific as well as skills training that relate to the use of new technologies. These new technologies relate not only to driver management systems but to the upskilling of drivers to understand manufacturer specific in-vehicle technologies such as advance driver assistant systems. In addition, road safety training and soft skills training such as fatigue and time management were deemed important for upskilling HGV drivers.

A key first step to implementing the study's recommendations is an assessment of the HGV driver training supply market, to determine whether the recommended training programmes and training methods exist, or whether new programmes must be developed. This assessment should include the availability of training providers capable of delivering the training in the preferred method of instruction.

Study limitations

The study had limitations related to sampling methodology and data collection.

No single resource with the contact details of logistic operators were available from the start of the project. Although the WCMD had a preliminary database of operators in the Western Cape this list was not sufficient for research purposes and needed to be expanded. As such the research team made use of weighbridge data to identify additional companies that frequently operate on Western Cape roads. This was later supplemented with additional contact lists prepared with the assistance of the WCMD and TETA.

The research team did not have direct access to a database of RTMS operators in the Western Cape. Use was made of the RTMS back office (as per ethics stipulations) to establish the population from which a sample size was drawn for RTMS registered operators in the Western Cape, to distribute the request for participation, the ethics clearance forms and survey links to potential participants. The research team did not contact any of the operators directly to participate as the team did not have permission to do so.

The sample limitations made it difficult to identify companies who could be targeted to participate in the research, and the identification and sourcing of additional participants was a cumbersome and time-consuming process.

The poor response rate from logistics operators was a limitation in the study and made it difficult to provide recommendations pertaining to HGV driver training needs from a company perspective. The company perspective is important for the purpose of this research. It contributes to the recommendations and company training needs form the basis of the Sector Skills Plans.

Responses from National Regulatory Authorities and from Industry Associations were also disappointing. The lack of response from National Entities is a concern since these entities are instrumental in paving the way for policy and regulations for transport (including training and education initiatives) going forward.

The limited participation from private and public sector is a concern in terms of training needs for HGV drivers, but also because this apparent lack of interest in developing and uplifting the sector through education and training will hamper efforts to professionalize heavy goods vehicle driving as a profession and qualification in South Africa.

Based on the lessons learned from the online survey participation, the recommendation would be to rather focus on qualitative research approaches (e.g., focus group discussions) as the preferred method for data gathering unless surveys are conducted in-person by appointment or like the driver surveys (face-to-face contact). Although the focus group discussions were attended, it was still a small sample of the identified entities that participated. With the focused interviews, the mitigation factor was the nature of the interviews (qualitative) which provided more in-depth information as opposed to the online surveys.

A further recommendation for future studies would be to include a pilot study with a specific focus on the research methodology and survey execution strategy. A project pilot could have aided in better experimenting with the most suitable sampling and survey techniques for each of the stakeholder groups to mitigate the lower-than-expected response rates. The research methodology should allow for follow-up conversations and building trusting relationships with potential respondents and allow companies to reflect on their participation and what it would entail.

The scope of the project was large from the start and although the participation from national authorities, RTMS certified and logistic operators were disappointing, the value of information that was provided by other stakeholder groups including drivers themselves, driver trainers as well experts within the road freight domain should not be underestimated.

Conclusion

This study was framed within the Safe System Approach, and it is the first South African freight study that has aimed to do so. The study findings pertaining to the need for training and skills development as well as the need for gender inclusive practices support the Western Cape Provincial Freight strategy and provides important criteria for benchmarking the Western Cape in terms of the National Road Safety Strategy.

The driver stakeholder group was well represented and provided insights regarding their daily challenges as well as requirements for skills development and training. Driver trainers shared their frustrations regarding the limited funding from TETA, and the slow uptake of operators after the Covid 19 pandemic to invest in driver training, education, and skills development initiatives. A lack of training and upskilling of HGV drivers have serious implications for road safety and there is a need to continuously support efforts that can reduce the carnage on South African roads. Human factors (including driving fatigued, micro-sleep, unhealthy lifestyle choice contributing to unsafe driving as well as intentional and unintentional moving violations) continue to be the biggest contributory factor to crashes on our roads.

Training needs revolve around the development of operational skills sets of drivers. However, the study also highlighted the importance of investing in the development of drivers with soft skill and road safety specific training. The need for driver training and education as well as the need to professionalise the occupation was emphasised by the driver trainers and experts in the industry. Indications are also that more should be done to encourage female drivers to enter the occupation.

In addition, the study highlighted the value of workplace road safety programmes and incentive and accreditation schemes. However, these programmes are company driven and there is a need for company management to through policies and procedures establish a culture of road safety.

Despite the limitations the study still managed to achieve its objectives.

Research Objective one (1) was concerned with understanding international and local best practices. These were framed through the literature review and secondary data analysis that highlighted the need for good data practices, introduction of workplace road safety programmes, driver management initiatives as well as factors contributing to HGV crashes other than behaviour. This includes management practices, having policies and legislation in place and the use of technology to manage drivers and vehicles on the road.

Research Objective two (2) was concerned with a better understanding of historical trends and patterns pertaining to heavy vehicle driver behaviour, specifically in the Western Cape. National data from the RTMC, data from provincial and municipal traffic departments as well as the secondary analysis of existing WCDM driver behaviour surveys and RTMS data aided in understanding HGV crashes, travel patterns, origin and destination as well as contributory causes to crashes in the Western Cape.

Research Objective three (3) was addressed through a combination of primary research and secondary research analysis supported by the literature review. The objective was to obtain an understanding of current skills sets and to identify gaps in current training practices from the perspective of a wide range of road freight stakeholders. The research considered a wide array of inputs from different stakeholders in the road freight subsector that are involved or has an interest in driver training and education. Despite the limited response from logistics companies and limited participation from national authorities, the qualitative information provided good insight into the current training and skills development practices for HGV drivers in the Western Cape (but also probably generalized to the country).

Research objective four (4) entailed providing recommendations which were framed within the SSA as well as the Western Cape Provincial Freight Strategy, with specific reference to institutional management and pillar 4 – safer road users. This is the first freight as well as road user study in South Africa that aimed to frame this research in the SSA. Although the study was specific to the Western Cape it has implications for training to be developed and rolled out not only for the Western Cape but for national South African driver training initiatives in support of curbing the road crashes and deaths. The research findings and recommendations provide baseline input into the development of TETA specific HGV driver training, education and skills development programmes that can support the development of additional modules to expand professional driver qualifications, serve to upskill drivers and to professionalize the occupation. The study findings also provide insight into preferred methods of teaching. In addition, the study identified new training needs including the need for soft skills training programmes as well as the need for training programmes that focus on upskilling drivers in terms of new technologies in vehicles. Lastly, the study findings support the value that instilling a road safety culture through workplace road safety, accreditation and incentive programmes could have.

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CHAPTER 1. INTRODUCTION

1.1. Background

Practitioners in the freight and logistics industry are trying to improve individual company competitiveness and transport planners are trying to find ways to improve supporting infrastructure to ensure that all companies and individuals can participate more effectively in the economy. Effective economic participation requires safe and secure transport and transport networks, including the safe movement of freight. Road freight crashes have a significant cost on society and the economy due to injuries, fatalities, and damage to transported goods and infrastructure as well as delays in clearing scenes and the resultant traffic congestion. In most cases, heavy vehicle related crashes are more severe and affect other transport network users such as commuters and pedestrians. These crashes have a severe negative influence on logistic operations and road safety. Reducing these crashes is important in achieving sustainable freight transport delivery in the Western Cape.

The Western Cape Mobility Department is implementing the Provincial Freight Strategy, 2019. Strategic objective 5A aims to reduce the number of freight-related, heavy vehicle crashes in the Western Cape by addressing the role that truck driver skills and competency could play in improving road safety.

Education, training, and skills development is deemed an essential component to reduce the number of crashes and fatalities caused by heavy freight vehicles on South African roads, and therefore the action 5A-2 requires the identification of key driver skills needed to facilitate safe movement of freight across the country.

1.2. Project purpose and objectives

This project entails an investigation into the status quo of driver skills in the Western Cape Road Freight sector and recommendations that can support the development of education and training initiatives and strategies to ensure safer heavy vehicle drivers on the Western Cape roads. This study also links to the National Road Safety Strategy interventions namely:

- 1A(ii) Continue to support improvement measures to address the problem areas within road safety.
- 4C(vi) Identify and address of high-risk road users for focused interventions.

1.2.1. Project purpose

This research provides a reference point with regards to insight into current skills and competencies of heavy vehicle drivers in the Western Cape. The research findings provide guidance in terms of recommendations in support of the development of future programmes to improve driver competencies in partnership with the private sector and the TETA.

For training programmes to have the desired effect, it is necessary to determine what the actual training needs for heavy goods vehicle drivers are. This research will support the development of education and training initiatives and strategies to ensure safer heavy vehicle drivers on the Western Cape roads.

This research aims to present evidence in support of providing recommendations for training measures aimed at reducing road freight crashes and to minimise the associated costs to the economy and the South African population in general.

TETA uses the Workplace Skills Plans/Annual Training Report (WSPs/ATRs) across the different subsectors to inform the development of a Sector Skills Plan for the SETA. The purpose of the sector skills plan includes the following:

- Inform supply-side planning in post school institutions.
- Determine funding priorities via the levy grant system.
- Support regional and employer plans.
- Inform allocation of resources to develop qualifications and learning programmes.
- Establish occupation specific skills priorities for the sector.
- Inform education and training institutions of demand needs in the labour market.
- Enable individuals to make informed career choices.
- Monitor skills development provision in the sector.

This research will inform the development of a sector education and training and education framework for heavy vehicle driver skills development.

1.2.2. Project objectives

The purpose of this project was to conduct research that will provide insight into the current skills and competency levels of heavy goods vehicle drivers in the Western Cape. The research aims to achieve the following objectives:

- Objective 1: understand current international best practices pertaining to heavy vehicle driver skills development and training.
- Objective 2: investigate and highlight current trends pertaining to heavy goods vehicle driver skills development initiatives.
- Objective 3: identify skills and competency gaps.
- Objective 4: make recommendations pertaining to future training and education interventions to address these gaps.

1.2.3. Project approach

The research project commenced with the inception meeting and preparation of the inception report. The tasks as approved in the inception report (14 November 2022) are summarised in Table 1, below, which provides an overview of project tasks as set out at the inception of the project.

Table 1. Project Tasks

Task	Deliverable
1. Project Inception	1.1 Inception Meeting 1.2 Inception Report
2. Secondary Research	2.1 Desktop Study - Literature Review
	2.2 Western Cape HGV Driver Skills and Behaviour survey
	2.3 RTMS Trend analysis

Table 1. Project Tasks	
Task	**Deliverable**
3. Primary data collection	3.1 Preparation for surveys (questionnaire development, interview guides and stakeholder identification/ CSIR ethics)
	3.2 Data collection (qualitative and quantitative)
	3.3 Data analysis and consolidation
4. Final deliverables	4.1 Draft working report for comments
	4.2 Draft Final report for comments
	4.3 Final report incorporating comments
	4.4 Close-out meeting and report (including PowerPoint presentation)

The study approach is illustrated in **Figure 1**.

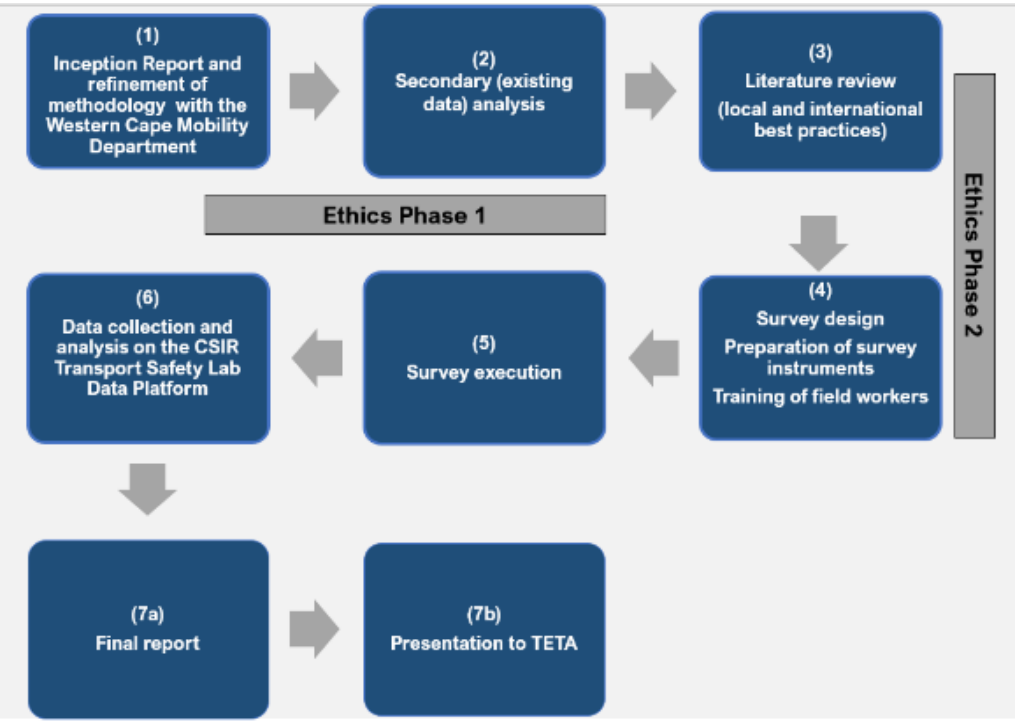


Figure 1: Road freight skills research project approach

1.3. Purpose of this report

This report is the final research report that:

- Provide a background to the research.
- Highlights key considerations from the literature.
- Discuss and compare the findings from South Africa to international best practices.
- Provide an overview of the research approach, methodology and research execution and data analysis.
- Conveys the findings from the research.
- Provide recommendations from research findings.

1.4. Overview of chapters

Chapter 2 provides an overview of the research design and detailed methodology. It also provides an overview of the Transport Safety Lab data platform which was used to collect, consolidate, and analyse research data.

Chapter 3 contains the findings of the literature review. It consists of local and international evidence to provide baseline research for understanding HGV safety and crashes within the context of the Western Cape Province. This ensured a systematic way in which research evidence was gathered from studies and trends were drawn from the studies. Chapter 3 also provides an overview of policies and strategies that are important for sustainable transport initiatives contributing to economic, social, and regional development objectives.

Chapter 4 provides the findings from the research, which include an overview of the secondary data analysis as applicable to the Western Cape. The secondary data analysis comprised of the trend analysis for the RTMS and the previous Western Cape HGV Driver Skills and Behaviour Survey of 2021. The findings from the primary data collected is presented and discussed according to the target audience and the research instrument used to conduct the surveys.

Chapter 5 provides an overview of study findings, which relates to the role of demographics (age, experience), licensing and hiring requirements, contributory causes to HGV crashes, regulatory considerations, training and education initiatives as well as the identification of training needs and skills gaps.

Chapter 6 details the study limitations. The discussion takes cognisance of the methodology, sample sizes, execution as well as the impact on the findings and recommendations.

Chapter 7 provides the research conclusions and recommendations.

CHAPTER 2. RESEARCH METHODOLOGY

2.1. Introduction

Chapter 2 provides an overview of the research design, methodology and execution of the research. This research was framed within the Safe System Approach and National Road Safety Strategy (Safer Vehicles and Safer Road Users' pillars, with reference to Pillar 1 Institutional Management). In addition, use has been made of the Transport Safety Lab data portal to collect and consolidate data that are collected online or in person.

2.2. Research design

2.2.1. Research approach

This study is an exploratory study, with the aim of identifying current skills and competency levels of heavy goods vehicle drivers in the Western Cape. This research therefore employed a mixed method approach, making use of both quantitative and qualitative research methods to explore the issue of HGV drivers in the Western Cape, and to make recommendations pertaining to addressing the training gaps and other challenges identified in the research.

2.2.2. Research methodology

The research followed a mixed methodology research approach, meaning that both quantitative and qualitative research tools were employed. Mixed methods research means that the researcher purposeful makes use of both quantitative and qualitative research methods in data collection, data analysis and interpretation of the evidence.

2.2.2.1. Quantitative research methods and applicability to this study

Quantitative research designs are fixed and deductive, with variables defined in advance of data collection. A quantitative approach was used to solicit information from drivers as well as from logistic companies registered in the Western Cape.

In addition, secondary quantitative information (existing data for the Western Cape 2021 HGV Driver Skills and Behaviour Survey as well as historical data for companies registered as RTMS certified in the Western Cape) provided input into trends and patterns for heavy goods vehicle drivers and companies in the Western Cape. The quantitative analysis of this secondary data also provided input (along with the literature review) into the development of the research instruments.

2.2.2.2. Qualitative research methods and applicability to this study

Qualitative research designs are flexible and inductive, allowing adjustment to approach based on findings throughout the research process. A qualitative approach was used to gain insights from heavy vehicle industry stakeholders in the Western Cape including industry associations, heavy vehicle driver trainers, insurance companies that play a role in heavy vehicle road safety as well as regulatory authorities responsible for policy and regulation pertaining to heavy vehicles and drivers (which include regulation and policy pertaining to HGV driver training). Quantitative research designs are fixed and deductive, with variables defined in advance of data collection.

2.2.2.3. Value of a mixed methodology and applicability to this study

Mixed methods are used to provide a better understanding of connections or contradictions between qualitative and quantitative data. Mixed methods provide an opportunity to quantify a problem while ensuring that participants can share viewpoints and experiences. It provides richer evidence and deeper context into the problem being explored.

The outputs from the two methodologies are purposefully integrated to provide a diverse view of the research topic, in support of highlighting different viewpoints.

2.2.3. Study Workflow/ Procedure

The study workflow as proposed and accepted in the Inception Report (14 November 2022) is focused on the consolidation of South African international and local best practice pertaining to heavy driver vehicle skills development, understanding existing driver skills and behavioural trends as well as conducting primary research to inform the development of a future training framework that will support improved driver training and skills development for the heavy goods vehicle driver industry.
The study commenced with a literature review and the analysis of the secondary data (RTMS trend analysis as well the Western Cape Truck Driver Skills and Behaviour 2021 survey).

Design of the primary research instruments (quantitative and qualitative research tools) were informed by the literature review and secondary data analysis. These research tools were

designed on the CSIR Transport Safety Lab data platform which has several functionalities including:

- Dashboards (graphs, data)
- Maps (visualise spatial data)
- Survey data collection and viewing
- Data validation and processing
- The data platform is used for the collection of various survey inputs.

Examples of the output from the Transport Safety Lab data platform can be found in Annexures B and F. The quantitative research consisted of the driver interviews, logistic company survey which included both RTMS and non-RTMS certified companies. Qualitative interviews were conducted with driver trainers, the insurance industry as well as industry bodies and regulatory authorities. All data was captured and analysed on this dedicated survey platform.

2.3. Description of research tasks

2.3.1. Literature review

The literature review (Chapter 3 of this report) was conducted with consideration of the United Nations Decade of Action (UNDoA), the NRSS 2030, the Western Cape Freight Strategy, 2019, as well as other South African and international policies and regulations. The Safe System Approach is a global best practice, that is premised on the notion that no road user should die or be seriously injured or disabled due to road traffic accidents.

The literature review addresses **Research Objective 1 – review of local and international best practices**. The literature review informed the development of the research instruments and will form the basis of the framework for recommendations for safer heavy goods vehicle drivers in support of working towards a safe road and traffic system.

2.3.2. Secondary research

The secondary data analysis partially addresses **Research Objective 2 - investigate and highlight current trends pertaining to heavy goods vehicle driver skills development initiatives.** The secondary RTMS data analysis provided insight into historical trends pertaining to HGV driver crashes, travel patterns and training. The secondary data analysis pertaining to the Western Cape HGV Driver Skills and Behaviour survey conducted in 2021 provided baseline information related to driver behaviour and insight into existing training and education initiatives for HGV drivers in the Western Cape.

2.3.2.1. RTMS trend analysis

Road Transport Management System (RTMS) is an industry–led, government-supported, voluntary, self-regulation scheme. The scheme encourages consignors, consignees, and road transport operators to implement a management-systems standard with outcomes that contribute to preserving road infrastructure, improving road safety, and improving productivity. It is based on a South African Bureau of Standards (SABS) South African National Standard (SANS) 1395-2019.

The RTMS Steering Committee granted permission to access and analyse the data for this research study. It should be noted that the data were collected external to the CSIR, and the analysis was done based on the data as received from the RTMS back-office.

The RTMS trend analysis included quarterly monitoring data as submitted by RTMS-certified transport companies for the period January 2017 to December 2021. The data submitted by transport companies with registered vehicles in the Western Cape were analysed separately and then compared to RTMS transport operations in the rest of South Africa. All nine provinces have registered RTMS vehicles participating in the scheme. Clear outliers in the data were regarded as incorrect data submissions and omitted from the analysis.

The data collected for 2017 and 2018 did not record the province in which the vehicles were registered. The trend analysis for the Western Cape included data submissions for the period January 2019 to December 2021.

Key findings are presented in Chapter 4 and the full report is attached as Annexure A. The results in this report, Annexure A should thus be interpreted as general trends and not as absolute values.

2.3.2.2. Western Cape HGV driver skills and behaviour survey 2021

This task analysed the freight survey results data that was conducted within the Western Cape province during the period 19 July 2021 and 22 November 2022. The survey and preparation of the questionnaires were done by the Western Cape Mobility Department, and the CSIR was only responsible for analysing the results from the survey.

The secondary data cleaning and analysis were carried out using Microsoft Office Excel. The data analysis and illustrations were done using pivot tables and pivot graphs. The results were represented as pie charts and bar graphs.

Chapter 4 provides an overview of the key findings as well as a comparison with the driver behaviour surveys.

The full report is attached as Annexure B.

2.3.3. Primary Research

2.3.3.1. Stakeholder mapping and segmentation

Different techniques were used for stakeholder mapping and sampling. Conducting a stakeholder mapping exercise for logistic companies in the Western Cape required researching and gathering information about the companies in the region, as well as a good understanding of the industry and its dynamics. This was done by reviewing trade publications, visiting trade shows, and reaching out to industry associations and experts.

A stakeholder mapping exercise is a process of identifying, analysing, and classifying stakeholders based on their level of interest and influence in a project or organisation. The process used to facilitate the stakeholder mapping exercise is depicted in **Figure 2** below:

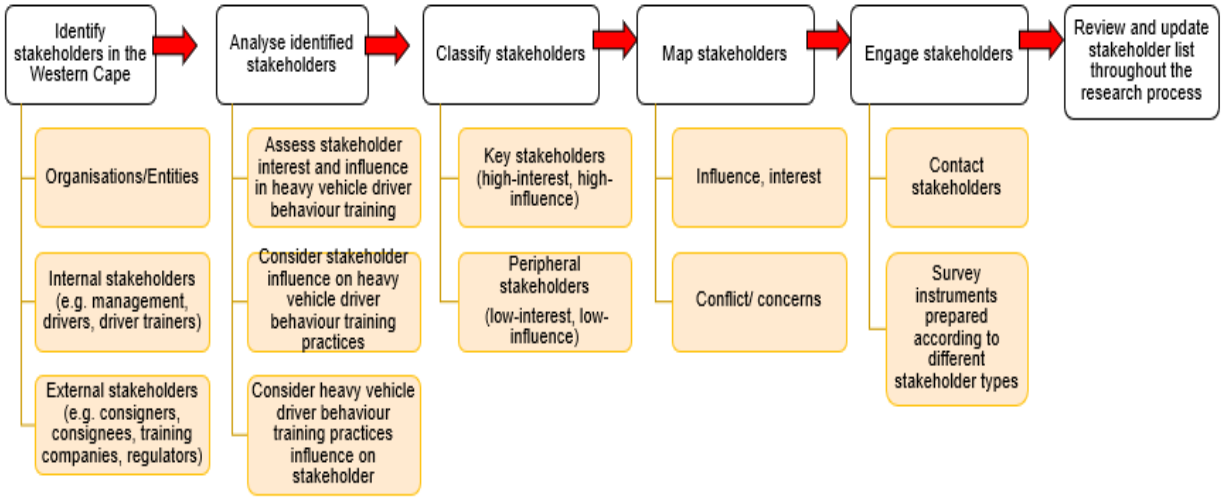


Figure 2: Western Cape stakeholder mapping exercise (generic process)

The stakeholder mapping exercise followed an iterative process whereby the research team identified stakeholders or target audiences deemed important to participate in the research. These stakeholders were clustered according to sector and function (regulatory, operations, training, skills development) as well as in terms of interest and influence on the study. Interest refers to how the project or organization will affect the stakeholder, while influence refers to the stakeholder's ability to affect the project. The stakeholder map (Annexure C) was created. A contact list was generated based on the stakeholder map and updated as the research progressed and new stakeholders emerged, or existing stakeholders changed their level of interest or influence.

Conducting a stakeholder mapping exercise for heavy vehicle industry and companies in the Western Cape required the gathering of information about logistic companies in the region, as well as a good understanding of the industry and its dynamics[1]. As indicated in Chapter 3.3. this necessitated a review and sourcing of information from a range of different sources using different approaches to solicit company information within the scope of the research ethics clearance received.

Table 2 provides an overview of the target audiences and information requests.

Table 2: Primary research - Target audience and information request

Target audience	Information requests
Logistic companies and RTMS certified logistic companies	• Company-specific job requirements for a truck driver (job specification) • What type of training (if any) is provided to drivers (content)
Driver surveys	• Whether the driver has attended an advanced driving course • Whether the driver has attended a workplace training course (Including refresher)

Table 2: Primary research - Target audience and information request	
	• Number of years of driving experience, and number of years with the company as a truck driver • Whether the driver has been involved in accidents in the previous five years • What are the most common, enroute driver frustrations? • Whether the driver has received training in South Africa or outside of SA.
Focus groups	• Driver trainer and related industry participants to gain the participants insights and perspective about the skills development needs and how these facilitate or impede their ability to carry out their jobs, as well as to gain suggestions for improvements.
Interviews	• Key informant and expert interviews to gain the participants insights and perspective about the skills development needs and how these facilitate or impede their ability to carry out their jobs, as well as to gain suggestions for improvements.
Road authority data	• Provincial and municipal road authority data that can inform the study from a behavioural perspective including information related to infringements and moving violations.

The Stakeholder Map prepared through the Stakeholder Analysis process is available in Annexure C.

2.3.3.2. Preparation of research instruments

The questionnaire and focus group schedules were designed taking cognisance of the draft literature review and include the following information:

- Demographic information pertaining to the drivers' age, gender, type of license.
- Driver experience
- Education and training (formal and informal).
- Operating/driving hours, which refer to the number of hours that drivers drive for work.
- Quality control programmes
- Behavioural and vehicle monitoring
- Insurance schemes in support of behaviour modification
- Traffic and law enforcement considerations
- Management and implementation of workplace road safety initiatives

The research instruments are sector specific, and the section below provide a brief overview of each survey instrument and the sector for which it was designed[2]. The research instruments, supports objective three of the research study which aims to identify skills and competency gaps. An overview of instruments per target audience is listed and described below.

[2] Survey instruments as approved by TETA and the Western Cape Mobility Department is available in Annexure D.

Logistic company surveys

Logistic companies with registered fleets in the Western Cape are one of the most important stakeholder groups in this research study. Logistic companies in the road freight sub-sector provide insights to the heavy goods vehicle drivers' skills in the Western Cape. The survey aims to capture the companies' assessment of their employed drivers' skills and the approaches or strategies implemented (if any) to improve and prioritise driver skills.

The development of the logistic companies' questionnaire was influenced by the heavy vehicle drivers' questionnaire to ascertain whether the logistic firms provide all the essential training before enabling its drivers to work as well as the assistance all the drivers need while they are on duty. The questionnaire also inquired as to whether the companies were aware of any issues that irritate their drivers and the causes of accidents that the company has previously encountered. The fundamental conditions that drivers must satisfy to be hired are also covered by the questionnaire.

RTMS Certified Logistic Companies

The aim of this survey is to capture and quantify the impact of RTMS accreditation on heavy vehicle drivers' skills, attitude, and health.

Driver surveys

The survey conducted by the Western Cape in 2021–2022 served as the basis for the heavy vehicle drivers' questionnaire. The survey sought to determine the degree of training that heavy vehicle drivers had and what skills they still believed they lacked. The instrument thus continued from those foundations. The tool also aimed to determine the average age and gender of heavy vehicle drivers, as well as their educational background and driving experience. The study also asked about the drivers' working conditions or environment as well as the difficulties they have in trying to carry out their regular responsibilities.

Focus groups guides

Focus groups are qualitative in-depth interviews with people who have the knowledge of the trucking and road freight industry. The following key stakeholders were consulted and interviewed:

- Logistic operators
- Current Training Providers
- Road Freight Association
- RTMC
- RTMS-certified companies

The interview guide was informed by the literature review and inputs from the Western Cape Department of Mobility. The interviews aimed to establish the skills gaps of heavy goods vehicles drivers. This was done by comparing what is required to perform given tasks and the skills available in the field to execute the said tasks.

Key expert and informant interviews

Insurance companies

According to literature findings (Chapter 3 of this report), driver skills and behaviour are two sides of the same coin. Even skilled and experienced drivers could sometimes make decisions potentially leading to crashes due to factors such as fatigue, arrival time pressures, etc. Therefore, it is crucial to investigate driver behaviour influences in conjunction with the driver skills. Behaviour can be managed in several ways, one of which is incentive schemes. Incentive

schemes are a form of behaviour management as they seek to influence the behaviour of the individual by linking positive consequences to desired behaviours. According to behaviour management theory, a person will be more likely to engage with a particular behaviour if the outcome of the behaviour is perceived as of value to him/her (Stuckey, 2013). The value outcome can be either intrinsic, associated with the value of safety such as performance feedback or extrinsic tangible such as financial incentives. Since insurance companies are responsible for financial costs of crashes on insured vehicles, most insurance companies have introduced different campaigns for safe driving initiatives such as "good driver behaviour" incentives.

Law and regulatory enforcement authorities

Legislation and regulation of products and services plays a key role in every aspect of business and service delivery, without which injury and death could occur as a direct result of non-regulation or even non standardisation. A key example is in the development, labelling, distribution, and consumption of medication. The transportation industry which has an exceptionally long and large value chain is no different and requires extensive legislation and regulation to prevent or minimise accidents on the roads, given the diversity of end-users of the road system and vehicles.

Some important components amongst many parts of the value chain are the education, training, management, and treatment of heavy vehicle drivers. The quality of the theoretical and practical training for drivers and their experience in the workplace and on the road, always finds its way into the primary causes of road accidents and is often expressed as "the human error".

Thus, this questionnaire sought to solicit input regarding the legislation and regulations that govern heavy vehicle education and training. Furthermore, the management and treatment of heavy vehicle drivers, which if not appreciated, can curtail the competence of an experienced driver.

Road authority data

Provincial and municipal road authority data was scrutinised for information that can inform the study from a behavioural perspective including information related to infringements and moving violations. The data could assist with identifying problem areas in the province, which will help in prioritizing training initiatives in those areas. Information obtained from the traffic departments highlighted areas where law enforcement needs to be enhanced.

2.3.3.3 Survey methodology and execution

The Inception Report (21 November 2022) outlines the research methodology as well as the agreed upon deliverables.

Mixed method designs

Table 3 below provides an overview of considerations (quantitative and qualitative) in a mixed method research study design. Considerations included sampling approaches, permissions, research instrument design, and data administration and recording. Quantitative and qualitative research processes were implemented concurrently. A concurrent approach assisted with answering the research questions from different perspectives. Participant groups were identified through the stakeholder mapping exercise (described in section 2.3.3.1). The stakeholder mapping exercise aimed to identify all stakeholders that can benefit or contribute to heavy goods vehicle driver safety from the perspective of training and development. The stakeholder mapping exercise therefore considered stakeholders (their level of influence as

well as ability to influence decision making) in terms of current and future heavy goods vehicle training, education practices as applicable to the Western Cape.

Table 3: Considerations in mixed method design (Creswell and Clark, 2006)

Qualitative data collection	Phases in the research process	Quantitative data collection
• Purposeful sampling • Small number of participants or sites	Sampling	• Random sampling • Adequate size to reduce error and provide power
• Individuals • Institutions providing access to individuals and sites. • Review boards	Permissions	• Individuals • Institutions providing access to individuals and sites. • Review boards
• Open-ended interviews • Open-ended observations • Documents • Audio and visual material	Research instruments	• Instruments • Checklists • Public documents
• Interview protocols • Observation protocols	Recording of data	• Reliable and valid instruments
• Attend to field work issues. • Ethical considerations	Administering data collection	• Standard procedures • Ethical considerations

In this research the following sampling methodologies were used:

Sampling methodologies

Stratified Sampling

A technique that divides a population into subgroups and ensures proportional representation in the sample from each subgroup. It provides a more accurate and efficient way of obtaining representative data.
Stratified sampling was used for the driver surveys.

Convenience Sampling

A non-probability sampling method where participants are chosen based on their convenient accessibility. While it offers ease and convenience, it may introduce biases and limit the generalizability of the results to the larger population.
Convenience sampling was used in Phase 1 for the logistic companies and RTMS surveys as well as driver trainers.

Purposive Sampling

A deliberate non-probability sampling method where participants are selected based on specific criteria relevant to the research objective. Researchers handpick individuals with

desired qualities, introducing potential bias if the sample does not represent the entire population.
Purposive sampling was used in:

- Phase 2 and 3 for the logistic companies and RTMS surveys
- The identification of insurance companies that are concerned with HGV behaviour and safety.
- The identification of regulatory entities responsible for policy and regulation including law enforcement and training.

Snowball Sampling

A non-probability technique used to study difficult to reach populations. Researchers start with a small group of meeting specific criteria and use their referrals to recruit additional participants. While useful for hidden populations, it introduces biases from social networks and may lack representatives.

Snowball sampling was used to identify driver training providers.

Determination of sample sizes

Mixed method studies combine qualitative and quantitative components to produce a whole that is superior to the individual parts. Sample sizes for quantitative and qualitative research differ in concurrent designs since the purpose of this research was not to compare results but to supplement and enrich the study. Sample sizes selected for quantitative research are typically larger than that of qualitative research designs (Creswell et al., 2006). Sample sizes need to fulfil or consider two criteria:

- will the sample be representative of the population?
- will the sample be precise enough?

The first criterion of a good sample is sample representativeness. An unrepresentative sample will result in biased conclusions, and the bias cannot be eliminated by taking a larger sample. The second criterion is sample precision. In quantitative research designs, a larger sample size provides more confidence relating to the results. The larger the sample, the smaller the margin of uncertainty (confidence interval) around the results. In addition, there is a need to consider the variability of what is being measured. The larger the variability the larger the sample needs to be.

An acceptable response rate is based on what the margin of error is accepted to be. The margin of error refers to the percentage that tells you to which extent you can expect your survey results to reflect the views of the overall population. The smaller the margin of error, the closer you are to having the exact answer at a given confidence level. For example, Survey Monkey © indicates that at a:

- 10% margin of error: 80 responses out of 500 are acceptable.
- 5% margin of error: 220 responses out of 500 are acceptable.
- 3% margin of error: 345 responses out of 500 are acceptable.

The sampling approaches are discussed in the description of surveys, and interviews and sample sizes are discussed in table 4 below.

Qualitative research is less dependent on the sample size. However, a rule of thumb for focus groups are 6 to 12 participants per group. The ideal is to continue performing groups until saturation, i.e., until no interesting or new information emerges (Creswell et al., 2006).

Qualitative interviews on a topic should be in the region of 10 to 15 interviews and again interviews are conducted until a saturation point is reached or no new themes emerge from the interviews.

Table 4 provides an overview of the target audience, survey purpose, sampling approach, population as well as responses and response rate.

Table 4: Summary of approach, sample size and responses.

Quantitative research

Target Audience	Survey purpose	Sampling approach	Population (N)	Sample size (n)	Actual responses	Response rate
Driver survey	Provide input into level of training held and training challenges from an HGV driver perspective	Stratified sampling Strata: 12 Truck stops in the Western Cape with approximately forty interviews per truck stop.	N= 47 398 (HGV population for the WC per e-Natis)	n=474 (10% of the proposed number of heavy vehicles/drivers per vehicle registered in the Western Cape)	265	74%
Logistic company survey	Provide input into employed drivers' skills, training provided and training challenges from a logistic company management and training perspective	Phase 1 Convenience sampling (Weighbridge data)	N=20	n=10 (50% of 20 companies identified from weighbridge data.	1	5%
		Phase 2 Purposive sampling through WCMD contact list generated	N=88	n= 8 (10% of the contacts from the WCDM)	3	4%
		Phase 3 Purposive sampling through TETA contact list generated	N=1000	100 (10 % of the contacts)	4	1%
RTMS certified companies	Provide input into the impact of RTMS accreditation on heavy vehicle drivers' skills, attitude, and health, and training challenges from a management	Phase 1 Convenience sampling (RTMS back office)	N=11 (Registered and operating in the Western Cape)	5 (45 % of RTMS registered Western Cape companies)	0	0%
		Phase 2 Purposive sampling RTMS back office & WCMD contact list	N=11	5 (45 % of RTMS registered Western Cape companies)	1	9%
		Phase 3	N=11	5	3	27%

	and training perspective for RTMS certified companies	Purposive sampling TETA contact list		(45 % of RTMS registered Western Cape companies)		
QUALITATIVE INTERVIEWS						
Target Audience	**Survey purpose**	**Sampling approach**	**Population (N)**	**Sample size (n)**	**Actual participation**	
Driver training providers	Perspectives on driver training challenges and gaps that can be addressed	Convenience and snowball sampling approaches	N=21	n=10	4	
Insurance companies	Perspectives on driver training and the role of incentives in behaviour change	Purposive sampling	N=5	n=5	1	
National Regulatory entities (law enforcement, policy, and regulation)	Perspectives on driver training challenges and gaps that can be addressed	Purposive sampling	N=6	n=6	3	
Industry expert interviews	Perspectives on driver training challenges and gaps that can be addressed	Purposive sampling	N=6	n=6	6	
Western Cape Traffic Infringement data						
Western Cape Provincial and Municipal Traffic Departments	Perspective on HGV driver behaviour and areas for prioritisation of law enforcement efforts	Purposive sampling	N=7 (Request was sent to Provincial Traffic Department, 5 District Municipalities & CoCT. Some DM's forwarded request to Local Municipalities)	N=4	5	

Description of surveys and interviews

The surveys (online and in person) addresses Research Objective 3 which aims to identify skills and competency gaps and forms the basis for Objective 4: recommendations.

Driver surveys

The purpose of the driver survey was to obtain inputs directly from heavy vehicle drivers in the Western Cape. Heavy goods vehicle drivers were requested to participate in this study to identify gaps in driver training and to provide insights to the current heavy goods vehicle driver environment and operations.

This included looking into the current skills and competency levels of heavy vehicle drivers, their behaviour on the road and what prompts them to behave in certain manners. In turn, the by-product of the surveys would be to reduce the number of freight-related, heavy vehicle crashes in the Western Cape by confirming that training programs are in correlation with the needs of the drivers as part of the Provincial Freight Strategy's objective 5A. Education, training, and skills development is deemed an essential component to reducing the number of fatalities caused by heavy freight vehicles.

The questionnaire was designed to obtain information on heavy vehicle driver skills and general well-being. Drivers employed by RTMS certified companies are also approached to participate in the survey.

Twelve truck stops were contacted, of which nine (9) truck stops gave permission for the surveys to be conducted in their facilities and 3 truck stops rejected the request.

Institutional permission to conduct driver surveys were received for the following fuel and rest stops (Please refer to Annexure F Western Cape Driver Survey Fieldwork Report 2023 for maps of the locations):

- Engen Winelands 1 Stop North and South (Cape Town)
- Caltex Fourways Motor (George)
- Inkamva Mosselbaai (George)
- Atlantic Oil Truck Stop (Beaufort West)
- Quest Fuel Truck Stop (Beaufort West)
- Engen Truck Stop (Beaufort West)
- Shell City (Beaufort West)
- Oppikopi Truck Stop (Leeu Gamka)
- Prince Albert Weg Service Station (Prince Albert).

Truck stops that denied the request for participation:

- Puma truck stop (Cape Town)
- Sasol George Highway N2 (George)
- Caltex Prima Truck Stop (Beaufort West).

The locations for the surveys considered strategic routes and locations for truck stops in the Western Cape. The surveys were in-person questionnaires with a team of 6 surveyors. The surveyors interviewed drivers at the truck stops and did this in pairs of male and female for safety purposes.

Driver survey population, sampling, and response rate:

The live vehicle population as per the National Traffic Information System (NaTIS) indicate that the Western Cape had approximately 47 398 registered trucks (heavy load vehicles

GVM>=3500 kg) in June 2022. Registered trucks in the Western Cape represents 12% of the total national registered truck population (393 849) for the same period.

This vehicle population was used to estimate the number of heavy vehicle drivers (at least one driver per vehicle) in the Western Cape. This is opinion surveys, and the number of respondents is open ended. The intent was to reach 10% of the population described above thus 474 respondents could be expected. The sample size of the heavy vehicle drivers in the Western Cape is thus estimated to be 474.

A stratified sampling approach was used in the selection of the targeted truck stops. Twelve Western Cape rest stops were identified, and the expectation was that forty drivers per truck stop would be interviewed. The truck stops identified were strategically placed on the Western Cape Road network, on national routes. As many drivers were approached at each truck stop as possible.

Although the intent was to interview 474 drivers (approximately 40 at each of the truck stops), not all truck stops were equally busy. The drivers who were available at the respective truck stop at the time of the interviews were approached. Truck stops were visited by the survey team at various times of the day to include as many drivers in the surveys as possible. Three hundred and fifty-seven (357) heavy vehicle drivers in the Western Cape were approached and 266 heavy vehicle drivers completed the survey. Due to one participant who self-reported as underaged (stated he was 16 although legally required to be 18 to drive), only 265 responses are reported, yielding a 74% response rate. The survey thus reached 75% of the intended sample size and received a 74% response rate.

RTMS surveys distribution

RTMS surveys distribution commenced on 21 April 2023. The RTMS-back office sent an email on behalf of the research team requesting participation and permission to be contacted. The RTMS back-office is the central point for RTMS registrations and administration and was therefore the entry point to request participation from RTMS companies. The email was sent to all eleven RTMS-certified operators in the Western Cape and companies with RTMS registered vehicles in the Western Cape. The latter includes companies with a national footprint (registered elsewhere in the country) that have depots in the Western Cape.

Use was made of the RTMS-back office to establish the population from which a sample size was drawn for RTMS registered operators in the Western Cape, and to distribute the request for participation, ethics clearance forms and survey links to potential participants. The research team did not contact any of the operators directly because the team did not have permission to do so. The contact details are confidential and may not be shared without the company's consent. One of the mitigation actions to the initial low response rate was to contact operators directly through the PBS project connections, but currently the WC is not participating fully in the Performance Based Standard (PBS) project and this contributes to the low number of RTMS-certified companies in the Western Cape. RTMS is a prerequisite for PBS.

RTMS survey population, sampling, and response rate:

Convenience sampling was used to identify RTMS certified operators. This is a non-probability sampling method where participants are chosen based on their convenient accessibility. While it offers ease and convenience, it may introduce biases and limit the generalizability of the results to the larger population.

Indications from the RTMS office were that there are eleven RTMS registered companies in the Western Cape. The RTMS office sent the emails to the 11 RTMS companies and no responses were initially received from the companies.

During Phase 2 and Phase 3 of the surveys, four RTMS certified logistic companies started the survey. However only three consented to participating in the survey and proceeded to complete the survey. Two of these RTMS certified companies also appeared on the list obtained from provincial weighbridge data.

Logistic Company surveys

Logistic company surveys therefore commenced during the first week of May 2023.

There was not a comprehensive list of Western Cape logistic companies available at the start of the project. Although the WCMD had a preliminary database of operators in the Western Cape this list was not sufficient for research purposes and needed to be expanded. Logistic companies identified during the stakeholder mapping exercise (through weighbridge data) were contacted with a request to participate in the surveys. Logistic companies only received the link to the survey upon completing the signed permission letters which was a requirement from the CSIR REC.

Signed institutional permission letters were obtained from logistics companies in the Western Cape.

Logistic company survey population, sampling, and response rate:

A convenience sampling approach was used. This is a non-probability sampling method where participants are chosen based on their convenient accessibility. While it offers ease and convenience, it may introduce biases and limit the generalizability of the results to the larger population.

Data on heavy goods vehicles weighed at the Western Cape Provincial weighbridges was used in Phase 1 of the research to identify Western Cape heavy vehicle companies. Weighbridge data provided an indication of the Western Cape companies whose vehicles were most frequently weighed at the province's weighbridges and thus assumed to have a Western Cape footprint. Companies with more representation at weighbridges are typically larger fleets, prevalent in the Western Cape, and will therefore have more representation at weighbridges than vehicles that are not from, or travelling within, the Western Cape. These companies, with larger fleets that frequent the Western Cape roads were also considered the most likely to have in-house driver training initiatives or company programmes that promote driver wellness and road safety. Larger companies tend to have driver trainers employed and the intent with focusing on the larger companies was to get access to and learn from the experience of the driver trainers as well as management of these companies.

Company contact information was obtained through an internet search. Each company was contacted with a request to participate. The twenty companies most frequently weighed at the weighbridges over a period of five years (2017-2021) were identified and contacted to participate in the survey (**Table 5**).

To expand on the weighbridge contact list, telephonic and email contact was made with logistics companies with whom the WCMD had previous contact on other matters (eight companies), the request to participate in the surveys was sent to six Industry Associations,

who distributed the request to their members. However, despite repeated efforts, the response rate was minimal. Only four logistics companies completed the survey during the first phase.

Table 5: Weighbridge data for the Western Cape from 2017 to 2021.						
Logistic Companies	**Number of weighs**					**Grand Total**
	2017	**2018**	**2019**	**2020**	**2021**	
Anderson Transport	4 955	5 399	4 019	3 069	3 473	20 915
Anton Le Roux Transport	3 115					3 115
Bakers Transport	3 737	3 607		2 050	2 426	11 820
Crossroads	2 826	4 045	3 834	2 568	2 810	16 083
Goldfields Logistics			3 013	2 440	3 075	8 528
Grain Carriers	6 440	7 821	8 075	6 002	9 210	37 548
Hestony Koelvervoer	3 679	3 529				7 199
Hestony Transport			3 281	2 460	3 110	8 851
HFR Transport	3 735	4 955	3 507	2 402	3 229	17 828
Imperial Cargo	11 686	12 248	7 178	1 847		32 959
Imperial Logistics			10 525	10 354	11 233	32 112
Jonckies vervoer	2 876	4 003	3 363	2 547	3 346	16 135
Lieben Logistics		3 661	3 727	2 225	2 368	11 981
Macdonald's Transport	3 713	4 016	3 163	2 589		13 481
Master Cargo					2 736	2 736
Milltrans					2 383	2 383
Neogistix			3 206	2 293	2 676	8 175
Pool Transport					2 368	2 368
Private	4 517	3 992				8 509
Shoprite	3 898	5 916	5 726	4 444	5 425	25 409
SSB Transport					2 732	2 732
Stemmet Transport				1 972		1 972
Swartland Logistics	4 263	4 667	3 061			11 991
Tanker Services	5 075	4 573				9 648
Thornlands				2 091	2 610	4 701
Time Link Cargo	3 736	5 465	5 296	3 685	4 357	22 539
Tip Trans	3 514	3 622	2 941			10 077
Unitrans	4 243	3 802	3 732	2 323	2 814	18 665
Van Der Vyver	4 807	4 989	3 732	2 323	2 814	18 665
VDM Vervoer	7 340	4 093	5 511	2403		19 347
Xinergistix	4 659	4 444	3 258			12 361
Grand Total	92814	98 838	90 210	62 817	76 198	420 877

Phase 2 of the data collection took place from the 28 June 2023 – 7 July 2023. Using a new list generated by the WCMD as a reference, the contact details of a total of 88 logistics companies were sought from the internet. From this list 28 logistics companies from the list were either not found on the internet (3 deregistered) or the contact details were not available.

With the contact details acquired from the internet search 60 logistics companies were telephonically contacted to request participation. Out of the 60 companies contacted:

- Emails were sent to 14 companies that agreed to participate.
- Telephone numbers of 18 company contacts did not work.
- No answer was received from 10 of the identified companies.
- The remaining 18 companies contacted were either not from the Western Cape, were not logistics companies, or refused to participate.

Lastly, to double up on efforts, follow up phone calls were made to some of the contacted companies including the 14 that agreed to receive the survey links. From the follow up calls, 1 company declined due to the other management member(s) disinterest in participating and 3 more companies refused to take part in the survey. However, other companies stated that they could not attend to emails and promised to respond, but unfortunately no response was received. With the remaining companies, the phone went unanswered or the relevant person to assist with the survey was not available.

From these phone calls, if a company indicated that they are willing to participate the researcher sent them the consent form to be signed. If the consent was signed the survey link was forwarded and the company could participate if they wished to do so. In most cases, the phone call was answered by persons not relevant to respond to the survey, like administrative or finance staff, and it was therefore not feasible to conduct telephonic interviews. Furthermore, the CSIR REC clearance was given for online surveys and focus groups. No additional responses were collected during Phase 2.

Phase 3 of the data collection took place from 20 July 2023 – 28 July 2023. This was a further intensive attempt to contact logistic companies (this time making use of a list provided by TETA that contained approximately 1 000 entries of Western Cape logistics operators registered on the TETA database), to request their participation and to complete the online survey (following the same approach as described in phase two above). Additionally, logistic companies were provided with the option to participate in a facilitated discussion on 27 July 2023. The additional effort resulted in the completion of:

- Four additional surveys for logistics companies (in total eight responses since the survey commenced)
- One additional survey for RTMS certified operators (in total four responses since the survey commenced – however only three companies consented to participate and proceeded to complete the survey)

Insurance companies' interviews

Purposive sampling approach was used. Purposive Sampling is a deliberate non-probability sampling method where participants are selected based on specific criteria relevant to the research objective. Researchers handpick individuals with desired qualities, introducing potential bias if the sample does not represent the entire population.
The three criteria to be met by insurance companies for selection for the study were the following:

1. South African Insurance company
2. Heavy goods' vehicle insurance company
3. Offers driver incentives for "good" driver behaviour

Since the focus was particularly on Heavy Goods Vehicle insurance companies, there were limited options to choose from as few motor insurance companies cater for heavy vehicles in South Africa. Furthermore, insurance company websites were visited to look out for any driver behaviour incentives or campaigns offered, over and above just the insurance cover.

Out of the five heavy goods vehicle insurance companies that fit the criteria and were therefore approached, only one responded positively. The insurer provided inputs on incentives offered in support of good driver behaviour and wellness to ultimately reduce crash incidents by heavy goods vehicles. Another heavy goods vehicle insurance company stated that they do not provide incentives at driver level, but at company level.

Regulatory and enforcement authorities' interviews

Purposive sampling approach was used to select the relevant representatives for this group of respondents. Purposive Sampling is a deliberate non-probability sampling method where participants are selected based on specific criteria relevant to the research objective. Researchers handpick individuals with desired qualities, introducing potential bias if the sample does not represent the entire population.
Legislation is the exclusive domain of government:

- National road traffic and related laws are developed by or through the national Department of Transport or its agencies. Therefore, DoT and its agencies (RTMC, RTIA, CBRTA) that are involved in managing or monitoring heavy vehicle traffic, and may potentially possess useful data, were selected.
- The custodian of legislation concerning labour (regardless of sector or industry) is the Department of Employment and Labour.

Furthermore, it was sought to interview at least one national organisation that represents the interests of truck drivers. Thus, the National Bargaining Council for the Road Freight and Logistics Industry (NBCRFL) was selected because it is reported to represent 80% of truck drivers in South Africa.

Apart from TETA, which is solely responsible for skills development in the transport sector, the following regulatory institutions that have a role to play in the skills and competency levels of vehicle drivers in South Africa were approached as shown in **Table 6** below.

Table 6: Regulatory authorities identified for the research

#	Regulatory Institution	Outcome
1	Road Traffic Management Corporation (RTMC)	Successful
2	Cross-Border Road Transport Agency (CBRTA)	Successful, after several attempts.
3	Road Traffic Infringement Agency (RTIA)	The Administrative Adjudication of Road Traffic Offences (AARTO) is currently only rolled out in Gauteng. RTIA declined to participate since the AARTO is not currently rolled out in the Western Cape.
4	Department of Employment and Labour	Successful, but minimal inputs.

Table 6: Regulatory authorities identified for the research		
#	**Regulatory Institution**	**Outcome**
5	National Bargaining Council for the Road Freight and Logistics Industry (NBCRFLI)	The organisation declined to participate since it is not involved in heavy vehicle driver training activities.
6	National Department of Transport (NDoT)	DoT only granted research team permission to engage DoT officials on Tuesday, 29 August 2023. After unsuccessful attempts to set an interview date, the questionnaire was sent to DoT to be completed instead of an interview. There is only one official that directly works with licensing and PRDPs. Several attempts to obtain DoT's inputs were made but no response was received at the time of finalising this report.

The purpose of engaging the above listed institutions was two-fold namely:

- To identify areas in the transport regulatory environment where gaps may exist particularly with regards to heavy goods vehicle drivers; and
- To identify phenomena or factors that highlight the level of skills or competency of heavy goods vehicle drivers.

The Road Traffic Management Corporation (RTMC) and the Road Traffic Infringement Agency (RTIA) were requested to participate in the regulatory interviews. The RTMC provided institutional permission and the interview was conducted during the first week of May 2023.

The Road Traffic Infringement Agency (RTIA) did not participate since Administrative Adjudication of Road Traffic Offences (AARTO) is currently only implemented in Gauteng.

The Cross Border Roads Agency (CBRTA) responded only after several follow-ups and after reaching out to a different official.

Focus group with heavy vehicle driver training institutions.

Both convenience and snowball sampling approaches were used. The approach entailed consulting the list of training providers in the Western Cape obtained from the TETA database list of training providers. A list of 21 training providers was compiled and letters inviting them to attend the focus group discussion were circulated. Despite several telephonic and email invitations the team received a low response rate to the invitations from the companies. Email invites with consent forms were issued to 17 of the 21 organizations since others did not engage in heavy goods truck driver training, or were unable to be contacted, or did not respond to phone and email requests. Out of the listed companies (21), 4 participated, with 3 driver trainers attending the focus group discussion (held on the 2 June 2023) and 1 (industry body representative) being a key informant interview.

The list was further supplemented by an internet search of driver training providers operating in the province. The research team also reached out to the South African Institute for Driver Instructors (SAIDI) to assist with contact details of companies that provide driver training and that deals with TETA on a larger scale than only the Western Cape. As indicated earlier,

facilitated discussions were also offered as an option to logistic companies to provide input into training requirements for the heavy vehicle freight industry.

Expert interviews

Additional industry expert online interviews were conducted with the:

- South African Institute for Driver Instructors (SAIDI)
- Master Drive
- RTMS auditing firm
- Road Freight Association (RFA)
- Training management of the RTMC
- Commercial Transport Academy

Road authority data

The WCMD requested infringement data directly from Provincial and Municipal Traffic Departments. Datasets from the traffic departments were forwarded by the WCMD to the research team. This data was analysed in terms of HGV infringements in the Western Cape. The notices included all notices - normal notices and speed notices.

2.3.3.4. Data analysis and consolidation

All data collected (online or in person) was captured on the Transport Safety Lab data portal for analysis. The data platform enabled the research team to capture data in real-time. This was to reduce the time it would have taken to manually capture data, especially from the driver, RTMS and logistic operators survey instruments.

The data was analysed on the data platform using dedicated analysis tools. This portal is secure, and the raw dataset will be provided as part of the project deliverables.

2.4. Ethics

The research commenced with a request for expedited ethics approval to analyse existing data (submitted to the CSIR REC on the 23 January 2023, preliminary comments, and response to screening 26 January 2023). Approval was granted for phase 1 analysis of existing data on 7 February 2023 (CSIR REC Ref: 426/2023).

A request for expedited approval to commence with phase 2 of the research (primary research) was submitted 29 March 2023. Ethics approval for phase 2 was granted on the 21 April 2023. Surveys commenced in April 2023 after the CSIR Research Ethics Committee (REC) provided ethics clearance. Although expedited approval was sought and provisional clearance provided, the REC only gave final approval for surveys to commence on the 20 April 2023.

Institutional permission letters were prepared for each of the target audiences. Invitations to participate in the research were forwarded to participants identified for each target audiences. The exception was for the driver surveys. Drivers were interviewed at the twelve sites that was identified as truck stops/fuel stations frequented by Western Cape heavy vehicle drivers. Permission was obtained by truck stop/fuel station. Please see Annexure E for the ethics approval.

CHAPTER 3. LITERATURE REVIEW OF INTERNATIONAL AND LOCAL HEAVY VEHICLE SAFETY

3.1. Introduction

Transport is considered a key element in eradicating poverty in South Africa. Road safety has for long been addressed in isolation of other social and economic issues; however, the road and road environment are an integral part of life as South Africans make their way to attend educational facilities, employment, social and welfare services. Transport, after education has been cited as the single most crucial factor for economic development in South Africa with land-based transport playing a primary role in meeting people's needs (Rodrigue and Notteboom, 2012).

However, the South African transport system is complex and exists within an institutional, spatial, environmental, and social context where the transport system components need to be designed to facilitate the seamless and safe movement of people, goods, and information. Without roads and transport, South Africa would come to an abrupt standstill. Efficient and effective transport networks contribute significantly to reduced cost of doing business in the country and improves the competitiveness of products and operations across all industries.

As elsewhere in low- and middle-income countries (LMIC), heavy goods vehicles (HGV) play a key role in achieving this objective and are essential to the South African economy (Arshad et al., 2020; Naude and Chitakunye, 2014; Magazi and Mohammed, 2015; Evgenikos et al., 2016). Heavy goods vehicles are an integral part of the traffic mix in South Africa and freight safety needs to be managed within this framework. Crashes involving HGVs are likely to be a result of systems issues involving a network of interlinked contributory factors. A holistic perspective is required to improve knowledge sharing and situational safety practices in transport (Grinerud 2022).

Pockets of research conducted in South Africa relates to specific sectors such as mining (Schutte and Maldondo, 2003), or specific routes such as the National Route 3 (N3) (Roberts, 2014; Venter et al., 2013; Radebe, 2010) have been conducted.

International research highlights the type of crashes and injuries associated with heavy vehicle crashes and describes crash characteristics in terms of the vehicle, road environment, and human factors. Past studies (Wolkowicz, 1989; Pigman et al., 1998; Raftery, 2013; Cerwick, 2013) have shown a relationship between secondary factors such as demographics/behaviour and crash occurrence.

Location, environmental and mechanical factors contribute to crash occurrence, but to a much lesser extent than driver-related variables (Cerwick, 2013). This is in line with Botha's (2005a) categorisation of factors contributing to traffic crashes in South Africa where it was implied that the human factor is the greatest contributory factor to road traffic crashes. Other vehicle related factors include age, load characteristics, carrier type and some spatial and temporal factors such as time of day, visibility, and so forth.

3.2. Heavy vehicle crash concepts and definitions

3.2.1. Road transport elements

Road transport elements are classified into four categories namely: road, vehicle, driver, and road environment (European Transport Safety Council 2001). The interaction between these elements provides an understanding of the complex relationships involving crashes (Botha, 2005).

3.2.2. Accidents versus crashes

An "accident" is defined as "an unplanned, unexpected, and not purposefully caused event which occurs suddenly and causes (1) injury or loss, (2) a decrease in value of the resources, or (3) an increase in liabilities" (Business Directory, 2014).

The Merriam-Webster Dictionary (2014) defines a *"crash"* as "to hit something hard enough to cause serious damage or destruction or to damage (a vehicle) by causing it to hit something". Crashes, in contrast to accidents, are preventable. According to the Road Peace Organisation (2007), the US National Highway Traffic Safety Administration (NHTSA) banned the use of the word 'accident'. The NHTSA felt that a 'continuation of the use of this word in lieu of 'crash' is counterproductive in educating the public and changing perceptions regarding the preventability of injuries and fatalities in the United States of America (USA) highway environment. The New Jersey Department of Transport (2004) supports this by saying that the terminology reinforced the philosophy that crashes do not just happen; they have causes and are preventable.

In South Africa, there has been a long-standing debate where scholars argue that the word "accident" implies that an event relates to fate or chance. As a result, this will imply that traffic accidents are not preventable. However, the National Road Traffic Act (NRTA 93 of 1996) still refers to accidents and since there is no consensus on South African terminology this report makes use of both terms (interchangeable) according to literature sources.

3.2.3. Traffic conflict, near crash or near miss

A" traffic conflict", "*near crash"* or "near miss" refers to circumstances that require rapid, evasive manoeuvre by the subject vehicle, or any other vehicle, to avoid a crash. In other words, without evasive action a crash would have occurred (Dingus et al., 2006).

3.2.4. Road safety performance indicators

Road Safety Performance Indicators (RSPIs) are measures (indicators) that reflect operational conditions of the road traffic system, which influence the system's performance in terms of safety (Hakkert, 2007). Road safety indicators are measures used globally by government and traffic authorities to assess the road safety situation in a country or across countries or regions. RSPIs are used to assess the current safety conditions of a road traffic system, monitor progress, and measure impacts of various safety interventions. These indicators benchmark road safety performance in different regions within a country. Successful use of these indicators is dependent on the quality and reliability of the available data. (European Transport Safety Council 2001).

Primary road safety indicators

Primary road safety indicators include rates that indicate the likelihood of a crash, death and injury or exposure to risk through the kilometres travelled or per population (Lotter, 2000). Crash rates, fatalities, and injury information provide the most direct measure of road safety in a country. Van Niekerk (2009) defines four types of injuries referred to as casualty crashes:

- Fatal accident is an accident resulting in the death of one or more persons. The persons killed may be drivers and passengers of vehicles, or cyclists and pedestrians. Such crashes can include serious and slight injuries.
- Major accident is an accident in which one or more persons are seriously injured.
- Minor accident is an accident in which one or more persons are slightly injured.
- Damage only crashes refer to accidents in which no one was killed or injured but resulted in damage to the vehicle or vehicles and/or other property, only.

Within the Safe System Approach and the Road Traffic Safety Management System (RTMS) ISO 39001, the RSPIs are the outcomes of road unsafety[3].

Secondary road safety indicators

Secondary safety performance indicators do not provide a direct indication of safety performance; however, they do provide a measurement of other factors that may influence safety performance in general (Raftery et al., 2011). Secondary indicators of road safety include compliance with law enforcement, moving violations, road user awareness, and so forth (Lotter, 2001).

3.3. Policies and theories in support of a safe road and traffic system

3.3.1. Sustainable and safe transport in a MIC country context.

The United Nations (UN) High-Level Advisory Group on Sustainable Transport defines Sustainable Transport as: "the provision of services and infrastructure for the mobility of people and goods advancing economic and social development to benefit todays and future generations in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts" (Department of Transport and Public Works 2019).

Transport safety, especially road safety, has for long been considered and addressed in isolation of other societal goals and objectives. However, this changed when road safety goals were for the first time incorporated into the 2015 Sustainable Development Goals (SDG) 2015[4]:

- **Sustainable Development Goal 3** Ensure healthy lives and promote well-being for all at all ages. Target 3.6: By 2030, halve the number of global deaths from road traffic accidents.
- **Sustainable Development Goal 11** Make cities and human settlements inclusive, safe, resilient, and sustainable. Target 11.2: By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by

[3] Please refer to Chapter 2: Road Traffic Safety Management System (ISO 39001)

[4] https://sdgs.un.org/goals

expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

Sustainable transport is a cross-cutting theme in the 2030 Agenda for Sustainable Development. It supports the achievement of at least 8 of the 17 Sustainable Development Goals (SDGs) and makes direct and indirect contributions to at least 13 SDG targets (**Figure 3**).

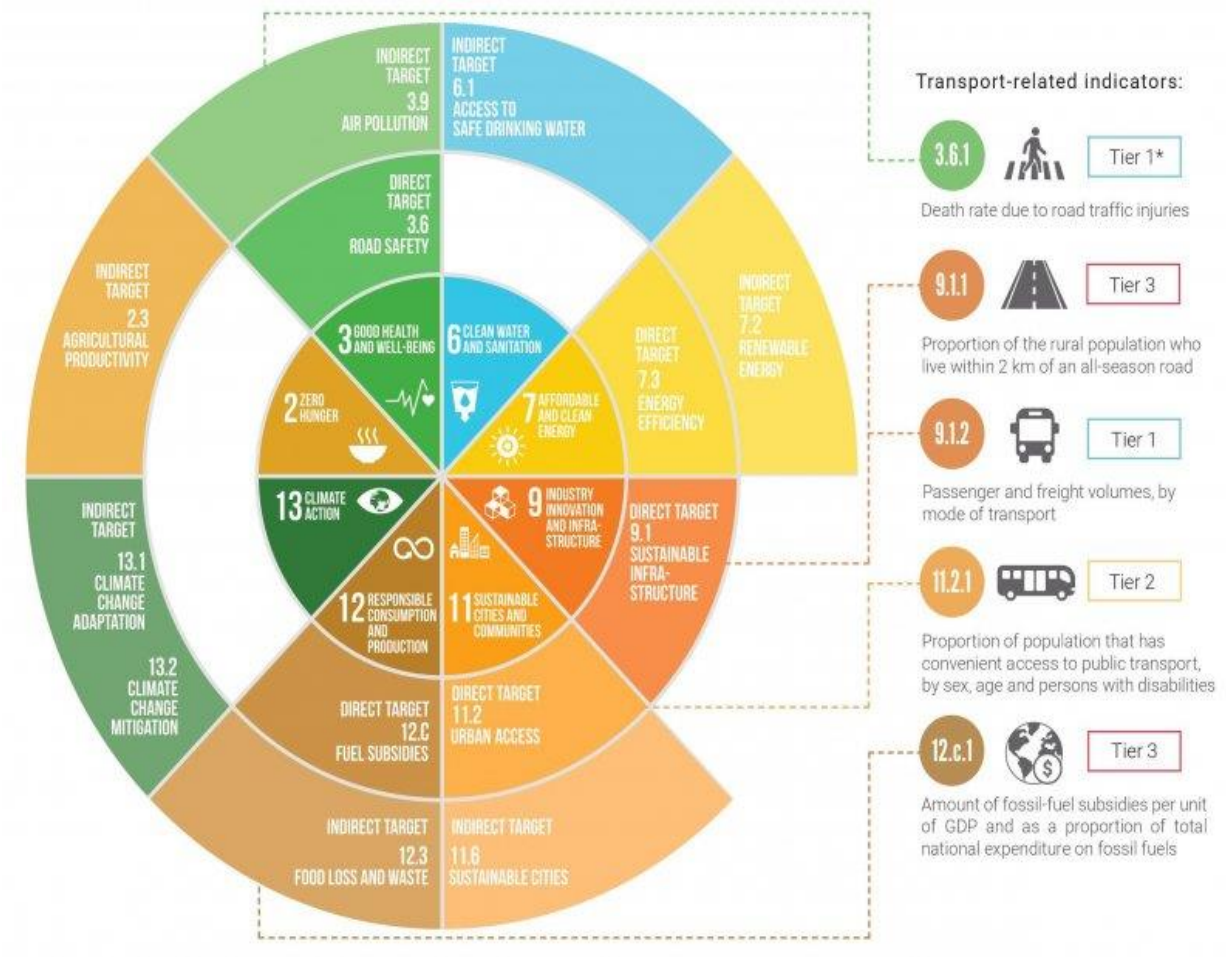


Figure 3: 2030 Agenda for Sustainable Development [5]

3.3.2. South African National Development Plan

The South African National Development Plan (NDP) 2030 highlights the need for an innovative approach to eliminate poverty and reduce inequality in our country (National Planning Commission (NPC), 2012). The NDP 2030 signals a shift from social and economic exclusion towards a systematically inclusive approach (**Figure 4**).

The NDP 2030 aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality. The NDP 2030 makes a firm commitment to achieving a minimum standard of living and, therefore, provides a framework for the adoption of a minimum standard of living by society.

[5] SlowCat Partnership for sustainable low carbon transport 2020

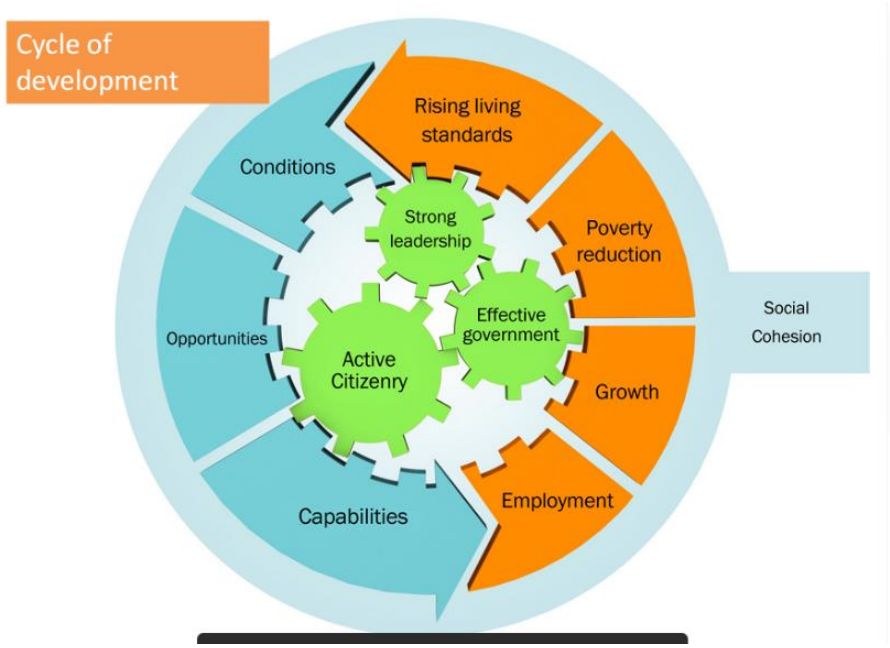


Figure 4: National Cycle of Development: NDP2030

Figure 5 illustrates that transport is considered an essential element in making this difference.

Figure 5: Road Traffic Injury and Cycle of Poverty(Small, M., van Niekerk, EC., Schermers, G., 2019)

Sustained action on road safety plays an important supporting role to many different elements of South Africa's NDP 2030, including economic development and social and environmental protection.

The NDP most directly references road safety in relation to "Promoting Health." A health goal is set for reducing injury, accidents, and violence by 50% from 2010 levels. The safety of road

users is also addressed in relation to transport infrastructure. Safety issues raised are focused on driver behaviour and associated compliance, rather than looking at safety on the road as part of a wider road traffic system. There is however some reference to the need to strengthen institutional capacity to manage road traffic, which is in line with the contemporary significance attached to this issue. There is no reference to the human losses caused by road traffic injury in relation to "Building Safer Communities."

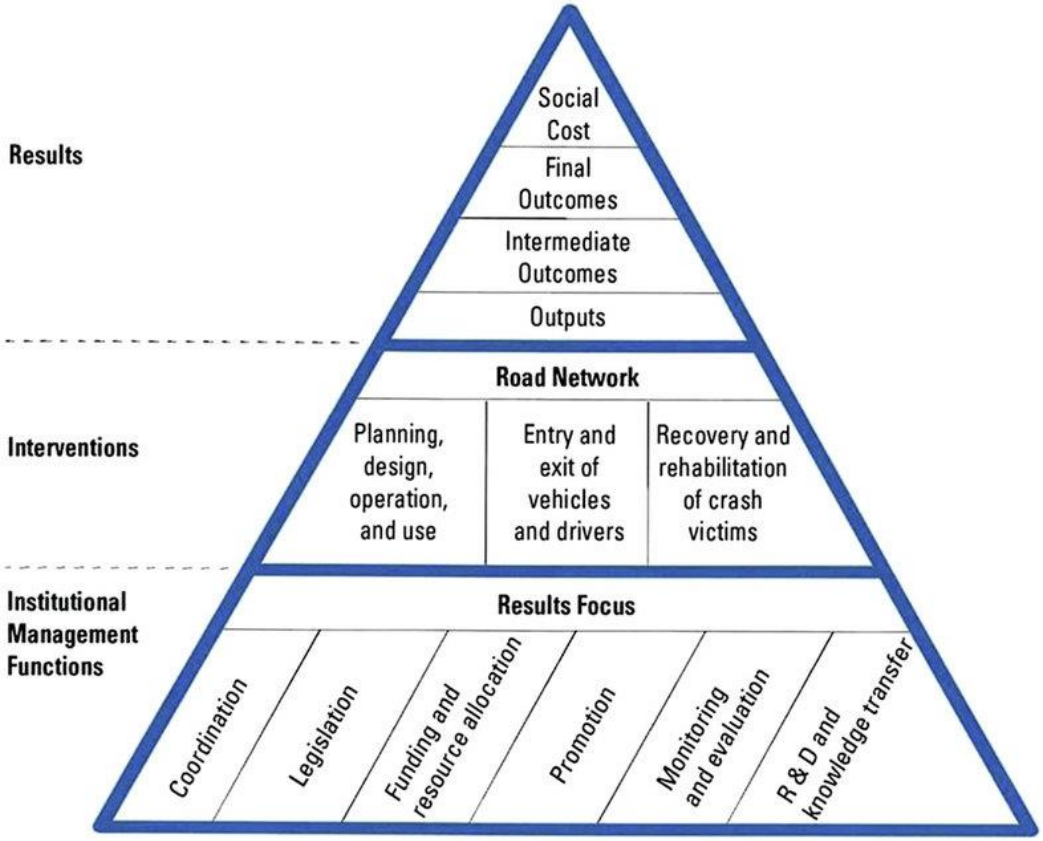
A key focus of the NDP 2030 is active citizenship and social activism, and a special focus on women and youth. It also sets the context of fighting poverty and deprivation through various sectors. Each sector has an obligation to give action to the NDP 2030, through selection of projects that would support it, where relevant.

The NDP 2030 states that *"Government will have the responsibility to oversee a transport system that takes into consideration the realities of transport in South Africa and strives to serve the interest of society. It will provide basic infrastructure where needed. Where the services would best meet transport needs."*

Given the extent and cost of the transport safety problem in South Africa as well as the rest of the Continent, there is an undeniable need to invest in research, development, innovation, and activities that build capacity to address this socio-economic burden across all modes of transport, including heavy vehicles.

3.3.3. Safe System Approach

Leading road safety nations have adopted a Safe Systems Approach to road safety (Raftery, 2011). The Safe System Approach (SSA) forms the basis of the Road Traffic Safety Management System ISO 39001 (**Figure 6**) as well as the framework for the study in support of the National Road Safety Strategy 2030 and the Provincial Freight Strategy.



Source: Bliss and Breen, building on the frameworks of Land Transport Safety Authority, 2000; Wegman, 2001; Koornstra et al, 2002; Bliss, 2004.

Figure 6: Road Traffic Safety Management System (ISO 39001).

The Safe System evolved from two concepts namely Vision Zero and Sustainable Traffic Safety Approach (Roux et al., 2021). **Table 7** provides an overview of sustainable road safety principles and measures that could potentially make freight transportation safer. All the principles are interconnected, and one principle cannot effectively function or address road safety without the others.

Table 7: Principles for sustainable road safety (Wegman 2006)

Principle	Definition
Functionality of the road	The function of the road as a freeway, distributor, or access road determines the type of vehicles permitted on the road, speed limits, accesses, and so forth.
Homogeneity of traffic, speed, and direction	This refers to diverse types of road users and vehicles using the same road traffic space at the same time. By acknowledging homogeneity of traffic or otherwise the differences in the traffic mix- speed, and direction, diverse types of vehicles and road users can safely be separated, channelled, and guided.

Table 7: Principles for sustainable road safety (Wegman 2006)	
Principle	**Definition**
Forgiving road environments	Forgiving road environments limit the consequences of road user errors. Socially, this principle refers to the fact that no matter how well trained or motivated drivers are, people make errors.
Predictability of the road and road user behaviour by a recognisable road design	Predicable road layouts prevent unsafe actions, as drivers are aware of what to expect on the road.

The Federal Highway Administration (FHWA) states that the SSA aims to eliminate fatal and serious injuries for all road users. It does so through a holistic view of the road system that first anticipates human mistakes and the second that planners and designers as well as road users have a shared responsibility to ensure that roads and road environments are inherently safe and that users are compliant through education, training, and awareness (Federal Highway Administration 2023).

Figure 7: Safe System Approach (U.S Department of Transportation 2023)

The SSA emphasises that although road users need to be well educated and situationally aware, the designers and planners of the road and traffic environment also has a responsibility to ensure that the road and the road environment is inherently safe and forgiving, and in the event of a crash that the victim receives the medical attention needed to survive the impact of the crash. Road safety is therefore a shared responsibility. In line with the SSA, the United Nations Decade of Action for Road Safety (UNDoA1) 2011 – 2020 as well as the UNDoA2 (2021 - 2030) prescribes five pillars on which a national road safety strategy is developed.

The South African government has pledged support for the UNDoA1 (2011-2020) and renewed their commitment to address the road safety scourge in Stockholm Sweden for the second Decade of Action UNDoA2 which is based on five pillars (**Figure 8**).

Figure 8: Pillars of the United Nations Decade of Action for Road Safety (https://visionzeronetwork.org)

The SSA is an important approach to managing heavy vehicle safety and investigation. It is also emphasised that governments, such as that of Australia uses the SSA to road safety when considering heavy vehicle road safety and principles are (Raftery 2011):

- Safer roads and roadsides due to better transport and urban planning, road design that accommodates errors, improved surfaces, and less roadside hazards.
- Speed is managed through more appropriate limits, facilitated through smarter, self-explaining roads and roadsides that encourages safe speeds.
- Advanced vehicle safety features, including electronic stability control, front and side curtain airbags and head restraints, collision avoidance systems and better maintenance of tyres and brakes.
- Road users, including HGV drivers are alert and aware of the risks, drive according to prevailing conditions, and make use of in-vehicle technologies for driver safety feedback that ensures alertness and compliance with the road rules.

3.3.4. Freight safety in the Safe System framework

The roadway constitutes a unique working environment. The road and traffic environment, enforcement, and the safety culture in the heavy vehicle industry not only influence the attitudes of the road users towards traffic safety but also legitimise and encourage behaviours that affect safety (Khadka et al., 2021). Crashes involving HGVs are likely to be a result of systems issues involving a network of interlinked contributory factors. A holistic perspective is required to improve knowledge sharing and situational safety practices in transport (Grinerud 2022).

A systematic approach to HGV driving and road safety would acknowledge that this is a shared responsibility, across the whole system or value chain, and that resources allocated to plan and manage workplace road safety should be focused across all levels of the system, and not solely on the behaviour and practice of the individual driver (Grinerud 2022).

Table 8 below provides an overview of the pillars as well as a description of each pillar. Column 3 provides an overview of the potential application of SSA pillars to road freight safety.

Table 8: UNDoA application to freight vehicle safety and freight accident investigation procedures

Pillar	Description	Application to freight safety
1 Institutional – lead agency	Designation of lead agencies with the capacity to: • Develop and lead the delivery of national road safety strategies, plans and targets. • Data collection and evidential research is essential	• A lead agency should include freight safety in the national road safety strategy where it prescribes the collection and use of freight data to address problems experienced. • Assess crash countermeasure designs and monitor implementation and effectiveness.
2 Safer roads	• Raise the inherent safety and protective quality of road networks for the benefit of all road users. • Achieved through: ▪ Road infrastructure assessment ▪ Improve planning, design, construction, and operations of roads.	• Based on the collection of reliable freight data, black-spot management[6] • Identifies engineering problems that contribute to heavy vehicle crashes. • Apply the principles of functionality, homogeneity, and forgiving roads, to make roads safer through design.
3 Safer vehicles	• Encourage universal deployment of improved vehicle safety technologies for	• Safer vehicle design includes Performance–Based Standards (PBS) for heavy

[6] Black spot management or hazardous location analysis is the reactive investigation and implementation of remedial measures at single, short road segments or sites (black spots) with the highest numbers of road accident casualties. Please see the TRH 29 South African Road Traffic Assessment Methods 2022

Table 8: UNDoA application to freight vehicle safety and freight accident investigation procedures

Pillar	Description	Application to freight safety
	both passive and active safety, through: ▪ Harmonisation of relevant global Standards ▪ Acceleration of uptake of modern technologies through consumer information schemes and incentives	vehicles developed in Australia and more recently in South Africa (Nordengen, 2011; Steenkamp et al., 2021).
4. Safer Road users	• Develop comprehensive programmes to improve road user behaviour. • Sustained or increased enforcement of laws and standards combined with public awareness/education to increase seat belt and helmet wearing rates, and to reduce drink driving, speed and other risk factors.	Based on the information collected from heavy vehicles crashes, tailor made programmes can be developed to address human factors such as driver behaviour (Grinerud 2022).
5. Post-crash responses	• Increase response to post-crash emergencies. • Improve long-term and short-term health care	• Accident investigation and reconstruction - develop typologies for heavy vehicle crash injuries. • Develop programmes and remedial measures to use in the other pillars.

The Safe System facilitates the design and implementation of interventions that will build capacity for road safety management. This is an inclusive approach that caters to all groups using road systems and road users including commercial and heavy vehicle drivers.

National Road Safety Strategy 2030

The National Road Safety Strategy (NRSS) is premised on the SSA and the NRSS's vision is to ensure safe and secure roads, as well as to half the number of fatal crashes by half from the 2011 baseline by 2030 (National Road Safety Strategy 2016 – 2030). This can be achieved by delivering on the strategic mission to attain a reduced number of road crashes, road fatalities, and serious injuries for all road users (**Figure 9**). Moreover, this will be done by promoting responsible and safe road user behaviour, providing safe and forgiving road infrastructure, ensuring safer vehicles on South African roads, and delivering quality road safety management.

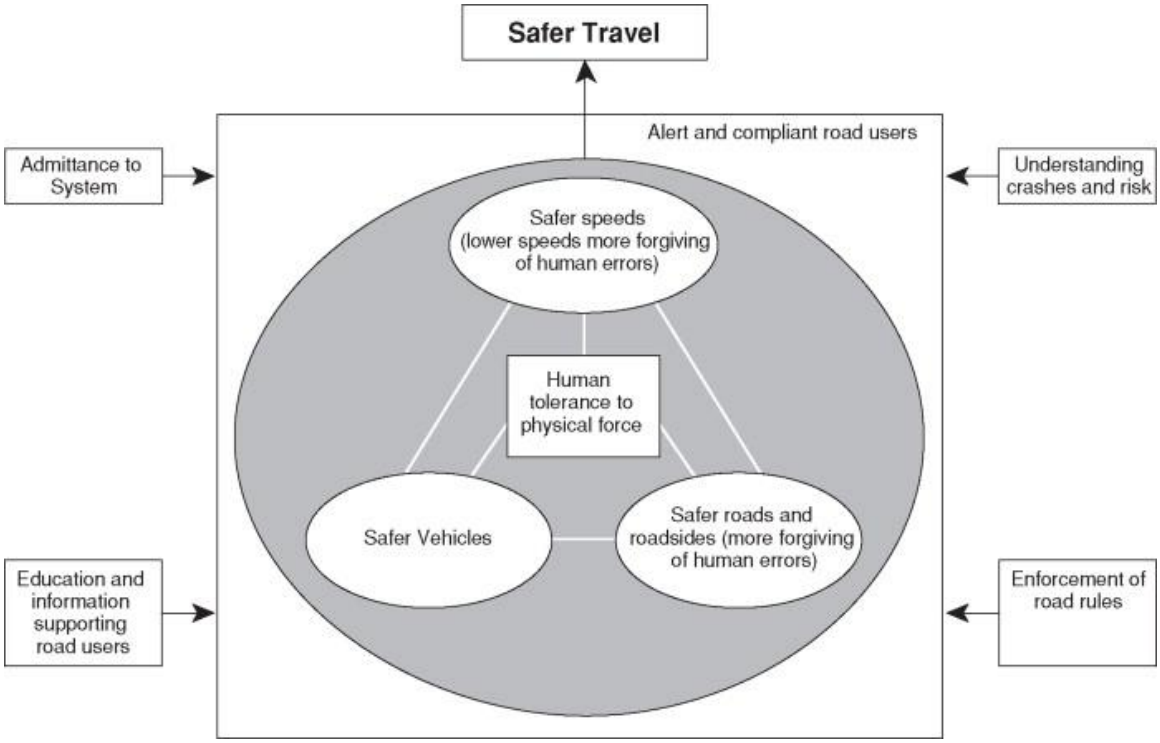


Figure 9: Safe System Management

The Safe System Approach (SSA) forms the basis of the UNDoA as well as the South African National Road Safety Strategy 2016 – 2030. The National Road Safety Strategy (NRSS) 2016 – 2030 that sets out to achieve the vision of zero road fatalities and serious injuries and requires that the road system be designed to expect and accommodate human error. Safe System Approach (SSA) principles require a holistic view of the road system and the interactions between roads and roadsides, travel speeds, vehicles, and road users. This is an inclusive approach that caters for all groups using the road system, including drivers, motorcyclists, passengers, pedestrians, bicycle users, commercial and heavy vehicle drivers.
The National Road Safety Strategy (NRSS) 2016 – 2030 (premised on the SSA) states that there are four critical areas for interventions that needs to be addressed to address road safety:

- **Promoting responsible road user's behaviour** which is seen locally and internationally as the greatest contributing factor to road crashes. Changing behaviour can only be affected by ensuring users are educated and aware of road safety, trained to behave appropriately and effectively discouraged from transgressing laws through enforcement. This includes the need to eliminate corruption.
- **Providing safer road infrastructure** with substantial proportion of deaths on the roads being pedestrian related, emphasis needs to be placed on developing and refining infrastructure design aimed at protecting vulnerable road users.
- **Delivering effective road safety management,** the entire strategy hinges on the effective leadership and governance to oversee that the implementation is completed, and operational requirements are effectively addressed.
- **Improving the quality of crash data and knowledge management** is an enabling element and a major shortcoming in the South African environment.

Addressing shortcomings in this area will allow for greater efficiency in the application of resources and better tracking of progress against set targets.

The NRSS 2030 is aligned with South Africa's NDP 2030, which sets national goals and objectives for the country (NDP). With regards to road safety the NDP 2030 has the following matters to be monitored and controlled which include:

- Roadworthiness of vehicles
- Vehicle driver behaviour
- Alcohol and substance abuse
- Addressing weaknesses in law enforcement.

The NRSS 2030 (pg. 7) stipulates that: "the process to develop the NRSS did not only focus on global commitments but also the national commitments". The key strategic themes to be addressed to achieve the desired state for road safety are:

- Improve coordination and institutional strength.
- Improve road safety data systems.
- Eliminate fraud and corruption.
- Ensure adequate funding and capacity.
- Enhance the use of technology to protect road users.
- Identify and address high-risk locations.
- Provide a self-explaining and forgiving road environment for all road users.
- Enable regular road safety audits on new and existing infrastructure.
- Increase vehicle safety standards.
- Ensure vehicles on the road network are roadworthy.
- Improve road user attitude and behaviour and involve communities in road safety.
- Improve enforcement effectiveness.
- Increase protection for vulnerable road users.
- Increase efficacy of first responses
- Simplify access to post-crash care.

The NRSS 2030 provides a framework for access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport. Outcomes from the analysis of previous strategies reveal the four key insights that this strategy aims to address (Wegman, Schemers and Van Schagen, 2013). These insights are:

- The critical role of stakeholder engagement – strategy needs to clarify the role played by all responsible stakeholders to minimize fragmentation of efforts and consideration of responsibility. This is associated with Pillar 1: Road Safety Management.
- Prioritise interventions appropriately – Prioritise and sequence interventions in accordance with the capacity to execute. Moreover, using data-driven intelligence and tailoring it to the specificities of the South African context increase the focus on implementation and management. This is associated with Pillar 1: Road Safety Management.
- Education of road users – There must be a focus on the education of all road users and promote responsible behaviour on the road. This is associated with Pillar 4: Safer Road Users.

- Quality of crash data- The collection and management of data need to be improved to enable the completeness of data to help make interventions more specific. Associated with Pillar 1: Road Safety Management (National Road Safety Strategy 2016-2030).

Western Cape Road Safety Strategy

Since 2014, the Western Cape Government has implemented the Safely Home Strategy which is a focused thematic communication strategy that strives to educate road users using specific road safety messages that are targeted, evidence led as well as aligned to other provincial and national strategies. The key focus is "Road Safety starts at home and if every person changes their driving habits for the better there will be fewer fatal road accidents. Although the evaluation does not mention heavy vehicle drivers as a specific cohort the success of this strategy is measured yearly and challenges that persist are highlighted as (TNS 2017; Kantar Pubic 2018):

- Knowledge – lack of knowledge of the rules of the road.
- Compliance – an unwillingness to abide by the rules of the road.
- Enforcement – inadequate enforcement.
- Follow-up – lack of follow-up on fines (enforcement).
- Impunity – resulting culture of impunity in respect to punishment of offenders.

Freight and Logistics Strategy 2007

The National Freight Logistics Strategy (Department of Transport 2007) aims to address (correct) the inefficiencies (unproductiveness) in the freight transport industry by focusing on achieving the following objectives:

- Lowering costs of doing business in South Africa.
- Addressing the absence of information that make it difficult to plan and integrate Government with private sector.
- Dealing with cross border freight operations and infrastructure in SA, the Southern African Development Community (SADC) and the Continent, so that the key players could develop a symbiotic relationship in trade.
- Facilitating seamless movement of cargo between first and second economy and addressing any hindrance to the movement of goods to achieve lower logistic costs.
- Corridor implementation initiatives.

Western Cape Provincial Freight Strategy 2019

The Western Cape Provincial Government developed the Provincial Freight Strategy (Department of Transport and Public Works 2019) to assist with the initiation of sustainable freight transport delivery in the province. The Western Cape Freight Strategy includes strategic actions to address the key issues in freight transport delivery in the Western Cape, where successful implementation of the Strategy will help in the transition to sustainable freight delivery.

Five guiding principles were identified for freight transport delivery in the Western Cape. A review of national, provincial, and local policy imperatives that have an influence on freight transport in the Western Cape, informed the development of the guiding principles. The freight

transport principles are ideals that the Western Cape province will strive for and are consistent with the requirements for sustainable transport delivery and relate to freight delivery best practice. The principles are **(Figure 10**):

- Freight transport network efficiency
- Inclusive economic development.
- Freight transport network safety
- Environmental sustainability
- Cost optimisation

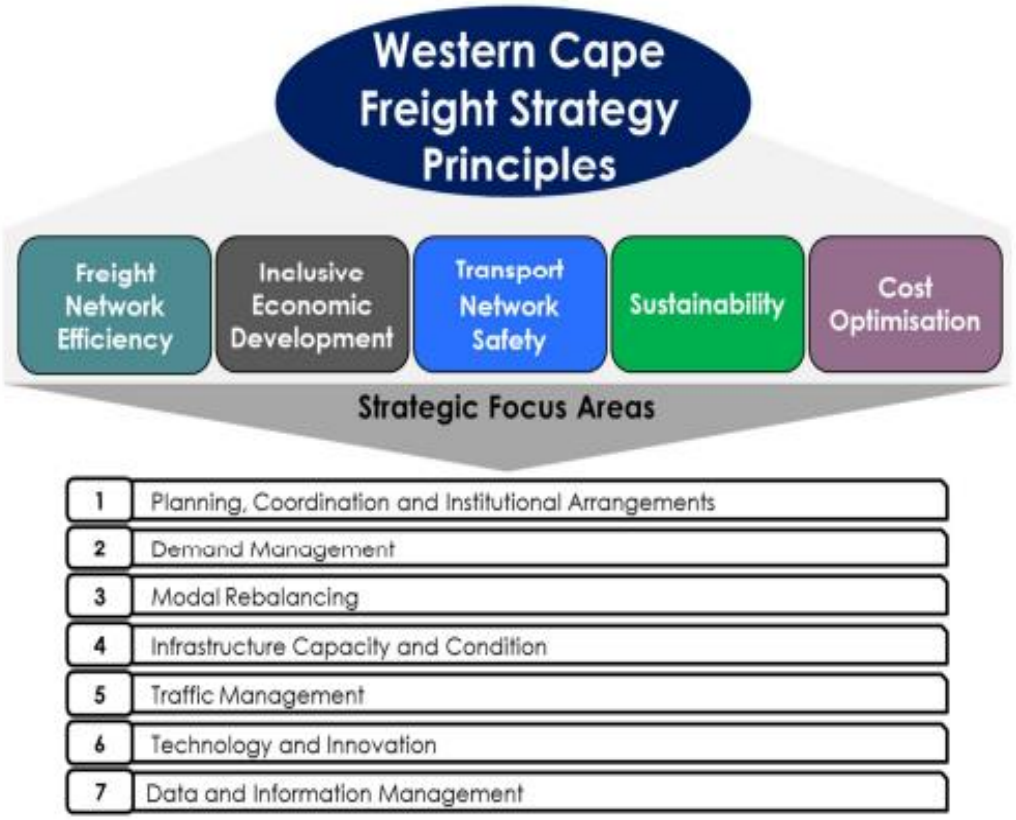


Figure 10: Western Cape Freight Strategy principles (Department of Transport and Public Works, 2019: 12)

3.4. Heavy vehicles in the context of the Western Cape

3.4.1. Background

In 2018 the World Health Organisation ranked South Africa at number 136 of 175 of participating countries regarding road safety. This ranking infers that South Africa falls within 30% of the poorest performing countries in terms of the relative risk associated with dying, due to a road traffic crash. South Africa and the Western Cape record a high number of crashes that involve heavy vehicles. A study conducted in 2007 showed that South Africa recorded more than twelve (12) heavy vehicle related fatalities per 100 million kilometres (B. Moore 2007). This was much higher than the average of four (4) fatalities per 100 million kilometres for the nine (9) countries in the study. Several issues contribute to the high number

of heavy vehicle crashes. Among these is poor driver behaviour, partly because of inadequate training. Such behaviour includes speeding, drunk driving, and dangerous overtaking. Reducing these crashes is important in achieving sustainable freight transport delivery in the Western Cape.

3.4.2. Western Cape registered heavy vehicles in comparison to South Africa

The Road Traffic Management Corporation (RTMC) 2023 study considered heavy vehicle and bus crashes for the period 2018 to 2022. According to the vehicle registrations, there were 41 759 registered trucks in the Western Cape. Registered heavy vehicles in the Western Cape make up approximately 12,8% of the total truck registrations (n=326 384) in South Africa and 0,4% of the total vehicle population (n=10 863 245) (RTMC, 2023).

3.4.3. Western Cape heavy vehicle crashes in comparison to South Africa

The RTMC analysis for the period of 1 October 2018 to 30 June 2022 investigated the number and type of vehicles involved in fatal crashes in South Africa. Over the analysis period a total of 48 330 vehicles were involved in 37 583 fatal crashes, with 66.9% of the vehicle registrations traced to the respective National Traffic Information System (NaTIS) classification. The study found that heavy passenger vehicles and heavy load vehicles (equipped to draw) were overrepresented by 6.9% and 5.4% respectively for fatal crashes in comparison to the total vehicle population (TVP). Considering that heavy passenger vehicles (mostly public transport type vehicles) and heavy vehicles travel more million vehicle kilometres (refer to section 2.3 of the RTMS analysis Annexure A) than other vehicle classes and would thus be exposed to more on-road conflict situations and/or to driver fatigue, it is expected that there are more fatal crashes for these classes. In addition, findings show that large heavy goods vehicles cause more fatalities compared to other vehicle classes/types. The types of fatalities associated with heavy vehicle crashes in the report included passenger, pedestrian, and driver deaths (Road Traffic Management Corporation 2023).

Number and severity of truck crashes

The RTMC made use of the number of registered self-propelled vehicles per province relative to the number of vehicles involved in fatal crashes recorded, to determine the percentage of registered self-propelled vehicles (trucks and busses) per province.

In line with the stipulations of the Protection of Personal Information Act (POPIA) 2013, the identity and exact location of the owners of the vehicles that were involved in the fatal crashes are not reported on, only the province in which the owner/business resides are provided to provide context in which provinces such owners reside (Road Traffic Management Corporation, 2023).

The analysis found that a total of 3 546 heavy vehicles (trucks) were involved in 2 237 fatal crashes with 2 926 fatalities recorded in South Africa. Truck crashes have an average crash severity of 1.33. The average crash severity (number of fatalities per crash) for crashes where trucks were involved in South Africa over the study period 2018 - 2022, is higher than for fatal crashes where all vehicles (including passenger vehicles) were involved (Road Traffic Management Corporation, 2023).

Truck crashes from operators registered in the Western Cape amounted to 236 or 6,7% of the truck crashes in South Africa (n=3 546) over the period 2018 – 2022 (**Figure 11**). A total of 168 fatal crashes occurred (7,5% of SA fatal truck crashes), in which 198 people died (6, 8% of SA truck crash related fatalities).

The crash severity for the Western Cape province was 1,2 (compared to the SA average of 1,3) and the average number of vehicles involved in the crashes were 1,4 (compared to the SA average of 1,6).

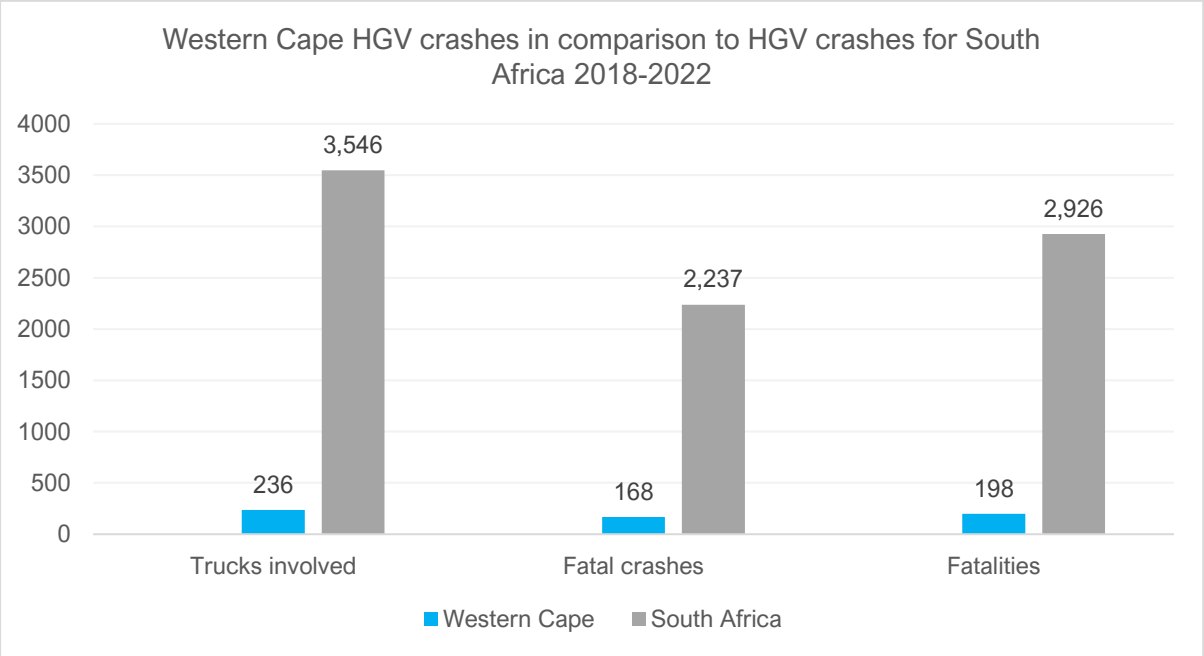


Figure 11: Western Cape heavy goods vehicle crashes in comparison to South African total truck crashes (Road Traffic Management Corporation 2023).

Figure 12 provide an overview of the type of fatal crashes involving HGV registered in the Western Cape, compared to the rest of South Africa. The single vehicle (left on the road) crashes are the most prominent at 20%, followed by accidents with pedal cyclist and fixed objects (~11%) and (~9%), respectively.

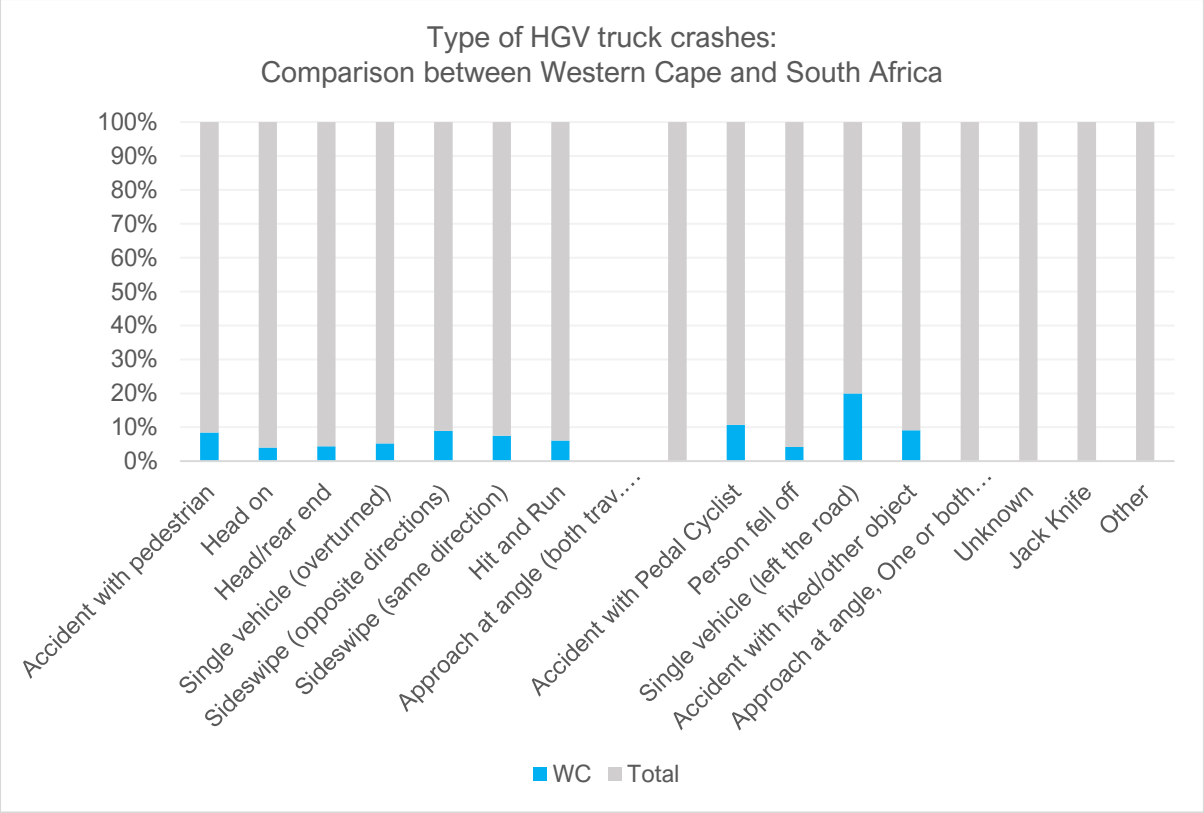


Figure 12: Western Cape heavy goods vehicle crashes in comparison to South African total heavy goods vehicle crashes (Road Traffic Management Corporation 2023).

Table 9 below provide an overview of the type of crashes where trucks were involved in the Western Cape. Trucks involved in fatal pedestrian crashes were the most prominent type of crash for the Western Cape (3,2%) followed by sideswipe in an opposite direction (0,8%), Single vehicle overturning and head on collision (respectively 0,6%) and head/rear crashes (0.5%). Non-motorised transport users involved in heavy vehicle crashes as well as fixed object crashes are problematic.

Table 9: Percentage of type of crashes involving heavy goods vehicles in the Western Cape *(Road Traffic Management Corporation 2023)*

Type of crash	%
Accident with pedestrian	3.2%
Head on	0.6%
Head/rear end	0.5%
Single vehicle (overturned)	0.6%
Sideswipe (opposite directions)	0.8%

Time of heavy goods vehicle crashes

Although province-specific information is unavailable, the RTMC report states that most crashes where HGVs were involved over the study period were between (Road Traffic Management Corporation, 2023):

- 18:00 and 22:00 on Saturdays with 5.3% reported crashes where HGVs were involved.
- 18:00 and 22:00 on Sundays with 5% of crashes where HGVs were involved (during the four-hour period between 18:00 and 22:00 on Saturdays and Sundays 10.2% represented fatal HGVs crashes).
- 18:00 and 21:00 on Fridays with 4.5% of truck related crashes.

Combined, fatal HGVs related crashes on Saturdays and Sundays constitutes 40.5% of fatal truck related crashes (Road Traffic Management Corporation 2023).

3.4.4. Cost of heavy goods vehicle crashes

The high number of road traffic crashes and their associated consequences has a significant impact on South African society, which in turn continues to hamper socioeconomic development and affects the well-being of all South Africans. This impact is measured in terms of human lives lost, "pain, grief and suffering," as well as an increasing cost to the economy (Labuschagne et al., 2017).

Calculating the cost of crashes included human casualty costs, vehicle repair costs and incident costs which was and estimated to be R142.6 billion in 2015 (RTMC, 2016). The cost of crashes study published by the RTMC in 2016 provides for the calculation of the cost of crashes on a section/s of road by using calculated severity costs for the unit costs per person, the unit cost per incident (crash) by severity and unit cost per vehicle type. In addition, ratios are provided to calculate severe injury, slight injury and no-injury where not known. The cost of crashes methodology adds 5% to the number of injuries, in line with international best practice, to allow for underreporting.

Road crashes and the subsequent trauma (fatalities and series of injuries) are a concern in the transportation of goods (Magazi and Mohammed, 2015; Assemi 2018). The number of road traffic crashes and the impact they have on the Country's economy is testimony to the fact that more needs to be done to curb this problem on South African roads. In South African society the high number of road traffic crashes and their associated consequences have had a significant impact on socioeconomic development and affecting the well-being of South Africans (Road Safety Annual Report, 2019). Road freight crashes have a cost on society because of injuries, fatalities, and damage to transported goods and infrastructure. In most cases, heavy vehicle related crashes are more severe and affect other transport network users such as commuters and pedestrians. The cost of truck[7] crashes to the economy between 2018 and 2023 was an estimated R 31 872 021 446 (Road Traffic Management Corporation, 2023). Reducing these crashes is important in achieving sustainable freight transport delivery in the Western Cape.

This impact is measured in terms of human lives lost, suffering, pain and increasing cost to the economy. The total cost of road crashes in 2017 amounted to an "estimated ZAR 162,05 billion, or 3,5% of GDP and in 2018 it amounted to an estimated ZAR 142, 29 billion" (Road Safety Annual Report, 2019). According to Arshad et al (2020: 4), Data obtained for the year

[7] The National Traffic Information System (NaTIS) define a "truck" as an articulated or an articulated-multiple truck.

2021 showed that HGV consists of 62% of road accidents and fatalities in South Africa (South Africa's Freight news, 2021). The official crash statistics for all South African provinces are compiled by the Road Traffic Management Corporation (RTMC). The RTMC publishes an annual road traffic report although the focus of this report is on fatal crashes and fatalities sustained in crashes. The estimated adjusted cost of crashes for 2021 is R188.3 billion (3.98% of the GDP for 2021). Previous research indicates that even though road authorities in South Africa collect crash data, the crash databases from different authorities illustrate the fragmentation that currently exists when it comes to crash data collection in South Africa (Department of Transport 2014). During this 2014 research it was found that none of the crash databases of different authorities were directly comparable (Department of Transport 2014).

Companies and owners of fleets, even individual drivers must incur certain costs. These costs could include vehicle insurance, costs paid for repairs, third party claims, medical costs, administration costs and human costs. Estimations of the annual costs of road traffic crashes can be used to allocate resources not only at a national (macro) national level but at micro and company level as well to ensure road safety is given due recognition.

Crash cost analysis involves two steps. First, quantify physical impacts, such as the number of crashes that occur, the number and severity of vehicle damages, human injuries, disabilities, and deaths. Second, monetize (measure in monetary values) these impacts. Estimates of unit crash costs by injury severity can be used to ensure that best use is made of any investment, through economic appraisal (De Beer and Van Niekerk, 2000). Potential economic benefits can be estimated based upon predicted crash savings. Economic benefits can be estimated after road safety interventions have been implemented, based on before and after records of crashes to which unit costs are applied.

Cost associated with crashes could have a significant impact on the bottom-line and potentially include (Labuschagne et al., 2017):

- **Administration costs:** This refers to the time and costs dedicated to deal with the costs (medical, psychological, third-party claims etc.) associated with crashes in a company.
- **Medical costs:** Medical costs result from treating casualties, e.g., the costs of hospital, rehabilitation, medicines, and adaptations for the handicapped.
- **Production loss/human resource hours lost:** Production loss refers to costs resulting from income and production losses. The consequence of the injured being temporarily or permanently disabled and the complete production loss of those killed. The calculations use the possible loss of production, i.e., the contribution (expressed in money) which someone could have made if he had not been injured or killed prematurely. It does not matter here if the injured or casualties had worked before the crash or would have worked in the future. The costs are calculated according to different kind of injuries and fatalities to show and to make prediction regarding the loss of human life as well as physical hours according to population, income, and gender (De Beer & Van Niekerk, 2000).
- **Human costs:** Human costs, also called human losses, refer to the loss of quality of life for casualties and their relatives and friends. These are costs in terms of suffering, pain, sorrow, and loss of the joy of living.

- **Material costs:** Material costs consist of the damage to vehicles, cargo, roads, and fixed roadside objects. The estimation of material costs is based on insurance data such as awarded damage claims, and on estimates of unclaimed damage and the own risk of those insured.

3.5. Crash causation and investigation theories

Several crash causation theories have informed the way in which crash investigations are approached today. The different theories are explained in the section below. Crash investigators need to understand why crashes occur, find the causes, and must be able to translate this information into corrective actions and interventions to prevent future crashes. Theories differ; the emphasis is on the investigator's understanding and application thereof. Heavy vehicle crashes are unique because of their size, manoeuvrability, and other factors. Crash investigations need to consider these unique characteristics.

3.5.1. Accident ratio theory

This theory **(Figure 13)** stipulates that for one (1) serious or major injury, there are at least ten minor injuries and thirty damage only crashes (Moore et al., 2020).

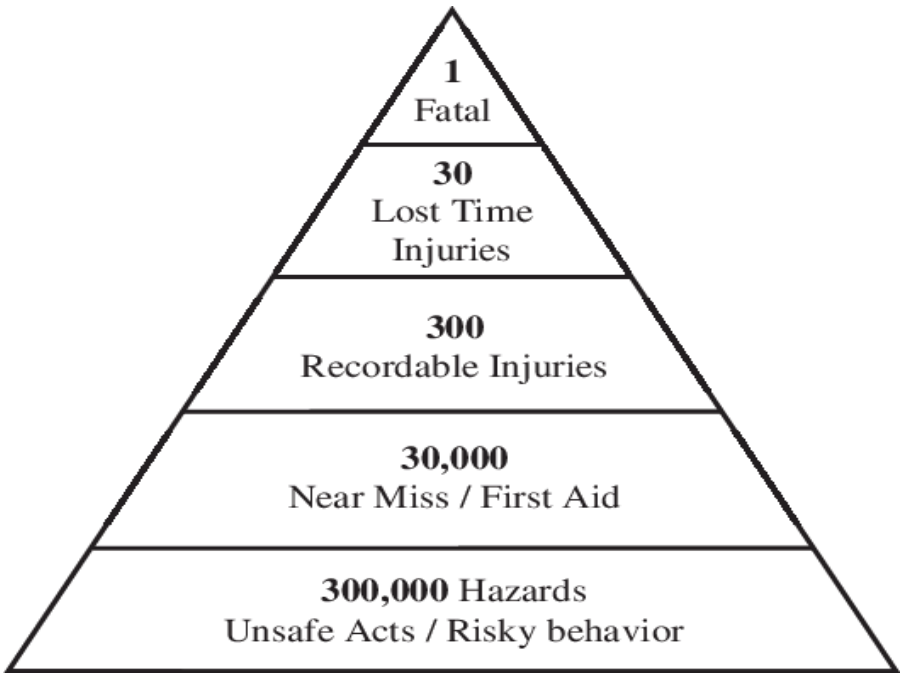


Figure 13: Heinrichs safety pyramid (Moore et al., 2020)

Crashes are in fact rare events and **Figure 14** below illustrates the injury pyramid showing the progression from traffic conflicts, to crashes where only damage to vehicles occurs up to the stage where the conflict results in serious injuries or fatalities.

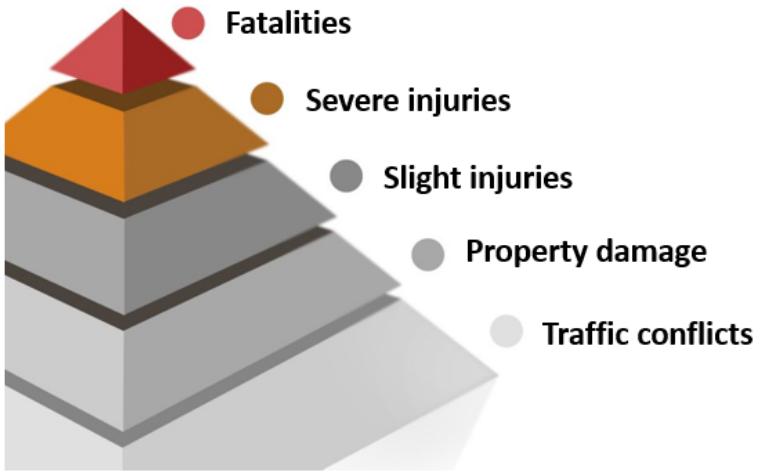


Figure 14: Injury pyramid

Fatal accidents constitute the top of the pyramid, and they are rare. Traffic conflicts, near misses/crashes (interaction between road users) that do not result in an accident form the base of the pyramid. **Figure 14** also shows that the frequency of occurrence of the specific type of injury decreases as you go up from traffic conflicts to fatal injuries at the top.

Expressing the number of crashes, injuries and fatalities as rates gives an indication of trends over time (Botha, 2005). A crash rate is one of the main indicators reflecting the processes of the transport system as well as their positive and negative development (Pakalnis, 2003). Crash rate, as a description of the transport system's functional operation, include complex relationships between the "road-vehicle-driver-road environments" since there are many factors and combinations thereof that may contribute to a crash. Exposure to risk expresses the likelihood that a crash could occur. This likelihood, expressed in terms of crashes per vehicle kilometres travelled or the number of registered vehicles and human population imply the level of safety.

The actual number of vehicle kilometres travelled is used to determine crash risk. Km/crash rates vary depending on numerous factors related to driver, vehicle, and geographic conditions, most of these risk factors do not change with annual mileage. The more kilometres a driver travels the greater his exposure to risk, and the higher the driver's chances of being involved in a crash. Crash risk per kilometres travelled increases in dense traffic because of the extended time on the road and therefore the exposure to risk is greater which could more easily result in a crash. Crashes per vehicle also tend to increase with more km/travelled per year.

The assumption is that if near misses and less serious crashes are more thoroughly investigated, major crashes can be avoided (Moore et al., 2020). Companies should invest in investigating and reporting minor incidents to understand the minor contributions and near misses. From investigating the minor accidents and near misses, it is possible to generate enough information to develop counter actions, which can potentially prevent large and costly

heavy vehicle crashes. The study of traffic conflicts and near misses are becoming increasingly important in understanding the causes of crashes (Dingus, 2006; Volvo, 2013). In the case of heavy vehicles, an understanding of how and why traffic conflicts occur between for example heavy and light vehicles, could provide valuable information related to driver behaviour, the road environment, the behaviour of other drivers in proximity to the heavy vehicle driver and so forth. This information can inform active (driver awareness and education) and passive strategies (vehicle design and cabin ergonomics) to prevent damage, injuries, and fatalities.

3.5.2. "Domino" theories

The domino theory suggests that one event will set a chain of similar events. Heinrich first published the domino theory of accident causation in 1931 (Oakley, 2005). This theory compares the events leading up to a crash (sequence of events). This theory considers the sequences of events (social environment, person fault, unsafe act, unsafe condition, injury). When the first domino falls, all the others follow, and it is difficult to stop or intervene before the crash.

The "Loss- Causation Model" redefines this concept by describing the sequence of events that lead to a crash as:

- lack of control where failure to maintain and comply with standards puts the sequence of events into action.
- basic causes that include personal and environmental factors.
- immediate causes which refer to the conditions that exist at the time of the crash.
- the incident and
- the loss, which refers to the death, injury, or loss.

The sequence starts with loss of control and eventually leads to loss of life, property, and other crash events.

3.5.3. Multiple causation theory

This theory expands on the above, "Domino theories" and highlights safe and unsafe acts as causes of crashes. This is based on the premise that it is not only one factor causing a crash. As a result, when investigating a crash, multiple probable causes (unsafe acts) are considered. Important for crash investigation procedures is the principle that a crash investigation is systematic, and the investigation continues until all probable causes are identified.

3.5.4. Epidemiological theory

Epidemiology refers to the study of how diseases occur (Baker 2012). The Epidemiological theory consists of the host, agent (what is causing the disease) and vehicle or environment in which this disease exists. During the past few years, the World Health Organisation (WHO) has extensively used this theory to highlight the burden of disease that road traffic crashes are to society. This model allows for determining the form of energy causing the disease, in this instance the road user, environment, or vehicle. The agent is analysed, and the reason or cause determined and addressed through corrective actions. The theory used alone is too narrow to be the only technique used in crash investigation but should be used in combination with other theories.

3.5.5. Haddon Matrix

The Haddon Matrix is used to illustrate factors and phases of injury when crashes occur (**Figure 15**). The dimensions of the Haddon Matrix include:

- The pre-injury phase referring to the cause of the crash.
- The injury phase referring to the crash phase.
- The post-injury phase that refers to the outcomes of the event (including death, injury, damage, or disability)

The Haddon matrix

		FACTORS		
PHASE		HUMAN	VEHICLES AND EQUIPMENT	ENVIRONMENT
Pre-crash	Crash prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and road layout Speed limits Pedestrian facilities
Crash	Injury prevention during the crash	Use of restraints Impairment	Occupant restraints Other safety devices Crash protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skill Access to medics	Ease of access Fire risk	Rescue facilities Congestion

Figure 15: Haddon Matrix

This theory is useful in determining how the crash occurred as well as understanding the causal factors in relation to other road transport elements. The Haddon Matrix is one of the most popular theories used to explain road traffic crashes in a specific context.

3.6. Heavy vehicle crash types

Many aspects such as roadway, driver intellect, sensory conditions and vehicle conditions affect the crash circumstances. The design of heavy vehicles is such that they have high aggressivity (weight of the vehicle in comparison to speed), presenting a significant risk to other road users, and poor crashworthiness, presenting a risk to HGV occupants. Type of heavy vehicle crashes are described below:

Rear-end collisions occur due to sudden slowing or braking. Moreover, the vehicle behind might not have maintained an adequate following distance, accelerated too quickly, or simply not realise what is happening to stop quickly. In this vehicle collision, injuries to the occupants of the impacted car tend to be worse, with whiplash being a common injury for all drivers and passengers (Sridharan 2020:16) “Fault is usually attributed to the vehicle that rear-ends the front vehicle due to not being within stopping distance, following too closely, or lack of attention’ (Sridharan, 2020).

Side-impact collisions are also called T-bone collisions. It occurs when the side of a vehicle is hit by the front or rear of another vehicle or object. Damages to the vehicle and injuries to

the driver or passenger are more likely to be severe in this type of crash. These factors vary based on the part of the vehicle as well as the vehicle's safety features including airbags, and the speed of both vehicles involved in the accident (Sridharan, 2020).

Head-on collisions happen when the front of two vehicles that are facing each other collide. This type of vehicle accident often leads to fatalities.

Single vehicle crashes include crashes where a vehicle might strike other objects such as a pole, trees, fire hydrant, walls, or may involve a pedestrian. Single-vehicle accidents may result in property damage and personal injury (Sridharan, 2020).

Multi-vehicle pileups involve multiple vehicles. They typically occur on freeways and are of the deadliest kinds of vehicle accidents. Being trapped inside or between crumpled vehicles makes it difficult or impossible to escape. Fire presents an additional threat because it can quickly spread to spilled fuel and cover the entire crash area. Determining the cause of these multi-vehicle collisions is often difficult (Sridharan, 2020).

Hazardous goods accidents: A hazardous goods accident is an incident where, while being transported, there is spillage, leakage or other escape of company products or wastes including raw materials, processed chemicals, or catalysts. This also includes any incident where there is a real or perceived danger of a chemical release where the road must be closed, public evacuated or other precautionary measures taken (CAIA, 2008).

3.7. Contributory factors to heavy vehicle crashes

Traditionally, the driving task is represented as involving the interaction between the driver, vehicle, and environment. Driving is a complex task that involves specific cognitive, perceptual, motor, and decision-making skills (George, 2004).

Figure 16 illustrates contributory factors/events or circumstances that contribute to the crash causation and include root causes, basic causes, lower and higher-level causes as well as management causes (Oakley, 2005).

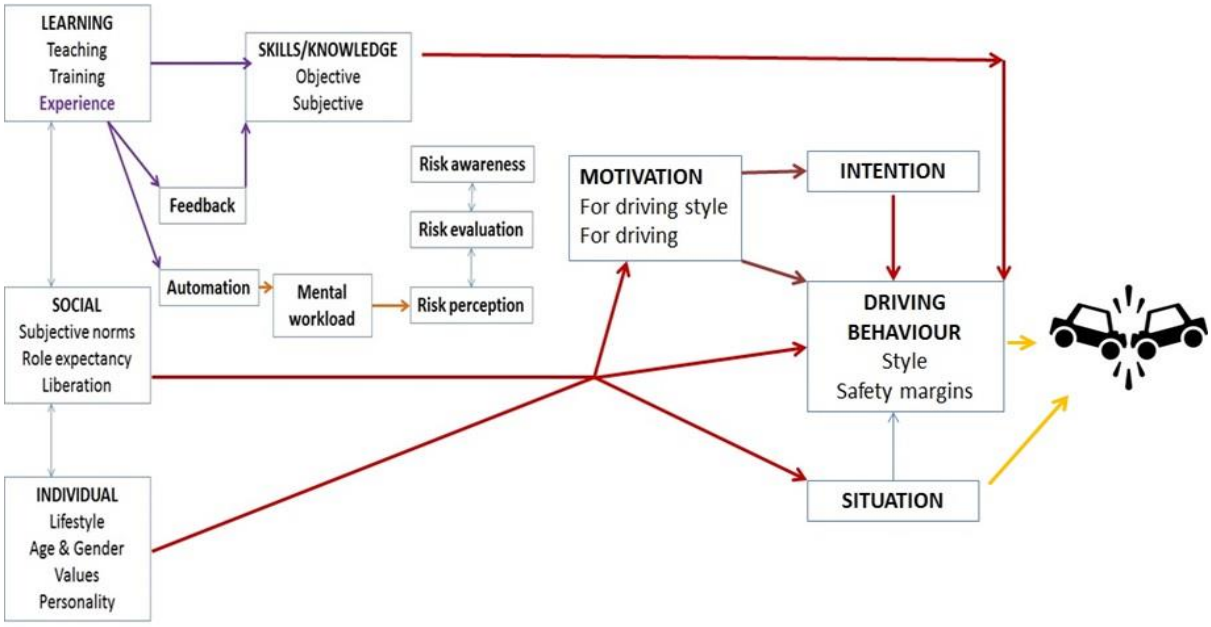


Figure 16: Contributory factors to crashes (adapted from Venter and Sinclair, 2014)

Corrective actions and interventions that aim to prevent future crashes and crash investigations form the basis of the development of these actions.

3.7.1. Human factors

Behavioural factors

Behavioural factors that contribute to crash causation can be grouped in four categories (Petridou and Moustaki, 2000):

1. Behaviours that reduce capacity over a long-term period e.g., inexperience, aging, disease, disability, substance abuse.
2. Behaviours that reduce capacity over a short period of time such as acute intoxication, drowsiness, acute psychological stress, and temporary distraction.
3. Behavioural attributes that promote risk-taking behaviour with long-term implications e.g., overestimation of driving skills, habitual speeding and disregard for traffic rules and regulations.
4. Behavioural attributes that refer to risk-taking behaviour with short-term impacts such as the use of psychotropic drugs, ethanol, motor vehicle crime and suicidal tendencies.

Behavioural factors such as “stopped” or “neglected” vehicles and “incorrect following” have a greater chance of incidents in vehicle crashes. Aspects such as “cellular phone usage”, “failure to yield right of way”, “negligence”, and “failure to comply with traffic law” also have a major chance of resulting in fatal vehicle crashes.

Human error

Human error includes inadequate driver training and techniques, driver distraction, and falling asleep. In 2014, the then Minister of Transport highlighted that many heavy goods vehicle drivers did not have adequate skills to handle vehicles they use to convey goods. Based on the statement made by the Minister, a set of requirements for obtaining a heavy vehicle driver’s license for heavy vehicles was then introduced (Figueredo et al., 2019).

Driving and exposure to risk

Research has found a clear relationship between longer professional experience and a reduction in reported involvement in accidents and near-miss accidents, regardless of age, substance use, working conditions and behaviour in traffic (Girotto et al., 2016). Driving experience is an indicator of how familiar a driver is with driving a heavy vehicle as well as the challenges associated with driving a heavy vehicle safely (Magazi and Mohammed, 2015).

Driving long distances without resting

Long-distance travel without rest can lead to fatigue and over time can result in the driver falling asleep while driving **(Figure 17).** Driving fatigued leads to slowed reaction time, poorer judgment, tunnel vision and micro sleep episodes, missing important cues or signals from the road environment, inconsistent speed and lane position and a decreasing ability to identify excessive sleepiness. Many heavy vehicle drivers are often not aware that they are driving tired until it is too late and sometimes even if they realise there tired, they do not stop and rest (Venter, Mohammed, and Labuschagne, 2013). Various sources have stated that many accidents involving heavy vehicle drivers are because of traveling long distances, the absence of adequate law enforcement, and human factors (Naude and Chitakunye, 2014).

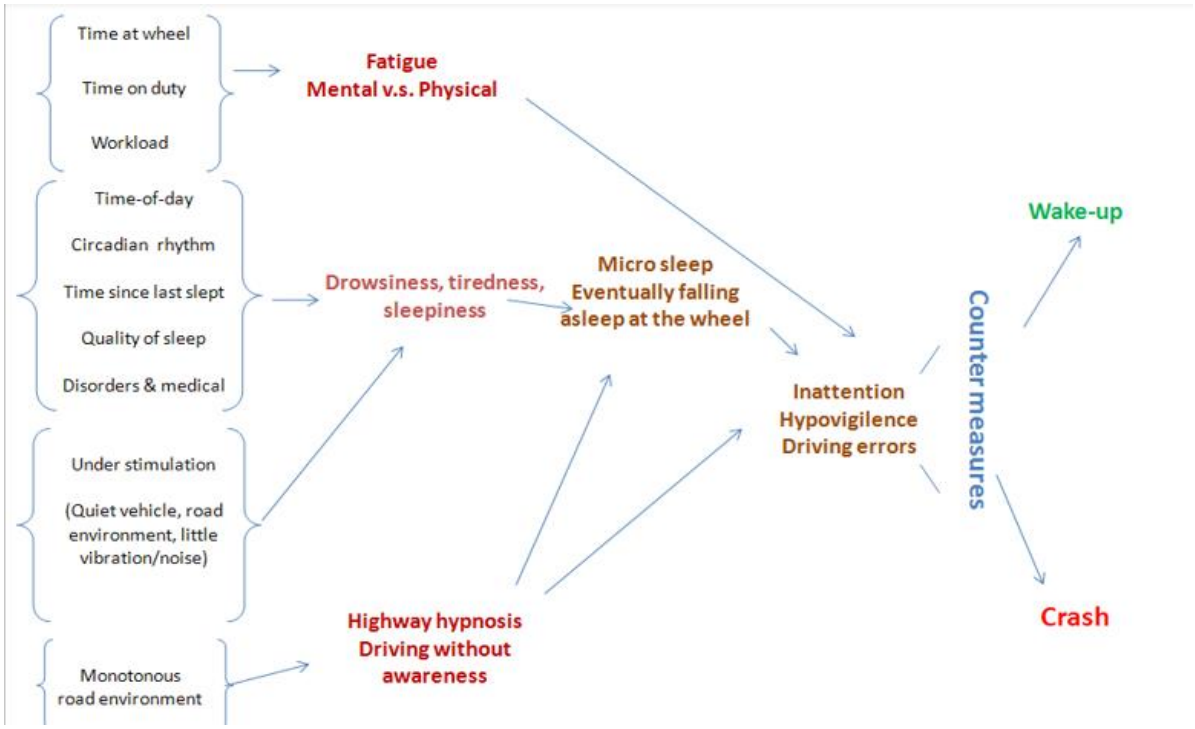


Figure 17: Contributory factors and consequences of heavy vehicle driver fatigue (Venter et al., 2013)

Circadian disruption and sleep deprivation leads to reduced states of alertness, impaired performance and a worsened mood and eventually fatigue. Lal et al. (2001) states that fatigue and drowsy driving are frequently reported for night-time driving, long hours of driving as well as driving in monotonous conditions. Sleep disorders coupled with fatigue, increase risk associated with being involved in a road traffic accident. Hypersomnia due to sleep apnoea (cessation of breathing for brief time periods when sleeping) has been associated with inferior performance on cognitive streaming. Cognitive streaming is a key component of driving and making split-second decisions while driving as cognitive streaming refers to the individual's ability to perceive added information, influences perception as well as the ability to communicate effectively. Psychomotor impairment is also positively correlated with fatigue when driving, which means that the individual does not have the ability to maintain an elevated level of attention and concentration as is required to drive safely. Mental fatigue has not yet been researched fully and the effects of neurophysiologic and cardiovascular activity when fatigue might be crucial factors in understanding driver fatigue (Lal et al., 2001).

Sleep disorders such as obstructive sleep apnoea increases the risk of a crash occurrence. Those drivers who suffer obstructive sleep apnoea often experience daytime sleepiness, challenging the performance of tasks requiring vigilance and alertness (Stevenson et al., 2010).

Heavy vehicle drivers often sleep in their heavy goods vehicle vehicles in a rest area and that is not conducive to proper rest. Naude and Chitakunye (2014) illustrate that drivers were being reported to have an average of 4 to 5 hours of sleep per night, and sometimes that sleep can be interrupted because of poor working conditions. Heavy vehicle drivers are often

remunerated per kilometre or load and to increase income they do not sleep enough (Maldonado 2002).

Professional drivers are not allowed to drive under the influence of alcohol (South African Road Safety, 2019).

Hazard perception

Hazard perception is a skill that develops over time (**Figure 18**). Age is associated with improved ability to recognise hazardous situations in the road environment and has important implications for safe driving practices as the ability to predict and react to dangerous events in the road (Jackson 2008).

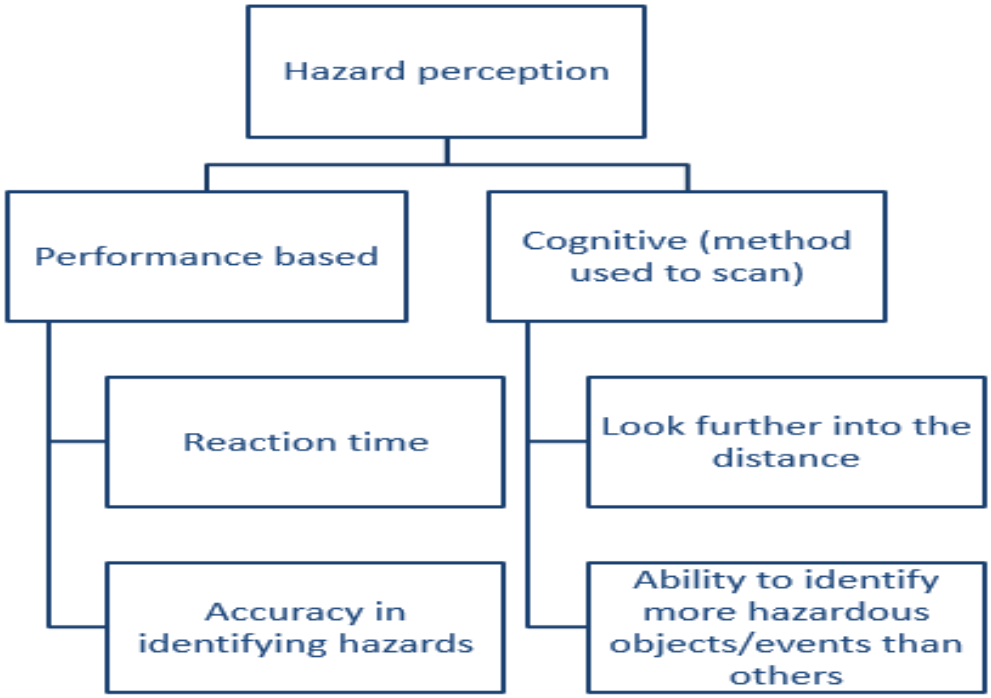


Figure 18: Hazard perception development (Venter and Sinclair, 2014)

3.7.2. Road environments and vehicle dynamics

Heavy vehicles constitute approximately 3% of the total vehicle population in South Africa (Road Traffic Management Corporation, 2021). Even though there are only a small percentage of heavy vehicles in the traffic stream, they are noticeable. Due to the size of the vehicles and their operating characteristics, heavy goods vehicles have a more significant effect on traffic flow than personal/light vehicles.

The presence of heavy goods vehicles also necessitate that local provincial authorities would or should have various levels of service (LoS) for heavy vehicles in comparison to personal and passenger vehicles. Heavy vehicles take up more physical space, the way they accelerate, brake and manoeuvre differ from other vehicles.

Operating behaviours differ and are influenced by factors such as how the road is designed, slopes, grades, traffic flow and presence of other road users including non-motorised transport users. Inner city streets are often crowded, and business districts have distinct pedestrian, delivery, and personal travel activities characteristics. In addition, heavy vehicles delivering

goods in business districts add to the congestion as they often do not have designated loading zones, they hamper the flow of traffic in areas where they must deliver goods and so forth.

These factors could play a key role in the way HGV contribute to congestion in urban areas. Contributing to this problem is poor driver behaviour, unroadworthy vehicles, vehicles travelling too fast or too slow for the prevailing traffic conditions as well as slow vehicles on freeways not keeping to the left-hand lane. Congestion is due to several factors that includes sudden changes in vehicle speed, road environments, and the mental and physical condition of the driver. Congestion contributes to higher stress levels, aggression and even blood pressure increases. Congestion also influences delivery times (origin to destination), fuel consumption as well as exposure to risk as longer time in traffic is correlated with higher risk. However, in terms of safety, congestion can reduce the severity of crashes and the associated consequences:

- Traffic congestion crash analysis clearly indicates a **decrease in crash frequency.** Fever crashes occur because the traffic is slow-moving and there is an almost involuntary raise in driver alertness.
- Traffic congestion slows vehicles down. This means an automatic reduction in speed which will **reduce the impact** of a crash. Therefore, speed reduces the amount of available time needed to avoid a crash.
- **Crash severity** declines with **speed reductions** which results in less serious or fatal injuries.
- **Drivers are more cautious** in dense traffic. Drivers' motivation for not being in a crash will differ and may include fear of death or disability or be related to property and damage costs.

3.7.3. Road safety performance indicators for heavy vehicle safety

RSPIs also include indicators for heavy vehicle safety. Social and financial costs of road traffic crashes impact not only on the socio-economic development of the country but on communities and individuals alike. RSPIs provide a means to assess these costs (impact) to develop targeted programmes and interventions to curb road traffic crashes.

As an example, the United States of America (USA) adopted the SSA and the vision for zero fatal crashes and fatalities, including heavy vehicles. **Figure 19** illustrates the reporting of heavy vehicle crashes and associated RSPIs on a national, regional, and county scale. This includes reporting of contributory factors, aligned with SSA pillars.

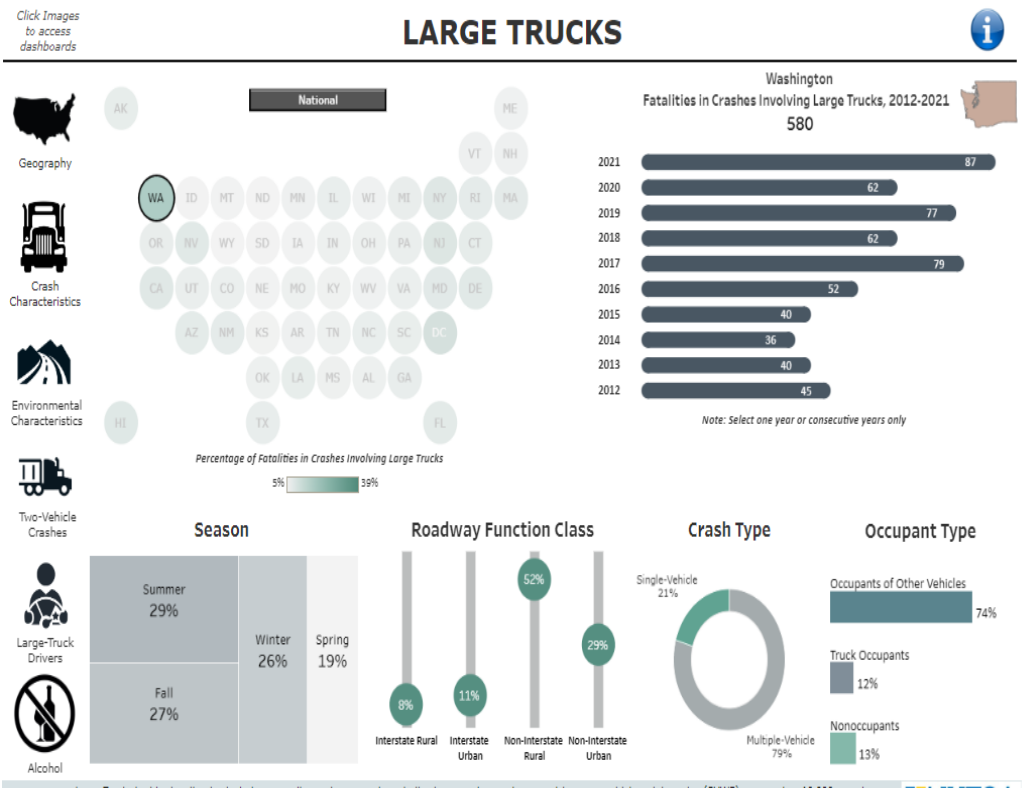


Figure 19: USA (Washington State) heavy vehicle/truck road safety indicators

However, it is unfortunate that specific heavy vehicle crash data is not readily available in South Africa. Primary indicators for heavy vehicle crashes refer to the outcomes (number of crashes, fatalities, and total cost to the economy) while examples of secondary indicators are:

- the number of heavy vehicles exceeding the speed limit.
- the number of heavy vehicle drivers observed not wearing a seatbelt.
- The number of rest or truck stops along a given freight route.

3.8. Organisational approaches to address heavy vehicle safety.

3.8.1. Workplace road safety and occupational health and safety plans

Work-related drivers are defined as those who drive a fleet vehicle at least once a week for work-related purposes, this in some countries also include those people who commute from work to home and vice versa (Newman, Tay and Mason, 2006). Work-related driving spans several industries which include transport and coordination companies, courier services as well as police and emergency services. It might also include drivers driving with subsidised company vehicles, truck drivers and even those driving from point A to point B to attend meetings. Newman et al (2006) indicates that road safety is a great concern for those involved in work-related driving.

Accountability for staff safety lies with senior management. In fact, if fleet safety is left at middle management level, it signals to the organisation that it is not important at all. A top-level senior manager must therefore take accountability for fleet safety within the organisation. Such accountability will ensure that fleet safety is on the organisation's agenda at the highest level and provide the appropriate executive line authority for allocation of resources and for the

approval of plans to enable the organisation to act. Supervisory control over the behaviour of travelling employees is less than compared to supervisory control in other work environments where employees are confined to a specific physical space. Employers have even less control over external factors, circumstances and conditions influencing employees on the road. Traffic volumes and road construction are on the increase. Workers/drivers might feel pressure to drive faster, for longer periods of time, taking more risks. In addition, drivers are required to manage and use in-vehicle technologies that could add to inattention while driving.

Drivers are often required to deliver goods and services to clients, on budget and on time. Private sector companies are profit driven and the occurrence of crashes impact negatively on the bottom-line. There is a need for management of road transport organisations to implement a systems-thinking approach and safety management systems in road transport organisations. Workplace road safety programs are based on the idea that employers should take responsibility for ensuring a culture of road safety in their organisations. A culture of road safety refers to a top-down approach to install good road safety values in employees. Occupational road safety means that all employees are exposed to road safety messages that encourage a company-wide drive to behaving safely on the road.

The management of road transport organisations must provide an opportunity to identify and reduce the frequency of unsafe driving behaviour by implementing corrective measures, such as coaching. Of particular importance is the improvement of knowledge sharing and situational safety practices. Safety training and education are highlighted as key factors in managing road safety for work-related driving of HGVs (Grinerud, 2022). Time pressure and fatigue are potential enhancers of commuting accidents the same way these factors are enhancers of accidents involving professional drivers. Findings concluded that 44% of the commuting crashes involved drivers with less than ten years of tenure concluding that job experience and training as protective factors are crucial for road safety efforts (Grinerud, 2022).

One of the main elements of the drive for workplace road safety revolves around the fact that all employees are road users and are in some way exposed to road related hazards, whether they are pedestrians, cyclists, private motorists, or professional drivers employed by the company. To achieve a certain level of road safety within the organisation is important that employees and management are committed to the programme.

3.8.2. Organisational management

Companies can improve efficiency, productivity and curb the loss of life by embracing a comprehensive approach to driver management. Improved operations and increased efficiency and productivity would overall benefit the country in terms of improved operations, infrastructure, and network, benefiting the economy.

Grinerud (2022) conducted a study to identify key elements that influence driver training and education to prepare an overall framework for how safety training could be executed and what the content should consist of. Safety training would be directed towards all parties in the system of work-related driving of HGVs.

According to Newman et al. (2003), organisations that implement fleet safety initiatives can realise considerable cost reductions. The critique issued in this paper concerns the evaluation of these initiatives which seldom take place. The argument is that the planning and design of

the evaluation programme should have a strong theoretical basis. Social psychological frameworks can be used to conceptualise each underlying social psychological process. They then examine the extent to which these processes influence and change driver attitudes.

It is stated that transport organisations have little focus on organisational safety management (OSM), and thereby also little focus on Safety management Systems (SMS). Nævestad et al (2022) identified five criteria for developing an organisational strategy for evidence-based organisational safety measures. The criteria are as follows:

- address risk factors found in previous research.
- influence safety outcomes in previous research.
- be attainable at a low cost,
- not be too complex, content-dependent, or comprehensive.
- complementized to existing safety management standards.

It is stated that driver behaviour is affected, among other factors, by the perceived level of stress, which is in turn influenced by how the transport task is scheduled and executed (e.g., fatigue risk due to long working hours, as drivers get paid for actual production). Route planners must be aware of this risk when scheduling transport routes. The implementation of training programs for managers is highlighted as important. Unfortunately, socio-economic conditions in South Africa are not always favourable and many drivers are paid per trip. This is a catch twenty-two situation as drivers who are paid per trip tend to make as many consecutive trips as they can to earn as much money as possible.

After scrutinising South African literature, it seems as if, although there are guidelines for minimum driving hours in South Africa, these guidelines are not implemented. There are, however, stringent controls in place for dangerous goods truck drivers and some of the bigger companies do have a buddy/twin driver system in place.

3.8.3. Third-Party Organisations and Regulatory Bodies

Different studies highlight third-party organisations and regulatory bodies as important parties that can influence safe road transport using HGVs. Grinerud (2022) states that time pressure is a critical problem in the transport industry and that, for example, transport buyers and forwarding agents are likely to put pressure on drivers. This means that drivers take greater risks while driving due to tight time margins for assignments (Nævestad 2022).

In Norway, transport buyers and forwarding agents can also influence safe road transport through the requirements they set. These requirements include that drivers must have winter driving proficiency before transporting their goods on winter roads (Nævestad 2022). It is stated that a lack of skills to drive on Norwegian winter roads is a road safety challenge. The management of road transport organisations' choice of strategy influences what kind of customers they acquire, and the organisations are directly enhancing or decreasing road safety for work-related driving of HGVs through organisational policies.

Governmental and regulatory bodies are important for the management of road safety for work-related driving of heavy goods vehicles. Governmental bodies are limited to those who approve legal acts, while regulatory bodies are limited to those who enforce laws and regulations. They play a key role in maintaining safety at all levels through their regulations and policies. Government and regulatory bodies need to enforce laws and regulations to

prevent unsafe driving practices and help drivers and road transport organisations overcome challenges in applying these regulations (Grinerud 2022).

3.8.4. Driver and fleet risk management in support of safer road users

Rose and Heyns (2014) state that risky driver behaviour can be reduced through the implementation of a driver risk management system to improve driver skills development and training. To mitigate this, Rose and Heyns (2014) found it critical to analyse driver behaviour and reduce the riskiest behaviours as much as possible.

Organisations that prioritise management activities to influence risky driver behaviour through proactive strategies not only reduce the associated risk and cost of unsafe driving, but also improve organisational efficiency and driving skills development. Organisations must be able to identify risky driving behaviour and implement a preventative process to correct and reduce risky driving behaviour before it causes an accident or injury. According to Johnson et al (2021) to effectively manage and reduce risky driving behaviour, and improve skills development, organisations require a proactive and comprehensive risk management platform. System parameters, activation, event analysis, and a management tool should all be included in an effective Driver Risk Management System (DRMS) to improve vehicle driving skills.

The DRMS must be capable of monitoring driver and vehicle performance, as well as capture and upload only those unsafe driving events that are relevant (Johnson et al., 2021). The risky driving events must be analysed and scored to determine the best course of action. The DRMS should also provide an easy-to-use management tool that profiles risky drivers and provides relevant supporting evidence that can be used to provide feedback to the organisation and driver. To determine the best course of action, the risky driving events must be analysed and scored. The DRMS should also include an easy-to-use management tool for profiling risky drivers and providing relevant supporting evidence that can be used to provide feedback to both the organisation and the driver. However, the driver should be able to recognise and modify his own risky behaviours (Guppy and Guppy 2003). A good DRMS should therefore provide feedback to both the driver and the organisation, reducing risky driver behaviour entirely.

Driver risk management systems to improve vehicle driver skills is being implemented through selected DriveCam implementations in South Africa (Rose and Heyns 2014). A case study based on selected DriveCam implementations in South Africa was created to test the framework. The framework required that the system be capable of identifying risky driver behaviour and proactively managing it so that risky driver behaviour is modified to prevent incidents, rather than only identifying such behaviour after an event has occurred. The DriveCam system is a DRMS that consists of several components that work together to form a complete management system. The parameters require that the system be set up so that it can monitor the telematics of a vehicle and should also include aspects such as accelerometers and GPS. This functionality is provided by the DriveCam system, which can also be parameterized for a specific type of vehicle so that activation is appropriate for the vehicle type. The DriveCam system includes intelligent activation to guarantee that only relevant events are recorded (Rose and Heyns 2014). It also filters out events triggered by noise, allowing events caused by risky driving behaviour to be managed. In addition to automated activation, the DriveCam system allows for manual activation, so that a recording of an event can be uploaded and stored in the system if the driver believes it is warranted. The system requires the driver to be aware of system activation as well. Because the system's goal

is to modify risky driver behaviour, improve driving skills, and awareness of system activation will aid the driver in becoming aware of risky driver behaviour and changing their own risky behaviour patterns.

The analysis of the events that triggered the system is the most critical aspect of the framework. DriveCam-recorded events are analysed off-site by DriveCam analysts, ensuring consistency, fairness, and impartiality. Based on this, activities are scored against a pre-determined scoring system, allowing both the organisation and the driver to focus risky behaviour prevention efforts on only the behaviour that is likely to result in a serious event or incident. Thus, every system trigger could be made up of one or more transgressions, each with a numerical score ranging from 0 to 10. The sum of these is used to calculate the overall event score. Events that triggered a recording are not viewed in isolation in the DriveCam system, but rather used to develop driver profiles to determine which drivers are most at risk of accidents and which of their behaviours are most likely to result in such events. This is done to improve their driving skills. DriveCam not only performs driver profiling, but also provides a fleet profile dashboard, allowing the organisation to identify potential problem areas and manage them accordingly.

Hanowski et al (2010) and Muronga (2015) investigated the use and effectiveness of naturalistic driving methods for improved driving behaviour. According to Hanowski et al (2010) naturalistic driving is a new study method that involves gathering data on driver behaviour and performance in the real world. For heavy vehicle drivers this entails gathering data from drivers as they go about their normal, revenue-generating delivery routes. The premise is that the data-capturing equipment is installed in the participant's vehicle and collects data as the driver uses the vehicle on daily deliveries ((Muronga 2015). Naturalistic driving studies are distinct in that they combine elements of epidemiological and empirical data collection to capture information that may not be entirely available from either of these two approaches alone. If the research's primary focus is on driver behaviour and performance, empirical data collection is regarded as a more powerful method for assessing cause-and-effect relationships because it provides a controlled set of conditions. Laboratories, driving simulators, test tracks, and open roads are frequently used to collect data in a controlled environment (Muronga 2015). Commonly, participants performance and behaviour are evaluated. This is done to monitor driver behaviour and performance in natural environments to improve long haul vehicle drivers' skills. The benefits of using the naturalistic methods are as follows: The method can get full, detailed pre-crash data and information on driver behaviour including fatigue, driver errors, and distractions.

3.8.5. Vehicle dynamics and in-vehicle monitoring

Driver assistance technologies

With Advanced Driver Assistance Systems (ADAS) the interaction between the driver, vehicle, in-vehicle systems, and environment becomes increasingly complex. New in-vehicle systems can adapt to a driver's current driving style or driving performance, and many of these systems are designed to communicate with each other. The driver must anticipate and respond to the systems as well as in some instances interact with the in-vehicle manager or "supervisor" of those systems. Technology is having unavoidable and fundamental impact on the way a person drive (European Commission 2016).

In-vehicle driver and vehicle monitoring

A 2014 study by the Department of Transport found that the use of technology is essential in the quest by freight transport operators to improve driver performance by constantly monitoring their behaviour and using the information and knowledge to produce interventions to modify behaviour for the better. In instances where drivers were involved in an accident, it was felt that the availability of technology would be of benefit in assisting in the investigation of road accidents involving freight vehicles. A recommendation was that the road freight industry should move towards adopting these technologies and that it should be compulsory for all operators (Department of Transport, 2014). The cost of these devices increases the operational costs to companies, which they pass on to clients. Clients may choose to make use of other (cheaper) operators despite those not having adequate road safety practices. According to operators the costs involve a once of fee for purchasing the devices but then an additional rental and maintenance fee is due per device per month.

The type of data that is generated through the employment of such system is invaluable. The information can be used to develop vehicle profiles as well as driver behaviour profiles that could be utilised to design and implement a company specific road safety programme. It could also assist in route planning, identification of hazardous locations etc. Two aspects of road safety are said to improve when making use of in-vehicle technologies (Labuschagne and Pallet, 2010). Aspect 1 is in-operation data to learn about the workload of the driver as it relates to a drivers' aptitude, and aspect 2 is the conditions in which the driving takes place. For both safety aspects, similar technologies are available on the South African market and is sold as "fleet management" solutions.

Technologies that assist with monitoring fatigue levels, GPS-based devices that monitor the location of vehicles and even speed and fuel efficiency of vehicles, are employed to improve efficiency and productivity of vehicles and drivers on the road. In most instances this is done to lower cost to the company. Different technologies are used by companies to manage medium to large fleets.

Route planning, pre- and post-trip inspections, debriefing of drivers after a trip, HIV and health checks, are standard procedures in many companies who wish to ensure that their drivers and vehicles are in good condition to do the work that is required. In-vehicle technologies such as tracking devices and speed limiters are the most used technologies by the operators.

Drowsy driver warning system

The National Highway Traffic Safety Administration (NHTSA) along with the Federal Motor Carrier Safety Administration (FMCSA), and the Intelligent Transportation System Joint Program Office (ITS JPO) conducted research into the potential safety benefits of deploying a drowsy driver warning system (DDWS) in heavy vehicles (Stephen 2016) cited by Hanowski et al (2010). Attention Technologies, Inc. contracted the Virginia Tech Transportation Institute (VTTI) to conduct a Field Operational Test (FOT) of a working DDWS prototype (ATI). The Driver Fatigue Monitor (DFM) prototype was designed to alert drivers when drowsiness was detected using auditory and visual alerts.

In-vehicle technologies such as driver warning and alert systems that are used to warn drivers of fatigue for the driver to take appropriate precautions to reduce heavy vehicle crashes (Venter et al, 2012). Moore et al (2014) illustrates that vehicle technologies are associated with

the lower incident and injury rates where there is risk. Furthermore, Venter et al (2012) stated that drinking coffee, switching the radio on, playing music, and opening the window are some of the countermeasures which can relieve boredom as well as stopping the vehicle to rest or sleep for a while. The other strategy for road safety on the management level is that practices pertaining to scheduling shift work, and working hours as well as education and awareness, programs are deemed important to alleviate fatigue and drowsy driving as road safety problems (Venter et al 2012).

In various countries around the world, it is mandatory to fit speed limiters for heavy vehicles which helps to decrease accidents. Naude and Chitakunye (2014) state that the development of safe and secure vehicle stops along major roads would improve the working conditions of heavy vehicle drivers. This is because they would be able to rest and recover in a safer environment. It will also be reducing the dangerous lack of sleep that affects the drivers' capabilities (Naude and Chitakunye, 2014).

3.8.6. Incentive schemes as a form of behaviour management

Driver education is mostly supported by insurance premium discounts and driver licensing provisions because it reduces driving faults like road crashes which cause road accidents and loss of life (Lonero, 2008). Incentive schemes are a form of behaviour management that seek to influence the behaviour of the individual by linking positive consequences to desired behaviours. According to behaviour management theory a person will be more likely to engage with a particular behaviour if the person perceives the outcome of the behaviour as of value to them. The valued outcome can be either intrinsic (associated with the value of safety such as performance feedback) or extrinsic (tangible such as financial incentives) (Newman et al, 2003). The study found that fleet managers tend to change attitude and address behaviour when following a central route. The peripheral route did not seem to have a lasting effect on behaviour change. Financial incentives were found not be effective as a behaviour management strategy in this study.

3.9. Driver training and education

3.9.1. Requirements for obtaining your PrDP in South Africa

A professional driving permit (PrDP) is required in South Africa if you are transporting goods, dangerous goods, or passengers for a living (Gainewe and Masangu, 2014). For all goods vehicles with a gross vehicle mass (GVM) greater than 3 500 kg and all dangerous goods vehicles, the permit is issued in addition to a standard driver's license. Every 24 months, the permit must be renewed. Municipalities operate Driving License Testing Centres that issue PrDPs. Before issuing a PrDP, no additional testing is performed. In South Africa, the only requirements for a PrDP are:

(i) A legitimate driver's license for the vehicle being used.
(ii) A doctor's medical certificate stating that you are medically fit.
(iii) No criminal record (in the previous five years)
(iv) Operating a motor vehicle while your blood or breath alcohol concentration exceeded a statutory limit.
(v) The National Professional Driving Certificate
(vi) Specifying and preparing a rigid heavy vehicle for road transport trips.
(vii) Operating a rigid light vehicle in accordance with the specifications.
(viii) Ensuring the quality of road transportation services.

(ix) Handling unexpected situations in accordance with established procedures.
(x) Examining vehicle performance and own vehicle operation in relation to requirements.
(xi) Parking a vehicle in accordance with the specifications.

Before a person can train to become a HGV driver, he or she must be at least 18 years old and have a full driver's license (category B entitlement). The type of driving license entitlement for heavy vehicle drivers is determined by the Maximum Authorized Mass (MAM) of the vehicle the individual intends to drive. The MAM is equal to the total weight of the vehicle plus the maximum load it can carry.

Drivers of vehicles weighing more than 3.5 tons must have a C 1 license (Mohammed & Magazi, 2014). The types of vehicles and the types of licenses that are found for HGV drivers in South Africa is categorized in **Table 10** below.

Table 10: Vehicle classes and license / operating requirements (Magazi and Mohammed, 2015)

Category	Criteria
Category D	This is for vehicles transporting dangerous goods. The driver must be at least 25 years old. It also permits the driving of category G and P vehicles.
Category G	It is restricted to non-dangerous goods vehicles and breakdown vehicles. The driver must be at least 18 years old.
Category P	Heavy vehicle carrying more than 12 people. Also makes provision for driving a category G vehicle. The driver must be at least 21 years old

3.9.2. Transport Education Training Authority

The Transport Education Training Authority's Road Freight Chamber is responsible for facilitating the training and skills development needs of employees of both public and private transport companies operating in the road freight industry. To ensure that training programmes achieve the desired impact, there is a need to understand the status quo and determine what the true need is. According to the Skills Development Levy Act 9 of 1999 companies operating within a specific Sector Education and Training Authority (SETA) are required to contribute a skills development levy paid to the South African Revenue Service (SARS) that can be claimed back, provided that certain procedures are followed such as the completion and submission of Workplace Skills Plans (WSP) and Annual Training Reports (ATR). **Table 11**, below provide an overview of training TETA currently provides.

Table 11: TETA training provision

Unit Standard	Name of Training	What is training about?
123257	Operate a rigid light vehicle	Aim of the course is to ensure safe, professional operation of a rigid vehicle vehicles with a gross mass below 3.5 tons. Allows credited learners to drive a specific type of rigid light vehicle in accordance

Table 11: TETA training provision

Unit Standard	Name of Training	What is training about?
		with legal, safety, manufacture, and other relevant requirements.
123259	Convey dangerous goods by road	The purpose of the learning is to ensure that professional drivers can deliver road transport services in a professional manner.
123253	Operate a rigid heavy vehicle	The purpose of learning is to ensure safe, professional operation of rigid (no articulation points) heavy vehicles with a gross vehicle mass exceeding 3.5 tons. Allows credited learners drive a specific type of rigid heavy vehicle in accordance with legal, safety, manufacturer and other relevant requirements and reflect on the way the vehicle is operated.
123254	Operate a vehicle combination	The purpose of learning is to ensure safe, professional operation of vehicle combinations with a gross vehicle mass exceeding 3.5 tons and consisting of a drawing vehicle and trailer/s. Credited learners can drive a specific vehicle combination in accordance with legal, safety, manufacturer and other relevant requirements and reflect on the way the vehicle is operated.
10973	Convey general freight	Loading, securing, conveying, and off-loading freight in a safe manner, and in accordance with the given periods and requirements of the specific type of freight.
10977	Convey abnormal freight	Conveying abnormal freight by road, according to legislation as well as the guidelines for the granting of exemption permits for the conveyance of abnormal loads.
50285	National Certificate: Professional Driving	• Ensure competent professional driving competence in the road transport sector
		• Allows the professional status of commercial vehicle drivers to be enhanced.
		• Qualified learners are capable of:
		• Obtaining and communicating road transport operational information
		• Assessing loads against given permissible load requirements
		• Planning road transport service delivery that meets specified requirements

Table 11: TETA training provision

Unit Standard	Name of Training	What is training about?
		• Driving a vehicle conveying a specific commodity
		• Qualification credits competent drivers, who are driving vehicles carrying freight or passengers for commercial purposes.
252245	Load petroleum products in rail or road tankers	The course entails the loading of bulk petroleum products into rail or road tankers in accordance with company procedures, policies, instructions, and relevant legislation. The acquisition of these competencies will ensure the timeous and safe loading of bulk petroleum products for transportation, thus contributing positively to the Southern African economy.
10974	Operate a vehicle combination, consisting of a drawing vehicle and trailer/s	Operating a Vehicle Combination in accordance with Legal; Safety; Manufacturer and other relevant requirements and reflect on the way the vehicle is operated.
123261	Plan road transport service delivery	Professional drivers can deliver road transport services in a professional manner.
		Driver planning trips and anticipating various scenarios that may occur once they are driving vehicles on the open road. By achieving this unit standard, learners can make informed choices regarding their own performance, as well as the performance of vehicles.
252250	Apply firefighting techniques	A learner credited with this unit standard will be capable of identifying, containing, preventing, and extinguishing different types of fires by operating basic firefighting equipment.
376480	Provide first aid as an advanced first responder	This unit standard is intended to enable the first responder in an emergency to react to health emergencies at an advanced level, until the arrival of more qualified emergency personnel.
259762	Demonstrate an understanding of HIV/AIDS and its impact on the workplace	Learners credited with this standard will develop a deeper understanding of HIV/AIDS as a disease. In addition, they would acquire knowledge of how it affects employees in the workplace and impacts on their rights and responsibilities. The importance of industry and company policies pertaining to HIV/AIDS is also discussed.

3.9.3. Organisational training

Safety training could take different forms like informal courses, coaching, knowledge sharing, and formal training/education. However, it seems in general there is a lack of programmes, and the reasons vary from programme development and implementation cost, a lack of information on effective training programs and a lack of senior management support (Figueredo, et al., 2019; Grinerud, 2022). Nonetheless, there are also findings that suggest that by providing driver/safety training, road transport organisations have an advantage when recruiting inexperienced drivers, as many drivers perceive driver/safety training as important (Guppy and Guppy 2003). In addition to driver/safety training, studies also highlight the importance of follow-up on driver behaviour. Periodic driver training is considered a successful approach as learners acquire new knowledge and changed their driving practices after completing 35 hours of mandatory periodic training (Grinerud, 2022). However, even though proper safety training is likely to have a positive outcome for road safety, few road transport organisations systematically provide non-mandatory safety training for their drivers.
Furthermore, in 2009, mandatory periodic freight transport training was implemented in Europe. It is stated that after completing this periodic training, the driver/student will:

- drive optimally and safely.
- demonstrate professionalism in the execution of the profession.
- protect their own and others' safety at work when the vehicle is stationary.

Grinerud (2022) suggests a safety training framework directed towards decision makers and parties in the road transport system for work-related driving of HGVs (**Figure 20**). The aim is that it should also be possible to implement the safety training framework for smaller road transport organisations. Hence, it is constructed to be simple, effective, and easy to implement with few resources. Consequently, the framework is not in competition with ISO 390001: 2012 Road traffic safety management systems, but instead it aims to be a substitute targeting both small and large road transport organisations.

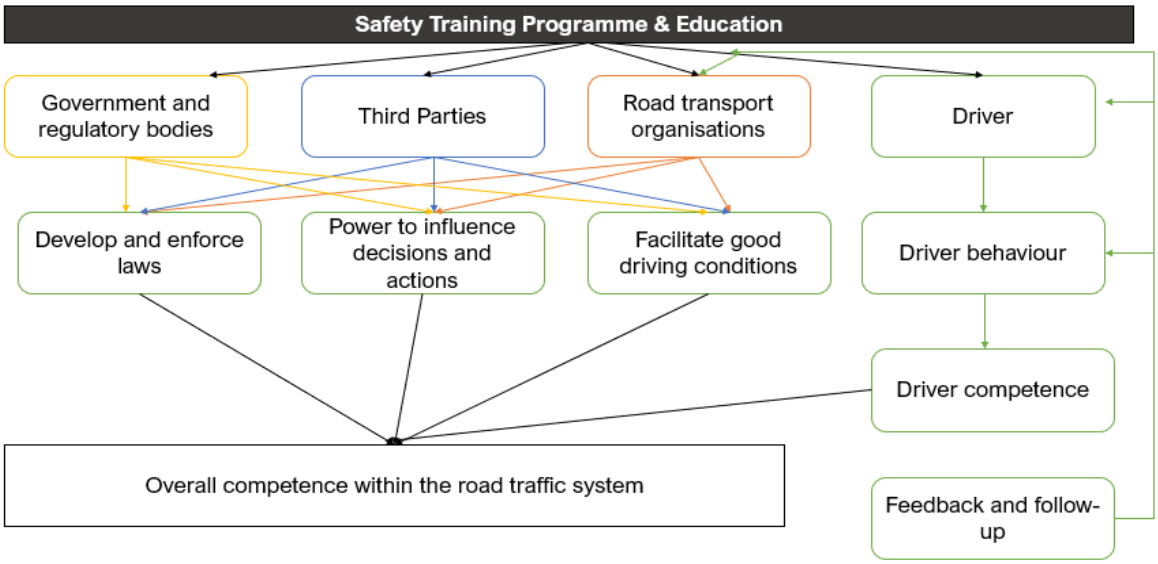


Figure 20: Safety training framework (adapted from Grinerud, 2022)

Grinerud (2022) suggested that the safety training is divided into two parts. One training program directed towards decision makers and parties at the higher levels of the system, and one training program directed towards drivers. This division is based on findings in the literature review. It is stated that communication between all parties in the system is important, to ensure familiarity with each other's challenges and opportunities. Consequently, communication is a key component of the management of road traffic safety for work-related driving of HGVs.

One intervention to increase communication could be joint safety training for every party in the system. By developing a safety training program directed towards governmental/regulatory bodies, third parties and road transport organisations, and customizing the content towards these parties, challenges and opportunities will be made known for every party. The challenges and opportunities experienced by each party are well-documented in the research literature, and the safety training content should be based on this. Most important is that each party is made aware of other parties' challenges and opportunities, and that collaboration and cooperation are presented as a valuable tool to increase road traffic safety for HGV businesses and drivers.

Finally, the actual transportation on the roads must be completed by competent drivers to minimize the possibilities of road accidents.

3.9.4. Minimum standards for driver training and education

Heavy vehicle driving is a higher career opportunity around the world it is considered a skilled profession, and one that now requires skills training and certification (Craig, 2020). Driver training is crucial to ensure the safety of heavy vehicle drivers. Accidents involving heavy vehicle transport are mostly caused by drivers' lack of experience (Naude and Chitakunye, 2014). There are a range of skills that heavy goods drivers must have. Fuller (2010) states that experienced drivers have vast array of skills that enable different automated decisions and control skills for heavy vehicles. "These skills include access to mental models of road and traffic dynamics which arm the driver with kind of in-the-head video" (Fuller, 2010).

The operation of heavy vehicles should be treated as a profession, regulated with separate licenses, and incorporating higher levels of expectations and consequences as compared to passenger vehicles. The processes for obtaining a PrDP must be stricter (Magazi and Mohammed, 2015). In addition, the authors stressed the need for systematised and institutionalised heavy vehicle driver training, education, and skill development. When one is acquiring a license, extensive training, and testing, both in the classroom and in-vehicle should occur.

Formal training, highlight safety to give drivers more realistic views of stress/workload effects on their performance at work. At the individual driver level, studies highlight the importance of driver/safety training and monitoring of driver behaviour. The management of road transport organisations are responsible to equip and to provide their drivers with the right competence to execute their work. Safety training is intricately linked to safety outcomes (Evgenikos, et al., 2016; Grinerud, 2022).

3.9.5. Classroom and practical training

In-classroom theory education training is where the training begins in a classroom, followed by in-car practical training (Craig, 2020; Lonero, 2008). Minimum standards for hours of training and driving practice can help drivers to reduce driving errors and poor driving judgment.

Training has been recommended to ensure at least a minimum standard of skill development for heavy vehicle drivers (Oswin and Cotton, 2018). The driver must have a standard driving license and it must be clean and free of convictions. This enable the heavy goods vehicle driver to go on and complete the specialist driver training that is required to manage HGV. According to Easton (2017), the training could be anything from a few days to a few weeks and will cover safety, theory, and practical driving skills. Transport for New South Wales states that under a Heavy Vehicle Competency Based Assessment (HVCBA) the driver will be given credit for the skills that are performed correctly. The assessment can be completed as a once-off criteria assessment or be progressively assessed while taking instructions.

As a part of the European Union's Road traffic safety work, a new directive related to basic and periodic training for professional drivers was implemented in all EU member states in 2008/2009 (EU directive 2003/59/EC). The directive concerns compulsory basic training of 280/140 hours and periodic training of 35 hours every 5 years. The training consists of 5 modules. Modules 1–4 are mostly theoretical, with some practical tasks such as securing cargo, first aid, correct use of tyre chains and correct use of fire extinguishers. Module 5 concerns the topic of 'safe behaviour on the road' and consists of both theoretical classroom teaching and practical driving (EU directive 2003/59/EC). In the periodic training, most training centres spend an average of 28 hours on modules 1–4 and 7 hours on module 5, with around 2 hours as practical driving with a professional instructor, where the aim is to drive optimally, defensively, and safely. Grinerud (2022) proposes a safety training program for HGV drivers based on two data sources:

- Post-training studies
- Results collected from actual driving training in module 5 as periodic training for professional drivers.

In the 1950s in both U.S. and Canada, driver education was widely available in their public schools and this availability declined in the early 1980s. The decline mostly affected the U.S. whilst driver education in Canada has been more diverse and remained strong in some provinces. It is very well known that driver education differs among the states, and there is no clear current understanding of programs across the U.S. "A federal project to address this need is in development" (Lonero, 2008 :3). Whilst in Canada the project to access driver education was completed by Natural Resources Canada in support of its mandate for education in aid of energy conservation (Lonero, 2008).

In 2017 Canada introduced a comprehensive new training and proficiency standard. Mandatory Entry level training (MELT) is a program that was designed to provide trainees with the competence to obtain a class 1 commercial vehicle license (Vehicle Canada 2020:1). Driver education is intended to reduce driver risk factors (Lonero, 2008). Currently, the trainees undergo at least 100 hours of classroom and practical road training.

Moreover, all HGV trainees would be tested under the same conditions and experiences. It also speeds up the training and reduces yard time. Most importantly it improves safety, reduces road crashes, and lowers training costs (Vehicle Canadian, 2020).

When training, drivers have challenges with handling the diverse types of heavy goods vehicles competently and safely. Vehicle classifications are based on weight, size, and different driving licenses related to those categories. Moreover, trainees must also learn how to manage the difference in heavy vehicle sizes for example between driving a semi-trailer, long-haul, or box vehicle (Vehicle Canadian, 2020).

3.9.6. Competency, standards, and standardizing qualifications

In the past, no academic qualification or experience was required for heavy goods vehicle driving, only minimal training was given to heavy vehicle drivers. Heavy vehicle drivers need competencies that need to be continuously strengthened (Oswin and Cotton, 2018). The standard of training, and supporting assessment is often inadequate with offerings of less than a day to obtain a heavy vehicle license. There are requirements such as the development of specific training for skilled trainers and assessors in licensing competencies and requirements as well as a program of assessment moderation. A better way to recognise competency, as opposed to time served, is consigned, however it must be based on genuine skill development to ensure safety outcomes (Oswin and Cotton, 2018).

Magazi and Mohammed, (2015) made recommendations pertaining to the fact that heavy vehicle driver education and training need to take place on a formal basis and that age and experience of the drivers be considered before a PrDP license is issued to the driver. It will be helpful and productive if formal institutions such as Further Education and Training (FET) colleges in the future play a bigger role in the issuing of qualifications for drivers (Magazi and Mohammed, 2015).

The Government of Western Australia illustrates that “competency standard specifies the attributes of safe heavy combination driver performance and behaviour”. The competency standard contains details that explicitly describe the performance that licensing services require from heavy combination drivers. Competency standards will be the foundation for the training and assessment of heavy combination vehicle drivers. The key purpose of heavy vehicle driver competency standards is for the individual to effect safe, efficient personal mobility by operating a heavy combination vehicle in the public traffic system (Government of Western Australia, 2018). The mandated training times and content have been recommended to ensure at least a minimum standard of skill development. Oswin and Cotton, (2018: I) state that “A training-based approach to heavy vehicle driver skill development is recommended as a preferred approach, with the Vocational Education and Training (VET) sector the best placed to offer this service”. According to Magazi and Mohammed (2015) in Australia, heavy vehicle drivers over the age of 40 years are mostly responsible for heavy vehicle crashes. Safety training, management commitment, scheduling or journey planning, incentives, and safety or return to work policies are associated with the reduced crash and injury risk (Mooren et al, 2014).

Human factors are the main cause of crashes, and many crashes are the result of poor driver behaviour, which is partially the result of inadequate driver training. At the Southern African Development Community (SADC) level, efforts are being made to standardise driver training standards and certification. In this regard, SADC Member States have agreed on a common

driving license format, and some Member States have already begun issuing the SADC driver's license. A Working Group has also completed the harmonization of the SADC Manual for Learner Drivers, SADC Manual for Driver Instructors, and SADC Manual for Driver Examiners (Johnson et al., 2021). The goal of these licenses is to standardise and uniformly issue licenses to all drivers in the SADC region (Johnson et al., 2021).

3.9.7. Computerised training

Virtual training was introduced and welcomed over conventional direct learning in the vehicle and on the road because it is flexible and saves time. Simulators have been used in visual training. Virtual Vehicle Training has the advantage of repetitive road situation training to gauge driver reactions and practice better responses (Lonero, 2008).

Petzoldt et al (2012) investigated whether driver education can be improved by computer-based training of cognitive skills. According to Petzoldt et al (2012), traditional forms of driver education have largely failed to develop skills that go beyond providing a descriptive knowledge of how to drive. However, Computer-based training (CBT) has the potential to provide novel solutions to this problem. Petzoldt et al (2012) states that to supplement existing driver training programs by addressing critical cognitive skills, a CBT module should be developed. The CBT makes use of video sequences of potentially hazardous driving situations, which includes multiple choice questions with feedback to increase levels of understanding.

The incorporation of multimedia elements is critical in the development of a new cognitive training application. Petzoldt et al (2012) states that rather than attempting to design a comprehensive educational package, researchers should choose anticipatory behaviour, and more specifically hazard perception and glance behaviour, as relevant skills to address to demonstrate that such an application can contribute to driver education. Specifically, focusing on the proceduralist approach of knowledge already acquired during theoretical lessons, developing a link between lessons and actual driving. The use of a problem-based approach when developing the multimedia training application is critical in response to the need for individual application of acquired knowledge and skills in contexts close to reality.

To reduce heavy vehicle crashes, driver education, graduate licencing, and other behaviour influences such as incentives must be considered (Lonero, 2008).

3.10. South African programmes for quality insurance of HGV

3.10.1. Safety and Quality Assessment System auditing

In 2003, the Chemical and Allied Association of South Africa (CAIA) introduced a directive that chemical companies using road hauliers to transport chemicals should be Responsible Care signatories and comply with the requirements of the Safety and Quality Assessment System (SQAS). The philosophy of responsible care is a responsibility of all parts of the supply chain (freight forwarders, vehicle companies, and warehousing companies) in all daily operations. The programme supports safety, health, and quality management programmes implemented by the industry. It is a recommended minimum requirement for the transportation of Dangerous Goods. The audit protocol assesses goods hauliers and distributors for a risk management system in the company that manages quality, safety, and environmental performance against uniform and standardised assessments.

3.10.2. Road Transport Management System: Voluntary Self-Regulation Scheme

One of the strategies aiming to improve road safety, revolves around self-regulation and monitoring. In addition, encourages the adoption of responsible operator behaviour (Department of Transport, 2011).

RTMS is a voluntary self-regulation scheme that encourages freight operators to implement a transport management system that improves road safety, preserve the road environment and in by doing so increases productivity. **Table 12** provide an overview of areas where standards are prescribed.

Table 12: Standards for the RTMS

Standard	Criteria
Loading	• Weight assessment systems • Load optimisation and monitoring at consignee, consignor, and transport operators • Load securement
Driver Wellness	• Working conditions • Social and health issues
Vehicle Operations	• Vehicle maintenance • Training standards for operators (NQF) • Advanced continuing training in: Driving, • Vehicle operations and safety, • Fleet management, • Specialised vehicles

Operators signing up for the programme are accredited and recognised for responsible road use, road safety, and compliance.

3.11. Legislation governing heavy vehicle driver behaviour in South Africa

Legislation that provides for heavy goods vehicle drivers in South Africa include:

- *Road Traffic Act 93 of 1996, Section 15(f)*
- *Road Traffic Act 93 of 1996, Section 12*
- *GNR.225 of 17 March 2000: National Road Traffic Regulations, 2000 Part II, Section 99*

Requirements for heavy vehicle good drivers include:

- Being physically fit and the ability to drive a heavy vehicle (able-bodied person)
- In possession of an appropriate driving licence (Code C or D), and a PrDP.

The skills for heavy vehicle good drivers include:

- Experience driving a specific type of truck (heavy goods vehicle)
- Skilled to drive a truck that is empty, half-full or fully laden (vehicle dynamics negotiated safely).

In addition to the minimum skills required the competencies for heavy vehicle good drivers include:

- Body fitness, and good or fair hearing
- Vehicle and road safety conscious
- Communication skills
- Ability to read and understand directions and physical address (navigational skills)
- Proper driving skills (patience, defensive driving, and heightened consideration for other road users (other trucks, lights vehicles, and non-motorised transport)
- Basic mechanical knowledge

3.12. Conclusion

Sustainable transport is globally considered as a cross-cutting theme and an enabler of improving livelihoods and contributing to the eradication of poverty. Sustainable transport as stipulated in the 1999 White Paper on Transport is an essential element to improve social and economic conditions in South Africa.

Transport is considered a key element in eradicating poverty in South Africa. Road safety has for long been addressed in isolation of other social and economic issues; however, the road and road environment are an integral part of life as South Africans make their way to attend educational facilities, employment, social and welfare services.

The Safe System Approach is a global best practice, that is premised on the notion that no road user should die or be seriously injured or disabled due to road traffic accidents. Where previously the focus was on the driver and behaviour, the Safe System Approach emphasises that although road users need to be well educated and situationally aware, the designers and planners of the road and traffic environment also has a responsibility to ensure that the road and the road environment is inherently safe and forgiving, and in the event of a crash that the victim receives the medical attention needed to survive the impact of the crash. Road safety is therefore a shared responsibility.

The National Road Safety Strategy is based on the Safe System Approach and the short, medium, and long-term actions are linked to the pillars of the Safe System. Heavy Goods Vehicles are an integral part of the traffic mix and freight safety needs to be managed within this framework.

Safe transport is an indicator of well the transport system is managed and functioning. Road traffic crashes and the consequences are an enormous burden on a developing and middle-income country, trying to eradicate poverty. The social and economic impact of crashes is significant, not only on the economy but on the livelihoods of people.

Movement of freight (goods and people) is the backbone of the country. Driving is however a complex task, that improves over time and with experience. This is especially true for heavy vehicle drivers that need to be skilled in driving oversized vehicles, traversing diverse types of road environments as well as interact with a range of other road users. Heavy vehicle crashes have a particularly negative impact on the economy as the occurrence of these crashes impact travel time, traffic streams and road environments. Due to the size and weight of the heavy goods vehicles, depending on the speed and the type of conflict they are involved in, the injuries sustained in these crashes tend to be severe.

The road is a unique environment, and heavy vehicle drivers tend to spend long hours on the road and are often socially isolated. Contributory factors to heavy vehicle crashes include driver inexperience, exposure to risk due to long working hours, fatigue, substance abuse and inability to manage healthy lifestyles.

Safe driving cultures are embedded in a company, through management, driver trainers and so forth. Workplace road safety and occupational health and safety programmes can play a significant role in establishing a company road safety culture. Driver management programmes (incentive schemes etc.) and in-vehicle technologies are increasingly being used to monitor driver and vehicle behaviour.

Driver training and education is a core pillar of the Safe System Approach. Heavy vehicle driver training is a specialised field and heavy vehicle drivers need to comply with a set of criteria to be able to drive a heavy goods vehicle. These criteria include age related criteria (which is correlated with driving experience), health (prerequisite for obtaining a professional driving permit in South Africa) as well as the skill to handle (driver training) the vehicle, and additional requirements for driving with hazardous goods and defensive driving skills.

CHAPTER 4. RESEARCH FINDINGS

4.1. Introduction

Chapter 4 provides an overview of the primary and secondary data analysis as applicable to the Western Cape.

The secondary data analysis comprised of the trend analysis for the RTMS and the previous Western Cape HGV Driver Skills and Behaviour Survey of 2021. For comparisons and detailed analysis refer to secondary research reports for both the Road Traffic Management System Operator Analysis[8] as well as for the Western Cape HGV Driver Skills and Behaviour 2021 survey[9].

Primary data collected is presented and discussed according to the research instrument that was prepared and used.

4.2. Secondary Research Analysis

4.2.1. Road Transport Management System (RTMS) – key findings

The RTMS trend analysis included quarterly monitoring data as submitted by RTMS-certified transport companies for the period January 2017 to December 2021. The data submitted by transport companies with registered vehicles in the Western Cape were analysed separately and then compared to RTMS transport operations in the rest of South Africa.

Registered RTMS vehicles in the Western Cape made a total of 878 488 trips and travelled a total distance of 310 million kms, during 2019 to 2021. Registered RTMS vehicles in the rest of South Africa made a total of 15 million trips and travelled a total distance of 5.7 billion kms, during 2017 to 2021.

On average the total number of operational registered RTMS vehicles in the Western Cape is 1 218, the average number of trips made is 73 207 and the average kilometre distance travelled is 25.9 million, per quarter. On average, the total number of operational registered RTMS vehicles in the rest of South Africa is 6 982, the average number of trips made is 755 818 and the average kilometre distance travelled is 283 million, per quarter.

The main findings in this report can be summarised as follows:

- The registered RTMS vehicles in the Western Cape on average represents the following percentages of the total national RTMS operations per quarter:
    - 15% of total number of operational vehicles,
    - 9% of total number of trips made, and
    - 8% of total kilometre distance travelled.

[8] See Annexure A - Road Transport Management System Operator Analysis

[9] See Annexure B – Western Cape Department of Public Works and Transport Driver Behaviour survey.

- 45% of transport operators with registered RTMS vehicles in the Western Cape have operational fleet sizes of between 100 to 500 vehicles. 46% of transport operators with registered RTMS vehicles in the rest of South Africa have operational fleet sizes of between 1 and 10 vehicles. Transport operators have larger fleet sizes registered in the Western Cape, when compared to the rest of South Africa.
- The top two commodities transported by registered RTMS vehicles in the Western Cape are palletised goods and fuel and gas, which respectively represents 20% and 19% of the total top 20-commodities kilometre distance travelled. Transportation of hazardous goods (fuel, gas, and chemicals) comprised 42% of the total kilometres travelled. Coal and chrome are the top sectors or commodities transported by registered RTMS vehicles in the rest of South Africa and respectively represents 21% and 11% of the total kilometre distance travelled.
- Considering the number of crashes and fatalities per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average crash and fatality rates are 2.3 and 0.03 respectively per million kilometres travelled. The average crash and fatality rates per million kilometres travelled involving registered RTMS vehicles in the rest of South Africa are 3.3 and 0.06, respectively. Registered RTMS vehicles in the Western Cape thus have a lower crash and fatality rate per million kilometres travelled compared to RTMS vehicles registered in the rest of South Africa.
- The recorded crash error indicates that 30% of all crashes involving registered RTMS vehicles in the Western Cape, are due to driver error. This is lower than the 44% recorded company errors involving registered RTMS vehicles in the rest of South Africa.
- Considering the number of traffic violations per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average traffic violation rate is 3.4 per million kilometres travelled. The average traffic violation rate per million kilometres travelled involving registered RTMS vehicles in the rest of South Africa is 7.1. Registered RTMS vehicles in the Western Cape thus have a lower traffic violation rate per million kilometres travelled compared to the vehicles registered in the rest of South Africa.
- Considering the number of corrective or disciplinary actions per million kilometres travelled involving registered RTMS vehicles in the Western Cape, the average number of corrective or disciplinary action rate is 9 per million kilometres travelled. The average number of corrective or disciplinary action involving registered RTMS vehicles in the rest of South Africa is 8 per million kilometres travelled. Registered RTMS vehicles in the Western Cape thus have a higher corrective or disciplinary action rate per million kilometres travelled compared to the vehicles registered in the rest of South Africa.
- On average 66% of registered RTMS employed drivers in the Western Cape were trained per quarter and 39% of registered RTMS employed drivers in rest of South Africa were trained per quarter. A higher percentage of registered RTMS employed drivers in the Western Cape thus receive training per quarter compared to registered RTMS employed drivers in the rest of South Africa.
- Considering the different fleet sizes, smaller fleets had a lower percentage of employed drivers trained per quarter than the larger fleets.

- On average 88% of registered RTMS employed drivers in the Western Cape had medical fitness certificates out of which 13% had chronic medical conditions. Considering registered RTMS employed drivers in the rest of South Africa, 85% had medical fitness certificates out of which 10% had chronic medical conditions.
- A higher percentage of registered RTMS employed drivers in the Western Cape thus have medical fitness certificates and chronic medical conditions compared to registered RTMS employed drivers in the rest of South Africa.

4.2.2. Western Cape Mobility Department Driver Skills and Behaviour Survey 2021

The Driver Skills and Behaviour survey was rolled out by the WCMD between 19 July 2021 and 22 November 2022 in preparation for the driver skills research project.

The total number of respondents that participated in the survey was 851. Of the 851 survey responses, 663 survey responses were complete and 188 surveys were partially complete. All survey responses were analysed (851), whether complete or partially complete. 806 identifiable individuals participated in the survey, the remaining 45 responses consisted of 14 repeated respondents and 31 anonymous respondents, The results of the freight survey gave insights to the need for driver training skills programmes and the current lack thereof. The average years of driving experience for the respondents is 15 years. **(Figure 21)**

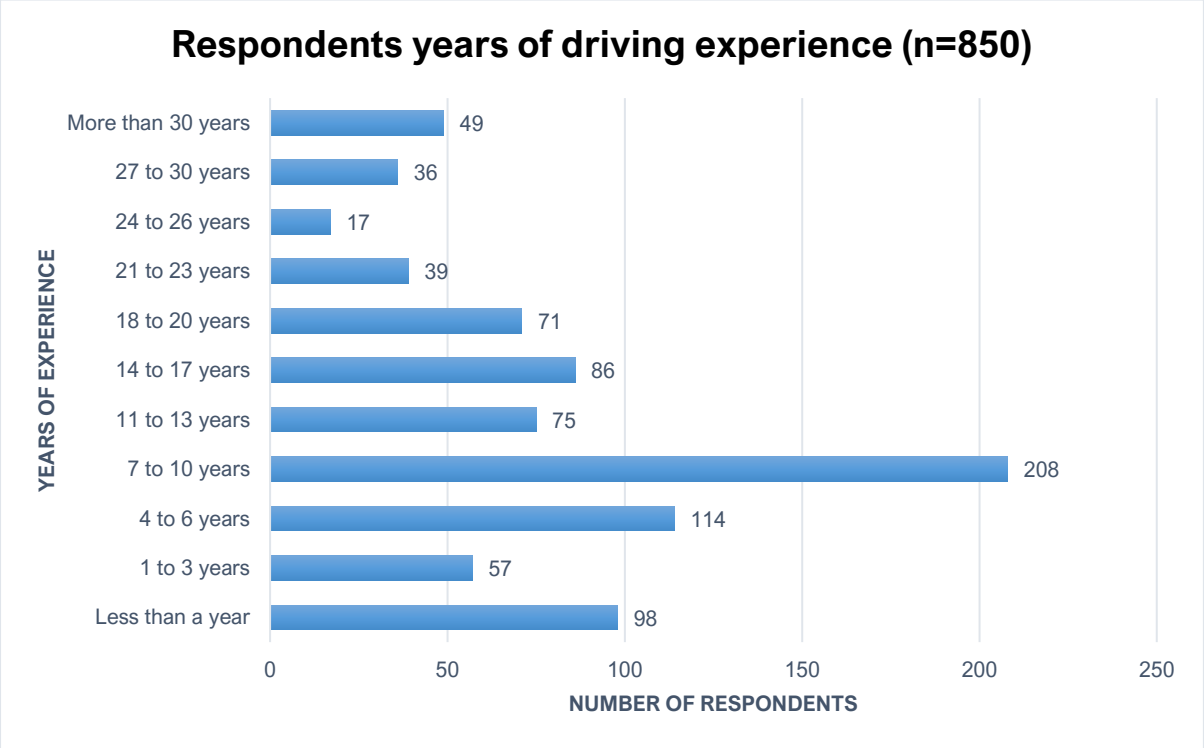


Figure 21: Respondents years of driving experience

Number of respondents is less by 1 due to the invalid number of years of driving experience on one respondent.

Most respondents (59%; or 506 out of 851) have done some type of safety training, and of these 25% have done advanced driver training. **(Figure 22)**

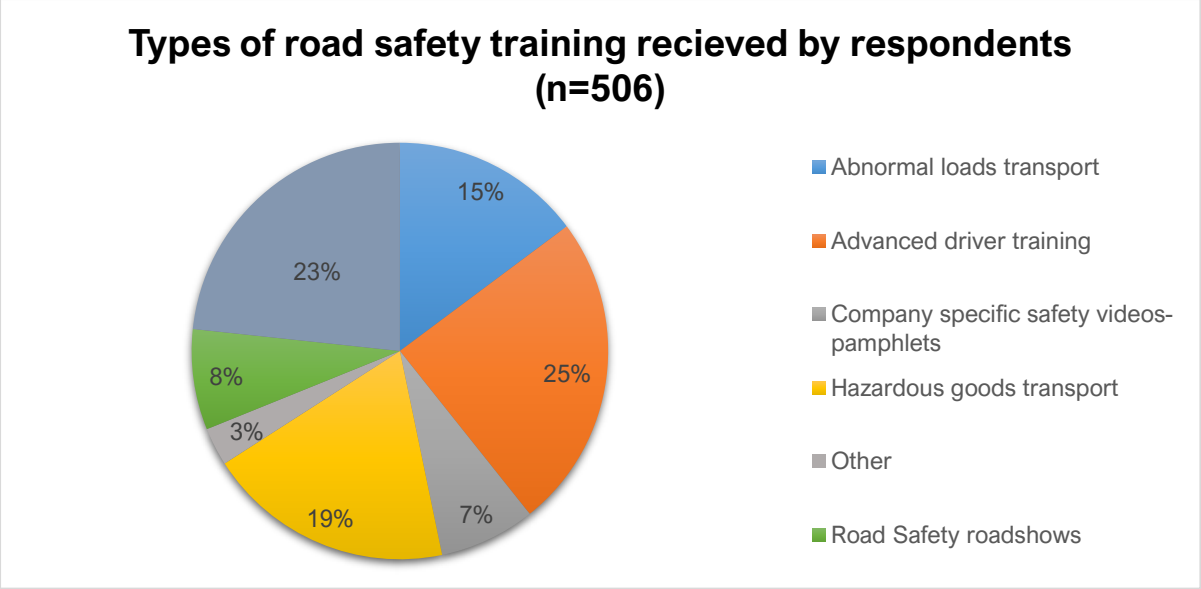


Figure 22: Types of road safety training received by HGV respondents.

Note: N=506 because 252 respondents have never received any road safety training and 93 did not give any response to the question.

While 26% of respondents indicated that they do not need training and 32% gave no response, the remaining responses acknowledged the need for diverse types of driver training especially advanced driving skills. Several respondents also highlighted the need for fatigue management training and some respondents expressed concerns regarding the frequency of breaks during trips allowed by their employers i.e., not allowing them to rest or giving them insufficient time to rest. Six percent (49) of the respondents indicated that they drive while fatigued, while 83% (705) indicated that they do not drive fatigued. 11% (97) of the respondents did not respond to the question.

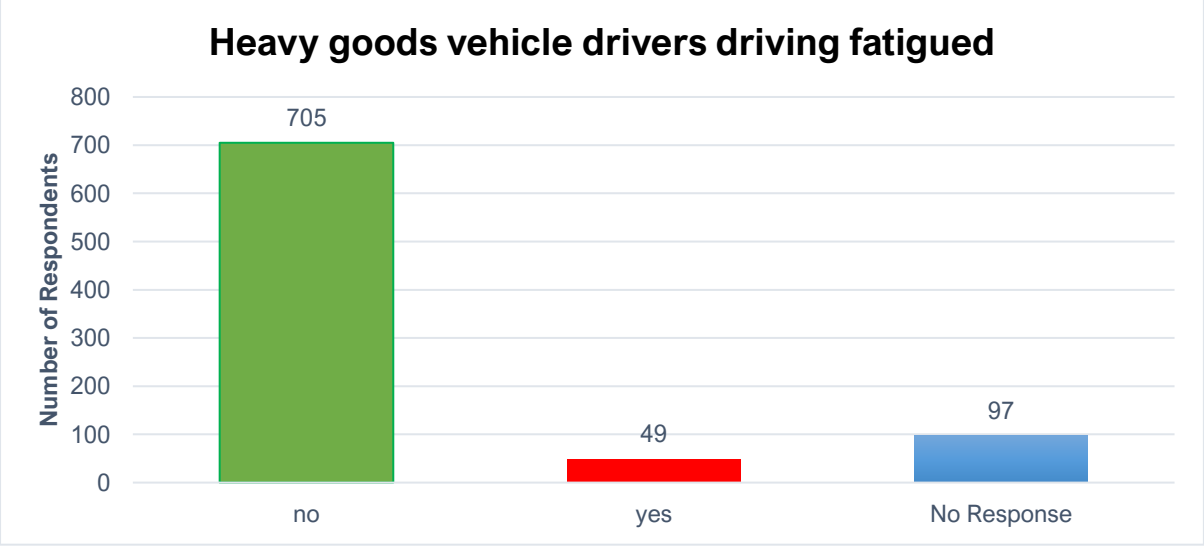


Figure 23: HGV drivers driving fatigued.

In some instances, not all the questions in the survey were completed because drivers were pressed for time or the survey team experienced technical issues with the devices used to capture the drivers' responses. Such instances resulted in the unanswered survey questions having a 'no response' result. The "no responses" to some survey questions may have influenced the results for those questions. In future surveys, the completion of all the questions in the survey needs to be emphasised.

(See Annexure B for the full survey analysis)

4.3. Primary Research Findings

4.3.1. Driver questionnaire

The sample size was 474 drivers, and the intention was to interview approximately 40 drivers at each of the 12 targeted truck stops. However, only 9 truck stop owners granted permission for the surveys to be conducted at their premises and the 9 truck stops were not equally busy. The research team approached all the drivers that were present at the time of the surveys. A total of 357 heavy vehicle drivers were approached to complete the driver survey and 266 heavy vehicle drivers consented to participate in the survey.

The total number of responses from heavy vehicle drivers is 266; however, due to one participant who self-reported as underage and stated he was 16 (although legally required to be 18 to drive), only 265 responses are reported, yielding a 74% response rate.

4.3.1.1. Demographics

261 drivers were male, three (3) were female and one (1) preferred not to identify their gender.

Most drivers were between the ages of 30 - 39 years (37%) closely followed by the age group 40 - 49 years (32%). The least drivers were between the ages 70 - 79 years. (**Figure 24**).

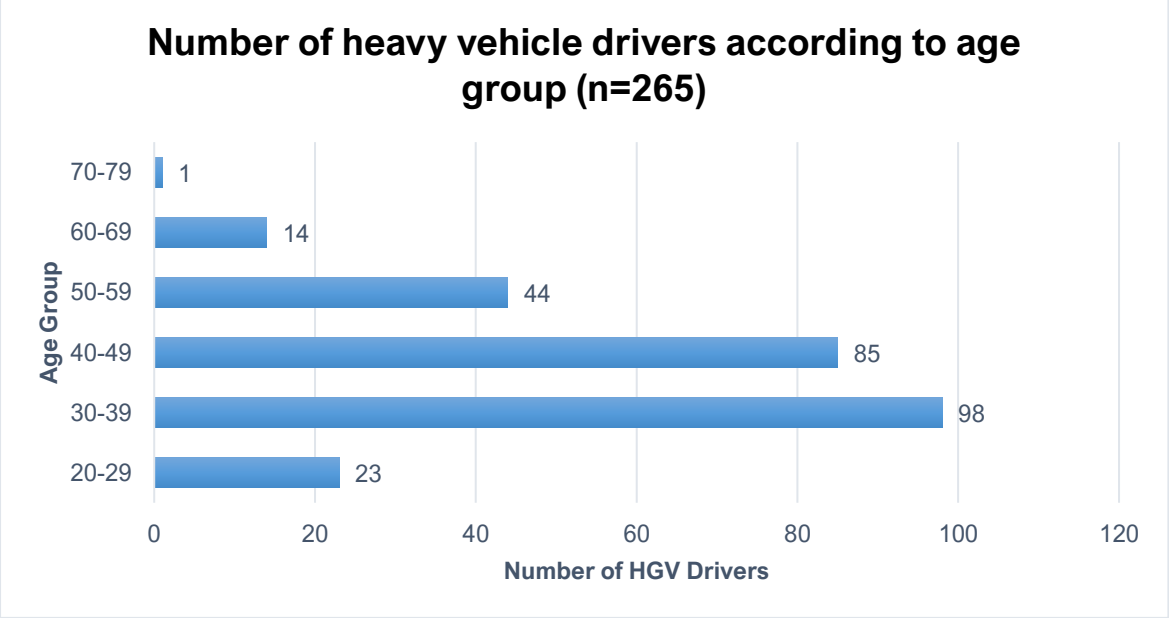


Figure 24: Number of heavy goods vehicle drivers according to age group.

About 76% of the drivers were African, 13% coloured and 11% white. **(Figure 25)**

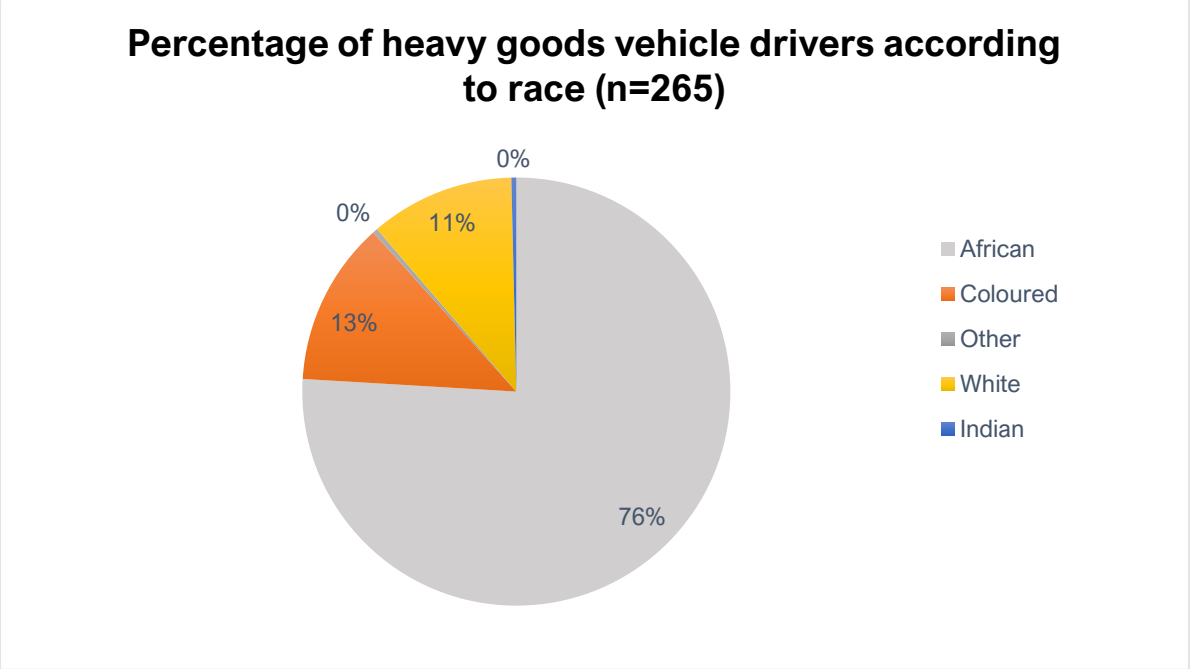


Figure 25: Percentage of heavy goods vehicle drivers to race.

In terms of education, 48% of the drivers completed matric and 31% have some senior high school, 5% of the drivers held higher education certificates/diplomas/degree **(Figure 26).**

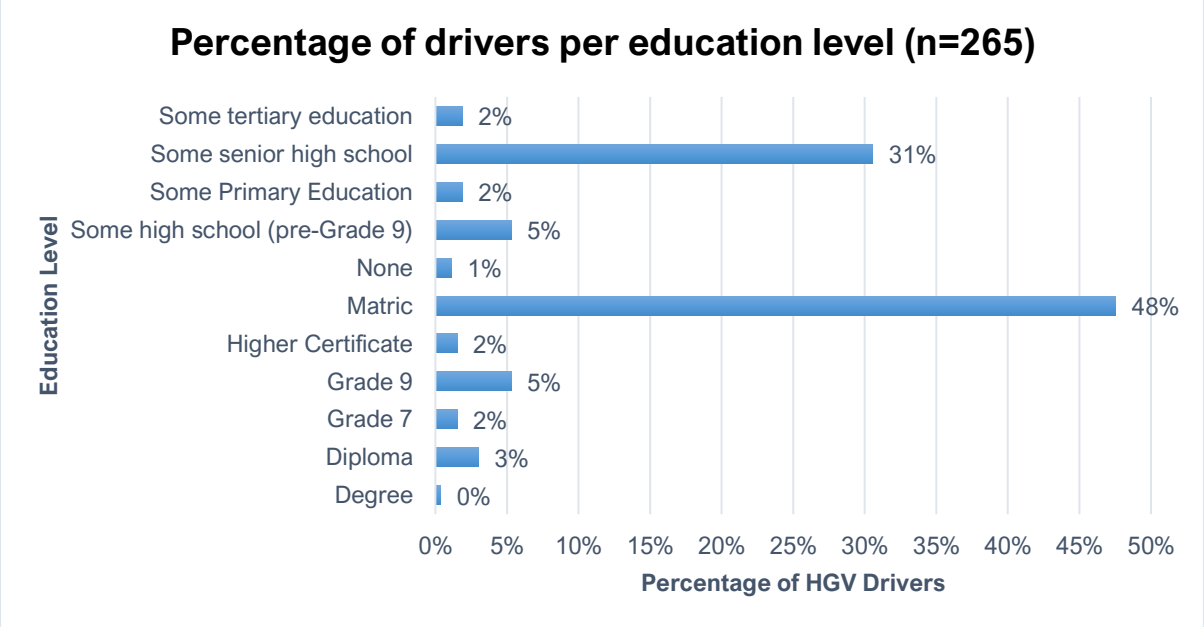


Figure 26: Percentage of heavy goods vehicle drivers according to education.

4.3.1.2. Driver licensing and experience

Most HGV drivers (99%) indicated that they have a valid driver's license. Sixty-six percent (66%) indicated that they have had a valid driver's license for more than 10 years and 28% indicated they have had their drivers licenses for between 5 -10 years. Nearly all drivers (99%) indicated they have a valid Professional Drivers Permit (PrDP) and 6% of the drivers admitted to transporting cargo not permitted by their PrDP.

Sixty percent (60%) of drivers indicated they have more than 10 years driving experience, 31% between 5-and10-years driving experience, and 9% between 0-and 4-years driving experience **(Figure 27).**

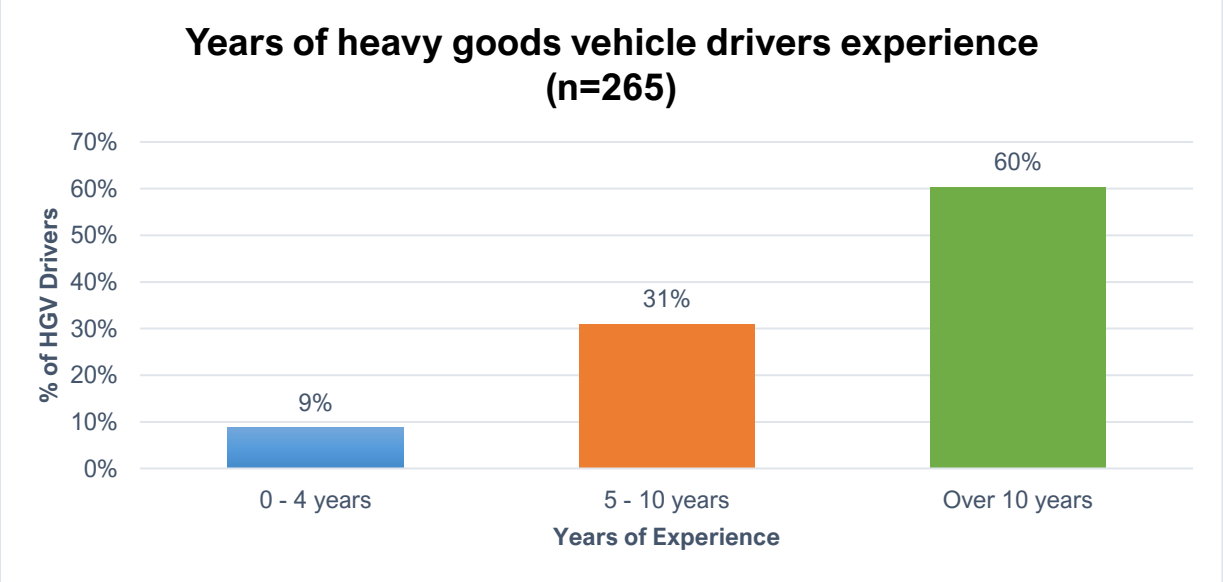


Figure 27: Percentage of heavy goods vehicle drivers according to years of driving experience

Twenty four percent (24%) of HGV drivers have been employed by their current company for between 3 and 5 years, 22% for between 1 and 2 years and 21% between 6 -10 years. Only 12% of drivers have been working for their current employer for more than 10 years (**Table 13**).

Table 13: Employment period by current employer

Employment Period	Number of HGV Drivers	% of HGV Drivers
0 – 1 month	7	3%
1 – 2 years	58	22%
2 – 3 months	14	5%
3 – 5 years	64	24%
4 – 6 months	21	8%
6 – 10 years	55	21%
7 – 11 months	13	5%
Over 10 years	33	12%
Grand Total	**265**	**100%**

In terms of basic mechanical knowledge to fix heavy vehicle failures, 64% of the drivers indicated that they could conduct basic mechanical checks.

4.3.1.3. Training and road safety education

Ninety-two (92%) percent of the HGV drivers interviewed felt that road safety training is necessary. The most important road safety training needs highlighted in **Figure 28** are:

- Advanced driver training (33.6 %)
- Basic road safety training (26.6%)

- Dangerous goods training (15.6 %)
- Dangerous goods training (15,6%)

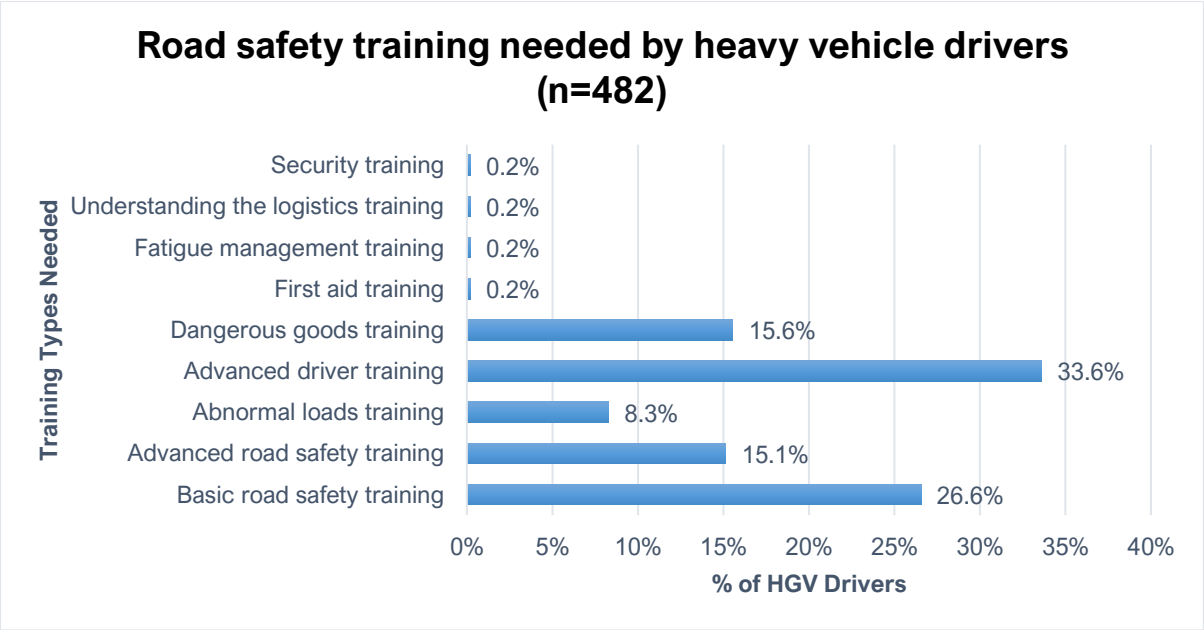


Figure 28: Road safety training needed by heavy goods vehicle drivers.

Note: Of the 265 respondents, 245 or 92% responded that there is a need for road safety training. They went on to identify what type of training is needed and were allowed to give more than one response, which led to 482 responses from 265 drivers.

Figure 29 shows the types of road safety training that respondents received previously.

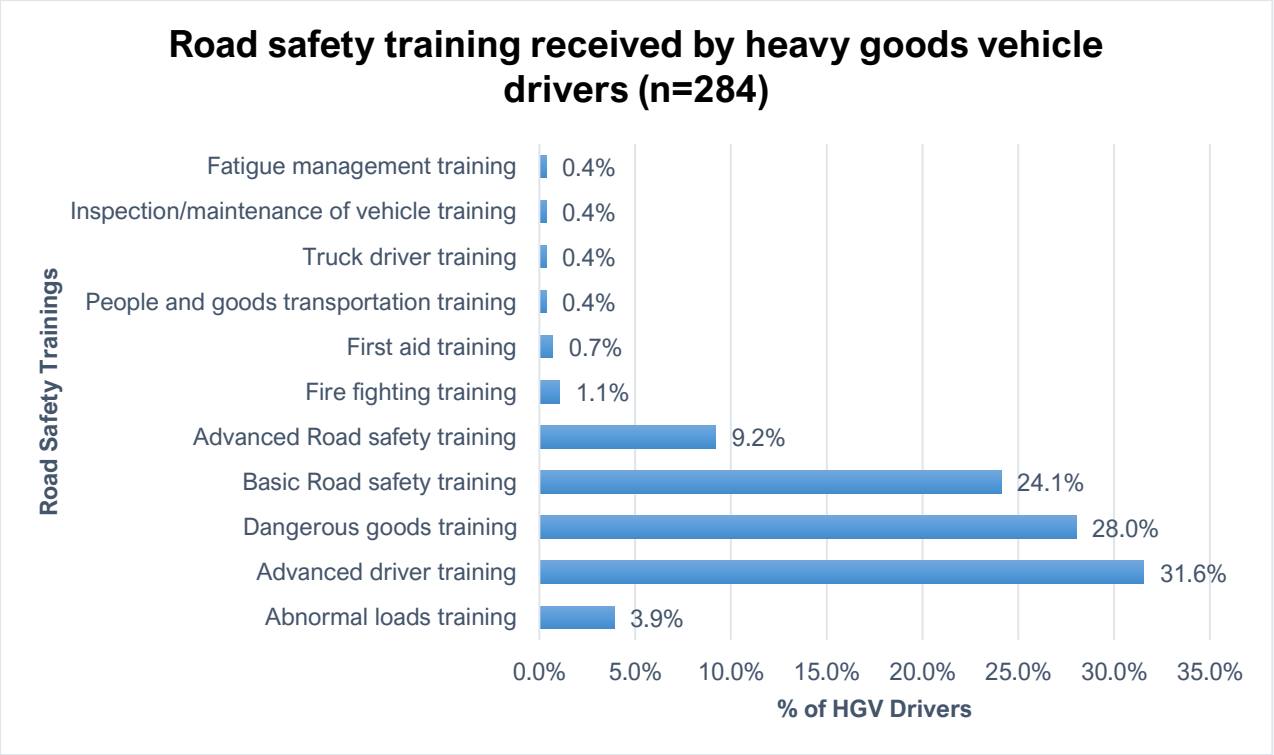


Figure 29: Road safety training received by heavy goods vehicle drivers.

Note: The heavy vehicle drivers were allowed to give more than one response which led to 284 responses from 265 drivers

4.3.1.4. Crash experience and safe driving practices

Seventy-seven percent (77%) of HGV drivers have never been in a crash. Of the 61 drivers (23%) who have been in a crash, 62% (38) reported that it was more than 5 years ago **(Figure 30).**

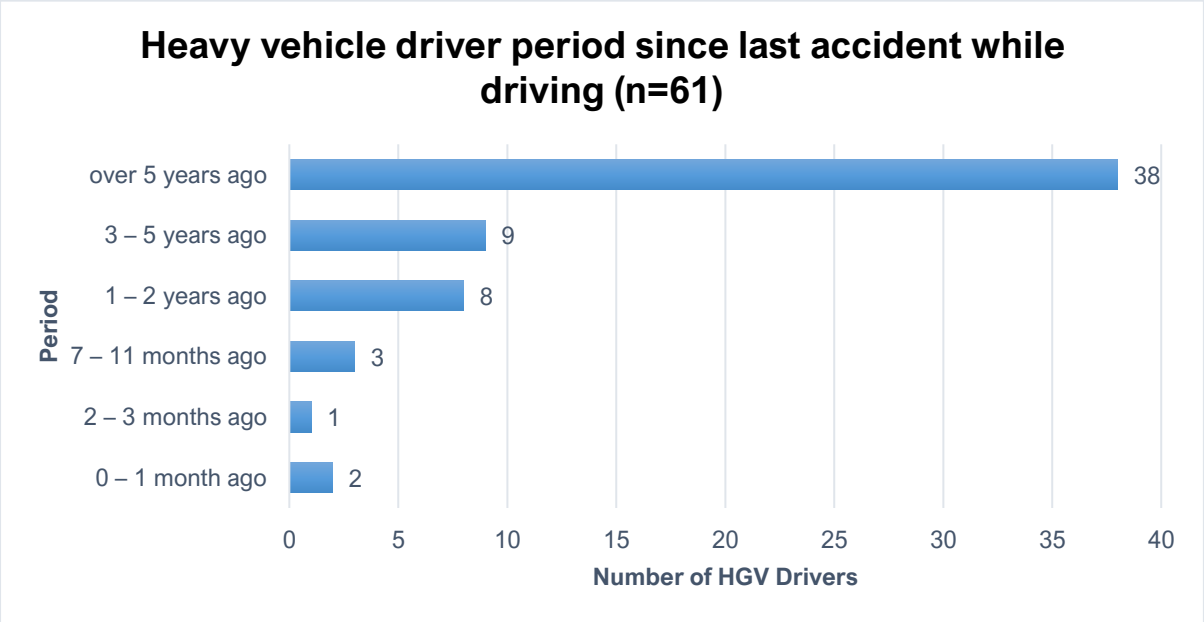


Figure 30: Period since last accident while driving.

The cause of most of the accidents is "bad driving by the other car" followed by "fatigue from other drivers" and "animals on the road" as shown in **Table 14** below.

Table 14: Causes of the heavy vehicle accidents.

Cause of the accident	Number of HGV Drivers	% of HGV Drivers
Bad Driving by the other car	12	38%
Fatigue from another driver	3	9%
Animals on the road	3	9%
HV Brake failed	2	6%
Wheel puncture	2	6%
Fatigue from HV Driver	1	3%
Heavy Vehicle Trying to Overtake	1	3%
A car bumped into HV Driver	1	3%
Pedestrian crossing highway at night	1	3%
Roadblocks and curves	1	3%
Steering rack problem.	1	3%
Third party involvement in accident	1	3%
Traffic light switch off	1	3%
Truck caught fire from cooking	1	3%
Working on-site	1	3%
Total	**32**	**98%**

Note: The number of drivers who provided reasons is not equal to the total number of drivers that participated in the survey due to addition of the question on the online questionnaire at a later stage.

About 80% of the HGV drivers indicated that they do not carry on driving if they experience medical issues while on the road and only 15% of the drivers have experienced medical issues

while on duty. About 46% of the drivers cover their own medical costs and 35% of the drivers' medical expenses are covered by the employer. About 7% of the drivers' indicated that their medical expenses are covered by the Bargaining Council (which is paid by the employer of the driver) (**Figure 31**).

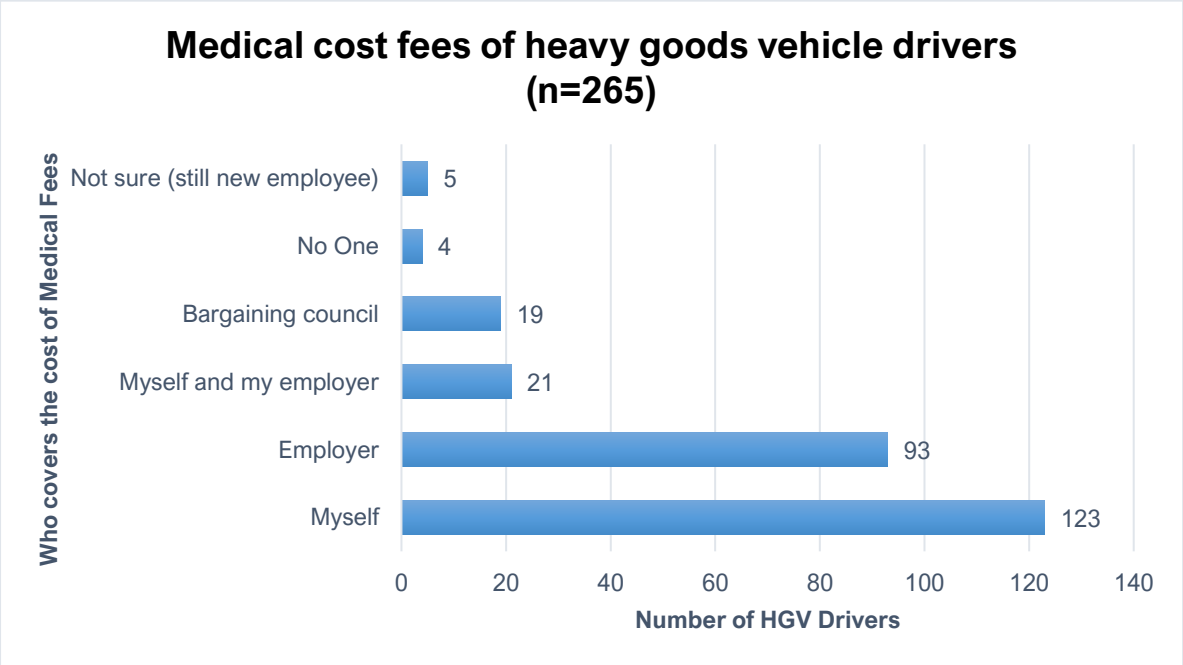


Figure 31: Responsible party for medical cost fees of heavy goods vehicle drivers

About 38% of the HGV drivers indicated that they do drive when tired or fatigued while 62% of the drivers indicated they do not. At least 96% of drivers indicated that they do rest or take a break from driving. Most drivers indicated (83%) that they sleep at a truck stop or filling station. About 2% drivers indicated that they are not allowed to sleep, and 1% of the drivers indicated that they have a twin driver system where one can sleep while the other drives (**Table 15**).

Table 15: Where heavy vehicle drivers normally sleep

Where do you normally sleep	No of HGV Drivers	% of HGV Drivers
Truck Stop	234	74%
Filling Station	30	9%
Roadside	16	5%
Day Trips Only	8	3%
No Sleep Allowed	6	2%
2 drivers no need to stop and sleep	4	1%
Hotel	4	1%
Anywhere safe	3	1%
BnB	3	1%
Company sleeping station	3	1%
Depot	3	1%
Delivery Point (Client Premises)	1	0%
Loading/ Off-loading Area	1	0%
Total	**316**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 316 responses from 265 drivers.

Only 4% of the HGV drivers said they never take a break during their trips and 96% (255) do take breaks. About 47% of drivers respectively indicated that they take a break every 2 -3 hours or every 200km – 300 km. (**Figure 32**)

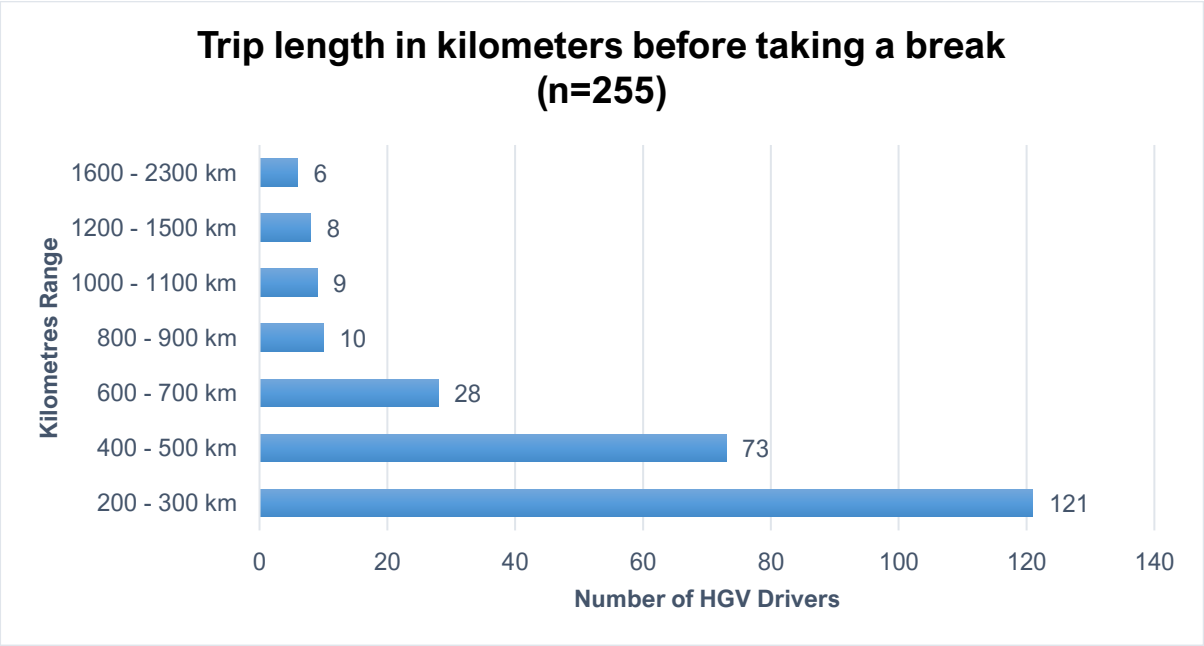


Figure 32: Trip length in kilometres before HGV drivers takes a break.

About 26% of HGV drivers indicated that it takes them between 24 and 48 hours to travel from origin to destination, 8% travel between 17 and 23 hours and 52% travel more than 48 hours on the road. The rest of the drivers (13%) travel between 2 and 16 hours (**Figure 33**).

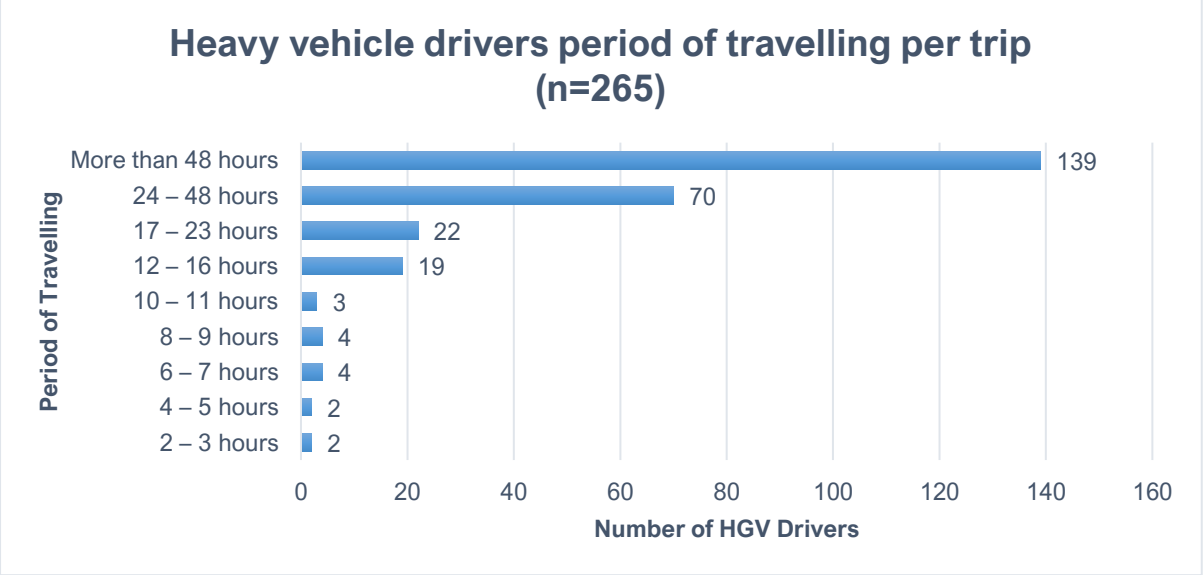


Figure 33: Heavy goods vehicle driver's period of travelling per trip.

In terms of other road user behaviour, 97 HGV drivers (37%) indicated they do feel pressure to drive dangerously while 63% of the drivers do not feel any pressure to drive dangerously. Of the 97 drivers who responded with a reason for this, the indication was that smaller passenger vehicles, minibus taxis and other heavy vehicles pressure them to "get out of the way" or by dangerously overtaking, reckless driving and lack of following distance from smaller

vehicles. Crime/Fear of hijacking was also highlighted as a key concern by some of the drivers. In terms of infrastructure failures, drivers highlighted potholes as well as narrow roads as sources of danger and frustration (**Table 16** and **Table 17**).

Table 16: Reasons for dangerous driving

Dangerous Driving	Number of HGV Drivers	% of HGV Drivers
Reckless Drivers especially small cars, taxis & trucks	32	33%
Delays/ Delivering on time/ Pressure from employer/Many Deliveries	27	28%
Crime/Fear of Hijack	19	20%
Tired drivers	3	3%
Impatient Motorists	2	2%
Slow speed	2	2%
To avoid accidents	2	2%
Driving at night	1	1%
Breaking the law to accommodate unruly drivers	1	1%
Strikes	1	1%
Bad Weather condition	1	1%
Looking for safe place to stop	1	1%
Family Emergencies	1	1%
Bad conditions of the road e.g., potholes	1	1%
Side tippers	1	1%
Slow truck drivers	1	1%
Vehicles breaking down on the road in areas that are blind spots.	1	1%
Total	**97**	**100%**

Table 17: Heavy goods vehicles driver's frustrations.

Frustrations	Number of HGV Drivers	% of HGV Drivers
Bad Driver Behaviour (Other trucks and smaller vehicles)	178	52%
Not Frustrated	38	11%
Potential Hijacking/Robberies	15	4%
Bad Road Conditions	14	4%
Traffic	12	3%
Speed Limit	11	3%
Life and Family Issues/Emergency Calls	10	3%
Micromanagement and pressure by employer	15	4%
Fatigue and No Breaks	7	2%
Company controls Trucks	6	2%
Delays (Late Loads, Accidents, Strikes)	5	1%
Not getting time off (being away from family for long)	4	1%
Deadlines and Reaching Targets	4	1%
Bright Lights at Night	3	1%

Table 17: Heavy goods vehicles driver's frustrations.		
Frustrations	**Number of HGV Drivers**	**% of HGV Drivers**
Surveillance on Trucks	3	1%
Inability to access shopping areas for meals	2	1%
Distraction from other drivers	1	0%
Employers do not listen to drivers	1	0%
Employers not maintaining the trucks regularly, resulting in breakdowns.	1	0%
Inconsistencies with the law enforcers	1	0%
Inefficiencies at weighbridges	1	0%
Late/changes instructions from company controller	1	0%
Loaded Goods	1	0%
Long Distance	1	0%
Multiple Destinations	1	0%
Overtime	1	0%
Payment Delays	1	0%
Stuck with no load	1	0%
Using companies' maps/routes	1	0%
Weather conditions	1	0%
Working conditions, they don't follow the labour laws	1	0%
Total	**342**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 342 responses from 265 drivers.

About 50% (132) of the HGV drivers indicated that they receive incentives from their employers. The type of incentives received are structured as follows:

- Monetary rewards for achieving low fuel consumption.
- Monetary bonuses for transporting more loads.

Figure 34 below shows that the predominant incentive type offered to HGV drivers is in the form of a bonus, which is offered about 60% of the time, relative to other incentives.

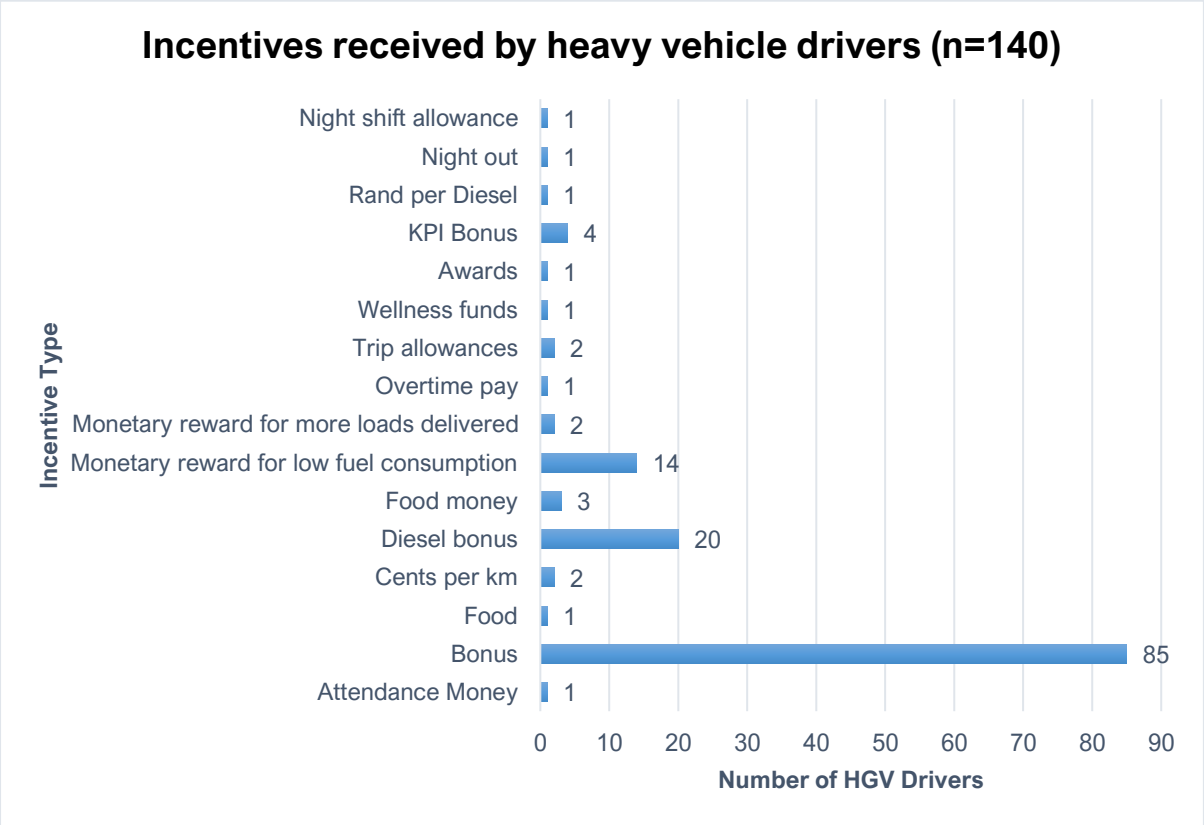


Figure 34: Incentives received by heavy goods vehicle drivers.

Note: The heavy vehicle drivers were allowed to give more than one response which led to 140 responses from 132 drivers.

Of the HGV drivers who admitted to avoiding weighbridges, forty-three percent (43% or 139) did so due to being overloaded and twenty-six percent (26%) to avoid delays. Four drivers highlighted that when an overload is found the driver becomes liable and not the company **Table 18).**

Table 18: Weighbridge avoidance

Why Avoid Weighbridge	Number of HGV Drivers	% of HGV Drivers
Overloading	139	43%
Avoid Delays	83	26%
Don't Avoid Weighbridges	31	10%
Criminal Activities	19	6%
Unroadworthy Trucks	15	5%
Don't know	9	3%
They are inconvenient when you have no load.	8	3%
Companies tell drivers to avoid, overloaded,	5	2%
No control on the load type carried. Some companies do not have internal weighbridges, and when issues are picked on the road weighbridges, the driver becomes liable, not the company.	4	1%

Table 18: Weighbridge avoidance		
Why Avoid Weighbridge	**Number of HGV Drivers**	**% of HGV Drivers**
Company delay helping driver if arrested there, overloaded vehicle	2	1%
Drivers are getting highjacked	1	0%
Fine is under driver	1	0%
Negative attitude from traffic officials	1	0%
New systems implemented (checking traffic fines) overload, road worthy, invalid documents.	1	0%
Inaccuracies and difference in calibration of the weighbridges.	1	0%
Total	**320**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 320 responses from 265 drivers.

Table 19 illustrate HGV driver responses relating to facilities they prefer when they must make brief stops. More than half of the drivers (54%) indicated they prefer to make use of truck stops. Additionally, 21% indicated that they use filling stations and 14%, dedicated roadside facilities where a truck can safely pull off.

Five percent of the HGV drivers indicated that they stop either at a mall (3,5%) or anywhere that is safe (1,5%). The remaining 6 of driver responses related to other facilities such as on-board sleeping stations, delivery point and company depots.

Table 19: Where heavy goods vehicle drivers make brief stops		
Where do you normally make brief stops	**No of HGV Drivers**	**% of HGV Drivers**
Truck Stop	214	54%
Filling Station	82	21%
Roadside	55	14%
Mall	14	3.5%
Anywhere safe	6	1.5%
Shop by the road	5	1%
2 drivers no need to stop and sleep	4	1%
Restaurants	4	1%
Day Trips Only	3	0%
Delivery Point (Client Premises)	3	0%
Hotel	2	0%
Company sleeping station	2	0%
Depot	2	0%
BnB	1	0%
Eat while driving	1	0%
Home	1	0%
Total	**399**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 399 responses from 265 drivers.

4.3.1.5. Origins, Destinations and Cargo

Table 20 and **Table 21** below show that most of the HGV drivers (32%) start their trips at the Western Cape, followed by 26% of the drivers starting their trips in Gauteng. Similarly, most of the drivers (29%) end their trips in the Western Cape, followed by 21% of the drivers ending their trips in Gauteng.

Table 20: Origins		
Origin	**No of HGV Drivers**	**% of HGV Drivers**
Gauteng	110	26%
Western Cape	135	32%
Kwa Zulu Natal	47	11%
Eastern Cape	34	8%
Northern Cape	15	4%
Limpopo	12	3%
Free State	11	3%
Mpumalanga	11	3%
Anywhere	13	3%
Northwest	12	3%
All over cross border	5	1%
Namibia	5	1%
Tanzania	1	0%
Botswana	1	0%
Mozambique	2	0%
Maseru	1	0%
Swaziland	1	0%
Total	**416**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 416 responses from 265 drivers.

Table 21: Destinations		
Destinations	**No of HGV Drivers**	**% of the HGV Drivers**
Western Cape	157	29%
Gauteng	117	21%
Kwa-Zulu Natal	70	13%
Eastern Cape	45	8%
Northern Cape	31	6%
Limpopo	28	5%
Mpumalanga	20	4%
North West Province	20	4%
Anywhere	16	3%
Free State	10	2%
Namibia	10	2%
All over cross border	5	1%
Botswana	5	1%
Swaziland	4	1%
Mozambique	3	1%
Maseru	2	0%
Angola	2	0%
Tanzania	1	0%
Zambia	1	0%
Congo	1	0%
Madagascar	1	0%
Total	**549**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 549 responses from 265 drivers.

Thirty-eight percent (38%) of the drivers start their trips between 04:00 am – 08:59 am followed by 20% of the drivers starting their trips anytime of the day. The rest of the time periods throughout the day are almost evenly distributed (~13.1% – ~13.9%) for drivers starting their trips. Fifteen percent (15%) of the drivers start trips during the night hours 20:00 – 03:59. (**Figure 35**)

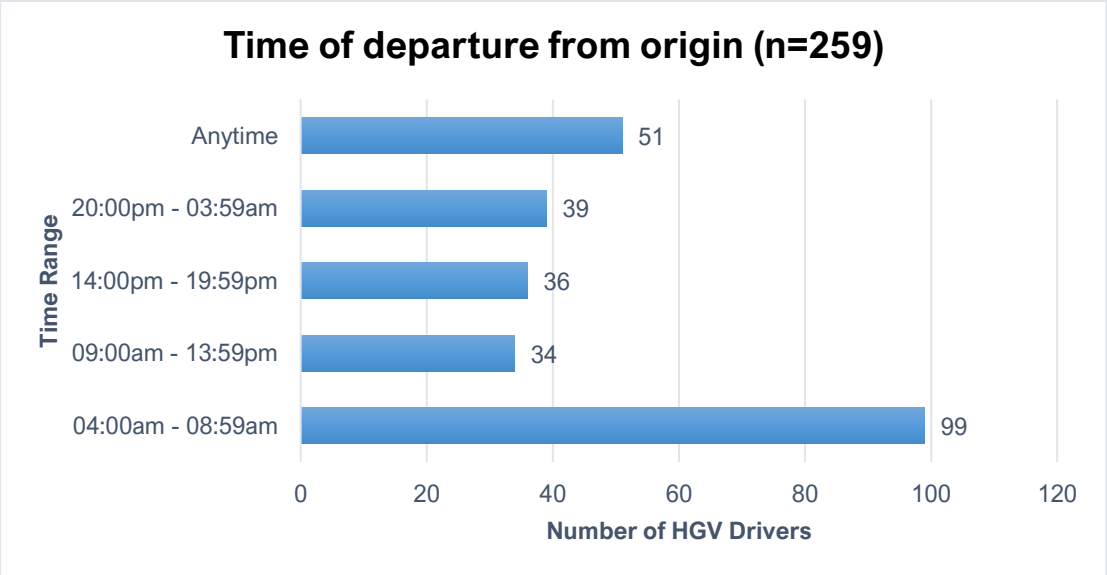


Figure 35: Time of departure from origin

Note: N=259 because the 6 missing responses were captured as point of departure and not time of departure therefore had to be removed from the responses.

Table 22 provides an overview of the type of cargo carried by the operators/drivers.

Table 22: Cargo transported by heavy goods vehicle drivers.

Cargo type	Number of responses per cargo type	% of total cargo
Food	81	21%
Anything	55	14%
Alcohol	21	5%
Chemicals	18	5%
Furniture	15	4%
Bottles	14	4%
Grain	12	3%
Coal	10	3%
Cars	9	2%
Cement	7	2%
Frozen goods	7	2%
Steel	6	2%
Clothes	5	1%
Appliances	5	1%
Papers	5	1%
Drinks	4	1%
Containers	4	1%

Table 22: Cargo transported by heavy goods vehicle drivers.		
Cargo type	**Number of responses per cargo type**	**% of total cargo**
Car Parts	3	1%
Metal	3	1%
Bulk Goods	3	1%
Boxes	3	1%
Can't disclose	3	1%
Confidential cargo	3	1%
Cosmetics	3	1%
Fertilizer	3	1%
Fuel	3	1%
Animal Feeds	3	1%
Mealies	3	1%
*Others	72	19%
Total	**385**	**100%**

Note: The heavy vehicle drivers were allowed to give more than one response which led to 385 responses from 265 drivers. *Others category includes cargo such as Carbon dioxide, Plastic materials, Wheat, Sand, Snacks, Pulp, Glass, Wood, Former Plate, Plastics, Household goods, Meat, & Oil, Tiles, Waste, Beds, New Horses, Cables, Batteries, Clicks Products, Construction Materials, Wines, Dog Food, Empty Cans, Fabric, Flowers, Chromium, Pharmaceuticals, Timber. These cargo types received less than 3 responses.

4.3.2. Logistic Company surveys

Eight logistic companies, registered in the Western Cape completed the logistic company survey between first week of June 2023 and the last week of July 2023. One logistic company and one training provider opted to participate in the facilitated discussion held on the 27 July 2023.

4.3.2.1. Location of companies

Table 23 provides an overview of where the companies are in the Western Cape.

Table 23: Location of registered companies	
Location	**Number of companies**
Strandfontein Cape Town	1
Cape Town	2
Genadendal	1
Head Office Kenilworth Cape Town	1
Wellington	1
Western Cape and Gauteng	1
Worcester	1

Figure 36 indicate the size of the participating companies.

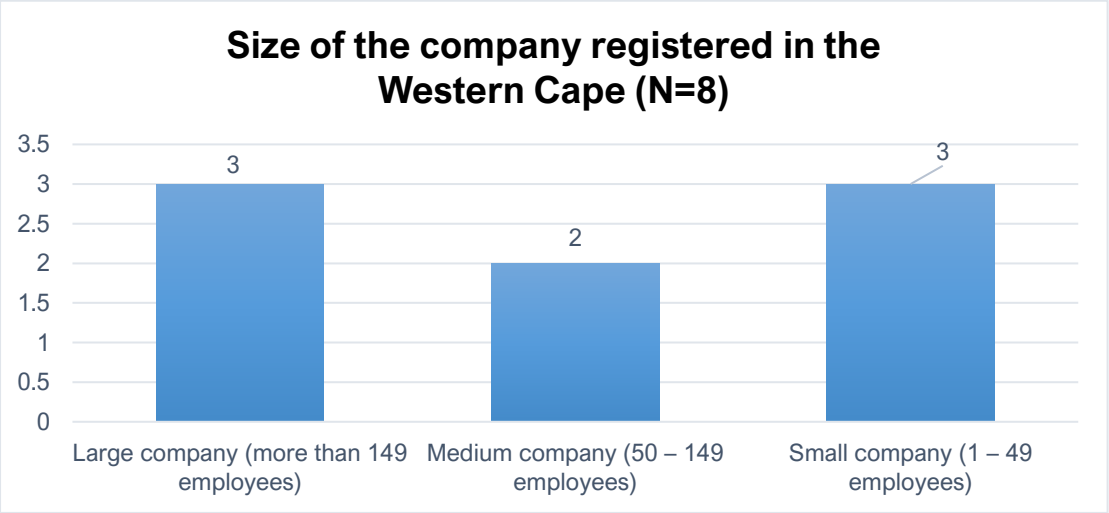


Figure 36: Size of Companies registered in the Western Cape

4.3.2.2. Hiring requirements

Companies prioritise drivers with specific qualifications and experience, such as:

- A valid PrDP,
- A clean criminal record,
- Several years of driving experience,
- A minimum age of 25 years,
- Physically fitness,
- Drivers need to have good eyesight,
- Ability to work under stress and,
- Good health (valid medical certificate)
  Larger companies are required, in line with the National Road Traffic Act 1996), that the medical fitness certificate is renewed yearly.

Additional requirements for driving specialized goods include having a valid professional permit for specialized loads such as dangerous goods as well as certain age requirements which are dependent on the goods. Some companies also require practical tests such as a theory test and the K53 on road practical driving test that probes the driver's ability to manage on road tasks **(Table 24).**

Table 24: Additional requirements highlighted by companies.

Requirements	Criteria
Requirements in line with the NRTA 1996 Medical fitness certificate	• Physically capable of driving, loading, and offloading. • Mentally capable of operating a vehicle. • Drug and alcohol free • Being verbally and numerically literate in English and preferably have a minimum qualification of grade 10/Standard 8 certificate. • Having a valid code EC (old code 14) or equally recognized driver's license and with a three (3) year blame free accident driving track record.

Table 24: Additional requirements highlighted by companies.

Requirements	Criteria
Requirements for transporting dangerous goods/ Goods	• Driver must be at least 25 years of age (dangerous goods) Dangerous goods loads need to be transported with a greater degree of responsibility. Crashes associated with dangerous goods are severe in terms of the environmental impact, the reaction-response required as well as the severity of injuries sustained in these crashes. Age is correlated with experience and the more experience a driver has, the expectation is that the driver will have a greater degree of responsibility. In addition, Class D PrDP makes provision for drivers from G (non-dangerous goods) and P (Passengers as goods) to apply for a D PrDP. This progression is testimony of the need for experience, which is gained over time as drivers get older. • Driver must be at least 18 years old (goods).
Road safety related	• Legislation training • Appropriate driver license • Dangerous Goods certification • Risk awareness training • Readiness to implement company and customer safety programs. • Preparedness to wear personal protective equipment, undergo regular training with all equipment and procedures associated with the work undertaken. • Committed to stop the vehicle in a safe place if tired or when losing concentration and use their stop work authority.
Practical tests	• K53 driving test (reversing with a large vehicle and trailer) • Theory test • Product specific training (specific vehicle make)
Soft skills	• Commitment to promote company ethics, vision & mission, policies, and procedures. • Responsibility • Accountability • Time management

4.3.2.3. Years of experience

Most companies (5) prefer drivers with 0-4 years of experience, indicating a balance between hiring seasoned drivers with sufficient experience and potentially seeking fresh talent for their workforce. One company indicated that four years of experience is enough if the driver is on a long- term training program, alternatively 5-10 years' experience of roads, loads and cross border operations. Two companies indicated a preference of 5 -10 years of experience.

Focus group interviews with logistic companies as well as driver training companies indicated that it is acceptable for drivers to have a minimum of three years' experience. However, it should be noted that the three years' experience **is a requirement from insurance companies** in case of road accidents. If a driver does not have at least three years' experience that can be problematic in terms of claims.

"Other" as a response to minimum years of experience category suggests that some companies may have different criteria or consider experience in a broader range. All the companies calculate minimum years of experience from when the driving licence card was obtained and reference of previous employment.

4.3.2.3. Employment duration

Companies have a mix of long-standing and newly employed drivers. Seven of the eight companies have had their longest employed driver for over 10 years and one company had their longest employed driver for less than four (4) years. The presence of drivers employed for over 10 years indicates stability, trust, and potentially a positive working relationship between the drivers and their employers.

Most of the companies reported recently appointing new drivers. **Table 25** provide an overview of how long ago a driver was employed by a company.

Table 25: Time since last employing a driver

Period	Number of companies
0 – 1 month ago	4
2 – 3 months ago	2
4 – 6 months ago	1
over 1 year ago	1

4.3.2.4. Road accidents

One of the companies had reported about 80 accidents in the last year (for additional context, this is a large company with a fleet size of more than 1500 vehicles) and another company reported zero crashes in the last year. Three companies indicated that they only had one crash in the last year, one company had three crashes while the remaining two reported 9 and 10 accidents in the last year, respectively. Figure 37 provide an overview of the period (how long ago) the crashes were reported in the last year.

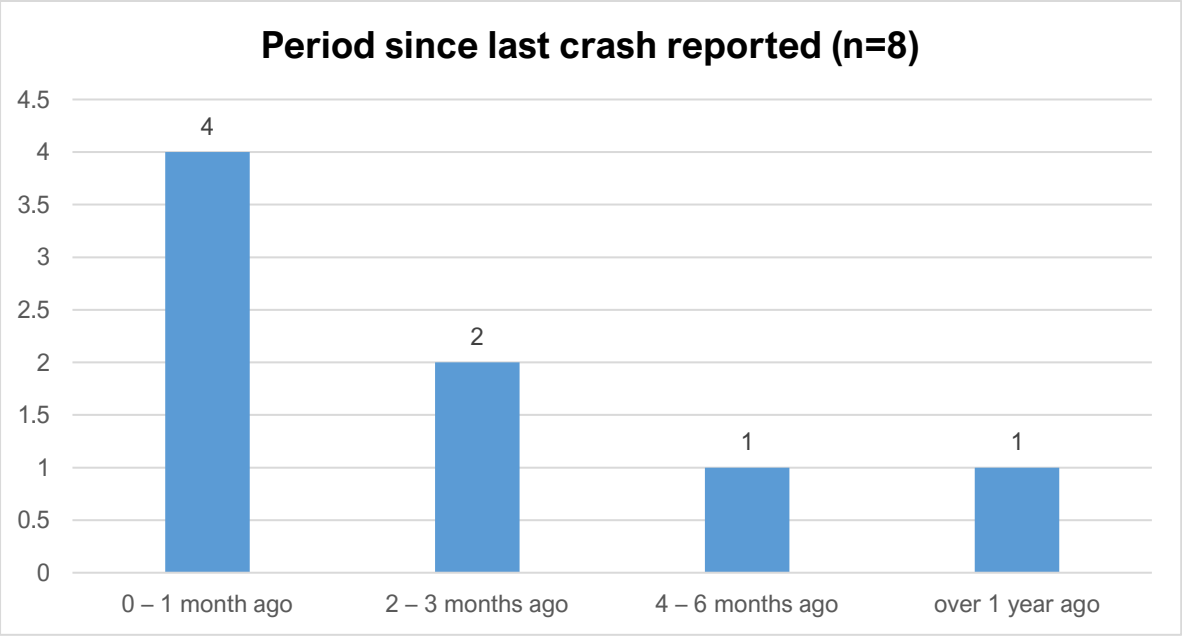


Figure 37: Period since last reported crash.

The reported causes of road accidents highlight various factors, including.

- The behaviour of other road users,
- Driver distractions,
- Fatigue,
- External factors like stray animals, and
- Third party vehicles.

The number of accidents could also be directly related to the fleet size of the company. This further suggests that large fleet companies need to address these issues through driver training, increased road safety awareness, and proactive measures to minimize accidents and ensure the safety of their drivers and the public.

4.3.2.5. Reporting and Frustrations

Six out of eight companies indicated that their drivers have a way of reporting frustrations. The methods of reporting include briefing, debriefing, WhatsApp groups, cell phones, truck phone and panic buttons. Some of the typical frustrations that are reported include traffic congestion, offload delays and border delays. The existence of reporting mechanisms indicates that companies recognise the importance of providing drivers with channels to express their frustrations and concerns. This allows for better communication and potentially addressing issues promptly, enhancing driver satisfaction and well-being.

4.3.2.6. Break allowances

Two logistic companies indicated that they permit drivers two breaks for 200 km trip distances; another company allows three 30-minute breaks on a 600 km trip distance, while the other five companies give an average of four breaks that take an average of 45 minutes on a 1000-kilometre trip journey. The allocation of breaks for longer trips demonstrates a focus on driver welfare and adherence to regulations related to rest periods. Providing sufficient breaks helps combat fatigue, improves driver concentration, and promotes overall road safety.

4.3.2.7. Monitoring drivers

Six companies indicated that they use cameras to monitor their drivers and the road environment. Four companies indicated that the cameras face both the driver and outside of the cabin while one company indicated the camera faces only the driver and one company only the outside of the cabin. Two companies did not answer the question.

The discrepancy in using cameras to monitor drivers suggests different approaches to driver monitoring among companies. Those utilising cameras likely prioritise monitoring driver behaviour and adherence to safety protocols. Companies not using cameras may have different strategies for driver management or rely on alternative methods such as:

- Telematics Systems: A lot of logistic companies use telematics platforms to collect data from various vehicle sensors and digital gadgets. The data such as braking patterns, speed, and GPS location are tracked by these systems. Vehicle companies can evaluate how drivers behave and detect mistakes from security guidelines through the examination of this data.
- Driver Scorecards: Some vehicles companies use driver scorecards for assessing and rating driver efficiency based on a range of indicators. These indicators include things like speed restriction obedience, cautious driving, effective vehicle handling, and general conformity with company policies. Companies can pinpoint areas in which

drivers may need additional training and support by reviewing these scorecards regularly.

- Reporting Incidents: inviting drivers to file reports of safety incidents or near misses can help determine areas for improvement. Organisations can set up channels for drivers to report concerns or provide suggestions regarding road conditions, and other safety issues. This data can be used to address any possible hazards and improve driver safety.

4.3.2.8. Driver Training

All logistic companies indicated that they offer mechanical training to their drivers, whilst seven also offer road safety training. This is the type of training where drivers can diagnose and fix any mechanical faults in the heavy vehicle, that do not require a professional mechanic. The type of road safety training offered includes basic first aid, in-house training regarding road behaviour in terms of company employee and disciplinary code of conduct, accident procedures for all types of cargo, basic rules of the road, defensive driving, HAZCAM training, and how to operate a combination of vehicles. The frequencies of these different types vary as follows: monthly, seasonally, or other. The type of training that logistic companies offer their driver varies and seems to be driven by the companies' specific goals and outcomes they deem important.

4.3.2.9. Driver trips

Seven of the eight companies indicated that drivers are expected to meet specific timelines. These expected timelines are due to, or may entail, completion of daily loads or client's requirements, as well as pre-bookings to enter the Port of Cape Town to load or off-load goods. Only one of the logistic companies had a driver whose longest trip is less than two hours, whilst the other logistic companies' longest trips range from 14 to 24 hours. Most of the trip destinations are in neighbouring countries, and a few are within South Africa. Three of the logistic companies indicated that they transport hazardous cargo. Although the different logistic companies have different requirements for drivers transporting dangerous goods, they all offer training for that commodity. Only one company indicated that they offer drivers incentives.

4.3.2.10. Company size

Two companies' fleet size is less than 10, two companies have fleet sizes between 11 and 50, one company has between 51 and 100, two of them have fleet sizes between 101 – 500 and one has a fleet size of over 1 500 with about 8 346 drivers. **(Figure 38)**

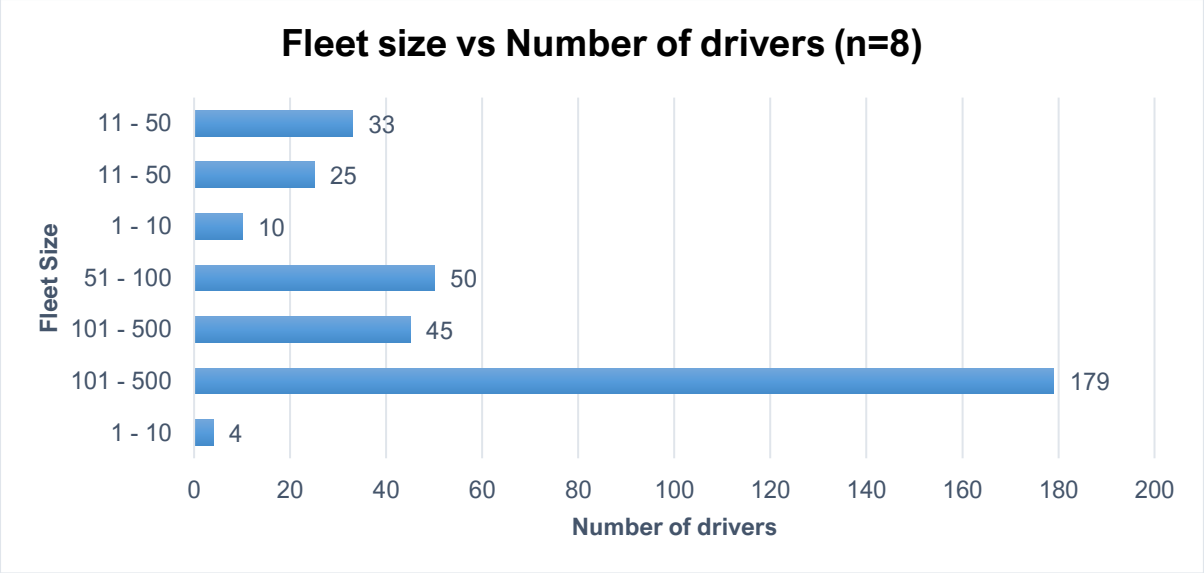


Figure 38: Fleet size vs Number of drivers

Note: One company with fleet size of over >1 500 with 8 346 drivers was removed from the graph for visibility

4.3.3. RTMS Certified Logistic Companies

Four RTMS certified logistic companies started the survey. The survey was opened by all four respondents but only three gave consent and continued to answer the survey questions.

4.3.3.1. Driver Behaviour Monitoring and Training:

According to insights from one respondent familiar with RTMS certified logistic companies, monitoring drivers' behaviour is crucial. This includes speed behaviour, with 70% of the drivers reportedly exceeding speed limits, driving hours, with 15% exceeding recommended hours, and adherence efficient driving practices. The organization has initiated training programs, resulting in a 25% improvement in driving techniques and behaviours. Additionally, fatigue management strategies have been implemented, reducing fatigue-related incidents by 30%.

4.3.3.2 Driver Management:

Monitoring is pivotal in driver management. Tracking incidents on duty, and implementing medical monitoring are a few of the driver management practices mentioned in the data. These practices seek to recognise and address any issues or incidents that may arise while drivers are performing their duties These practices have led to the identification and resolution of 40% of issues or incidents during drivers' duties. Toolbox talks have proven effective in addressing safety concerns, leading to a 20% decrease in safety-related incidents. Emphasizing medical monitoring has ensured 95% of drivers meet health standards for their roles.

4.3.3.3. Driver Health and Wellness

Companies show a strong commitment to driver health and wellness. Medical surveillance programs have identified and addressed health concerns in 60% of drivers. Chronic conditions are managed in 10% of drivers, and initiatives on healthy eating have seen a 15% improvement in driver health metrics. Emphasizing rest periods and wellness support has reduced fatigue-related issues by 35%.

4.3.4. Key Informant Interviews

4.3.4.1 The Road Transport Management System auditors

Active monitoring to inform and improve driver behaviour is essential and should not just be a tick-box exercise, otherwise RTMS accreditation will not have a direct impact on the skills, health, and attitude of heavy vehicle drivers. A way to test whether a driver is a well-skilled driver, is to monitor how long it takes a driver to park a vehicle and load or offload goods. The number of incidences or accidents per driver (even small crashes or near misses) should also be monitored. If these are monitored, measures could be put in place to improve the skills of the driver. The RTMS accreditation process considers various elements related to driver and vehicle management, and the companies are audited to be certified. In other words, a thorough investigation is conducted in relation to RTMS compliance before accreditation is issued. Although RTMS is not legislated and employers are not compelled to have annual health checks or wellness programmes, companies need to comply with the RTMS standard to retain RTMS accreditation.

4.3.4.2. Labour Monitoring Systems

Standards that have been set such as those in the Labour Relations Act (LRA) require continuous monitoring for them to be effective; otherwise, few or no one complies with those requirements. In South Africa there are less than effective no monitoring systems.

4.3.4.3. Driver Training and Testing

It is important that when drivers are tested on their driving skills that they should be tested using a similar vehicle that they intend to drive at work and that driver skills are tested using a laden, half-laden, and an empty vehicle.

In South Africa, well-skilled drivers tend to be sought after by many companies including overseas companies, which leaves South Africa with fewer qualified and well experienced drivers.

4.3.4.4. Factors contributing to accidents.

Some of the main factors that can contribute to the causes of accidents include fatigue and reckless driving by light motor vehicle (LMV) drivers.

4.3.5. Insurance Companies

Out of the six heavy vehicle insurance companies in South Africa that were approached, only one responded positively and was interviewed.

The survey consisted of inquiries that primarily focused on driver safety, skills, and conduct. The responses provided clear indications that the insurance company effectively regulates driver behaviour through various incentive programs and campaigns they offer. Thus far, the insurance company has achieved success in influencing driver behaviour, as evidenced by a reduction in the number of annual claims associated with accidents caused by driver behaviour. Additionally, most of these incentives have been implemented for a period ranging from 5 to 10 years, with the most recent campaigns taking place approximately 3 to 5 years ago.

Women Inspiring Women to Lead in Transport (WIWIT) training entails a four-month practical driver development programme, including theory modules. Participants obtain their learner's driving licences and attend as many driving lessons as they need, after which they are assisted to obtain their commercial driving licence and professional driving permit, working with the

Commercial Transport Academy (CTA) driver trainers. They also complete various soft-skills programmes – including personal budgeting, gender-based violence awareness, HIV/Aids, and harassment in the workplace. The women complete an advanced truck and trailer driving programme before they enter the workplace. Through sponsorship WIWIT ultimately aims to train 1 200 female truck drivers and transport and logistics professionals over five years.

The direct involvement of the insurance company includes sponsoring two branded truck trailers for advanced truck and driver training; computer training centres in Gauteng and the Western Cape; laptop computers for training; Personal Computer (PC) screens, desks, chairs, and student bags; and access to the "Learnovate" e-learning portal offering soft-skills courses.

Table 26 below provide an overview of the insurance industry response.

Table 26: Insurance industry responses

#	Question	Response
1	Has your insurance company been involved in any driver safety and/or skills awareness campaigns for heavy vehicle drivers?	Yes
1.1	Please provide a list of those campaigns	Hollard Highway Heroes - Driver of the year competition for truck and bus drivers Hollard Trucking Driver Rewards Card Programme - ongoing incentive scheme via MasterCard solution Advanced Driver Training Programmes - TETA Accredited Women Inspiring Women to Lead in Transport - USAID Funded Skills Development Programme in partnership with The Commercial Transport Academy Truckstop Activations in partnership with RTMC - Driver Wellness and Truck Driver Safety
1.2	Where were the campaigns hosted?	Hollard Highway Heroes - National
1.3	When were the campaigns hosted	3 – 5 years ago
2	Does your insurance company advertisement include heavy vehicle driver safety awareness?	Yes
2.1	Where are these advertisements published?	• Billboards • Magazines • Newspapers • Online Media • WhatsApp groups

Table 26: Insurance industry responses

#	Question	Response
3	Do you offer driver incentives for "good" heavy vehicle driver behaviour?	Yes
3.1	What is the total number of incentives currently offered by the insurance company?	5
3.2	Please name the incentive/s you offer?	(Same as campaigns)
3.3	How long have the initiative/s been in place?	5 – 10 years
3.4	Has there been any observed changes to driver behaviour since the onset of the incentive/s?	Yes
3.5	Since the onset of the incentive/s has there been an increase or decrease in annual claims for accidental damage caused by driver behaviour?	Decrease
3.6	What average percentage of your consumers currently have the incentives cover plan?	25%
3.7	Do you plan to continue offering the current incentives plan in the future?	Yes
3.8	Do you plan on introducing additional incentives soon?	Yes

Even though incorporating incentives into the insurance policy does not lead to an increase in monthly premiums, a significant number of logistic companies/operators opt out of availing these benefits. Only 25% of the logistic companies that utilise the insurance choose to take advantage of these incentives. There are various reasons why these companies decline to accept the incentives, and a few examples include:

- Requirements of tracking devices
- Unions (political issues)
- Lack of awareness

It is generally the big logistic companies that show interest in Road Safety initiatives whilst, small companies do not.

4.3.6. Regulatory Authorities

Three out of the six national regulatory authorities that were approached (RTMC, CBRTA, and Department of Employment and Labour) participated in this research, with one providing minimal input.

The RTMC granted the research team an interview and the responses are presented in table 27 below.

The CBRTA responded to a follow-up made by the WCMD in late October 2023. The CBRTA does not undertake the function of endorsing non-South African heavy vehicle driver qualifications, licenses or health fitness certifications. It has no responsibility in terms of the education or skills development for HGV operators as this is the responsibility of the operator. The CBRTA only checks the compliance status of the operator applying for a permit. To consider an application, the CBRTA only requires the operator's tax clearance certificate, road worthy certificate and company registration documents.

RTIA indicated that since AARTO is currently only rolled-out in Gauteng, they were unable to complete an interview with the research team.

The Department of Transport responded to the survey participation request late August 2023. Several attempts were made by the research team to obtain DoT's input, either by way of an interview or through the completion of the questionnaire. DoT indicated their interest in the project and intention to respond but noted that capacity constraints and competing priorities were making it difficult to do so. A final attempt at soliciting DoT's participation was made on 2 November 2023, with their response expected on the 3rd November 2023. However, at the time this report is being updated, no input was received.

Thus, the only broad statement that can be highlighted with regards to heavy vehicles and heavy goods vehicle drivers contributing to an unsafe road system is as follows:

The legislative and regulatory framework in South Africa can be described as robust but can still be improved. The enforcement of the law however is lacking owing to numerous reasons including corruption and lack of resources to enforce the law. This lack of sufficient law enforcement has also led to unsafe heavy vehicles and unlicenced drivers operating on South Africa roads including in the Western Cape. **Table 27** provides an overview of responses.

Table 27: Regulatory Authorities responses (RTMC)		
#	**Question**	**Response**
1	Is it the responsibility of Road Traffic Management Corporation (RTMC) to develop policy concerning the skills and competencies of heavy vehicle drivers in South Africa?	No, The RTMC however does contribute to this in the form of the research that it carries out which then informs the training that is provided to vehicle drivers.
2	Is it the responsibility of Road Traffic Management Corporation (RTMC) to develop manuals or guidelines to be followed in the training of heavy vehicle drivers?	No, the RTMC only trains Instructors at Licencing Authorities
3	Does RTMC regulate and monitor institutions that offer theoretical courses and practical training for driving a heavy vehicle?	No,
4	Which regulation prescript specifies the mandatory, academic qualifications of a heavy vehicle driver?	National Road Traffic Regulation, 2000
5	What minimum qualifications should be attained by an individual to be qualified to drive a heavy vehicle?	See Regulation 99, 115
6	Are there any supplementary or recommended academic qualifications for a heavy vehicle driver?	Yes, provided by private training institutions and driving schools.
7	Which regulation/s prescript specifies the mandatory, health fitness requirements for a heavy vehicle driver?	See NRTA Section 15 Regulation 102
8	What are the mandatory health and fitness requirements for a heavy vehicle driver?	See NRTA Section 15 Regulation 102

4.3.7. Driver Training Providers

A focus group discussion was arranged with driver training providers operating in the Western Cape Province. Invitations were sent to 21 driver training companies and three responded to the request to participate in the focus group discussion. The focus group discussion was held on the 2nd of June 2023.

Type of training that is provided to heavy vehicle drivers by the training providers.

The session focused on driver training approaches, the type of training provided and recommendations to improve driver training. The driver trainers who participated in the focus group play an active role in offering learnerships for the National Certificate: Professional Driving. These learnerships encompass comprehensive training on the unit standards, equipping learners with the necessary skills to obtain a driver's license.

The driving instructors indicated that amongst the type of training programmes that are provided there is a K53 refresher course, and training to enable compliance with dangerous goods requirements.

One of the primary challenges highlighted by the training providers is funding. The reduced or lack of funding from TETA has created many challenges for training providers. Furthermore, since the COVID-19 pandemic many trucking companies are focusing on only regulated training such as dangerous goods re-certification, first aid, and firefighting training. Training for advanced driving and refresher courses has completely stopped.

From a driver training perspective what can be changed to make things better?

The following areas were highlighted for potential improvement:

- TETA should provide sufficient funding to training providers to offer robust training to new heavy vehicle drivers.
- Fight corruption.
- Some companies prefer to employ more experienced and better trained foreign truck drivers compared to South African truck drivers.
- Some drivers are being trained but not absorbed in the market.

Other issues raised by the participants.

The following issues were raised:

- There needs to be provision for training of truck drivers that focuses on the vehicle technology considering the changing and evolving technology that vehicles incorporate.
- Drivers require more practical training more than computer-based training.
- The PrDP's minimum requirement is a small vehicle whereas a heavy goods vehicle driver may be required to drive a larger, fully laden vehicle.
- It is incorrect for someone to obtain a code 10 driver's license and be authorised to drive a code 8 vehicle.
- It is recommended that a written and practical test be established as a standard requirement for obtaining a PrDP.
- The proposal regarding driving hours suggests that a code 14 license should have a standard requirement of 30 hours. However, this raises an issue because companies are only willing to cover the cost of 20 hours for their drivers. Additional hours are crucial to guarantee driver confidence and build experience.

- A driver should be trained on how to drive the vehicles according to the vehicle manufacturer specifications. This lack of knowledge leads to accidents especially on hilly terrain as drivers are not equipped to use the vehicle technology to its full potential. Vehicle manufacturers should be able to provide drivers with a certification showing that the said driver is able to operate the vehicle according to its specifications.
- Driver trainers have observed that a lot of foreign nationals do not always have the latest skills on the latest vehicle technology which causes a lot of problems.

4.3.8. Advanced driver training providers

Table 28 provide an overview of the advanced driver trainer interviews. Advanced driver trainers provide specialised driver training as opposed to only K53 training and refresher training.

Table 28: Advanced driver training provider interviews

#	Question	Response		
		Training Provider 1	Training Provider 2	Training Provider 3
1	Who develops the content of your theoretical and practical training manuals and study guides, and how regularly is the content updated?	R&D Training Provider and best practice standards by international partners. Updated annually, or sooner (as per clients' requirements)	TETA learnership - evaluated annually.	Training Department Training contents are updated as required
2	What is the rate of uptake of training of truck drivers, annually?	Dependant on cost and availability of drivers.	670 women National Certificate of Professional Driving - 60 to 80 drivers	Did not answer.
3	What type of training do you offer to truck drivers? Please name them.	Defensive driving (accredited and non-accredited) Specialized programmes	Short skills, Theory, Practical, Technical, Soft skills, Self-development	In cab, Defensive Driving, Basic Road Rules
4	What type of training do most truck drivers enrol for? Please name them	Drivers do not enrol but companies.	Economical driver training (request by operator) Product training	All training is compulsory
5	What do you regard to be the training requirements for those programmes in which truck drivers enrol?	Training updated frequently to accommodate different generations of drivers.	Training outside of the classroom (e.g Apps), Route risk assessment, Vehicle specific training	All the drivers are trained by TETA accredited training providers
6	Is the theoretical and practical training content the same for all heavy vehicles or are there customised/specialised	Both	Generic	Generic

Table 28: Advanced driver training provider interviews				
#	Question	Response		
		Training Provider 1	Training Provider 2	Training Provider 3
	areas for different type of heavy vehicles or dangerous goods? If there are what are those differences? • Generic • Customized			
7	To what extent does the training that you provide to truck drivers adhere to international standards?	Once or twice a year MasterDrive embarks on international engagements. As far as budgets and rates of exchange allow.	Benchmarked practical training against the Volvo trucks. Economical program is an international.	Training we provide are according to TETA qualification.
8	Has there been a skills assessment to determine gaps in skills/education/training?	Yes The advanced training provider engages with clients to identify gaps to fill those.	Yes it depends on the company that requires that training for their employees.	Yes
9	What informs the skills development programmes that you offer?	Public Demand Other institutions Needs analysis	Depends on the logistics company. Telematics – driver behaviour	TETA does regular audits and have to approve learners that went through the school.

Additional interview questions and responses that provided insights from the perspective of the advanced training providers (**Table 29**):

Table 29: Driver Labour and Employment

#	Question	Response	
		Training Provider 1	Training Provider 2
1	What are the qualifications, skills, or competence areas that aspiring or heavy vehicle drivers generally lack?	Experience Driver Compliance	Legitimate driver's license Vehicle specific training
2	Does South Africa have enough skilled truck drivers?	No, because the skilled drivers are sourced to other countries.	No
3	Are there any supplementary or recommended academic qualifications for a heavy vehicle driver?	Yes Complementary Skills: Literate, tech-savvy, mathematical skills.	Yes Soft skills, Self-development
On the functions of the Cross-Border Road Transport Agency			
#	Question	Response	
		Training Provider 1	Training Provider 2
1	Does CBRTA undertake the function of endorsing non-South African heavy vehicle driver qualifications or licenses?	No	No
2	Does CBRTA undertake the function of endorsing non-South African heavy vehicle driver health fitness certifications?	No	No
On Logistic Companies/ Operators			
#	Question	Response	
		Training Provider 1	Training Provider 2
1	What are the basic requirements drivers before they get hired?	Driver's licence PrDP Good Health Driving skills	There isn't a standard way that this is done.
2	What are the main causes of truck accidents?	Fatigue/health – (62% of accidents caused by this) Vehicle conditions Driver behaviour Distracted driving	Fatigue – (Lack of proper rest stops infrastructure, sleep apnoea) Epilepsy

3	Do drivers have a way of reporting their frustrations on the road? • If **Yes**, please provide a rough percentage of companies that do this. • And please explain how the drivers report their frustrations on road	Yes Percentage (unknown) Some form of telematics	No
4	What are drivers most common frustrations?	Supervisors not understanding drivers. Being monitored Victimised by law authorities	Long work hours Loneliness Truck stops
5	How many breaks are drivers allowed to take per trip distance?	1 every 200 km	1 every 200 km
6	Do you offer drivers basic mechanical training (e.g., How to diagnose a truck for minor issues which do not need a qualified mechanic)?	No	No
7	Do you offer drivers road safety training?	Yes	No
7.1	What road safety training do you offer to drivers?	Driver assessments Defensive driving Toolbox talks	Defensive driving Elements of route specific safety training
7.2	How often does the road safety training happen?	every 2 years	As and when the client (i.e., truck operator) request the training.
8	Do you offer training on transporting dangerous goods	Yes	Yes
8.1	If yes, what are the requirements of a driver transporting dangerous goods?	In-line with the legislation	In-line with the legislation
9	Can you identify any additional areas to improve driver skills in general? • If yes, please mention the identified areas	Yes Lack of criteria or audit of the content of the training by RTMS certified companies.	Yes Medical conditions of drivers

Additional commentary that provided insights from the interviews with advanced training providers:

- Drivers tend to be resistant to the use of telematics as they perceive this to be an invasion of their privacy.

- In the near the future, virtual reality and augmented reality may be a need for driver training programmes.
- One of the issues with the current training methods is that drivers tend to drive better when being assessed by an instructor in the vehicle, which is usually not a true reflection of their actual driving behaviour.
- There are scientific tools such as psychometric profiling that are used to measure driver risks, attitudes towards driving, their commitment, etc. But these international tools have not been translated to the South African context and English language.
- CBRTA have issues with congestion at the borders.
- The notion that foreign drivers are reckless hasn't been proven, their risk lies more in experiencing xenophobia. Furthermore, quality of education of foreign drivers (e.g., Zimbabwean) is much higher than South Africa's drivers' education, which results in better driver behaviour of foreign drivers.
- Many international countries are attracting South Africa's senior truck drivers through better salaries and working conditions.
- The National Certificate of Professional Driving lacks soft skills training.

4.3.9. Western Cape Traffic Department Data on HGV Infringements

4.3.9.1 Introduction

Data recorded by Western Cape Traffic departments is crucial in highlighting the driver skills gaps in the province. It will also aid in identifying problem areas in the province, which will help in prioritizing training initiatives in those areas. Information obtained from the traffic departments highlighted areas where law enforcement needs to be enhanced.

The information requested from the Western Cape Provincial and Municipal Traffic Departments was as follows:

- Which traffic departments report the most "heavy goods' vehicles" traffic infringements?
- What average percentage of traffic infringements are related to "heavy goods' vehicles," relative to other vehicle types?
- What routine checks are done on heavy goods' vehicles on the road?
- What are the most common infringement types by heavy goods' vehicles drivers?
- What average percentage of heavy goods vehicle infringements are related to dangerous goods carrying vehicles?
- What average percentage of heavy goods vehicle infringements are related to non-dangerous goods carrying vehicles?
- What percentage of infringements of heavy goods' vehicles are found on national roads?
- What percentage of infringements of heavy goods' vehicles are found on provincial roads?
- What percentage of infringements of heavy goods' vehicles are found on municipal roads?

4.3.9.2. Infringement Results

The Western Cape Traffic Departments that provided the relevant information were:

1. The Western Cape Provincial Traffic Department
2. Swartland Municipality Traffic Department

3. Saldanha Bay Municipality Traffic Department
4. Swellendam Municipality Traffic Department
5. City of Cape Town Traffic Department

Figure 39 below shows the average percentages of HGV infringements in the Western Cape traffic departments. City of Cape Town (CoCT) recorded the highest percentage of 60% and Saldanha Bay Municipality recorded the lowest percentage of 2%. The reason for the low percentage recorded in Saldanha Bay Municipality could be that the data reflected only 426 infringements between January 2023 and May 2023 (inclusive of all notices, normal notices, and speed notices). Each traffic department provided percentages of heavy goods' vehicle related infringements out of the overall infringements of all vehicle types.

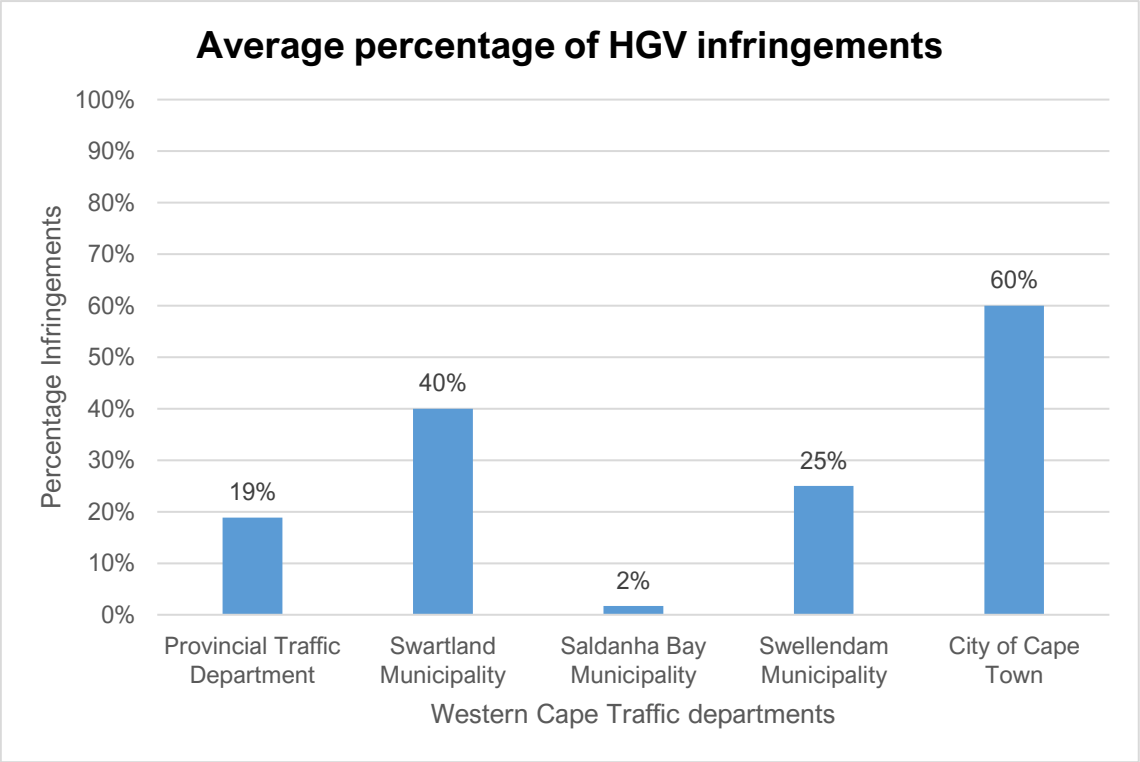


Figure 39: Average percentage of Heavy Goods Vehicles' infringements

The graph shown in **Figure 40** below illustrates the average percentage of violations involving dangerous goods by heavy goods vehicles (HGVs) in various traffic departments of the Western Cape. Among them, the Swartland Municipality had the highest percentage, at 30%, while the Swellendam Municipality had the lowest percentage, with only 2%.

Notably, the Saldanha Bay Municipality had a remarkable absence of any recorded infringements concerning dangerous goods by HGVs, this could be attributable the municipality's method of data capturing which does not specify whether a notice was issued to a dangerous or non-dangerous goods vehicle. Each traffic department provided percentages of dangerous goods related infringements out of the overall infringements of all types of goods associated with heavy goods vehicles.

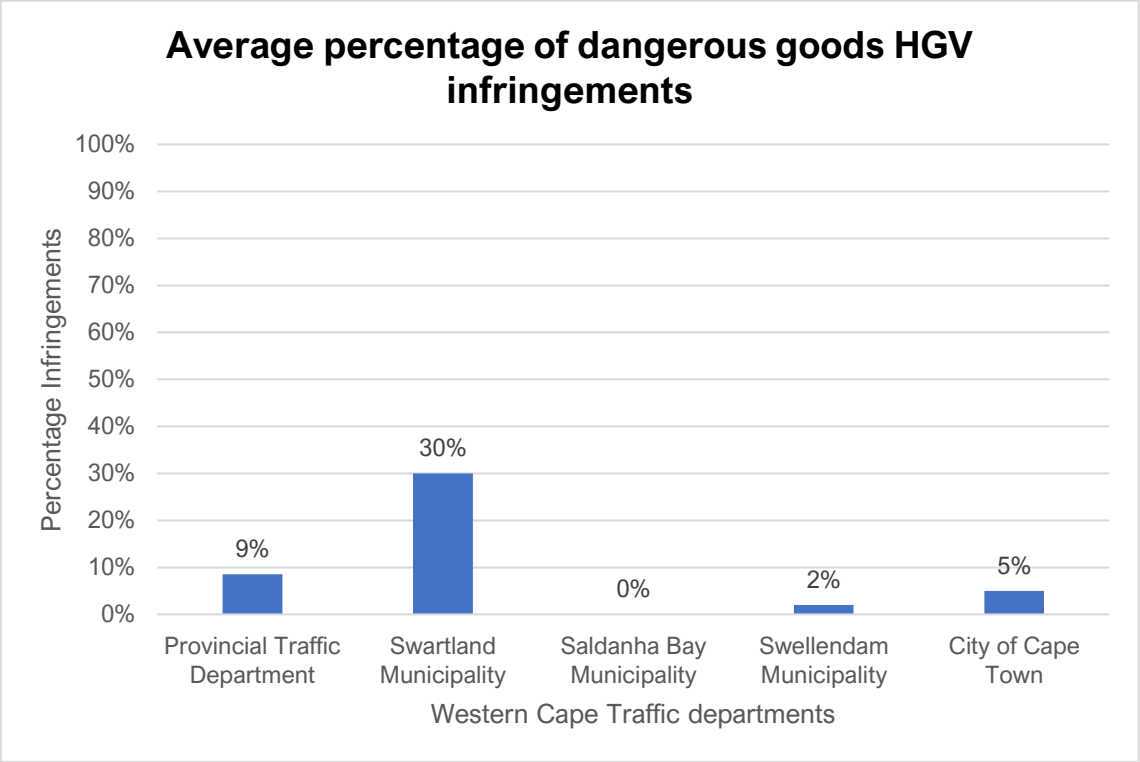


Figure 40: Average percentage of hazardous cargo Heavy Goods Vehicles' infringements

Figure 41 below shows the average percentage of non-dangerous goods HGV infringements in the Western Cape traffic departments. The CoCT and the Provincial Traffic Department recorded the highest percentages of infringements at 95% and 91% respectively. The lowest percentage was recorded at Swellendam Municipality at 30%. Saldanha Bay Municipality was unable to provide the percentage, hence recording 0%. Each traffic department provided percentages of dangerous goods related infringements out of the overall infringements of all goods types associated with heavy goods vehicles. Important to note that the percentages in Figure 39 and Figure 40 add up to 100% for the corresponding traffic departments, which shows that the only two types of goods associated with heavy vehicles as recorded by the traffic departments are dangerous and non-dangerous goods.

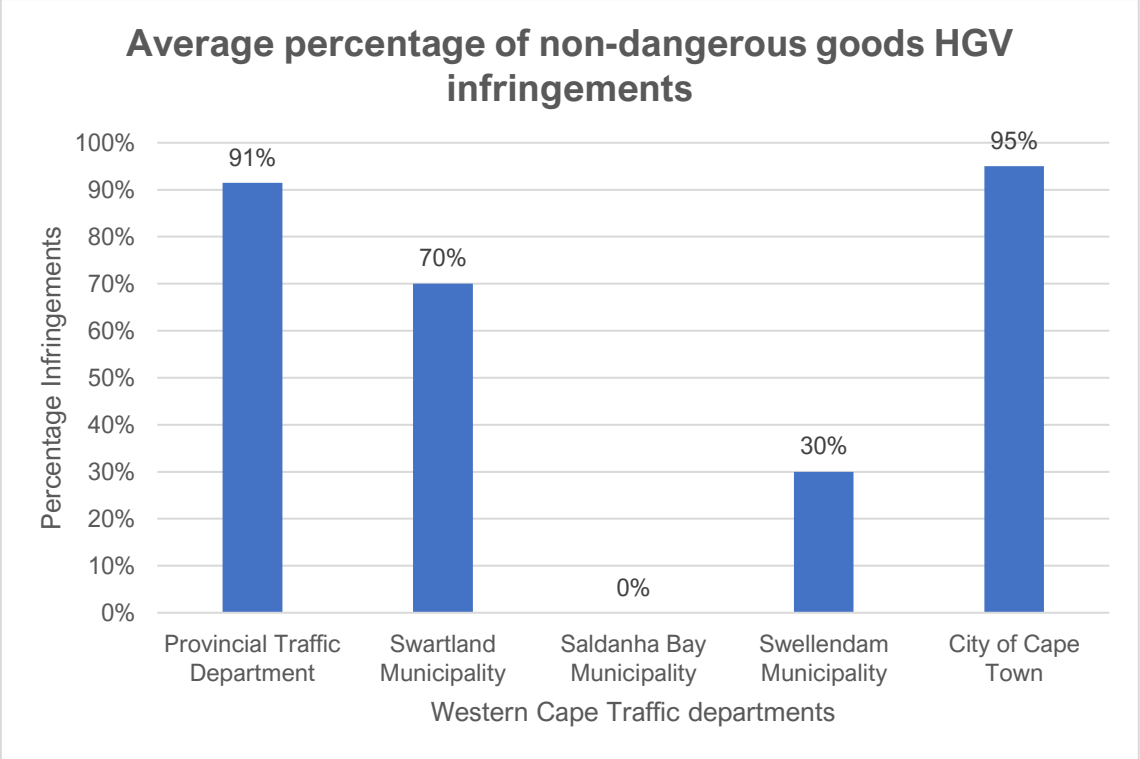


Figure 41: Average percentage of non-dangerous goods Heavy Goods Vehicles' infringements

Figure 42 below shows the average percentage of HGV infringements recorded on National Roads in the Western Cape by the different traffic departments in the province. The data showed that 100% of the HGV infringements recorded by the Provincial Traffic Department were on the National Roads because all their weighbridge facilities are primarily along national roads. The second highest percentage of infringements was recorded by Swartland Municipality at 70%. The Saldanha Bay Municipality and the City of Cape Town did not have any records of infringements on the National Roads as they only operate at municipal roads. Each traffic department provided percentages of infringements recorded on National Roads relative to the overall infringements recorded elsewhere.

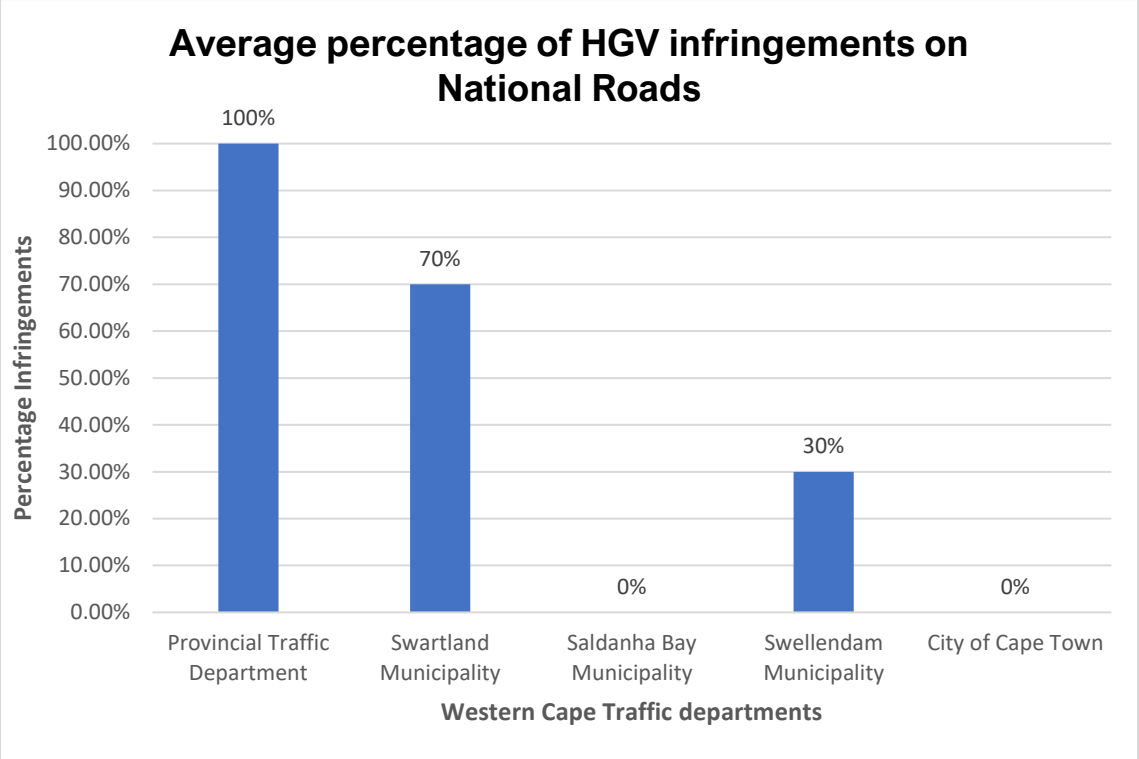


Figure 42: Average percentage of Heavy Goods Vehicles' infringements on National Roads

Figure 43 below shows the average percentage of HGV infringements recorded on Provincial Roads in the Western Cape by the different traffic departments in the province. Swartland Municipality and Swellendam Municipality recorded percentages within a relatively close range of 20% and 15%, respectively. The Provincial Traffic department had no data showing HGV infringements from provincial roads because all their weighbridge facilities are primarily along national roads, and the assumption is that the two weighbridges on provincial roads capture mostly vehicles from the N1. Saldanha Bay Municipality and City of Cape Town did not have data showing HGV infringements recorded from provincial roads. Each traffic department provided percentages of infringements recorded on Provincial Roads relative to the overall infringements recorded elsewhere.

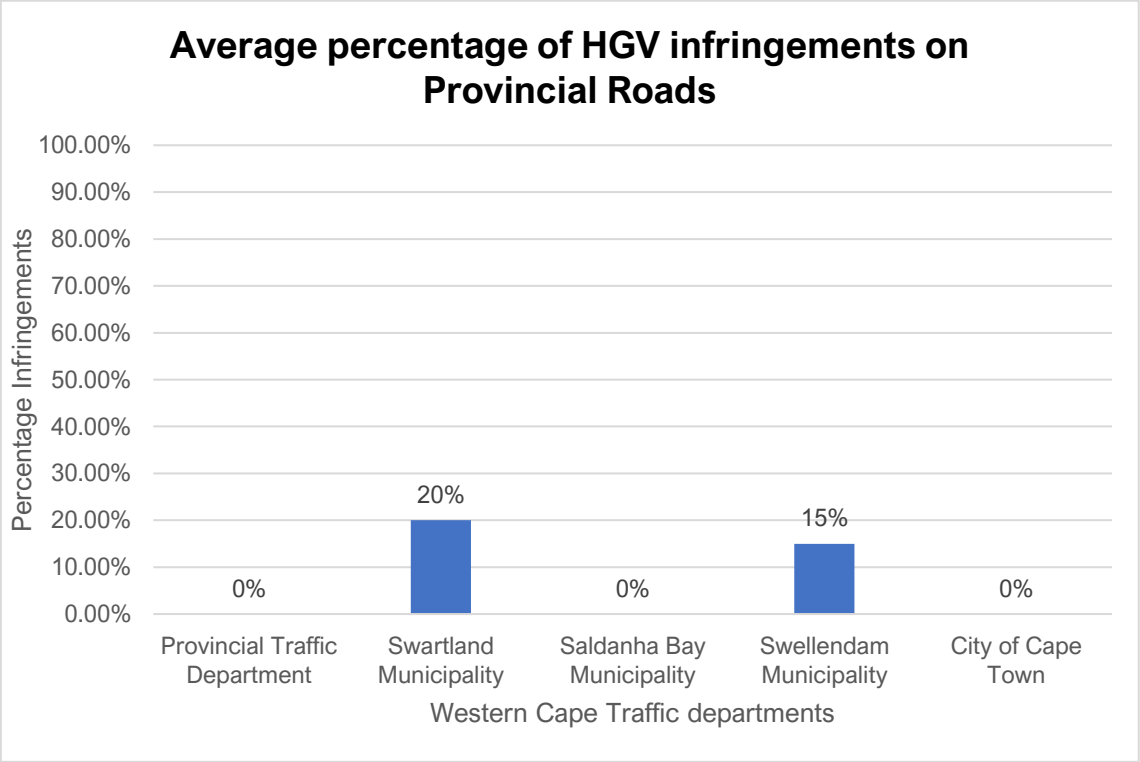


Figure 43: Average percentage of Heavy Goods Vehicles' infringements on Provincial Roads

Figure 44 below shows the average percentage of HGV infringements recorded on Municipal Roads in the Western Cape by the different traffic departments in the province. The City of Cape Town recorded the highest percentage of 90% (at least) and Saldanha Bay Municipality recorded the lowest percentage of 2%. The Provincial Traffic Department does not operate on municipal roads and hence was unable to provide data on the infringements on municipal routes. Each traffic department provided percentages of infringements recorded on Municipal Roads relative to the overall infringements recorded elsewhere.

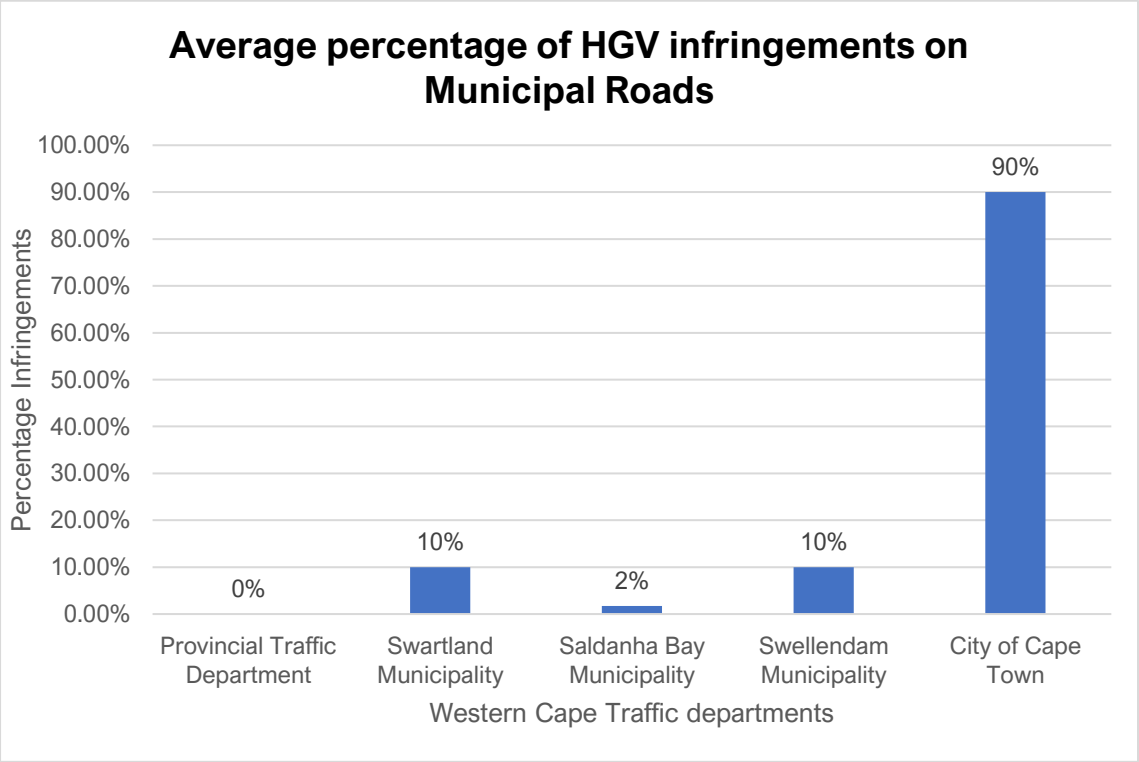


Figure 44: Average percentage of Heavy Goods Vehicles' infringements on Municipal Roads

Table 30 below shows the type of routine checks done on HGVs by the different traffic departments on the road. The Provincial Traffic Department does not perform any routine checks on the road because the National and Provincial Road network is not designed to safely pull off HGV unless in emergencies or at truck stops. The eight (8) weighbridge sites are primarily utilised for routine vehicle checks which are referred to as Road Traffic Quality Systems (RTQS).

Table 30: Routine checks done on HGV by traffic authorities on the road

Traffic Department	HGV Routine Checks
Provincial Traffic Department	• Road Transport Quality System (RTQS) checks are done at weighbridges
Swartland Municipality	• Driver fitness – (driving licence, PrDP and dangerous goods compliance etc.) • Roadworthiness – (tyres, overloading, fitness etc.)
Saldanha Bay Municipality	• Normal routine checks • Special roadworthiness operations
Swellendam Municipality	• Compulsory RTQS checks • fatigue operations
City of Cape Town	• Vehicle fitness • Driver fitness • Goods overhaul Control

The most common checks done across the traffic departments are related to driver fitness and vehicle fitness checks.

Table 31 below shows the most common infringement types by HGV recorded at the different traffic departments in Western Cape. The Provincial Traffic department was able to provide numeric data associated with the different categories of common infringements.

For this study, the categories of common infringements are divided as follows:

- **Load:** Vehicle overload
- **Roadworthiness:** Vehicles fitness; Tyres; Lights
- **Driver behaviour:** Cell phones; Seatbelts; Driving under influence**;** Speed; Reckless and Negligent driving; disregard road traffic signs
- **Documentation:** unlicensed vehicles; driving permits; PrDP; Operators' card; Expired documentation
  Other: Fraud; RTQS; Uncovered Load

Table 31: Showing the most common infringement types by HGV recorded at the different traffic departments in Western Cape.

	Most common infringement types by HGV				
Traffic Department	**Load**	**Roadworthiness**	**Driver behaviour**	**Documentation**	**Other**
Provincial Traffic Department	X	X	X	X	X
Swartland Municipality	X		X	X	
Saldanha Bay Municipality		X	X	X	X
Swellendam Municipality	X		X		
City of Cape Town		X		X	

The Swartland and Swellendam Municipalities indicated that the Provincial Traffic department recorded the most infringements. Information obtained from the traffic departments also highlighted areas where law enforcement may need to be enhanced. This assumption is further supported by the values provided by the Provincial Traffic department as shown with categories and specific values as shown below for the period 01 April 2021 till 31 March 2023 (in descending order):

- Vehicle load - **40 005**
- General Driver behaviour – **26 729**
- Vehicle roadworthiness/un-roadworthiness – **20 172**
- Documentation – **9 902**
- Other – **9 737**

The most common infringement types recorded across the different traffic departments are related to driver behaviour and documentation.

Out of all the traffic departments, the infringement data above shows that the Provincial Traffic Department is the only one that generally records all the infringements categories as listed in **Table 31** above.

CHAPTER 5: DISCUSSION OF FINDINGS AND RECOMMENDATIONS

5.1. Introduction

This study was conducted in support of understanding and quantifying HGV drivers training needs across the Western Cape. The study aims to direct and inform training programmes to improve driver behaviour and skill development in the province, and to make recommendations pertaining to future training and education interventions to address these gaps.

5.2. Research objective 1 - Local and international best practices pertaining to heavy vehicle driver skills development and training.

Research objective 1 is addressed through the literature review that provides an overview of global and local best practice. The Sustainable Development Goals highlight areas in need of consideration to address inequality and socio-economic challenges by 2023. The NDP makes provision for sustained action to curb poverty, improve social, economic, and environmental development.

The SSA is globally considered a best practice to comprehensively address road safety. Heavy goods vehicles are an integral part of the traffic mix and freight safety that needs to be managed within this framework. Crashes involving HGVs are likely to be a result of systemic issues involving a network of interlinked contributory factors. Several policies and strategies emphasize the need for a renewed focus on road safety. Driver training and education is one pillar of this approach that in conjunction with institutional management, the design of the road and road environment as well as the safety of vehicles contribute to improved road safety.

Globally, evidence shows that there is value in the introduction of workplace road safety programmes (incorporating road safety into company policies, procedures. Fleet safety starts with the management of the logistics operator and the management, from an institutional point of view have a responsibility to ensure that the drivers they employ are fit for purpose, skilled and trained to operate safely and professionally on public roads. Government programmes accreditation and insurance schemes play a role in driver management but ultimately it is the culture of a company that instils safety as a core part of the business.

Within the Safe System there is a need to holistically consider the influence of all transport elements on safety. Safety is also a key indicator of how well the transport system functions. The Safe System Approach (SSA) forms the basis of the Road Traffic Safety Management System ISO 39001 as well as the framework for the study in support of the National Road Safety Strategy 2030 and the Western Cape Provincial Freight Strategy. The Safe System advocates that humans make mistakes and that a safe and forgiving system will minimise fatalities and severe injuries. The responsibility lies with road authorities to provide safe and forgiving road environments, however road users need to be educated, aware and compliant with road rules and regulations.

This research considered international and local best practice pertaining to heavy driver vehicle skills development; understanding existing driver skills and behavioural trends; as well as conducting primary research to inform the development of a future training framework that will support improved driver training and skills development for the heavy goods vehicle driver industry. The National Road Safety Strategy (NRSS) 2016 – 2030 states that there are four critical areas for interventions that needs to be addressed to address road safety:

- **Promoting responsible road users' behaviour** which is seen locally and internationally as the greatest contributing factor to road crashes. Changing behaviour can only be affected by ensuring users are educated and aware of road safety, trained to behave appropriately and effectively discouraged from transgressing laws through enforcement. This includes the need to eliminate corruption.
- **Providing safer road infrastructure** with substantial proportion of deaths on the roads being pedestrian related, emphasis needs to be placed on developing and refining infrastructure design aimed at protecting vulnerable road users.
- **Delivering effective road safety management,** the entire strategy hinges on the effective leadership and governance to oversee that the implementation is completed, and operational requirements are effectively addressed.
- **Improving the quality of crash data and knowledge management** is an enabling element and a major shortcoming in the South African environment. Addressing shortcomings in this area will allow for greater efficiency in the application of resources and better tracking of progress against set targets.

5.3. Research objective 2 - Current trends pertaining to heavy goods vehicle driver skills development and initiatives.

Research objective 2 sought to investigate and highlight current trends pertaining to heavy goods vehicle driver skills development initiatives and was addressed partially through the primary research (selected findings) and through the secondary data analysis.

5.3.1. Legislative and policy frameworks

The legislative and regulatory framework in South Africa can be described as robust but can still be improved. A lack of sufficient implementation of law enforcement has also contributed to unsafe heavy vehicles and unlicenced drivers operating on South Africa roads including in the Western Cape.

The analysis of the infringement data showed that it is possible to get an understanding of the intensity of law enforcement efforts across provincial, district and local roads. There is however a need to standardise the method of recording and reporting to support law enforcement efforts across the province.

5.3.2. Demographic trends pertaining to HGV driver employment.

The primary research indicates that the heavy vehicle driver industry in the Western Cape is still a male dominated industry. This is despite initiatives and approaches that encourage skills development for females to enter the heavy vehicle driver training labour market. Most drivers interviewed (two-thirds) were between the age of 30 and 49 years. Almost half of the drivers interviewed had a matric qualification while a third had some senior school education.

The secondary analysis showed that:

- Western Cape RTMS companies tend to employ drivers that are experienced, and indications are that these companies tend to place a higher value on education and training of drivers than seems to be true for the rest of the country.
- Western Cape RTMS companies encourage drivers to consider health and well-being as an integral part of driver wellness which influences driver behaviour (alertness, fatigue management, speed management) which all contribute to the status of road freight safety in the province.
- Generally, Western Cape registered RTMS heavy goods vehicle companies seem to invest in the upskilling of drivers through various initiatives.

The key informants, regulatory authorities and advanced training providers share the same views regarding the limitation of the pool of skilled drivers that have at least 5 to 10 years of experience. Their views also indicated that well-skilled drivers tend to be sought after by many companies including overseas companies, which leaves South Africa with fewer qualified and well experienced drivers. The research findings also indicate that most drivers interviewed worked for the company for less than 10 years.

According to the key informants, most drivers coming into the market have 0 to 4 years of experience. Indications are that transport operators tend to source drivers from other countries since these international drivers tend to have more experience and that operators are increasingly requiring drivers to conduct competency assessments for drivers to be considered for employment. This has implications for training and skills development as a license provide access to the labour market and there is thus a need for upskilling of local drivers.

5.3.3. Operational and crash trends

The secondary data analysis provided insight into specifically Western Cape HGV driver behaviour and operations based on historical data. South Africa and the Western Cape record a high number of crashes that involve heavy vehicles. A study conducted in 2007 showed that South Africa recorded more than twelve (12) heavy vehicle related fatalities per 100 million kilometres (Moore, 2007). This was much higher than the average of four (4) fatalities per 100 million kilometres for the nine (9) countries in the study.

Between 2018 and 2022, South Africa reported 3 546 heavy vehicle crashes and 2 926 fatalities, with the average crash severity rate in the region of 1.33. The Western Cape contributes to approximately 7% of the national heavy vehicle crashes and approximately 7% to national fatalities. However, secondary data that was analysed for RTMS operators indicated that the Western Cape has a lower number of crashes per million kilometres travelled than the rest of the Country, this is despite RTMS certified operators in the Western Cape having larger fleets.

The cost of heavy vehicle crashes is significantly higher than that of passenger vehicles due to the severity of injuries associated with these crashes, the influences these crashes have on productive time lost, infrastructure damage and damage to transported goods. Heavy vehicles, due to vehicle characteristics (mass, size) combined with travel speed causes more severe crashes in terms of serious injuries and fatalities but also have implications for closing of roads (recovery operations after a crash, closing of roads that causes congestion and backlogs), environmental implications in spillage events and so on. The cost of these crashes to the

economy is enormous and reducing these crashes is important in achieving sustainable freight transport delivery in the Western Cape.

Contributory causes to crashes were highlighted as distracted driving, driving while fatigued, and poor behaviour from other drivers. Several issues contribute to the high number of heavy vehicle crashes. Among these are poor driver behaviour, partly because of inadequate training. Driving experience is correlated with improved road safety as with experience, skills improve as well as the ability to identify and react to hazards in the road and traffic environment. Inadequate training, coupled with inexperience (ability to recognise and react to hazards in the road environment is developed over time with experience) as well as the inability to control and manoeuvre these large vehicles. This ability also improves with experience over time.

Fatigue is however locally and globally considered one of the biggest contributory causes. Long hours of driving causes fatigue, which in turn coupled with poor lifestyle habits or poor health leads to microsleep episodes, highway “hypnosis” or tunnel vision, all secondary events, because of fatigue that are known contributory causes to heavy vehicle crashes.

Yet the primary research findings highlighted that most Western Cape truck drivers interviewed indicated they are required to rest according to their company policies and that they do make use of dedicated resting facilities such as truck stops. The role of telematics and driver behaviour monitoring programmes were highlighted as essential by operators as well as driver trainers. Drivers are aware that they need to stop frequently during long trips (200 km and more) to take resting breaks from driving. However, only 47% of the drivers interviewed do stop within the recommended range.

Telematics are considered a key intervention to monitor driver behaviour and is considered an aid in road safety. Telematics are used to monitor drowsy driving, manoeuvres, and other forms of distracted driving. However, there is a feeling that it is mostly the larger companies that are willing to invest the funds to ensure that drivers are monitored.

5.3.4. Law enforcement, behaviour and infringement trends

Five municipalities provided infringement data. The five regulatory authorities that participated in the research serve different local, provincial, and national routes. Provincial traffic department data is focused on National routes (where the weighbridges are operational), while the Swartland and Swellendam district municipalities (also in relation to National routes and the presence of weighbridge facilities) include both national and regional routes. The CoCT and Saldanha municipalities are responsible for local routes.

The combined data provided was not limited to vehicles registered in the Western Cape and it is therefore not possible to indicate that the infringements issued were for Western Cape HGVs. The road authorities separated HGV data from the infringement data related to other modes of transport.

The CoCT on average issues the highest percentage of HGV infringement notices. The CoCT is likely a key origin and destination point for goods because of import and exports through the Port of Cape Town. The assumption is that the CoCT most likely deal with a higher concentration of HGV entering and leaving the municipality. Correlations between traffic counts and the infringement data will be useful to confirm this assumption. The driver questionnaire did probe origin and destination points however, this was allocated in terms of

province rather than municipality, however in future this can also potentially test this assumption.

Interestingly, although CoCT and the Provincial Traffic Department on average issues most notices related *to non-dangerous goods violations*, Swartland Municipality on average issues the highest percentage of *dangerous goods violation notices*. This is an interesting observation and might also have to do with location of the municipality along the National route 7 (N7) that serves as a corridor alongside industrial developments and farms.

Routine checks alongside national, provincial, and local routes are conducted by all the road authorities that participated in the study. The categories of common infringements are:

- **Load:** Vehicle overload
- **Roadworthiness:** Vehicles fitness; Tyres; Lights
- **Driver behaviour:** Cell phones; Seatbelts; Driving under influence**;** Speed; Reckless and Negligent driving; disregard road traffic signs.
- **Documentation:** unlicensed vehicles; driving permits; PrDP; Operators' card; Expired documentation
  Other: Fraud; RTQS; Uncovered Load

The most common infringement types recorded across the different traffic departments are related to driver behaviour and documentation.

The infringement data provided an indication of the law enforcement efforts as well as the type of transgressions that law enforcement officials need to address on Western Cape roads. Due to the small sample size, it was not possible to cluster the road authorities in terms of district and local road infringements. However, if in future a larger sample of road authority data is available it would be useful to cluster and compare HGV infringements according to type of road authority to get an indication of the law enforcement efforts across regions and to prioritise future law enforcement initiatives across the province.

Secondly the data submitted from the participating road authorities seem to differ in terms of the type of information that is captured. Data is a key cornerstone of the SSA. This infringement data can be used to understand HGV driver behaviour across national, district and local roads, recognise shifts in HGV traffic and assist with prioritising future law enforcement efforts. There might also be a need to standardise the way and format in which infringement data is captured at provincial, district, and local level.

5.3.5. Licensing trends

Primary research indicated that most drivers have a valid driver license as well as a PrDP while more than two thirds indicated they have had a valid driver's license for 10 years or longer. Minimum requirements for obtaining a PrDP are legislated in the NRTA and some of the requirements are that drivers undergo a health assessment and drivers must be 25 years and older. Special categories of licenses (such as licensing for dangerous goods and niche market car carrier) require 5 to 10 years' experience.

5.4. Research objective 3 - Skills and competency gaps identified from the research.

Research objective 3 considers the identification of identify skills and competency gaps. This section looks at the nature of skills gaps for truck drivers within the trucking industry. It draws

from key informant interviews with logistic companies, the RTMC and RTMS and focus group discussions with truck driver training providers. The focus group discussion and key informant interviews highlighted a few potential skills shortages for truck drivers that may need to be addressed.

The following were identified as gaps in the skills development framework.

5.4.1. Driving contexts

One of the key features mentioned for training was how to handle driving in different contexts. From the key informant interviews and the focus group discussion the need to obtain training and continuous practice in a variety of contexts such as driving in congested surroundings was highlighted. Additionally, it was emphasised that training ought to encompass driving in different weather conditions such as wet conditions.

5.4.2. Economical driving

According to interviews with trucking companies, drivers should receive Eco driving skills training. The potential benefits that could be accrued from economical driving was fuel saved from efficient driving. Economical driving also extends to driver skill in the way in which the driver handles and controls the vehicle, vehicle idling and speeding.

5.4.3. Defensive driving

Defensive driving was highlighted as an area that needs attention for inexperienced drivers. Inexperienced drivers often lack defensive driver skills. On defensive driving, the participants pointed out the lack of skills among inexperienced drivers and the need to invest more resources and time for defensive driver training. Companies especially small trucking companies are reluctant to send their drivers for defensive driving training as it is deemed unaffordable. They do not have the resources or capacity to allow their driver to enhance their skills.

5.4.4. Training approaches

According to the key informant interview with one of the industry experts, the lack of meaningful training was highlighted as an issue. They noted that some of the reasons why existing training does not achieve the desired effects of reducing road accidents is that most of the training conducted focuses less on the practical component. Companies provide academic classroom type training for compliance purposes. Also, driver training lacks the right intentions.

Advanced driving

Operating the braking system of heavy loaded vehicle properly requires training and skill. Drivers are required to receive training on how to use the braking system appropriately and understand the associated risks to avoid potential accidents. One aspect of the braking system highlighted in the key informant interviews was the skill required to handle downhill breaking such skid control and safe braking.

Experienced drivers

The research interviews highlighted a shortage of experienced truck drivers. Companies preferred to employ highly experienced drivers who possess at least 5 to 10 years' experience of truck driving; whilst drivers who have acquired their licenses and training find it hard to be hired. There was a perception that hiring experienced drivers assures good driver behaviour, increased safety, economical driving, and adherence to traffic laws and regulations. However, these experienced drivers become redundant as the trucking driver technology evolves.

Currently learners pursuing a driver's license are required to complete 20 hours of lessons. In the focus group discussion, there was a sentiment that 20 hours of lessons were not enough and that instead 30 hours should be the requirement. The reasons attributed to increasing the hours for lessons was that with more hours, learners were likely to gain confidence and experience behind the wheel.

PrDP

A PrDP is a requirement to drive a heavy goods vehicle. The focus group discussion participants expressed the need to impose both a written and practical test for drivers who want to obtain a PrDP.

Heavy Vehicle Manufacturers

The focus group discussion also highlighted that vehicle manufacturers such as Scania, Mercedes Benz and Volvo should provide certification showing that drivers have received training on how to drive their vehicles according to manufacturer's specifications. This will ensure that drivers will operate vehicles in a safe and efficient manner.

In addition, lack of implementation of defensive driving techniques, basic driving skills such as keeping a safe following distance, unfamiliar road environments as well as a lack of law enforcement were cited as contributory causes to crashes.

5.4.5. Supplement or additional training requirements

The findings described above are a combined representation of the findings for all research participants and stakeholder groups. Although not representative of the whole Western Cape HGV stakeholder regime in the Western Cape, drivers as a stakeholder group were well represented in this study.

Driver training is at the core of road safety and driver trainers indicated that K53 training and refresher training is available to HGV drivers. However, a fifth of drivers interviewed have been involved in a crash. The findings for this selected group indicated that from a drivers' perspective (more than 40%) there is a need for specific road safety (either basic or advanced) focused training.

First aid training received almost no responses. However, within the Safe System Approach, post-crash care and the ability to save a life or to prevent a serious disabling injury is a motivation to reconsider the provision of first aid training.

5.5. Research objective 4 - Recommendations for future training and education of Heavy Goods Drivers

The final objective of this research was to make use the research findings to inform the development of a future training framework that will support improved driver training and skills development for the heavy goods vehicle driver industry. Despite the challenges that was experienced in the execution of this research, the research findings still have value to inform the development of sector skill plans which should aid in the development of training initiatives and programmes that upskill HGV drivers not only in the Western Cape but nationally.

The section below provides an overview of the recommendations consolidated from the different stakeholder groups, in terms of skills development and bridging training gaps.

5.5.1. Overview of upskilling requirements

There is a general need to upskill drivers, especially South African drivers. Operators indicated that logistic companies prefer to appoint drivers that have:

- **Experience** (typically more than ten years), however this pool of skilled drivers is small and there is a need to upskill less experienced drivers, and to retain drivers in companies for longer periods for these drivers to gain experience. The presence of drivers employed for over 10 years indicates stability, trust, and potentially a positive working relationship between the drivers and their employers.
- **Have the correct licenses** (PrDP and associated licenses for carrying specific goods).
- **That drivers are healthy and have clean criminal records**.

These requirements aim to ensure the competence and reliability of the drivers they hire.

There are indications that larger companies tend to invest more into the development of drivers. More needs to be done to encourage smaller companies to also invest in upskilling their drivers.

5.5.2. Workplace road safety programmes

Workplace road safety programmes have internationally shown promised to address road user behaviour from an institutional perspective. Accreditation schemes such the RTMS is deemed good practice as it addresses and promotes driver health and wellness and improved driver behaviour though in-house programmes and monitoring. Companies that are certified tend to have better road safety performance, including improved driver behaviour and reduced crash and fatality rates.

Driver trainers also indicated that the demand that currently exists is for pre-employment examination where companies can test prospective drivers before they employ them.

5.2.3. Reward and accreditation schemes

The insurance industry highlighted that heavy vehicle driver safety campaigns and programmes are implemented in partnership with other private and public entities. These programmes and campaigns have had a positive influence on the reduction of claims. Within the Safe System approach, coordination of road safety horizontally (between government departments) as well as vertically (between government, private sector, and public organisations) is key to address the carnage on the road. As such, there needs to be better integration and collaboration efforts between government and industry partners in support of road safety.

Accreditation schemes such as RTMS have a positive impact on driver skills, attitudes and motivation, general health, and reduction of chronic illnesses. RTMS auditing systems check company compliance regarding driver skills development and general health monitoring of drivers. This is evident from the collected RTMS quarterly monitoring data as presented in the secondary analysis. There are different industry opinions regarding the success of such schemes. Active monitoring to inform and improve driver behaviour is essential and should not just be a tick-box exercise, otherwise RTMS accreditation will not have a direct impact on the skills, health, and attitude of heavy vehicle drivers. A way to test whether a driver is a well-skilled driver, is to monitor how long it takes a driver to park a vehicle and load or offload goods. The number of incidences or accidents per driver (even small crashes or near misses) should also be monitored. If these are monitored, measures could be put in place to improve the skills of the driver. Companies should not simply just answer questions regarding the

annual health check of drivers or if the company has a wellness programme in place to which a response can be a simple yes or no, it enquires further action and implementation.

Although RTMS is not legislated and employers are not compelled to have annual health checks or wellness programmes, companies need to comply with the RTMS standard to retain RTMS accreditation. However, company policies need to entrench road safety as core to logistic operations and should be at the heart of any logistic operators' ethos.

5.2.4. Professional driver qualifications

Professional driver qualifications are a very expensive exercise (cost of approximately R30 000 for general citizens). Driver trainers were very vocal about the issue that TETA no longer provide adequate funding for training and skills development. This challenge has resulted in fewer drivers being trained and less contribution to improve the unemployment rate in South Africa. TETA requires specific processes to be followed before funding is considered and allocated. Although there are flagship programmes, there is only a limited number of people that can be accepted.

Funding for projects for unemployed people who want to pursue professional driving have seized. Even logistic companies are investing less in driver training because of the lack of funding. Training that providers are offering has now become confined to regulatory training (dangerous goods re-certification, first aid, firefighting) given the circumstances. Training for advanced driving and refresher training has become non-existent because of the issue of affordability and lack of funding. Currently, there is no funding for upskilling truck drivers. Therefore, funding for skills development in support of socio-economic development is thus an issue that needs to be addressed as a matter of urgency.

Industry is sourcing skills from other countries since experience is a key requirement. Although South Africans enrol in professional driver training education programmes, they do not gain the necessary experience to be employed in South African markets. There is thus a need for programmes to accelerate development, ensuring that the currently employed drivers get the necessary experience and contribute positively to the South African economy. In addition, considering gender equality and socio-economic development, there should be more programmes that upskill females to enter the HGV driver market.

5.2.5. Specialized driver training and skills development initiatives.

To enable dangerous goods driving additional requirements included the need for drivers to have undergone training in:

- Defensive and technical driving techniques
- Risk awareness
- Road safety objectives
    - Legislation and highway codes
    - Readiness to implement company and customer safety programmes.
    - Preparedness to wear personal protective equipment, undergo regular training with all equipment and procedures associated with the work undertaken.
    - Committed to stop the vehicle in a safe place if tired or when losing concentration and use their stop work authority.

5.2.6. Soft skills development programmes

In addition to ensuring that drivers are upskilled providing different types of practical and theoretical training, there is also a need to provide "softer skills" training such as time

management and especially fatigue management which, coupled with the hours spent on the road, is a key contributor to HGV crashes. Soft skills highlighted include:

- Commitment to promote company ethos, vision & mission, policies, and procedures.
- Responsibility
- Accountability

Operators and driver trainers highlighted the need for driver self-management training that should include time management and especially fatigue management training.

5.2.7. Training and education instruction methods

Classroom and computerised training were not deemed effective training methods. Practical training to equip drivers to handle and manoeuvre the vehicle is considered the most important type of training, and lack of proper practical training and testing (for licensing purposes) was highlighted as a gap for professional drivers. In addition, there is a need for programmes that improve driver experience and confidence specifically relating to the use of new technologies on specific types of vehicles. Specialised training such as advanced driver training is supported by TETA and the industry provides accredited and non-accredited training to drivers. Specialised training should focus on building competence and provide exposure to the driving task for drivers to gain experience. Supplementary training should include complementary skills including literacy, technology mathematical skills, business, and financial skills development.

Classroom training

Classroom training, computerised training and simulator training is not deemed sufficient to improve road safety skills. Training initiatives need to be practical and interactive and should encourage and enable drivers to actively participate in the training.

Practical driver training

A suggestion raised by the advanced training provider is that that drivers tested on their driving skills should be tested using a similar vehicle that they intend to drive at work and a loaded and non-loaded vehicle, but also a concern was highlighted that there may be risk factors to consider as inexperienced drivers may cause fatal incidents.

Alternative training mediums

Although classroom type training is currently in place, there was a notion that drivers do not engage this type of training properly. Taking drivers through real life incidences and experiences that have happened before may be valuable in addressing some of the skills gaps identified in historic incidents. A suggestion was made regarding the use of real-life videos of unsafe driver behaviour and demonstrating consequences thereof (e.g., driver falling asleep, leading to a crash). Furthermore, drivers will find live practical training more engaging and create skills that have a lasting and meaningful impact on the road.

In addition, simulator training, in line with international best practices, was highlighted as a potential alternative to improve training and education of heavy vehicle drivers.

5.2.8. Safety focused training initiatives

The results of the Western Cape HGV Driver Skills and Behaviour survey 2021 gave insights to the need for driver training skills programmes and the current lack thereof. Majority of respondents have done some form of training, but the respondents acknowledged the need for diverse types of driver training (especially the need for advanced driving skills). Several

respondents also highlighted the need for fatigue management training and some respondents expressed concerns regarding the frequency of breaks during trips prescribed by the logistic companies i.e., not allowing them to rest or giving them insufficient time to rest. The high percentage of “no responses” to the survey questions may have influenced the results.

Contributory factors to crashes are highlighted as behaviour of other road users, driver distractions, fatigue, and external factors, for example, stray animals. This suggests that companies need to address these issues through driver training, increased road safety awareness, and proactive measures to minimize accidents and ensure the safety of their drivers and the public. The study found that most drivers felt that road safety training is necessary. However only two thirds of the drivers interviewed have been exposed to road safety training. Less than half of drivers have had the opportunity to attend basic road safety training and advanced driving courses while less than 10% attended abnormal goods training and advanced road safety training. In terms of future driver training needs, the following courses were deemed important:

- Advanced driver training
- Basic road safety training
- Advance road safety training
- Dangerous goods training
- Abnormal loads training

Safety training could take different forms like informal courses, coaching, knowledge sharing, and formal training/education. However, it seems in general there is a lack of programmes, and the reasons vary from programme development to implementation cost, a lack of information on effective training programs and a lack of senior management support.

5.2.9. Vehicle telematics and OEM specific training

Vehicle telematics, monitoring driver and vehicle behaviour is also deemed a good tool to support road safety from a management perspective. Provision needs to be made for training of truck drivers that focuses on the vehicle technology, considering the changing and evolving technology incorporated in vehicle designs. The employer must obtain funding to do product training (the Truck e.g., Volvo), there are many buttons and modern technology incorporated in the console and drivers need to be trained on how to operate and be comfortable with the technology.

5.2.10. Training aimed at uplifting female drivers as entrants to the profession.

There is a need to promote females within the profession. Only three female drivers were interviewed, which means that in comparison to male drivers, females have almost no share in this labour market.

5.2.11. TETA funded training

One of the primary challenges highlighted by the training providers is reduced funding for training from TETA. After Covid pandemic many trucking companies are focusing on only regulated training such as dangerous goods re-certification, first aid, and firefighting training. Training for advanced driving and refresher courses has completely stopped. This has led to several challenges including that some training providers are investing less in out-sourced training, the training that is being provided is curtailed or restricted to the regulated training such as dangerous goods re-certification, first aid and firefighting training.

Advanced driver training or refresher courses are no longer being offered. Given that the participants were few it is currently not clear how prevalent these issues are in the truck driver training sector.

5.2.12. Input into work skills plans

TETA uses the Workplace Skills Plans (WSP) across the different subsectors to inform the development of a Sector Skills Plan for the Sector Education and Training Authority (SETA). **Table 32** provide an of how the research findings can support the development of sector skills plans for HGV drivers in the Western Cape.

Table 32: Input towards skills development

Type	Type of input	Evidence
Inform supply-side planning in post school institutions.	Partial	Providing supporting evidence that there to diversify training and to provide training that will aid in professionalizing HGV driving as a profession
Determine funding priorities via the levy grant system.	Partial	No priorities could be determined from a company perspective. However, supporting evidence to emphasize the need for levies for training were provided by the driver trainers as well as experts in the industry.
Support regional and employer plans.	No	Not from a TETA perspective. However, the road authority data has the potential to assist with prioritizing law enforcement efforts as well as to monitor and evaluate regional and local law enforcement interventions.
Establish occupation specific skills priorities for the sector.	Yes	Training needs highlighted included specialized training, soft skills training and training that will aid in handling of the vehicle with respect to in-vehicle technologies.
Inform allocation of resources to develop qualifications and learning programmes.	No	Not applicable
Inform education and training institutions of demand needs in the labour market.	Partial	Providing supporting evidence that there to diversify training as well as highlighting the types of training needed to upskill HGV drivers.
Monitor skills development provision in the sector.	Partial	The need for skills development for HGV drivers in the Western Cape is supported. The information obtained in this study has potential to influence the development of monitoring and evaluation programmes, especially new skills sets that are needed.

CHAPTER 6. LIMITATIONS OF THE STUDY

6.1. Introduction

The limitations of the study are the elements of the research methodology that impact the interpretation of research results. In this section the limitations of the study are discussed in relation to the sampling and data collection methodologies; how these influenced the findings of the study, and how the learnings from the study can inform future research projects.

6.2. Sample limitations

There was not a comprehensive list of Western Cape logistic companies available at the start of the project. Although the WCMD had a preliminary database of operators in the Western Cape, this list was not sufficient for research purposes and needed to be expanded. As such the research team made use of weighbridge data to identify additional companies that frequently operate on Western Cape roads. This was later supplemented with additional contact lists prepared with the assistance of the WCMD and TETA.

The research team did not have direct access to a database of RTMS operators in the Western Cape. Use was made of the RTMS back office (as per ethics stipulations) to establish the population from which a sample size was drawn for RTMS registered operators in the Western Cape, to distribute the request for participation, the ethics clearance forms and survey links to potential participants. The research team did not contact any of the operators directly to participate as the team did not have permission to do so.

The sample limitations made it difficult to identify companies who could be targeted to participate in the research, and the identification and sourcing of additional participants was a cumbersome and time-consuming process.

6.3. Data collection limitations

A major limitation of the research was the poor response rate from logistic operators and RTMS registered operators, who as the employers of drivers, are important stakeholders in this research.

To increase participation from logistic operators in the Western Cape, two additional rounds of data collection through the online survey were initiated, with follow-up phone calls and emails requesting companies directly to consider participation. Furthermore, companies were given the option of attending focus groups discussions to solicit more responses and participation.

The addendum to this research report describing the efforts to improve participation from logistics companies provide the further details of these additional efforts.

The expectation was that due to the nature of RTMS (promoting responsible road use), certified operators would be eager to participate in the research and provide input into driver wellness, education and other information that can contribute to improving road safety.

One of the mitigation actions to the initial low response rate for RTMS certified operators was to contact operators directly through the CSIR's PBS project connections, but currently the Western Cape is not participating fully in the Performance Based Standard (PBS) project, and this contributed to the low number of RTMS-certified companies in the province. RTMS is a prerequisite for PBS.

Three of the six National Regulatory Authorities that were approached, participated in the research. Only one National Regulatory Authority participated in the qualitative interviews. One was not able to participate due to AARTO only being implemented in Gauteng and not in the study area of the Western Cape; another because they are not directly involved in driver training. One authority only provided input in early November after the WCMD made a final attempt at reaching out. The lack of response from national entities is a concern since these entities are instrumental in paving the way for policy and regulations for transport (including training and education initiatives) going forward.

Industry associations and driver training providers contributed to eleven of the expert interviews. In addition, only one insurance company participated.

The lack of responses from both private and public sector is a concern, not only because the lack of response made it difficult to do comparisons for this study in terms of training needs for HGV drivers, but also because this lack of interest in developing and uplifting the sector through education and training will hamper efforts to professionalize heavy goods vehicle driving as a profession and qualification in South Africa.

6.4. Impact on findings and recommendations

The driver surveys represented the training needs from a driver perspective and the qualitative interviews were conducted until a saturation point was reached and no new themes emerged from the interviews.

The poor response rate from logistic operators made it difficult to provide recommendations pertaining to HGV driver training needs from a company perspective. Logistic operator training needs form the basis of Sector Skills Plans for which TETA is responsible.

In addition, the RTMS responses would have provided input into “best practices” pertaining to driver training and education since these companies are required to maintain a specific standard to maintain their accreditation. Nonetheless, the four responses from the RTMS operators coupled with the secondary analysis of the RTMS data supported the findings from other stakeholder interviews.

Due to the low response rate from national regulatory authorities responsible for policy making, the research is not able to make inputs into this regard.

The scope of the project was large from the start and although the participation from national authorities, RTMS certified and logistic operators were disappointing, the value of information that was provided by other stakeholder groups including drivers themselves, driver trainers as well experts within the road freight domain should not be underestimated.

The objective of this research was to make use the research findings to inform the development of a future training framework that will support improved driver training and skills development for the heavy goods vehicle driver industry. Despite the challenges that was experienced in the execution of this research, the research findings still have value to inform the development of Sector Skill Plans which should aid in the development of training initiatives and programmes that upskill HGV drivers not only in the Western Cape but nationally.

6.5 Recommendations for future studies

Based on the lessons learned from the online survey participation, the recommendation would be to rather focus on qualitative research approaches (e.g., focus group discussions) as the preferred method for data gathering unless surveys are conducted in-person by appointment

or like the driver surveys (face-to-face contact). Although the focus group discussions were attended, it was still a small sample of the identified entities that participated. With the focused interviews, the mitigation factor was the nature of the interviews (qualitative) which provided more in-depth information as opposed to the online surveys.

A further recommendation for future studies would be to include a pilot study with a specific focus on the research methodology and survey execution strategy. A project pilot could have aided in better experimenting with the most suitable sampling and survey techniques for each of the stakeholder groups to mitigate the lower-than-expected response rates. The research methodology should allow for follow-up conversations and building trusting relationships with potential respondents and allow companies to reflect on their participation and what it would entail.

CHAPTER 7: CONCLUSION

7.1. Introduction

This project explored the current local and international trends pertaining to HGV driver education and skills development, explored the status quo of current driver skills and competencies in the Western Cape Road Freight sector and identified gaps and future training and skills development needs for ensuring safe and responsible heavy goods vehicle driving on the Western Cape roads.

Although the study had several challenges, the research objectives were met:

- Research Objective one (1) was concerned with understanding international and local best practices. These were framed through the literature review and secondary data analysis that highlighted the need for good data practices, introduction of workplace road safety programmes, driver management initiatives as well as factors contributing to HGV crashes other than behaviour. This includes management practices, having policies and legislation in place and the use of technology to manage drivers and vehicles on the road.
- Research Objective two (2) was concerned with a better understanding of historical trends and patterns pertaining to heavy vehicle driver behaviour, specifically in the Western Cape. National data from the RTMC, provincial and municipal traffic departments as well as the secondary analysis of existing WCDM driver behaviour surveys and RTMS data aided in understanding HGV crashes, travel patterns, origin, and destination and contributory causes to crashes in the Western Cape.
- Research Objective three (3) was addressed through a combination of primary research and secondary research analysis supported by the literature review. The objective was to obtain an understanding of current skills sets and to identify gaps in current training practices from the perspective of a wide range of road freight stakeholders. Despite the low response rate from logistics companies and limited participation from national authorities, the qualitative information provided insight into the current training and skills development practices for HGV drivers in the Western Cape (but also probably generalized to the country).
- Research Objective four (4) entailed providing recommendations which were framed within the SSA as well as the Western Cape Provincial Freight Strategy, with specific reference to institutional management and pillar 4 – safer road users. This is the first freight as well as road user study in South Africa that aimed to frame this research in the SSA.

7.2. Research methodology

This study explored the current Western Cape as well as international context with the aim of identifying trends in relation to heavy goods vehicle safety, occurrence of crashes, contributory factors to crashes and to identify current skills and competency levels of heavy goods vehicle drivers in the Western Cape. Lastly the purpose of the study was to identify gaps in the existing training regime and to recommend future training initiatives in support of upskilling Western Cape HGV drivers.

This research study employed a mixed method approach, making use of both quantitative and qualitative research methods to explore the issue of HGV drivers in the Western Cape. The

study commenced with a literature review that considered local and international best practices pertaining to heavy vehicle driver training, education, and skills development. A stakeholder mapping exercise were conducted at the inception of the project. Stakeholders were identified and clustered into stakeholder groups (operators, driver training, industry associations, drivers, and heavy goods vehicle experts). In addition, the process assisted with the identification of regulatory and private sector entities playing a role in heavy goods vehicle safety. The literature review and the secondary trends analysis informed the development of the research instruments, and the research instruments were tailored according to the stakeholder groups.

The research protocol and accompanying documents were submitted to the CSIR REC for ethics clearance twice:

- Phase 1: to get REC clearance to commence with the secondary data analysis.
- Phase 2: to commence with the primary data collection efforts.

The primary research entailed using both quantitative and qualitative research methods. Mixed methods provide an opportunity to quantify a problem while ensuring that participants can share viewpoints and experiences. It provides richer evidence and deeper context into the problem being explored. A quantitative approach was used to solicit information from drivers as well as from logistic companies registered in the Western Cape. A qualitative approach was used to gain insights from heavy vehicle industry stakeholders in the Western Cape including industry associations, heavy vehicle driver trainers, insurance companies that play a role in heavy vehicle road safety as well as regulatory authorities responsible for policy and regulation pertaining to heavy vehicles and drivers (which include regulation and policy pertaining to HGV driver training).

The scope of the project was large from the start and although the participation from national authorities, RTMS certified and logistic operators were disappointing, the value of information that was provided by other stakeholder groups including drivers themselves, driver trainers as well experts within the road freight domain should not be underestimated.

Driver behaviour surveys yielded the best research return. Initial efforts to solicit participation from logistic operators were unsuccessful and further attempts were made. Additional phase 2 and phase 3 data collection efforts are testimony to the fact that logistic operators are considered one of the most important stakeholder groups in this research. However, despite three attempts over three months, the response rate from the logistic operators remained low. Although a large focus was on the logistic companies it should be noted that participation from other entities such as industry associations and government was also disappointing. With the focused interviews, the mitigation factor was the nature of the interviews (qualitative) which provided more in-depth information as opposed to the online surveys.

All data was captured and analysed on the CSIR Transport Lab data portal. This allowed for efficient collection of real-time data and enabled the onsite team to analyse data accordingly.

7.4. Research findings

Important insights were gained from local publications that detailed the extent of the heavy vehicle crash problem, the cost to the economy and contributory causes of crashes, specifically in the Western Cape. International research also highlighted HGV crashes as a

significant problem and specific reference is made to the role that workplace road safety programmes could potentially play in the curbing of HGV crashes.

The secondary analysis of the WCMD driver behaviour survey and the historical data provided by the RTMS assisted with establishing trends and provided detailed information pertaining to historical trends that included type and crash causation in the Western Cape, travel patterns, origin and destination information and kilometres travelled. This research also highlights the importance of collecting data. Data is a key cornerstone of the safe system approach as it provides indicators which can be used to track and measure progress in support of reducing traffic crashes and injuries and provide a mechanism for benchmarking and prioritising interventions.

The primary research findings highlighted the fact that logistic companies tend to prefer drivers that are slightly older with more experience. This correlates with international and local indications that behaviour improves over time. With age and experience the recognition of hazards in the road environment improves and road users are better equipped to physically react to threats (e.g., learn to better manoeuvre the vehicle or to avoid specific situations).

In terms of specialised training, professional qualifications are needed and there is a need to upskill female drivers in support of local economic development and poverty alleviation. In addition, training needs pertaining to hazardous goods, addressing basic mechanical failures and, special loads were highlighted. Soft skills training (time and fatigue management) was also considered important alongside road safety specific training initiatives. The method of instruction was highlighted, and practical training and vehicle specific training was deemed important. Classroom and computerised training do not equip driver well for handling and operating or driving safely. Augmented and virtual reality training might in future play a more prominent role to upskill drivers.

The recommendations highlighted in Chapter 5 are mostly associated with operational skills. The graduate progression from being a code 14 HGV driver to a driver that is responsible for special loads carry monetary benefits for many of the participants. This is not problematic per se as the purpose of driver training and education is not only to ensure road safety but also to contribute to upliftment and professionalisation of HGV driving as a profession. However more participation from logistic companies and RTMS certified operators could have provided in-depth information that relates to training needs that can inform not only TETA programmes but the development of road education and awareness initiatives that has a direct influence on behaviour change as well as support the design and roll-out of awareness and communication campaigns by the province.

Lastly, the analysis of the infringement data showed that it is possible to detect law enforcement efforts from road authorities. There is however a need to standardise the method of recording and reporting data to support future prioritisation law enforcement for HGV on national, regional, and local roads.

7.5. Alignment with international best practices

Internationally, countries who are moving towards zero fatalities and injuries do so within the Safe System Approach which forms the basis of the design and implementation of targeted interventions that address road safety concerns across the five pillars. Crashes involving heavy goods vehicles are the result of the interaction of systemic issues and as such HGV crashes need to be addressed within this system. Several issues contribute to the high number of

heavy vehicle crashes. Among these is poor driver behaviour, partly because of inadequate training and driver fatigue due to long hours of driving.

The Safe System Approach forms the basis of NRSS 2023. The improvement of road safety is also a key objective of the Western Cape Freight Strategy, 2019.

The SSA is premised on the UNDoA pillar approach, and this research is framed within Pillars 1 to 4 as indicated in table 30 below. Ensuring that drivers are equipped and fit to drive through education and training, is a key requirement of the SSA. At an institutional level, there is a need to manage and coordinate the upskilling of drivers (which is considered a professional occupation in most developed countries). The onus rests on the government and the private sector to ensure that good quality drivers are on the road and that drivers are equipped to handle risk; that they are compliant and well educated.

Road authorities have the responsibility to ensure that roads and infrastructure (including roadsides) are designed in a manner that protect users if they make a mistake, and that the mistake do not cost lives or cause disabilities which in turn contribute to the socio-economic burden of road crashes on families and on the economy.

Companies and drivers have the responsibility to ensure that vehicles and drivers are fit for duty.

Achieving a safe road traffic system (ISO 39001; Bliss and Breen, 2009) consists of the successful interaction of different elements.

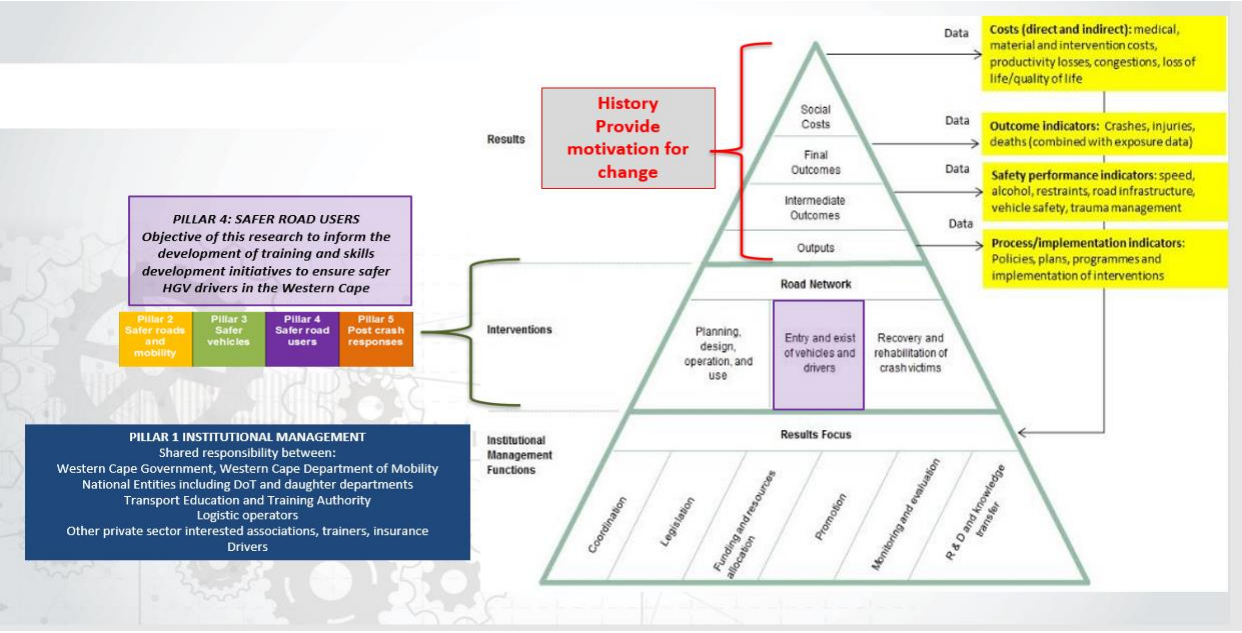


Figure 45: Towards a Safe System: Contextualising this study in the SSA framework.

The concept of safer road users' is a key pillar in achieving this safe transport system. Driver training and education is a cornerstone of achieving safer and responsible road usage. However, it is one aspect that needs to be addressed in conjunction with the other pillars namely the planning and design of the road environment, land use management, managing operating speeds, ensuring safe and fit vehicles on roads as well as

The Safe System Approach is premised on the fact that road safety is a shared responsibility. This responsibility is shared between the designers and planners of the system as well as the users and implementers of the system. The road safety responsibility is shared through an understanding of institutional relationships, coordination between entities, the existence of road safety policies and legislation as well as research and development and finally education and advocacy (figure 1).

Road safety or institutional management is a key and recuring theme in this study. Road safety management (or also referred to as institutional management) refers to the coordination and integration between government and private sector (in other words the logistic operators, driver trainers, insurance companies, driver associations and individuals (heavy goods vehicle drivers). Relevant institutional relationships for this study, is the Western Cape Government, specifically the Western Cape Mobility Department (owner of this project and responsible to partner with institutions for the development and roll-out of future programmes to improve road safety. Heavy vehicle driver training and skills development initiatives are part of the road safety interventions aimed at improving road safety on Western Cape roads. Western Cape Mobility Department in partnership with national entities including the Department of Transport and agencies (RTMC, CBRTA, RTIA) as well as the Transport Education and Training Authority, need to ensure that at a provincial and national level efforts are made to promote safe and responsible heavy goods vehicle driver behaviour.

Institutional road safety management advocates for road authorities like the Western Cape Provincial Government to invest in the coordination of road safety functions across departments and with the private sector to address unsafety in the road environment. Collaboration initiatives (such as those between industry, government, and insurance companies) need to be encouraged in support of addressing freight safety in the South Africa.

On the other hand, driving on public roads is the core business of a logistics operator. From an institutional management point of view, road safety and ensuring that driver training and skills development to ensure safe and competent driving practices, should be at the forefront of operations. Best practice that promotes the adoption of road safety as a core of the business include the introduction of workplace road safety programmes adoption and

Over the past decade the Western Cape Provincial Government has been actively addressing road and transport management in the province, including road safety. Although indications from the secondary trend analysis are that the Western Cape is doing better in terms of addressing freight safety as opposed to the rest of the country, there is still a need for targeted interventions to address road safety as a public health issue as well as a socio-economic concern.

In line with the NRSS 2030, the Western Cape Provincial Freight Strategy highlights the need for training and education initiatives to curb the high number of crashes, as well as the cost of these crashes to the country. A key outcome of this strategy is the investment in training and education of heavy goods vehicle drivers, which will contribute to the pillar that addresses safer road users. In addition to minimum requirements for driver licensing and training, there is a need to invest in the development of competent and skilled drivers. The TETA in South Africa fulfil this function as it provides funding to develop these skills and competencies with learnerships and other skill development programmes. Although there is a need for theoretical training, additional considerations should include practical training initiatives. In addition to historical practical training there is a need for more specialised training that include upskilling

heavy good vehicle drivers in terms of new technologies, specific training in terms of type of vehicles (OEM related) as well as employing modern technologies to influence the uptake and facilitation of heavy vehicle driver learning, education, and development. A lack of practical training approaches was highlighted as a serious gap in the current training regime.

Error! Reference source not found. frames this research and findings with the four pillars of t he SSA.

Table 33: Heavy vehicle driver safety with the SSA

SSA principle	Recommendations
Institutional management	There is a need for institutional management of driver training and skills development. This entails that management of companies take ownership of road safety. Management takes ownership of road safety by investing in training and education, driver monitoring devices as well as the implementation of health and safety plans that encompasses driver wellbeing and safety, vehicle maintenance, pre – and post trip inspections, route planning and monitoring to improve HGV operations. In addition, management has a key role to play in collecting and reporting on heavy vehicle crashes, conflicts, fatalities, and serious injuries due to work related driving. Management and company approaches should include appropriate channels and mediums to engage with drivers to voice frustrations, opinions, and suggestions regarding better and safer working conditions.
Safer road and infrastructure	Within the SSA the onus rests on the road authority to ensure that the road environments are inherently safe and forgiving. This means that when new road environments are designed, they should include designs that stems out of a deeper understanding of HGVs as part of the traffic mix. This should include design considerations that consider the vehicle dynamics and skill levels to provide road environments that can absorb HGV driver mistakes and errors. Changes to design(s) or incorrect designs can result in (for example) drivers adopting higher operating speeds, because it seems safe, and the road design allows for it. The safety implications are contingent upon the context in which these modifications occur. The use of higher-speed design solutions may enhance safety on limited access routes with high operating speeds characterized by little vulnerable road user or access-related activity. There is an important relationship between road design, the adjacent road environment and human behaviour/selection of behaviour deemed appropriate for that scenario. This relationship highlights the need for understanding the transport system (operating) dynamics - including an understanding of the physical environment (design characteristics of the roadway, environment and social environment influenced by user decisions and behaviour). While the laws of physics make it noticeably clear that speed and crash severity are inextricably linked (i.e., severity

Table 33: Heavy vehicle driver safety with the SSA	
SSA principle	**Recommendations**
	increases geometrically as speed increases), there has been a good deal of controversy over the impact of speed on crash occurrence. For a given roadway type, there is a strong statistical relationship between speed and crash risk. When the mean speed of traffic is reduced, the number of crashes and the severity of injuries will go down. When the mean speed of traffic increases, the number of crashes and the severity of injuries will usually increase.
Safer vehicles	Similarly, indications are that vehicles need to be safe and that drivers should be educated and skilled in using specific types of vehicles as well as have Original Equipment Manufacturer (OEM) Training.
Safer drivers and other road users	Professional driver training and education is important to ensure that drivers are aware and alert. Additional training should include knowledge about driving in specific types of environments, handling and operating of different types of heavy vehicles and ensuring that drivers are competent and equipped to safely drive the vehicle allocated to them. Drivers should also be upskilled in navigating changing environments and challenging environments (weather related, terrain related). Self-management training should include the provision of time management and fatigue management training. In addition, speed management is a key skill that all HGV drivers need to understand.

Experienced heavy goods vehicle drivers seem to be dwindling. Yet experience has been highlighted as a key requirement for employment with operators. Skilled and experienced drivers are better equipped to deal with changes in traffic and road environments; have a greater perception of risky and dangerous situations as well as being better equipped to manoeuvre the large vehicles through different traffic streams and road environments. There is thus a need to create opportunities in existing operating environments that foster learning, retention, and the development of skilled local drivers.

7.6. Recommendations

The research is specific to the Western Cape however it is possible to develop programmes that have a larger national target audience. This research findings and recommendations provide baseline input into the development of TETA specific HGV driver training, education and skills development programmes that can support the development of additional modules to expand professional driver qualifications, serve to upskill drivers and to professionalize the occupation. The study findings also provide insight into preferred methods of teaching.

In addition, the study supports the value that instilling a road safety culture through workplace road safety, accreditation and incentive programmes could have. Lastly the study highlighted new training needs including the need for soft skills training programmes as well as the need

for training programmes that focus on upskilling drivers in terms of new technologies in vehicles.

A key first step to implementing the study's recommendations is an assessment of the HGV driver training supply market, to determine whether the recommended training programmes and training methods exist, or whether new programmes must be developed. This assessment should include the availability of training providers capable of delivering the training in the preferred method of instruction.

REFERENCES

Assemi, B and Hickman, M. 2018. "Relationship between heavy vehicle periodic inspections, crash contributing factors and crash severity." *Transportation Research Part A Policy and Practice* 113.

Arshad, A.K. 2020. Heavy Goods Vehicle Accidents: Drivers' Perspective. International Journal of Advanced Research in Engineering and Technology (IJARET), 11(6):1006-1011.

Baker, S.P and Li, G. 2012. "Epidemiologic Approaches to Injury and Violence." *Epidemiologic Reviews* 34 (1): 1 - 3.

Bliss, T and Breen, J. 2012. "Meeting the challenges of the Decade of Action for Road Safety'." *IATSS Research,* 35: 48-55.

Botha, G.J. 2005. "Measuring road traffic safety performance." *Southern African Transport Conference.*

Breen, J. 2015. *Road safety study for the interim evaluation of road safety policy 2010-2020.* Brussels: European Commission.

De Beer, E and van Niekerk, E.C. 2000. *An estimate of the unit cost offroad traffic collisions in South Africa for 1998.* Pretoria: National Department of Transport.

Department of Transport and Public Works. 2019. *Provincial Freight Strategy.* Cape Town: Western Cape Government.

Canada (2020) *Changes in Canadian Vehicle Driver Training*.

Craig, G. (2020) *Vehicle Driver Training is Changing. Become A Vehicle Driver*. Assemi, B and Hickman, M. 2018. "Relationship between heavy vehicle periodic inspections, crash contributing factors and crash severity." *Transportation Research Part A Policy and Practice* 113.

Baker, S.P and Li, G. 2012. "Epidemiologic Approaches to Injury and Violence." *Epidemiologic Reviews* 34 (1): 1 - 3.

Bliss, M and Breen, G. 2010. *Safety Science .*

Bliss, T and Breen, J. 2012. "Meeting the challenges of the Decade of Action for Road Safety'." *IATSS Research,* 35 : 48-55.

Botha, G.J. 2005. "Measuring road traffic safety performance ." *Southern African Transport Conference .*

Breen, J. 2015. *Road safety study for the interim evaluation of road safety policy 2010-2020.* Brussels: European Commision .

Corporation, Road Traffic Management. 2016. *The Cost of Crashes 2015 Research and Development Report .* Pretoria : RTMC.

Darby, P., Murray, W., Raeside, R. 2009. "Applying online fleet driver assessment to help identify, target and reduce occupational road safety risks." *Safety Science* 47 (3): 436 -442.

De Beer, E and van Niekerk, E.C. 2000. *An estimate of the unit cost ofroad traffic collisions in South Africa for 1998. .* Pretoria: National Department of Transport.

Department of Transport and Public Works . 2019. *Provincial Freight Strategy.* Cape Town: Western Cape Government .

Department of Transport. 2007. *National Freight and Logistics Strategy: IMPLEMENTATION OF THE SOUTH AFRICAN FREIGHT LOGISTICS STRATEGY.* Pretoria : Department of Transport.

European Commission. 2016. *Advanced driver assistance systems.* Brussels: European Commission.

European Transport Safety Council. 2001. "TRANSPORT SAFETY." Brussels.

Evgenikos, Petros, George Yannis, Katerina Folla, Robert Bauer, Klaus Machata, and Christian Brandstaetter. 2016. *Characteristics and causes of heavy goods vehicles and buses accidents in Europe.* Viena: Transport Research Arena.

Federal Highway Administration . 2023. *Focused Approach to Safety.* Accessed March 13, 2023. https://highways.dot.gov/safety/other/focused-approach-safety.

Figueredo, Grazziela, Utkarsh Agrawal, Jimiama Mase, and Mohammad Mesgarpour. 2019. *Identifying Heavy Goods Vehicle Driving Styles in the United Kingdom.* IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS.

Fontainne, M.D. (2003). *Engineering and technology measures to improve large truck safety:. Technical Assistance Report, .* Charlottesville, Virginia: Transport Research Board .

Gander, P.H., Marshall, N.S., James, I. and Le Quesne, L. 2006. "Investigating driver fatigue in truck crashes: Trial of a systematic methodology." *Transportation Research Part F* 6: 65-76.

George, C.F.P. 2004. "Driving and automobile crashes in patients with obstructive sleep apnoea/hypopnoea syndrome." *THORAX International Journal of Respirotory medicine* 59: 804-807.

Grinerud, K. 2022. "Work-Related Driving of Heavy Goods Vehicles: Factors That Influence Road Safety and the Development of a Framework for Safety Training." *Safety .*

Guppy, Adams Julie, and Andrew Guppy. 2003. *Truck driver fatigue risk assessment and management: a multinational survey.* Enfiled: Department of Psychology, Middlesex University.

Häkkänen, H. and Summala, H. 2001. "Fatal traffic accidents among trailer truck drivers and accident causes as viewed by other truck drivers ." *Accident Analysis and Prevention* 33 (2): 187-196 .

Hanowski, Richard, Jeffery Hickman, Myra Blanco, and Gregory Fitch. 2010. *LONG-HAUL TRUCK DRIVING AND TRAFFIC SAFETY: STUDYING DROWSINESS AND TRUCK DRIVER SAFETY USING A NATURALISTIC DRIVING METHOD.* Blacksburg: Center for Truck and Bus Safety, Virginia Tech Transportation Institute .

Jackson, L., Chapman, P and Crundall, D. 2008. “What happens next? Predicting other road users' behaviour as a function of driving experience and processing time.” *Ergonomics* 52 (2): 154-164.

Johnson, K Jennifer, L Amanda Terry, and Vingilis Evelyn. 2021. *Providing healthcare and fitness to drive assessments for long-haul truck drivers: A qualitative study of family physicians and nurse practitioners .* London: Western University.

Joubert, J.W. 2010. “On the social network perspective of road-freight facilities.” *29th Southern African Transport Conference.* CSIR Pretoria: Document Transformation Technologies. 684-692.

Kantar Pubic. 2018. *The Safely Home Survey 2017 (year 3).* Cape Town: Western Cape Government Department of Transport and Public Works .

Labuschagne, F.J.J. and Pallet, K. 2010. “Intelligent vehilce based traffic monitoring-exploring application in South Africa.” *Proceedings of the 29th South African Transport Conference (SATC 2010) .* Pretoria: Document Transformation Technologies. 564-575.

Labuschagne, FJJ., De Beer, E.C., Roux, D and Venter, K. 2017. “The cost of crashes in South Africa 2016.” *36th Southern African Transport Conference.* Pretoria. 474 -485.

Lal, S.K.L and Craig, A. 2001. “A critical review of psychophysiology of driver fatigue.” *bIOLOGICAL pSYCHOLOGY* 55: 173-194.

Larsson, P., Dekker, S.W.A and Tingvall, C. 2010. “The need for a systems theory approach to road safety.” *Safety Science* 48 (9).

Lotter, S. 2000. “ROAD SAFETY PERFORMANCE MEASUREMENT IN SOUTH AFRICA.” *Southern African Transport Conference .* Pretoria . 1-13.

Maldonado, C., Mitchell, D, Taylor, S and Driver, H. 2002. “Sleep, work schedules and accident.” *South African Journal of Science* 98: 319-324.

Messiha, Mina, Laura Fox, Serkan Varol, and Bandar Aldhuwayhi. 2020. *Traffic Accidents Cause and Effect Analysis: A Case Study in Chattanooga.* University of Tennessee at Chattanooga.

Mohammed, and Magazi. 2014. *THE IMPORTANCE OF HEAVY VEHICLE DRIVER EDUCATION IN SOUTH AFRICA.* Pretoria: Department of Transport.

Moore, B. 2007. “An Integrated Approach to the Regulation of Heavy Vehicles.” *Special Session SP11, 23rd World Roads Congress.* Paris.

Moore, S.M., Yorio, P.L., Haas, E.J., Bell, J.L and Greenawald, L. 2020. “Heinrich Revisited: a New Data-Driven Examination of the Safety Pyramid.” *Mining, Metallurgy & Exploration* 37: 1857–1863 .

Muronga, Khangwelo. 2015. *THE EFFECTIVENESS OF THE NATURALISTIC DRIVING STUDIES IN IMPROVING DRIVER BEHAVIOUR.* Pretoria: Tshwane University of Technology.

Murray, W. 2007. *Worldwide Occupational Road Safety (WORS).* Queensland: Centre for Accident Research and Road Safety .

Nævestad, T., Phillips,R., Hovi, I., Jordbakke, G.R and Elvik, R. 2022. “Estimating Safety Outcomes of Increased Organisational Safety Management in Trucking Companies.” *Safety .*

National Institution for Ocupational Health and safety (NIOSH). 2009. *Proceedings of the First International Conference on Road Safety at Work 2009.* NIOSH.

Nordengen, P.A. and Piennaar, N. 2007. “The road transport management system (RTMS): A self-regulation initiative in the heavy vehilce transport industry in South Africa.” *Proceedingsof the South African Transport Conference (SATC 2007).* Pretoria: Document Transformation Technologies. 1-9.

Pack, A.I., Pack, A. M., Rodgeman, E., Cucchiara, A., Dinges, D.F. and Schwab, C.W. 1995. “Characteristics of crashes attributed to the driver falling asleep.” *Accident Analysis and Prevention* 27 (6): 769-775.

Petridou, E. and Moustaki, M. 2000. “Human factors in the causation of road traffic crashes.” *European Journal of Epidemiology* (Kluwer Academic Publishers.) 16: 819±826.

PHILIP, Pierre . 2004. *Sleepiness of Occupational Drivers.* Place Amélie Raba Léon.

Pratt, S. 2003. *Work-Related Roadway Crashes.* Cincinnati: National Institute for Occupational Safety and Health (NIOSH).

Raftery, S.J., Grigo, J.A.L and Woolley, J.E. 2011. “Heavy vehicle road safety: A scan of recent literature.” *Journal of the Australasian College of Road Safety* 22 (3): 18 - 24.

Road Traffic Management Corporation . 2023. *Fatal Truck and Bus Crashes in South Africa – March 2023.* Pretoria : Road Traffic Management Corporation .

Road Traffic Management Corporation . 2021. *State of Road Safety January - December 2021.* Pretoria : Road Traffic Management Corporation .

Road Traffic Management Corporation . 2016. *Traffic Offense Survey 2016.* RTMC Research and Development Unit.

Road Traffic Management Corporation. 2022. *Traffic Injury Study.* Midrand : RTMC.

Rose, Luke, and Gert Heyns. 2014. *Reducing risky driver behaviour through the implementation of a driver risk management system.* Johannesburg: Institute of Transport and Logistic Studies (Africa).

Sagberg, F. 1999. “Road accidents caused by drivers falling asleep.” *Accident Analysis and Prevention* 31: 639–649.

Stephen, Paul Rau. 2016. *DROWSY DRIVER DETECTION AND WARNING SYSTEM FOR COMMERCIAL VEHICLE DRIVERS: FIELD OPERATIONAL TEST DESIGN, DATA ANALYSES, AND PROGRESS.* National Highway Traffic Safety Administration.

Stuckey, R., Pratt, S.G and Murray, W. 2013. “Work-related road safety in Australia, the United Kingdom and the United States of America: an overview of regulatory approaches and recommendations to enhance strategy and practice.” *Journal of the Australasian College of Road Safety* 24(3) (3): 10–20.

Summala, H. and Mikkola, T. 1994. “Fatal Accidents among Car and Truck Drivers: Effects of Fatigue, Age, and Alcohol Consumption.” *Human Factors: The Journal of the Human Factors and Ergonomics Society,* 36 (2): 315-326(12).

TNS. 2017. *Safely Home 2 2016 Road Safety Survey Results .* Cape Twon: Western Cape Government Department of Transport and Public Works.

Touahmia, Mabrouk. 2015. *Identification of Risk Factors Influencing Road Traffic Accidents.* Hail: Department of Civil Engineering University of Hail .

U.S Department of Transportation . 2023. *What Is a Safe System Approach?* Accessed March 19, 2019. https://www.transportation.gov/NRSS/SafeSystem.

Vision for Zero Network. 2017. *United Nations Launches New Initiative to Reduce Road Crashes.* 17 March . https://visionzeronetwork.org.

Wegman, F., Schemers, G. and Van Schagen, I. 2013a. *National Road Safety Strategy for South Africa .* Leidschendam, The Netherlands: SWOV Institute for Road Safety Research.

Wegman, F.C.M. and Aarts, L.T. (red.). 2006. *Advancing Sustainable Safety; National Road Safety Outlook for 2005-2020.* Leidschendam.: SWOV Institute for Road Safety Research.

Western Cape Government . 2019. “Provincial Road Freight Strategy .” Department of Transport and Public Works . https://www.westerncape.gov.za/files/freight_strategy_report_final_2019.pdf.

Zhang, Qiuhan Danielle. 2018. JPUR.

Roderique, J and Nottenboom, T. 2012 The Geography of Transport Systems (3rd edition) Routledge, New York.

Stuckey, R. P. (2013). Work-related road safety in Australia, the United Kingdom and the United States of America: an overview of regulatory approaches and recommendations to enhance strategy and practice. Journal of the Australasian College of Road Safety, 24(3)(3), pp. 10–20.

Umama, A (2010). Passenger Car Equivalent Factors for Level Freeway Segments Operating under Moderate and Congested Conditions. http://epublications.marquette.edu/theses_open/60.

U.S Department of Transportation. 2023. *What Is a Safe System Approach?* Accessed March 19, 2019. https://www.transportation.gov/NRSS/SafeSystem.

Van Der Westhuizen, M. (2011). Trucking Wellness- A unique and sustainable response to Driver Wellness the South African road freight industry. *CAIA Responsible Care Workshops.* Johannesburg.

Vision for Zero Network. (2017, March 17). *United Nations Launches New Initiative to Reduce Road Crashes*. Retrieved from International, News available from https://visionzeronetwork.org.

Venter, K.; Labuschagne, F.J.J.; Le Roux, M, and Cloete, G, (2013), ‘*Human factors for engineering: a South African study, Road Safety and Simulation Conference*.

Venter, K.; Mohammed, s. and Labuschagne, K. (2012) *Human Factors for Engineering on the N3 Route:* Sections N3/8 N3/8X andN3/9 Report 2: Crash and Health Statistics.

Wang, L., Ning, P, Yin, P. Cheng, P.; Schwebel, D.C., Liu, J., Wu, Y., Liu, Y., Qi,J., Zeng Zhou, M., Hu, G (2019) Road traffic mortality in China: analysis of national surveillance data from 2006 to 2016 https://doi.org/10.1016/S2468-2667(19)30057-X.

Wegman, F., Schemers, G. and Van Schagen, I. 2013a. *National Road Safety Strategy for South Africa.* Leidschendam, The Netherlands: SWOV Institute for Road Safety Research.

Wegman, F.C.M. and Aarts, L.T. (red.). 2006. *Advancing Sustainable Safety; National Road Safety Outlook for 2005-2020.* Leidschendam.: SWOV Institute for Road Safety Research.

Western Cape Government. 2019. "Provincial Freight Strategy." Department of Transport and Public Works. https://www.westerncape.gov.za/files/freight_strategy_report_final_2019.pdf.

Wolkowicz, M.E. (1989). *Commercial vehicle Accidents: The data gathering experience.* Ontario: Ministry of Transportation - Transportation Technology and Energy Branch.

Yan, M., Chen, W., Wang, J., Zhang, M. and Zhao, L (2021) Characteristics and causes of Particularly Major Road Traffic Accidents Involving Commercial Vehicles in China DOI :103390/ijerph18083878.

Annexure A: RTMS Trend Analysis

Annexure B: Western Cape Mobility Department - Driver Skills and Behaviour Survey 2021

Annexure C: Stakeholder map

Annexure D: Research Instrument

Annexure E: Ethics Clearance Letter

Annexure F: Western Cape HGV Driver Survey Fieldwork Report

Annexure G: Interview Guide – Regulatory Entities

Annexure H: Interview Guide – Advanced Training Institution

Annexure I: Survey Questionnaire (2023) Responses

Annexure J: Consent Form