MANAGING VEHICLE-RELATED RISKS FROM SUPPLY CHAIN PRESSURES

MACKIE RESEARCH
OPTIMISING HUMAN SYSTEMS

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EXECUTIVE SUMMARY

Introduction and strategic context

Workplace vehicle-related harm is a growing area of focus in New Zealand. Given the wide ranging and complex arrangements of vehicle use within supply chains, a 'system' approach is needed to determine solutions that are most likely to address the context that drives harm, and hence have the greatest chance of being effective. This project involved an evidentially based investigation of approaches to managing risks across the supply chain, with attention given specifically to Transport, Postal, Warehousing, and Manufacturing within the New Zealand context. Using a highly participatory research method, the project was carried out over 11 months between April 2020 and March 2021 and was designed to build on existing and new programmes of work by industry and New Zealand agencies. This report concludes with 13 system focused recommendations to minimise vehicle-related harm across supply chains.

Catalysing this project are figures from WorkSafe New Zealand showing that 70 percent of work-related fatalities involve vehicles (WorkSafe 2019), with recent research by Lilley (2020) indicating it may be higher. Second to Agriculture, the Transport, Postal, and Warehousing industry is where vehicle-related fatal and non-fatal injuries are mostly likely to occur. Manufacturing was included because of the inseparable activities across the industries, although when the focus is on vehicle risks, there is a tendency for harm statistics to focus relatively more on on-road and distribution operations.

WorkSafe data shows that in Transport, Postal, and Warehousing in 2019 there were 147 vehicle-related injuries that required more than a week away from work, with 114 occurring in road transport. In Manufacturing, there were 54. Of the total vehicle-related fatal incidents, trucks and semi-trailers were most likely to be involved. On-road figures show that in 2019 there were 57 fatal crashes involving trucks, 170 serious injuries and 521 minor injuries. Of the 57 fatal crashes involving trucks, among a range of other vehicle and environmental factors, 30 involved contributing factors related to the truck driver[1].

[1] Analysis of crash data 2019 in the Waka Kotahi Crash Analysis System.

What we know about the vehicle-related harm being caused

Work-related vehicle incidents are a major health and safety burden to both workers and the public in New Zealand and overseas (Mathern, 2019). Harm can result from being trapped between a vehicle and a structure, vehicle collisions, being hit by a vehicle or falling from a vehicle, being injured by vehicles overturning, and during vehicle maintenance (WorkSafe, 2020; Health and Safety Authority, 2020).

Transport, postal, warehousing, and manufacturing workers are at risk of poor health outcomes from shift work, long hours, exposure to diesel and moving vehicles, fatigue, and poor access to rest facilities. Specific evidence on truck driver health shows that they generally exhibit poor health profiles including hypertension, high blood glucose, intestinal problems, arthritis, lung disease, diabetes, sleep disorders, and work-related stress (Clemes, et al., 2020; Thornthwaite & O'Neill, 2017; Boyce, 2016).

Recent statistics on psychological harm in New Zealand Transport, Postal, and Warehousing showed that nearly 60 percent of workers reported that work-related stress had been damaging to their mental wellbeing and just over 30 percent reported experiencing work-related depression or anxiety (WorkSafe, 2020a). Lone work, prolonged work-time pressure, and long stretches away from family and friends are a few of the cited reasons for growing mental health problems among commercial drivers (Shattell, et al., 2010; Tedestedt George, 2018; Belzer, 2018).

Contextual factors causing the harm

There is consensus in more contemporary areas of Occupational Health and Safety literature that harm is not the result of individual, aberrant behaviour but is rather a symptom of an ill-functioning system and the interplay between contextual factors (Mathern, 2019; Mayhew & Quinlan, 2006; Rawling & Kaine, 2012; Edwards, Davey & Armstrong, 2014; Thornthwaite & O'Neill, 2016; Tedestedt George, 2018). In a review of risk factors in the road freight transport industry in New Zealand, Mathern (2019) summarised that contextual factors such as remuneration, employment status, management commitment, upstream decisions, and goal conflict can lead to symptoms such as speeding, fatigue, stress, aggressive driving, and others.

It is relevant to consider the interconnected nature of the contextual factors that lead to the symptoms because it ensures the focus for intervention is on the entire system, rather than any one party. Individual interventions are likely to be ineffective and compromised by competing pressures from risk factors upstream when efforts repeatedly fail to take a holistic approach

(Mathern, 2019). For this reason, the supply chain was deemed an appropriate lens for this project in which to examine the interplay between contextual factors affecting vehicle-related harm and identify points where interventions could address harm-causing factors further upstream.

Rasmussen's Socio-Technical System Framework (Figure 1) was used as a conceptual framework ensuring the research considered the interconnected nature of contextual factors and all relevant system levels. Creating a system that functions safely requires that decisions made among the top levels are reflected in the activities and actions of those at the lower levels. Equally, information from the lower levels should transfer upward to inform the decisions made at the top (Rasmussen, 1997) as shown by the arrows Figure 1 below.

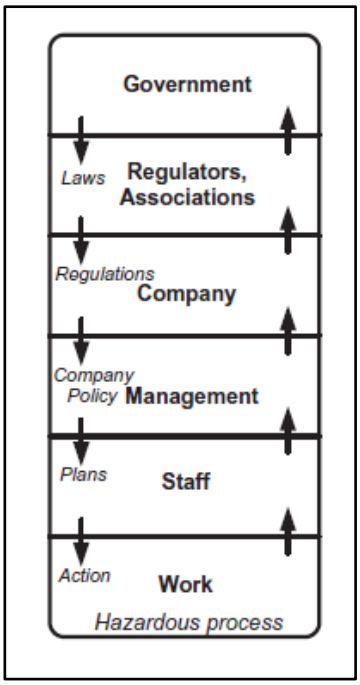


Figure 1: Rasmussen's risk management framework as shown in Salmon et al., (2012)

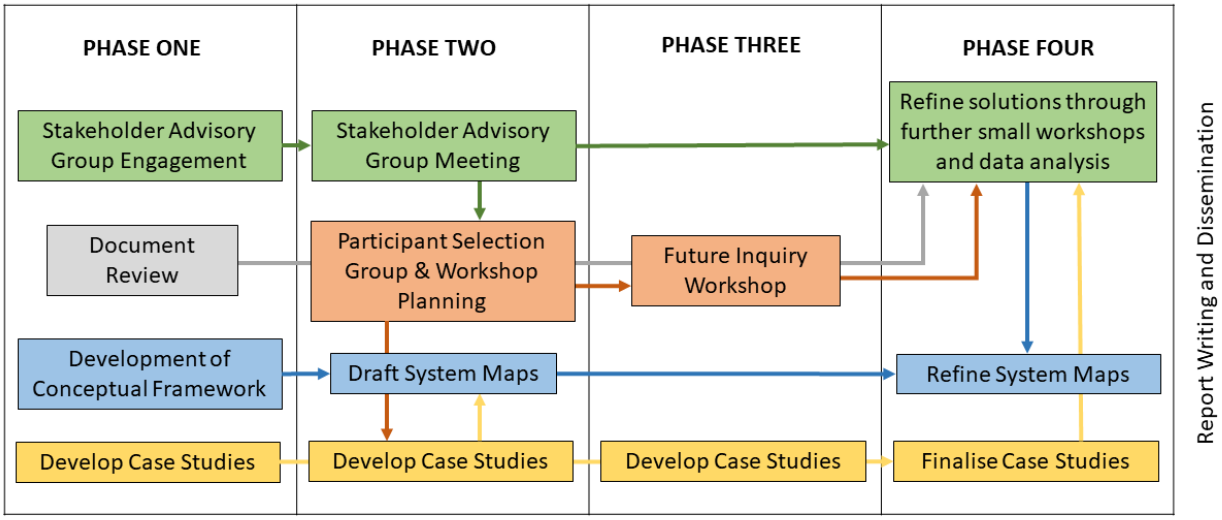
Consideration was also given to socio-ecological approaches in this project so as not to lose sight of the human experience when the whole system is in view. Elements of socio-ecological approaches were relevant, for example, in the case study interviews and the Future Inquiry Workshop during which individual responses could be recorded.

Method

The project approach focused on developing solutions in the wider supply chain system to address the areas of harm discussed above. Grounded in a Human Factors systems approach,

the project design was based on the premise that existing knowledge and expertise exist within industry and government and that system participants are best placed to identify suitable interventions, if they represent the whole system, and the right conditions are set for them to effectively contribute.

As shown below, four phases of research were carried out, each designed to foster engagement, maintain focus on the system, and primarily uncover appropriate interventions for New Zealand.



In *Phase One* a review of international evidence was carried out and a Stakeholder Advisory Group, representing both industry and government, was established to determine the scope of existing interventions and begin engagement with key system members.

Phase Two entailed a digital Stakeholder Advisory Group meeting of 40 key system members. From that group a Future Inquiry Workshop participant selection group was formed. Case study interviews with those demonstrating existing good practice in New Zealand also began during Phase Two.

During *Phase Three* a full day in-person Future Inquiry Workshop was held with 67 participants bringing the 'whole system into the room'. Eight stakeholder groups, listed below, were represented at the workshop.

1. Drivers and their advocates
2. Regulators and government authorities
3. Business leaders and advocacy groups of non-transport providers
4. Educators and health and safety champions
5. Business leaders and advocacy groups of road transport providers
6. Workers and their advocates

7. Community, people in the road environment, on-road support
8. Equipment and data providers

In *Phase Four* preliminary findings were presented in two smaller workshops – one with WorkSafe and another with a sub-group of representatives from the Future Inquiry Workshop. The case studies were also completed during this final phase. The research concluded with an analysis process that mapped data from the research stages into themes and finally recommendations.

Document review

The review of online, published documents including academic and grey literature uncovered a series of intervention approaches applicable to the system of supply chain related vehicle risk. Although not all were proven concepts, they provided potential exemplars for the New Zealand context. The Australian context in particular demonstrated how legislation is being used to address harm from supply chain pressures. Although a contentious topic, the discussion on Safe Rates in Australia provided further evidence on the link between safety and pay.

Also from Australia, the review revealed details of the Chain of Responsibility legislation and the National Heavy Vehicle Law[2], and showed how related activities such as accreditation programmes aided operators in meeting their legal requirements[3]. Further abroad but in a similar vein, several accreditation schemes emerged from the search, the most frequently mentioned being Transport for London's Fleet Operator Recognition Scheme [4].

International work time rules were examined to compare New Zealand's to those of other countries, finding that European Union countries have lower legal work time limits compared to New Zealand. The review also revealed higher level approaches, namely the European Commission's Social Provisions[5] for transport (social rules to ensure adequate protection of road transport workers) and encouraging the use of social dialogue[6]. The two latter approaches emphasise that good working conditions and collaboration between all supply chain members lead to safer transport conditions.

[2] https://hvnlreview.ntc.gov.au/
[3] See for example the work of TruckSafe - https://www.trucksafe.com.au/
[4] https://www.fors-online.org.uk/cms/
[5] https://ec.europa.eu/transport/modes/road/social-provisions_en
[6] See the work of the ILO on social dialogue - https://www.ilo.org/ifpdial/areas-of-work/social-dialogue/lang--en/index.htm

Case studies demonstrating existing good practice in New Zealand

Five case studies were created, showing a series of interventions currently in action to manage work-related vehicle risk by New Zealand individuals, groups, and organisations. The aspect of activity in focus for each case study was derived through a combination of scanning publicly available information and a subsequent semi-structured interview(s) with key individuals. Each study has an accompanying system map to show the influence of upstream factors on risk to those working with vehicles. The case studies are:

1. A distribution centre integrating safety across the supply chain
2. The Log Transport Safety Council – Co-ordinating safety efforts across the supply chain
3. Forklift loading and site management – Engagement and safety across the supply chain
4. A transport company – Improving culture and consistency of working conditions across the supply chain
5. Using information and technology to support safety outcomes.

The case studies showed a clear link between senior management commitment to safety and increased positive safety cultures. Further they highlighted the importance of engagement throughout the supply chain, regular engagement with workers and contractors, clear Occupational Health and Safety messaging, and the importance of good management practices when implementing and using safety-monitoring technology. Whilst these are not unique interventions, the consistent reference to these aspects within successful interventions does reinforce their importance.

Future Inquiry Workshop

With the 'system in the room', participants were asked to examine the past, present, and future, with the aim of finding common ground and prioritising areas for action. Participants identified positive aspects from the past, such as adoption of technology and businesses taking more responsibility. However, examples of features that had not worked well were thought to be pressures flowing through the supply chain system, a lack of accountability, and regulation that is unfit for purpose among other issues. In the present they recognised a need for change, calling for regulatory stagnation to be addressed along with improved procurement practices, system collaboration and leadership, among others.

Participants settled on strategy statements and identified opportunities for first do-able steps in the following areas: fatigue and well-being related interventions; digital app-based driver inductions; addressing procurement, pay, conditions and well-being; improving vehicle safety; enhancing industry leadership; infrastructure quality; and data sharing. The workshop highlighted an urgency for change, a willingness to collaborate, and created fertile ground for similar gatherings in the future. There was a strong message from participants at the conclusion of the workshop that the day's effort should translate into ongoing momentum through further tangible progress and action.

The Future Inquiry Workshop participants in a plenary group session

Synthesis of the findings

The data collected during the project were brought together and coded to determine common themes based on areas of intervention resulting from the project stages. A Venn diagram (Figure 2 below) shows how the main results from each data set overlapped and how certain concepts, such as collaboration, stand out in various ways, including social dialogue, tripartite forums, and system, industry, and sector leadership. The first theme is therefore titled *collaboration*. In another example, the second theme is *the regulator and regulations*, which incorporates the call for regulatory reform by the Future Inquiry Workshop participants. This included discussions on the applicability of the Australian Chain of Responsibility legislation in New Zealand. While the centre section of the diagram below was used to identify the main themes, all the concepts mentioned in the diagram are integrated into the discussion. Seven main themes resulted and are detailed below.

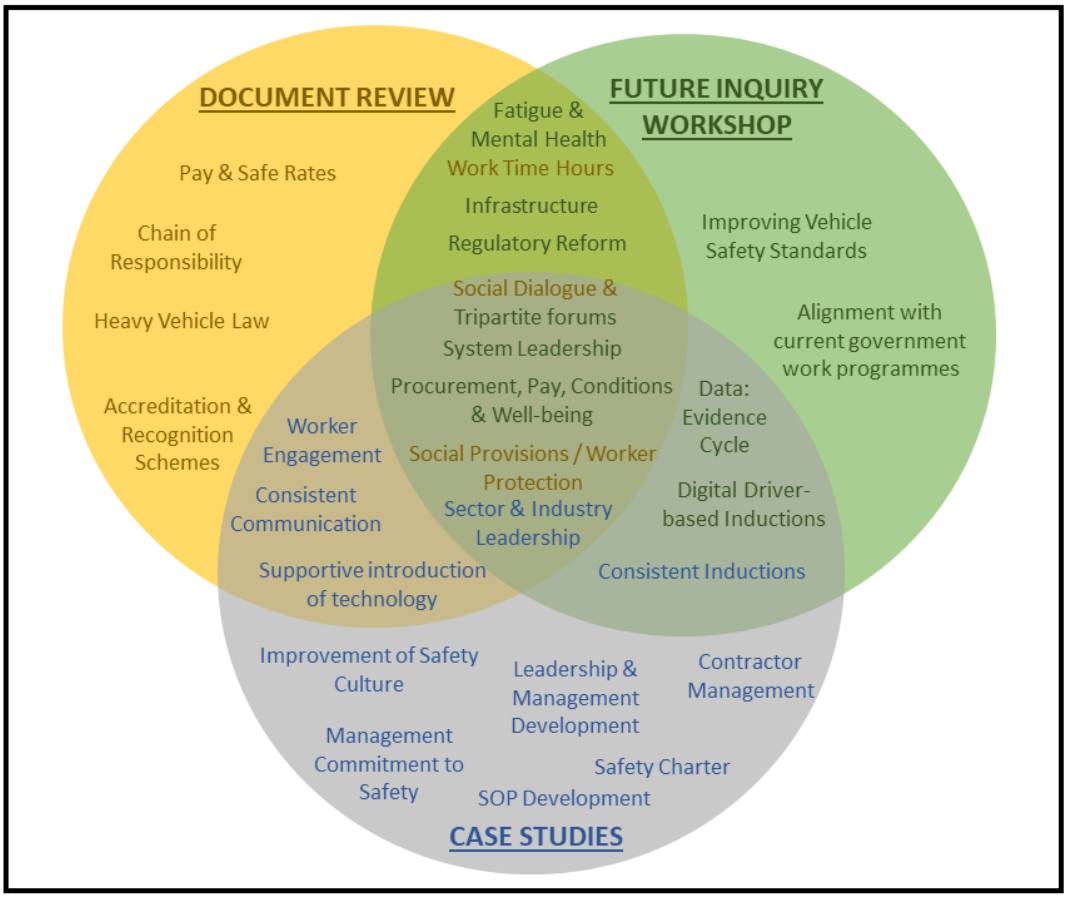


Figure 2: Venn diagram of the three main data sets

1. System collaboration: The data repeatedly showed how collaborative efforts among supply chain members at various levels led not only to improved risk management and Occupational Health and Safety outcomes, but also efficiency and productivity. System-wide collaboration would ensure that future interventions are based on the experience of the whole system, that constraints can be more easily overcome, and that top-level decision makers learn alongside workers. Through collaboration, the participants saw the possibility for reduced mistrust, fewer siloed responses, and improved Occupational Health and Safety across the system.
2. The regulator and regulations: Participants at the Future Inquiry Workshop and throughout the case studies placed numerous and varied demands on regulatory agencies including a call for greater collaboration between them, clarification of transport-related agency roles, a review of current work time rules, and in other data sets a call for the Chain of Responsibility principles to be further expanded in New Zealand. Existing collaboration between regulatory agencies such as the New Zealand Police and WorkSafe, or between industry and the agencies was evident in the findings, as was a cross-government desire to

improve workplace safety in and around vehicles, and a strong desire to do things differently.

3. Safety culture and management practice: Organisations, managers, and other stakeholders reported on the importance of leadership and management capabilities in the reduction of vehicle-related harm to workers both within their organisation and across the wider supply chain. Senior management commitment was suggested by the participants to positively impact Occupational Health and Safety through improved positive safety cultures, an immediate response to concerns, clear and consistent messaging, and worker engagement. Occupational Health and Safety training for managers was promoted among the participants; however, acknowledgement should be given to constraints such as tight budgets, time pressure, and operating within a system where it is often difficult to prioritise Occupational Health and Safety.
4. Procurement, contracts, and contracting: Public procurement has the potential to raise standards within freight services given the size and reach of government agencies. Regarding private procurement practices, the Future Inquiry Workshop participants agreed that a tripartite forum should be formed to gather potential solutions and grasp the potential economic impact of alternative procurement practices. International efforts such as the United Nations' Sustainable Development Goals seek to promote fair competition, decent work, and productive employment through greater job creation, promoting innovation, and entrepreneurship. No clear direction on how to solve the issues around pay emerged, yet this is strongly associated with health and safety outcomes in the literature.
5. Technology: At the Future Inquiry Workshop, safety-monitoring technology was accepted as a contributor to safer systems, but also seen as a distraction to those who were there to talk about supply chain pressures from a more organisational and regulatory system design perspective. The data revealed a need for strong leadership, engagement, feedback, coaching, and clear communication with workers when safety technology is implemented to address unsafe practices. With supportive policies and positive organisational cultures, safety monitoring technology was shown to be effective.
6. Evidence-cycle and data: While previous research demonstrates a need to improve vehicle-related harm, further evidence and data would give a more fine-grained understanding of the detailed issues on road and on work sites, and therefore solutions. The need is two-fold; better information is required to understand factors leading to adverse events and harm pathways; and likewise, better data is needed to support various

initiatives such as improvement of driver inductions. There is potential for advancement if data streams are pooled and made more available to show what is known, what needs to be known, and how the information can be used. An industry with more complete intelligence could innovate and plan better.

7. **Fatigue and well-being** were identified as issues of concern to the system. The Future Inquiry Workshop participants recommended a leadership committee to collect background information aimed at better understanding the extent and nature of the problem, local and international solutions, and facilitate a co-ordinated effort between government and industry. As a starting point, it was suggested that previous effort to address fatigue and wellbeing in New Zealand and overseas be reviewed before further effort to understand and address system determinants of fatigue and wellbeing.

Recommendations

The recommendations resulted from a synthesis of the seven themes. The researchers identified the key elements from each theme and looked at how they interconnected, discussed whether several issues could be housed within one recommendation, and lastly, converted the themes into tangible and actionable recommendations. The strategy statements and first do-able actions developed by the Future Inquiry Workshop participants are all integrated within the recommendations because they were settled on by the system-representative participants.

Some issues were discussed heavily throughout the data collection, but no clear solution resulted. Pay is one example of this. This topic featured strongly throughout the research stages, however, no consistent or universally agreed recommendation emerged. Where this was the case, the researchers have recommended that further investigation be carried out.

The table below details the 13 recommendations that emerged from this project and shows who is best placed to own and carry out each recommendation, and what the likely impact may be. The system level tasked with ownership should see themselves as a nexus point, rather than solely responsible, as the nature of a systems approach requires the involvement of all levels. Recommendations 1-5 focus on actions related to defining a healthy industry and developing leadership. Recommendations 6-13 focus on more specific areas of action. Recommendation 1 is suggested as the primary place to begin as many of the other recommendations would benefit from the presence of a system-wide representative group.

Defining a healthy industry and developing leadership	
Recommendation 1 – Ongoing use of the 'system in the room' Building on the engagement carried out through this project and existing industry initiatives, the formation of a system-wide representative group (hereafter called the System Group) is recommended. This group would be well placed to focus on continuous learning and directions, dissemination of information, and informed support for high-quality public and industry-led initiatives. The Future Inquiry Workshop participants that put up their hands for this initiative would be a logical initial group, with others added as needed. With this group in place, the experience of the system can readily be shared with government agencies and others tasked with creating solutions. This recommendation is linked to and will influence the progress of many of the following recommendations.	**Ownership**: As agreed by the Future Inquiry Workshop participants, this group should be industry led and government supported, with a revolving Chair style of governance. **Impact**: If adequately resourced and with clear terms of reference, the potential impact is high and could result in short- and long-term improvements. Benefits include evidence-based interventions based on system level issues and ideas, improved communication, and less siloed thinking.
Recommendation 2 – Establishing an intervention logic for 'good work' The system requires a clear line of evidence, logic, and action to reach defined outcomes and an overall vision. Put simply, what is the industry aiming for and how will it get there? As a basis for designing and implementing solutions across the supply chain, and building on existing effort, a work programme is needed to define what 'good work' is in a supply chain context. Consideration should be given to specific areas identified through this project such as: - Fair pay, payment structures, and remuneration - Safe work duration and shift patterns - Reduced exposure to harm and Occupational Health and Safety risks - Social dialogue and supply chain collaboration - Productive employment for everyone - Leadership by Persons Conducting a Business or Undertaking (PCBU), sectors, and government - Fair competition and decent work underpinned by clear regulation - How best practice is recognised and rewarded	**Ownership**: It is suggested that this work be facilitated through the System Group with a work programme initiated by relevant government agencies.

The 'Future' component of the FIW data is likely to provide a good starting point for this work.	
Recommendation 3 – Clarification of Government Roles Clarification of the roles and co-operation between government transport-related agencies (principally WorkSafe, Waka Kotahi, Ministry of Transport and Police/Commercial Vehicle Safety Team). There should be a focus on clearer communication with industry and co-operation around regulation, Occupational Health and Safety leadership, education, prosecution, and enforcement.	**Ownership**: The regulatory agencies and others involved in designing work and safety systems **Impact**: Short-term: clear action and leadership from the agencies. Longer-term: compliance with regulations, clear expectations of Occupational Health and Safety duties, and improved health and safety.
Recommendation 4 – PCBU and Sector Leadership Strong leadership at the sector level, and senior management/director level within PCBUs, was found to improve Occupational Health and Safety across the supply chain. Leadership at each of these levels should be incentivised, building on models such as ShopCare, the Log Transport Safety Council, and the PCBU examples shown through the case studies in this project. Strong leadership at these levels would encourage worker input into Occupational Health and Safety, supply chain engagement, clear and consistent communication, senior and board level support and visibility, active management of health, safety and well-being, trust building, and ownership of supply chain responsibilities including overlapping duties. The research highlights a strong need for manager and leadership training. Focal areas to consider may be Occupational Health and Safety related data and technology management, safety culture development, change and performance management with regards to Occupational Health and Safety, contemporary risk identification methods, supply chain engagement, and the importance of their role as leaders. Sector group and larger organisational leadership provides support for small businesses and contractors who may not have resources for specific Occupational Health and Safety capabilities. Best practice from the case studies showed leaders who: - Displayed strong collaboration with contractors	**Ownership**: Sector groups, PCBUs, managers and leaders in organisations, with support and guidance from the regulators. **Impact**: Improved safety standards, culture, and actions at organisational and sector levels, and across the supply chain.

- Shared safety resources - Included safety specifications in contracts - Aided contractors to meet the set standards and absorbed the cost where possible - Ensured consistent safety expectations for employees and contractors - Worked closely with contractors to ensure fair work allocation and adequate income without intending to compromise their commercial freedom	
Recommendation 5 – Improved methods for monitoring and mapping risk and harm Improved methods for monitoring risk and harm through the supply chain are needed. A fuller picture of how pressure and harm flow through the supply chain will aid in proactively preventing harm and holding appropriate actors to account when harm occurs. For this to be realised, contextual information about incidents, near misses, and routine activities need to be designed into data collection processes based on systems that have been demonstrated overseas. Socio-technical methods can then be used to map the context around harm and identify failures in system components including the people and processes within the system.	**Ownership**: Initiated by government agencies with planned industry engagement and eventual ownership. **Impact**: More effective harm reduction by addressing higher level contributing factors.
Specific areas of focus	
Recommendation 6 – Responsibility across the supply chain Further develop Health and Safety legislation and enforcement of it, with a specific focus on PCBU responsibility and regulatory enforcement throughout the supply chain, building on existing related initiatives and drawing on chain of responsibility frameworks present in other countries such as Australia. This research highlighted that organisations who endeavoured to adopt and prioritise chain of responsibility principles found themselves at a commercial disadvantage, highlighting a gap in the New Zealand system. Equally, efforts to campaign for improved supply chain regulations and a discontent over inadequate supply chain enforcement by participants suggest further investigation is required.	**Ownership**: Regulatory agencies. **Impact**: A greater focus on the upstream causes of harm in line with contemporary health and safety theory.

Recommendation 7 – Safety first in public procurement Review of public procurement of freight services and guidelines for procurement that places Occupational Health and Safety at the forefront of service agreements procured by government. With a priority on social dialogue, explore how good practices can be adopted by the wider industry. This may lead to guidelines on the benefits of safe procurement, education on what is value for money – that it is not always about cost – and the positive outcomes of procuring safely throughout the supply chain.	**Ownership**: Government agencies with input from the System Group. **Impact**: The data highlighted the impact public procurement could have on raising Occupational Health and Safety standards. A review is relatively low impact but action from this review could result in consistent improvement over time.
Recommendation 8 – Vehicle safety technology management Develop guidelines for proactive use of vehicle safety technologies, focusing on education and coaching, worker engagement, and communication throughout implementation and on-going usage. With the rapid advancements in technology and the popularity among business owners and others to utilise it, it is important that supportive policies and management practices are in place to optimise vehicle safety technology and reduce the mistrust and stress caused to drivers and workers caused by poor use.	**Ownership**: Industry and organisations. **Impact**: Supportive policies and management practices can reduce mistrust and stress caused to drivers and workers. Practices such as positive feedback, coaching, and appropriate reward structures can ensure greater benefits result from technological advancements.
Recommendation 9 - Standardised and digitalised driver inductions Standardisation and digitalisation of driver inductions to sites in New Zealand. This would help to reduce misinformation to parties not always visible throughout the supply chain. As the information on what thorough induction looks like is collected, consideration should be given to the design of sites including loading areas and driver safe zones, traffic management plans, adequate access to and allowed use of toilet facilities and rest areas, among other required elements.	**Ownership**: Industry and organisations, as suggested by the Future Inquiry Workshop participants. **Impact**: The biggest impact could be seen if all members of the supply chain receive consistent Occupational Health and Safety information. Additionally, site improvement could, in the short- and long- term, reduce harm so long as the resources and the will are there. Standardised, digital

	inductions are likely to take time.
Recommendation 10 – Data Sharing and use Establish 'ways of working' between government and data providers to leverage wider benefit from data that could contribute to understanding and addressing vehicle-related workplace harm. Start with a stocktake of relevant data, agreements for data sharing and use. There is a desire from data providers to begin this process and work collaboratively with government. From the government perspective, overall value, principles, and ways of collaborating with industry would need to be determined initially.	**Ownership**: Government agencies and sector/industry groups, with support from organisational level leaders. **Impact:** This is a long-term goal for the system as there are constraints to overcome, however the benefits include accurate intelligence for intervention, planning, and innovation.
Recommendation 11 – A system view of fatigue Building on the large existing body of work on fatigue and fatigue management, establish a programme of work to map the system determinants of fatigue to better understand the structural arrangements that are driving fatigue. Fatigue is a tangible exemplar of how underlying factors interconnect to result in harm to workers, and therefore could be used as a digestible starting point to approach other issues taking a system view such as pay, payment structures, long working hours, and infrastructure quality. In a collaborative effort with industry and government, the work time rule should be reviewed as a specific area of concern within the wider system that is driving fatigue.	**Ownership**: In consultation with the System Group. Government supported and funded. **Impact**: A high impact if fatigue interventions consider contextual determinants such as working hours, shift structures, and pay. The mapping could begin immediately, building on the conceptual examples from this research.
Recommendation 12 – Overcoming operational barriers to low pay The literature highlights the link between low pay and poor Occupational Health and Safety outcomes, yet there remains disagreement throughout the system as confirmed in this project. Working through stakeholders' concerns and constraints is therefore a necessary place to start. Further work and research are required to understand the concerns, constraints, and operational barriers that system stakeholders face in considering driver pay. With the system in the room, methods laid out in this project could be utilised, but this time with a specific focus on pay and overcoming operational barriers for all those involved.	**Ownership**: Either government agencies or the System Group working with trade unions and industry if supported to do so. **Impact**: Overcoming system fractions is necessary to see progress. Collaborative work done by the System Group may produce progress not seen before if

	traditional constraints can be overcome.
Recommendation 13 – Review of the raw data A significant amount of 'gold was left in the river' through the sheer volume of information collected through this project. A scan of the raw data for specific nuggets that could be considered for action is suggested. Appendix five includes a list of all solutions mentioned throughout the entire project, in varying levels of detail.	**Ownership**: WorkSafe as owners of the data and then collaborative efforts with the System Group.
	Impact: Potentially unexpected benefits from good ideas that might gain sudden traction.

How these recommendations address vehicle-related harm from supply chain pressures

System-wide improvement demands that people at all system-levels address constraints and explore possibilities together, otherwise we revert to targeting the symptoms rather than the causes. Changes across the system must therefore start with collaboration, leadership, and the definition of a vision of good work. To make informed decisions on interventions we must have data across all system levels. Those in positions of economic and hierarchical power must take responsibility for their role and look for leadership throughout the supply chain, including the regulator and regulatory system. We must also look closely at the most vulnerable, invisible, and those verging on viability with the aim of improving productive employment, fair competition, and decent work for all. They are the ones most likely to experience harm from an ill-functioning system.

This was an ambitious project, as system-based work tends to be. Asking the stakeholders to take a system view is difficult as many are, for a variety of reasons, focused on their immediate environment. Taking a systemic view of solutions still seems new to many and hence some backfill work may be needed to work through how harm emerges in a vehicle and supply chain context. This project provides a step in that direction, testing the readiness of the system and gauging their willingness to move towards systems-thinking. And although the projected outcomes from the recommendations will go some way in addressing risks across the supply chain, the value of this project is in the foundation for future collaborative efforts requiring system-wide attention.

CONTENTS

MAPS, TABLES AND FIGURES

KEY TERMS

System terms

A System	Based on Rasmussen's Risk Management Framework (Rasmussen, 1997), in our context a system is comprised of various levels (e.g. government, regulators, management, staff, and others) each of which are co-responsible for production and safety. Actions at all levels of the system interact to shape its performance, it is not possible to decompose the system.
Systems thinking	Safety and incidents are emergent properties arising from non-linear interactions between multiple components across complex socio-technical systems (Salmon & Lenné 2015).
Contextual factors	Forces external to the individual, but which act on the system and set the context for harm (Tappin, Bentley, & Vitalis, 2008).
Individual factors	Factors that contribute to a harm event found at a proximal level to the individual worker.
Worker	All individuals engaged in work including among others, managers, drivers, and machine operators.

Health and safety terms

Harm	Injury to physical and/or mental health; to damage or injure.
Hazard	Something that may cause harm, the potential for harm or an adverse effect.
Occupational health	The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs (ILO / WHO 1950) and is not merely the absence of disease or infirmity (WHO).
Occupational safety	(With a transport focus) the degree of protection from physical risk to life or property present during carrier movements of freight and passengers (Mejza, Barnard, Corsi & Keanne, 2003, p.16).

Risk	The chance, however large or small, that a hazard could cause harm (Health and Safety Executive, 2019).
Safety culture	Described in this project as identifying values and attitudes that interact with organisational structures that then form understandings of risk and safety influence the working environment (Grytnes et al., 2016).
Safety climate	Described in this project as "workers' shared perception of their organisation's policies, procedures, and practices as they relate to the value and importance of safety within the organisation" (Huang, et al., 2013, p.5).

Vehicle-related terms

Heavy vehicle	Defined by the New Zealand Transport Agency, a heavy vehicle has a gross vehicle mass (GVM) of more than 3500 kilograms. There are two classes of heavy vehicle, medium goods vehicle, and heavy goods vehicle.
Light vehicle	Defined by the New Zealand Transport Agency, a light vehicle has a gross mass not exceeding 3.5 tonnes.
Vehicles as a workplace	Any vehicle being used for work, on the road or at a workplace.
Those who drive for work	Anyone travelling on the road for work as a core or secondary component of their job.
Truck driver	Driver requiring a specially endorsed class of licence, to transport bulky goods. Registration or licensing is required (ANZSCO: 1222.0).
Owner driver	Someone that operates up to a maximum of three vehicles to transport goods (not passengers). The owner of the business must also drive one of the vehicles. This applies to contractors, not employees (This definition is from the Owner Drivers and Forestry Contractors Act 2005, from Victoria, Australia).

The definitions of the terms above have been chosen by the researchers for the purposes of this project while acknowledging that many variations exist. Some terms remain in the original authors' voice or as in the reviewed document and therefore some may be used interchangeably. As noted by Mathern (2019), **industry** and **sector** are often used interchangeably, however in alignment with her findings, and using the ANZSIC classification system, Transport, Postal, and Warehousing is classified as an industry, as is Manufacturing.

1. INTRODUCTION

Workplace vehicle-related harm is a growing area of focus in New Zealand. Given the wide ranging and complex arrangements of vehicle use within supply chains, a 'system' approach is needed to determine solutions that are most likely to address the context that drives harm, and hence have the greatest chance of being effective. This project was designed to meet the request for an evidentially based investigation of approaches to minimise risks across the supply chain, with attention given specifically to Transport, Postal, Warehousing and Manufacturing (TPW&M) within the New Zealand context. The research builds on existing and new programmes of work by industry and New Zealand government agencies and uses a highly participatory approach to identifying system level solutions. This report concludes with 13 system focused recommendations to reduce vehicle-related harm across supply chains.

1.1. Research aim

To provide WorkSafe with a clear, evidentially based, and participatory investigation of approaches to minimise the vehicle-related risks that emanate from business models, contracts and contracting, and supply chain pressures.

1.2. Project phases

This project was completed over 11 months between April 2020 and March 2021 and entailed four phases as shown in Figure 3 below.

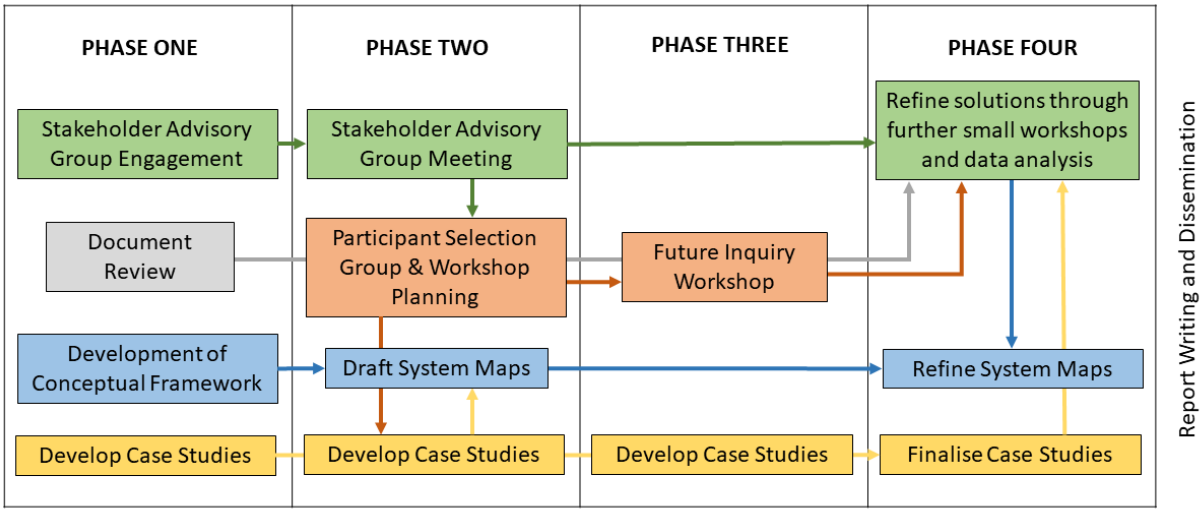


Figure 3: Research phases and the included activities

Phase One entailed the review of both local and internationally online published documents to gather information on approaches and interventions currently happening. A Stakeholder Advisory Group (SAG) was also established during this phase for preliminary engagement. Concurrently, conceptual frameworks for the project were chosen and modified, and initial ideas for case studies drafted.

A SAG meeting was held during *Phase Two* with the purpose of informing the stakeholders about the project, gauging their current understanding of supply chain, business model, and contracting pressures, and securing buy-in for the Future Inquiry Workshop (FIW) that was to be held in Phase Three. From the group of 40 at the SAG meeting, a FIW participant selection group of nine members was formed. This group represented a range of people from across the system, with various backgrounds. They were tasked with defining the system and creating the FIW participant list among other vital tasks. During Phase Two, the case studies were developed further based on examples put forward by the SAG members and the research team.

Under *Phase Three*, the FIW, held in late October 2020, saw the gathering of 67 participants who had a relationship to TPW&M in New Zealand, what will be referred to as 'the system'. The aim of the workshop was to gather the 'whole system in the room' and facilitate discussion on the past, present and future. The focus was on approaches to harm reduction in and around vehicles focusing on supply chain, business model and contracting pressures. Through the FIW process the participants were able to establish common ground, identify and take ownership for do-able actions and present intervention approaches for change.

During *Phase Four*, the research team collated all data, resulting in seven key themes under which the findings sit. These preliminary findings were presented in two follow up workshops; one with WorkSafe and another with a selection of individuals representing each of the eight FIW stakeholder groups with the purpose of refinement and preliminary feedback. This feedback was incorporated, and the report finalised.

Above and Below: Stakeholder groups in discussion at the Future Inquiry Workshop

> **"What we've being doing up until now doesn't work and we can't nibble round the edges, so we've got to be bold enough to take a big step – so what's that big step?"**
>
> **Future Inquiry Workshop Participant**

2. BACKGROUND

2.1. The nature of the problem

2.1.1. Strategic context

Several domains of work came together resulting in the call for this research on supply chain pressures specifically looking at TPW&M.

Harm analyses conducted by WorkSafe showed that a large proportion of workplace fatalities were related to vehicles, but this harm was dispersed across a range of vehicle uses, albeit with some standout areas such as on-road trucking. More than 70 percent of work-related fatalities in New Zealand involve vehicles, with recent research by Lilley (2020) suggesting it could be higher. A high percentage such as this warrants a closer look at what is causing the harm and what the key risk factors are.

Second to Agriculture, the Transport, Postal, and Warehousing industry is where vehicle-related fatal and non-fatal injuries are mostly likely to occur. Manufacturing was included because of the inseparable activities across the four, although when the focus is on vehicle risks, there is a tendency for harm statistics to focus relatively more on on-road and distribution operations. In Transport, Postal, and Warehousing in 2019 there were 147 vehicle-related injuries that required more than a week away from work, with 114 occurring in road transport. In Manufacturing, there were 54. Of the total vehicle-related fatal incidents, trucks and semi-trailers were most likely to be involved. On-road figures show that in 2019 there were 57 fatal crashes involving trucks, 170 serious injuries and 521 minor injuries. Of the 57 fatal crashes involving trucks, among a range of other vehicle and environmental factors, 30 involved contributing factors related to the truck driver[7].

There is consensus in more contemporary areas of Occupational Health and Safety (OHS) literature that harm is not the result of individual, aberrant behaviour but is rather a symptom of an ill-functioning system and the interplay between systemic factors. Factors such as economic and time pressure, working arrangements and business models, high competition, and payment structures have been identified as key underlying systemic factors that are contributing to harm across many industries including transport (Tedestedt George, 2018), and

[7] Analysis of crash data 2019 in the Waka Kotahi Crash Analysis System.

are likely to be present in closely related industries such as postal, warehousing, and manufacturing.

There is a solid body of research across various industries which identifies risks and further work linking them to supply chain pressures. What is lacking are nuanced and New Zealand-specific suggestions on what to do about them. For this reason, WorkSafe commissioned this project with a primary focus on solutions in the hope to move away from regulating errors and instead focus on what is creating the risk in the first place.

2.1.2. The supply chain

The supply chain was deemed an appropriate lens for this project in which to examine the interplay between contextual factors affecting vehicle-related harm and identify points where interventions could address harm-causing factors further upstream than is typically the focus.

Supply chains describe the series of relationships involved in procurement and delivery of goods and services. The supply chain may involve a simple relationship between two parties, though more commonly they are long and complex relationships between numerous types of organisations that partake in the process of production through to end users. Up until the early 2000s there was little evidence connecting supply chain pressures, business practices, and OHS (IOSH, 2009). In the evidence that has resulted since, researchers have explored both the positive and negative influences of supply chain pressures on OHS arrangements (Walters, Bhattacharya, & Xue, 2011).

By way of positive influence, the potential exists for parties with positional power in the chain to enhance and raise the OHS standards within supplier organisations (Walters, et al., 2011; Lingard, Oswald, & Tiendung, 2019). The scope exists for such parties to use market power at their disposal, by for example, setting requirements on how activities are undertaken, and then monitoring and enforcing their compliance (Walters & James, 2011). On the negative side authors have demonstrated that against the backdrop of market pressures and an increasing trend towards decentralised work practices such as outsourcing, it cannot be assumed that organisations are motivated or supported to prioritise OHS. Barriers include, among other things, conflicting organisational priorities such as those pertaining to time efficiency and production pressures, and a lack of readiness within the organisational culture and work routines to receive such changes (Frick & Wren, 2000).

Only in a relatively narrowly defined set of circumstances are market-based business initiatives alone enough to combat these pressures and encourage organisations to do the right thing. For such potential to be realised, OHS arrangements cannot impede the effective supply of the goods or services they are contracted to deliver, and external pressures must be present in the form of relevant legislative and regulatory provisions (Walters & James, 2011).

There are commercially practical motivations for using contractors and outsourcing parts of the supply chain to smaller businesses and/or those who are self-employed, and it does not necessarily always result in poor OHS outcomes. There are, however, compelling reasons why the "de-integration of production and service delivery are likely to be adverse" (James et al., 2007, p.167). There is evidence to show that injury rates vary negatively with the size of the workplace (Eurostat, 2002; Walters, et al., 2018) and the type of employment (Quinlan, 2013). A shift of work to smaller organisations would seem likely to be associated with a rise in their exposure to risk (James, et al., 2007).

There are several reasons for this, firstly smaller organisations may have less resources to dedicate to adequate systems of risk management. Low operating margins which can result from commercial contracts, add to the difficulty in resource distribution. Some contractors, caught in the complexity of the supply chain, can become invisible and physically isolated from those tasked with monitoring their conditions. The isolation both physically and by nature of their contract, can reduce their exposure to OHS messaging, training, information, and their ability to collectivise or seek support from a trade union (Underhill & Quinlan, 2011; Quinlan & Bohle, 2009; Tedestedt George, 2018). The results of such can lead to work intensification, long and irregular hours, exposure to dangerous work and invisible work (Johnstone, 2016). Further, Underhill, Lippel and Quinlan (2011) highlight that groups of workers engaged in precarious work such as contracting can be exposed to psychological distress, work-life imbalance, and often greater exposure to occupational violence.

2.1.3. Contextual factors causing the harm

Previous research has identified a great number of interconnecting factors that impact the OHS experience of workers, across many industries and particularly in transport (see the work of Mackie & Moore, 2008, Mayhew & Quinlan, 2006, Tedestedt George, 2018, Rawling & Kaine, 2012, Edwards, Davey & Armstrong, 2014, Thornthwaite & O'Neill, 2016/17 among others). Although research relevant to this project has focused predominantly on transport, contextual factors that have emerged help paint a picture of the system in which the other industries also

sit. Although impossible to list all, a summary of the principle contextual factors is featured in Figure 4 below. At the centre of this figure are the supply chain, business models, and contracting strategies that are impacted by the surrounding contextual factors.

The contextual factors in Figure 4 were collected from throughout the academic literature but it must be noted that many of the studies had *poor* OHS as the focus and consequently are a representation of the worst case. They are, however, relevant to this project given the focus on harm and how to solve it.

Figure 4: Contextual factors impacting the supply chain, business models, and contracting strategies.

The contextual factors interconnect to manifest in potentially harm-causing symptoms (Hensher & Battellino, 1990), as confirmed by Mathern (2019) in a review of risk factors in the road freight transport industry in New Zealand. Mathern summarised that remuneration,

employment status, management commitment, upstream decisions, and goal conflict lead to symptoms such as speeding, fatigue, stress, aggressive driving, and others.

Many of the contextual factors included in this report are those collected over decades of investigation; however, the system is dynamic and requires constant review. For example, it would be an oversight to not mention the impact of the COVID-19 pandemic on the supply chain as reports emerge of increased pressures, increased online orders, and surely a mental health toll also.

The figure below (Figure 5) displays an array of symptoms from the interconnection of contextual factors, likely to impact on those working in and around vehicles.

Figure 5: A summary of potential symptoms resulting from contextual factors.

It is relevant to consider the symptoms of the contextual factors because it helps to explain the high levels of vehicle-related harm shown in the statistics. Additionally, and in line with a systems approach, it also ensures that the focus for intervention is on the entire system, rather than any one party. As summarised by Mathern (2019), practices within the industry undermine

any individual interventions because of competing pressures from risk factors upstream. This is further compounded when businesses repeatedly fail to take a holistic approach to intervention implementation strategies aimed at reducing the risk of harm in and around vehicles.

2.1.4. Vehicle-related harm

Vehicle-related workplace harm is recognised as being a considerable problem both locally and globally and incidents occur both on-road and off. Road traffic fatalities are reported by the World Health Organization (WHO) as being the eighth leading cause of death (World Health Organization, 2018); in industrial countries, vehicle-related incidents account for up to 40 percent of work-related accidents (Nævestad et al., 2018).

The data available is heavily skewed towards heavy vehicles and on-road harm. In New Zealand in 2019 there were 57 fatal crashes involving trucks, 170 serious injuries and 521 minor injuries. Of the 57 fatal crashes involving trucks, among a range of other vehicle and environmental factors, 30 involved contributing factors related to the truck driver[8]. In these incidents, 67 people died, 208 were seriously injured and 693 suffered minor injuries on the road in New Zealand (Ministry of Transport, 2020).

In New Zealand, driving for work was associated with nearly a quarter (23 percent) of on-road fatalities (not including commuting) (Lilley, 2019). The highest rate of work-traffic fatalities was among the 'Transport, Postal & Warehousing' industry (Lilley et al., 2020). There are a range of risks and hazards that exist in TPW&M.

Of relevance to this project are the activities that sit across TPW&M and where possible holding focus on the interface between them rather than singling out any one in particular. Despite this, much attention is given to heavy vehicles and the related industries in the information available for review including available statistics and data. However, many of the systemic issues are likely to have applicability across a range of risks associated with working in and around vehicles, across multiple industries, sectors, and vehicle types.

Safety factors

Work at delivery and collection sites can involve some of the most dangerous activities for workers operating in and around vehicles (Health and Safety Authority, 2020). Sites can be run at a busy pace, be efficiency rather than safety-focused under pressure, and in worst case scenarios have poorly maintained or inadequate infrastructure that can cause harm to workers.

[8] Analysis of crash data 2019 in the Waka Kotahi Crash Analysis System.

The interaction between onsite workers and those coming and going, such as drivers, can be challenging to manage and requires clear management to ensure consistency of OHS messaging, rules, inductions, and other relevant information. Poor communication between the groups of workers on site can lead to anything from minor to very serious incidents.

Consequently, WorkSafe (2020) and the Health and Safety Authority (2020) suggest that such workers are harmed by being trapped between a vehicle and a structure, vehicle collisions, being hit by a vehicle or falling from a vehicle, being injured by vehicles overturning, and during vehicle maintenance.

Heavy vehicle drivers receive a great deal of attention in the academic literature providing detailed insight into the hazards faced specifically by this group of workers. One example is the study by Thornthwaite and O'Neill (2017) who found in their survey of 559 heavy vehicle truck drivers in Australia that more than half (52 percent) had fallen or slipped out of the truck with one in five doing so in the last 12 months. Just less than half (45 percent) had fallen from the cab, trailer or loading dock. Drivers had driven into a stationary object (42 percent), a moving vehicle (27 percent), had been hit by falling objects (32 percent) or a moving vehicle (15 percent). One in ten drivers had reported involvement in a major crash, however they noted that this may be under reported. Many cited near misses (which are also likely underreported).

Common injuries sustained by truck drivers, according to the Occupational Safety and Health Administration (United States Department of Labor, 2020) include strains and sprains, fractures, cuts and lacerations, manual handling injuries, and soreness and pain.

Vehicle maintenance carried out by those working around, on top or under vehicles can also lead to harm, especially if equipment is used unsafely or is poorly maintained (Health and Safety Executive, 2019). Vehicles falling or rolling off incorrectly positioned stands or jacks are one of the main causes of fatal incidents in motor vehicle repair work in the United Kingdom. Improper equipment use, a lack of safe working procedures, and incorrect installation of equipment have been cited as causes (Health and Safety Executive, 2019).

The recent release of figures from WorkSafe (2020a) and Colmar Brunton (2019) show that two thirds (76 percent) of workers in TPW&M in New Zealand say they are exposed to physical hazards at work, including loud noise, extreme temperatures, and vibration from sitting in vehicles and using tools that vibrate. Among the organisational hazards, the most prevalent are working night shifts and working outdoors for most of the day or week.

Physical health factors

Again, heavy vehicle drivers are heavily represented in the literature when looking at the physical health impact of working in and around vehicles. Health issues such as those related to fatigue, although most commonly associated with the work activities of truck drivers (Williamson & Friswell, 2013), can be linked to others working in and around vehicles, especially if they too are working long hours, undertaking shift or night work. Similarly, workers in and around vehicles are likely to be exposed to diesel exhaust (WorkSafe, 2020a) from large work vehicles and potentially at warehousing and manufacturing sites, where the exposure may be higher in confined spaces. Machine and vehicle operators alike can further be impacted by exposure to high levels of whole-body vibration (Schneider & Irastorza, 2011; Copsey, 2011; Thornthwaite & O'Neill, 2017).

Truck drivers in particular are at high risk of poor health resulting from occupational conditions. In one study, Clemes, et al., (2020) reviewed and summarised the literature on cardiometabolic risk factors, lifestyle health behaviours and mental health status of truck drivers globally to determine the scale of these health concerns. They found strong evidence that truck drivers generally exhibit poor health risk profiles including being overweight and having hypertension, hypercholesterolaemia, high blood glucose, and poor mental health. Other studies have shown truck drivers to suffer from intestinal problems, arthritis, lung disease, diabetes, effects of prescribed and non-prescribed medication, sleep disorders, and work-related stress (Thornthwaite & O'Neill, 2017; Tedestedt George, 2018; Boyce, 2016).

As above with poor safety outcomes, factors that have been linked to poor health include shift work and long working hours, stress, poor schedule planning, night work, poorly maintained equipment, and lifestyle factors such as alcohol and smoking (Hege, Lemke, Apostolopoulos & Sönmez, 2019; Lemke et al., 2017).

Mental health factors

Recently published statistics on psychological harm in New Zealand TPW showed that nearly 60 percent of workers reported that work-related stress had been damaging to their mental wellbeing and just over 30 percent reported experiencing work-related depression or anxiety. The research by Colmar Brunton for WorkSafe New Zealand stated that mental health is of concern among this group of workers but there is a significant gap in perception between workers and employers about the extent of the problem (WorkSafe, 2020a).

Lone work, prolonged work-time pressure, and long stretches away from family and friends are a few of the cited reasons for growing mental health problems among commercial drivers, including truck drivers (Shattell, et al., 2010; Tedestedt George, 2018; Belzer, 2018. Hege et al., (2019) raised concern about depression levels, supported by da Silva-Júnior et al., (2009) who showed the link between prolonged occupational stress and depression among truck drivers. Additionally, being the first to scene in fatal road incidents often leads to a decrease in truck drivers' perceived mental health (Tedestedt George, 2018). Tedestedt George also reported that drivers who were required to operate machinery without adequate training showed signs of anxiety in the lead up to and during a driving shift.

2.1.5. Efforts to reduce vehicle-related harm

Individual-focused interventions remain popular in harm reduction for many reasons but mostly because they are simpler to implement and measure, and because it is easier to understand how harm arises from immediate actions. It does however, mean that important aspects of the wider system remain unchallenged.

There is common misconception in road safety circles that a systems approach is being adopted through contemporary road strategies such as Vision Zero, the Australia and New Zealand Safe Systems Approach, or the UN Decade for Road Safety (Larsson, Dekker & Tingvall, 2010). Elements of systems thinking are present in these strategies but, as Salmon and Lenné write, "they are not underpinned by systems thinking nor do they adopt systems thinking models and methods during implementation activities" (2015, p.244). They go on to say that some of the key principles, such as the acknowledgement of human fallibility and the idea that external actors are responsible for safety are present in the strategies. However, some contradictions exist also. For example, behavioural failures are still described as 'errors'; a term which leads to an inherent focus on individuals. The Safe System approach falls short because while components of the system (e.g. safe roads, vehicles) are clearly segments of the road safety system, there is little consideration of the interplay between wider system design and the outcomes that play out within the four pillars of the Safe System. It must be noted that the latest Road Safety Strategy in New Zealand – Road to Zero, while not focusing entirely on system thinking, does introduce 'Safety Management' which hints at influences of organisational arrangements and their impact on safety.

Contemporary human factors and health and safety literature holds that workplace harm is normally the result of multiple system failures or deviations from expected practice, rather than

simply the result of an individual's actions alone. Workers are exposed to risk and hazards from multiple levels and a range of factors – some a direct result of the work environment and some indirect. Workers also have their own predispositions; together exposure and predisposition are likely to increase harm. Although the relationship between factors is complicated, primary focus on individual error alone is not helpful.

3. METHOD

3.1. Overall approach

This project employed a mixed-method approach, grounded in Human Factors Systems theory and participatory design. The systems approach in this project, routinely used across various fields (most notably in New Zealand in the investigation into the Pike River tragedy (Royal Commission on the Pike River Coal Mine Tragedy, 2012)), seeks to identify contributing factors causing pressures that can ultimately contribute to harm in the workplace. Consideration is therefore given to all elements of the work system relevant to the unit of focus, recognising the interaction between the elements, acknowledging that these interactions do not occur in isolation (Tappin, Bentley & Vitalis, 2008).

Rasmussen's Socio-Technical Complex Systems risk management framework (Figure 6) was chosen to guide this project. This framework is made up of a hierarchy of levels, and although not rigidly set, the layers typically comprise of government; regulators; company; company management; staff; and work (Salmon et al., 2010). The premise of the approach is that individuals either trigger or divert incidents in their workflow depending on the contextual mechanisms at various levels and the safety emergent behaviour arises from interactions between the actors and other system artefacts at each of those levels. According to Rasmussen, creating a system that functions safely requires that decisions made among the top levels are reflected in the activities and actions of those at the lower levels and vice versa. Without this vertical integration systems can lose control of the processes formed to ensure safe outcomes.

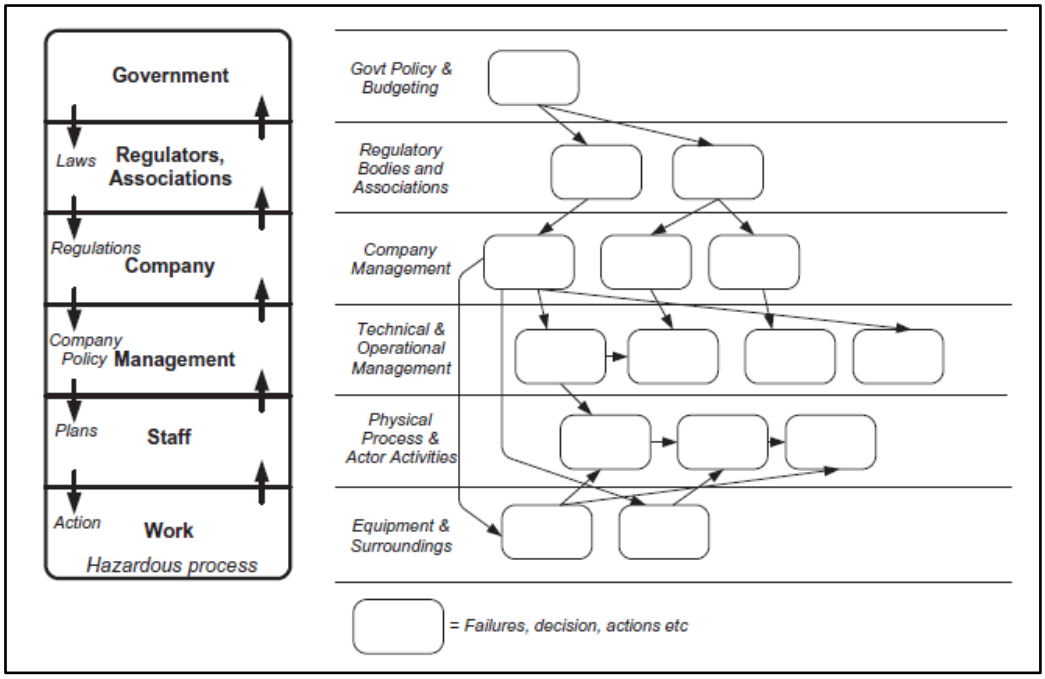


Figure 6: Rasmussen's risk management framework and Accimap method as cited in Salmon et al., (2012).

The framework was used in various ways throughout the project. For example, in Phase One, the intervention approaches in the document review have been categorised using Rasmussen's framework and members of the Stakeholder Advisory Group (SAG) were chosen to represent the different levels of the system. The sampling for the Future Inquiry Workshop (FIW) employed a similar strategy. AcciMaps, an injury analysis method based on Rasmussen's framework (McLean et al., 2020) and seen to the righthand side in the figure above (Figure 6) has been used to graphically display the contextual factors relevant to incidents and interventions. Note that these maps included in this report have been created based on the information gathered in this research. In depth analyses using AcciMaps would normally involve detailed data about incidents. The point here is to show conceptually how the issues and solutions raised fit within a socio-technical system.

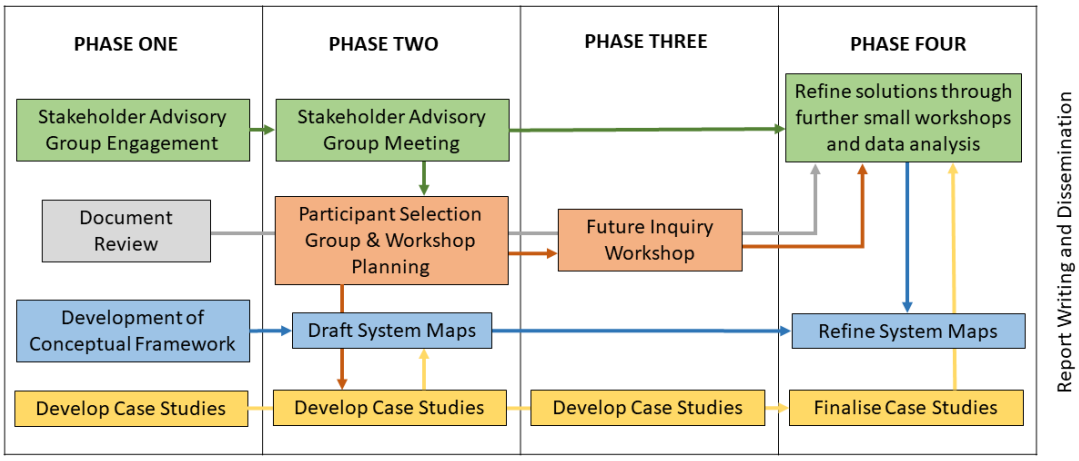
For our application an 'Industry and Supply Chain' level has been added. Consideration was given to a 'Global' Level to show the impact of global pressures and international markets. However, this was not used by the researchers consistently given the New Zealand contextual information in focus, although this does not mean such factors are irrelevant. A level titled 'Society' could have also been added in a series of maps to show wider consumer and road-using public influence and impact. Likewise, a level titled 'family and community' was also discussed. The researchers had difficulty placing this group in the hierarchy, and the impact and

influence of such groups did not tidily fit the brief of this project so was not included, however these groups warrant consideration in further work.

Consideration was given to socio-ecological approaches such as the Ecological Industrial Systems model (Tedestedt George, 2018) in this project so as not to lose sight of the human experience when the whole system is in view. Elements of socio-ecological approaches were relevant, for example, in the case study interviews and the FIW during which individual responses could be recorded.

3.2. Project phases and activities

The figure below is featured once more as a reminder of the project phases and the activities within each. What follows is an outline of what was undertaken during each of the activities.



3.3. Description and method for the project activities

3.3.1. Stakeholder advisory group meeting

Stakeholders from across the industry were invited to an online meeting on the 4th of August 2020 with the purpose of receiving project information and to generate support for the upcoming FIW. During the meeting, participants were divided into breakout room sessions to discuss contextual, upstream factors that had led to an incident. These data were collected and used to populate early system maps.

The 40 participants were reached through collaboration with industry groups and WorkSafe, and snowball sampling was then used to reach others. Participants were selected who had the time, resources, and availability to participate in the group, leverage within the industry, and

who had sufficient industry knowledge to advise on activities already in action and assist with the FIW.

3.3.2. Document review

Published documents were systematically scanned to gather approaches aimed to minimise the vehicle-related risks that emanate from across the supply chain. The terms used in the search included key elements of the project's aim, which can be found in Appendix One.

A range of documents were considered, including but not limited to industry best-practice guidelines, websites from international organisations and accompanying reports, union reports, regulatory and government level documents, with the addition of academic literature where appropriate. Documents were considered for inclusion if they were in English (a select few in Swedish, as one of the authors understands Swedish). Parameters were set to focus on documents that discussed interventions wider than the individual and had a transport, postal, warehousing or manufacturing focus.

Only documents published online were reviewed. This is an obvious limitation as the authors suspected that other initiatives may be occurring throughout the industry that were unpublished. To address this and noting the importance of industry buy-in, the authors sought information from the SAG, the Participant Selection Group, FIW participants, and the research team's contacts. Proactive organisations, groups, and individuals presented themselves through this process. The level of detail that resulted required more of a story to be told and nuances explained. For this reason, the information has been written up as case studies.

3.3.3. Case Studies

Each of the five case studies in this report detail how an individual, organisation or group worked to manage risks across the supply chain. The participants were sourced through various means including those listed above in 3.3.1. The aspect of activity in focus for each case study was derived through a combination of scanning publicly available information and a subsequent interview(s) with a key person or people. Once written up, a draft version was sent back to the participants for content accuracy, and any clarifications were resolved.

The semi-structured interviews sought to provide insight into what measures they had taken to manage risks across the supply chain, what prompted the measures, what the barriers and facilitators had been, and the eventual outcomes. In most cases, the organisation or group in question had implemented a series of actions so the interview focused on a key area of activity.

No attempts were made to triangulate the case study data by interviewing workers or those at other levels of the system for example, the contracted carriers. The data collected from these case studies has instead been triangulated with the two other sets of data: The document review and the FIW findings in the final sections of this report.

3.3.4. Future Inquiry Workshop

This project was designed on the premise that existing knowledge and expertise exist within the system and that system participants are often best resourced to identify suitable interventions. Future Inquiry was chosen as an approach as it embodies the premise of this project design, whilst also ensuring clear and structured methods for fair participation, conflict management, and actionable outcomes.

Participant selection group

The Future Search method (Weisbord & Janoff, 2000), on which the Future Inquiry process is based (Blewett & Shaw, 2008), requires the formation of a small, carefully chosen group to be involved in the planning of the FIW particularly with participant selection.

The Participant Selection Group consisted of nine people. A call for volunteers to this group was made at the SAG meeting and participants were selected for their understanding of the industry, their contacts, and their influence. It was ensured the group represented a range of voices and attitudes from across the industry so that balanced system representation could be achieved.

Their main tasks were to define the system, and then to select, sponsor, and manage the FIW participants (Weisbord & Janoff, 2010). The whole system is defined by Weisbord and Janoff (2010) as a cross section of those with authority, resources, expertise, information and need.

Defining the system boundaries was the first step in deciding who to invite to the workshop. The selection group begun by brainstorming a list of organisations, job roles, groups, associations, and people who:

1. Have influence over how vehicle-related risks from supply chain pressures are managed; and
2. Are influenced by vehicle-related risks from supply chain pressures.

The group then reviewed the brainstorm which consisted of over 150 items in the initial stage and started grouping like with like to form categories within the system. They then identified

any groups they believed were missing until everyone was content that the system boundaries had been defined. The 8 stakeholder groups were as follows:

1) Drivers and their advocates
2) Regulators and government authorities
3) Business leaders and advocacy groups of non-transport providers
4) Educators and health and safety champions
5) Business leaders and advocacy groups of road transport providers
6) Workers and their advocates
7) Community, people in the road environment, on-road support
8) Equipment and data providers

Within each of the groups there were six to 11 voices. No two voices in each group or in the list were the same, for example in the first group there was a courier driver, a heavy vehicle operator, a transport operator, and others.

The working process to define the System can be seen in Appendix Two. The group was then tasked with assigning an individual for each voice and planned who would make contact. Contingency plans were made with respect to COVID-19 restrictions which may have been enforced on the planned date of the workshop. With all appropriate and recommended precautions in place, participants were able to safety travel to and participate in the workshop as planned.

Careful thought was given to who was invited, including preparation of a backup list if the first choice was not available. An invite was drafted, confirmed by the group, and then sent out.

The Participant Selection Group met formally for two, three-hour sessions with much more time spent in discussion via the phone or email. The group worked tirelessly to contact members, follow up confirmations, and ensure that on the day, the system was represented in the room.

The workshop

On the 29th of October 2020 a one-day FIW[9] was held at Eden Park in Auckland to give the industry stakeholders an opportunity to work together to identify common ground and to generate solutions to managing risks across the supply chain. This workshop followed a carefully designed, well-established process as explained below.

[9] For detail on Future Inquiry see: Blewett, V., & Shaw, A. (2008). Future Inquiry: Participatory ergonomics at work. Paper for the *Nordic Ergonomics Society Conference*. Reykjavík, Iceland.

The day started with an examination of the past then moved through to the present, then on to the future. The participants were divided into 8 stakeholder groups (listed above) by the Participant Selection Group and participants worked both in these groups and in mixed groups during the workshop. This meant the participants had the opportunity to discuss ideas with their peers and at other times speak on behalf of their stakeholder groups to others. The entire group also came together at various times during the day so that all could hear the views being expressed (Blewett & Shaw, 2008).

To examine the past, participants were divided into their stakeholder groups and asked to identify what has worked well and what hasn't with respect to managing risks across the supply chain. They discussed what was worth keeping, changing, and discarding. They were asked: What have we achieved up to now and what are the gaps we need to address? The result of this exercise was a long list of commonly agreed issues from the past. To determine participants' current realities and the issues impacting them now, in their stakeholder groups they were asked to identify what worked and what did not. The ideas were collated on large pieces of paper and fastened to the wall, giving everyone the opportunity to review what was discussed.

Together as a whole group, participants were asked to reflect on the trends and themes influencing vehicle-related risks from supply chain pressures now – in the present. They then looked for themes or trends that were then drawn up in the form of a large mind map (Figure 7). Each participant was then given five sticky dots, the colour correlating to their stakeholder group, and encouraged to place a dot next to the issues they considered most important. As a filter for voting they were asked to consider which trends were:

- Urgent – it's critical to deal with this matter straight away
- Feasible – it's possible to do something about this
- Effective – if dealt with, this will make a difference.

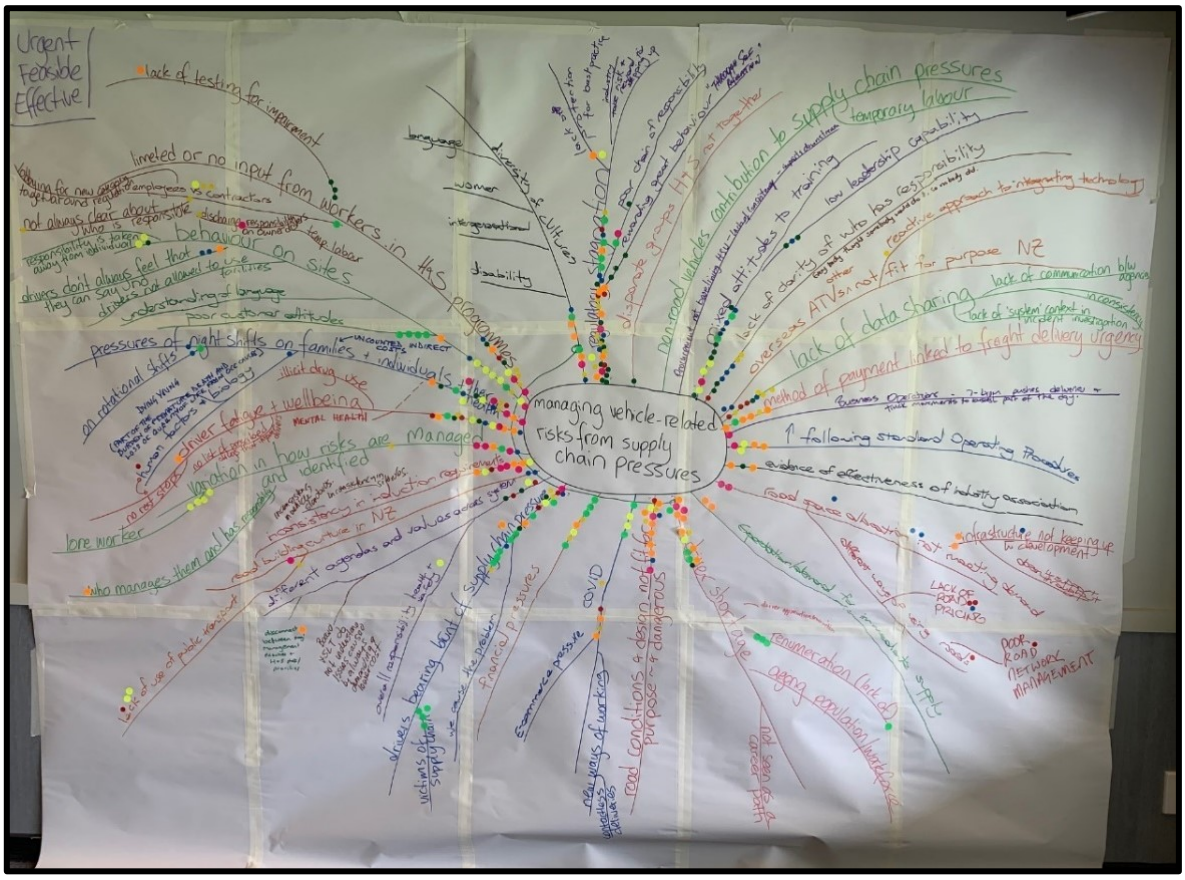


Figure 7: *The completed mind map created by the participants*

Once back in stakeholder groups, the participants examined the mind map and chose a few trends that were important to their group. They discussed what they are doing now in response to that trend and what they (not others) are not doing in response to that trend.

Having focused on what the historical issues were and what was currently impacting them, the participants were then asked to focus on the future. Participants projected themselves ten years into the future to treat October 2030 as the present. In this future projection, the 'present' i.e. 2030 was described to them as being a place where vehicle-related harm was a thing of the past, where supply chain pressures had been managed effectively, and where TPW&M were leaders in best practice. The groups drafted up the front page of a feature article for a combined celebration issue of NZ Trucking and NZ Truck and Driver to promote this achievement, describing the approach used to deal with future development. From there, by way of a reverse history, participants thought back from 2030 and considered what they remembered as key events, milestones, and how they overcame barriers to getting to the ideal future reality of 2030. The whole group identified common ideas from the articles and reverse

history. These were worded as broad action themes which then formed the basis for the strategy statements that would take the participants through to the final action planning for the day. Note, not all action themes were developed on the day – however, this does not mean they were not important – only that the group in the room did not give them priority on the day of the workshop.

The group then developed seven strategy statements to make the future happen by writing and agreeing on desired action, first do-able steps and who will be responsible for those steps. Each of these seven strategy statements received broad consensus from the participants on the day.

The records from the FIW were emailed out to the participants a few days after the workshop giving them the opportunity to clarify and confirm the contents. A copy of this data is included in Appendix Three.

Full group plenary session at the Future Inquiry Workshop

Participants working in mixed stakeholder groups at the Future Inquiry Workshop

3.3.5. The second workshops

Two follow up workshops were held during the last project phase – one between WorkSafe and the researchers, and the other with a group of eight stakeholders representing the FIW groups. The aim for each session was to present and refine the preliminary findings and develop them into tangible and specific interventions while still ensuring fidelity to the data. At this stage it was important not to discount any interventions, rather to comment on their feasibility, challenges to implementation, and how they might be operationalised. The matrix below (Figure 8) was used to focus discussions during these sessions and used again later to determine feasibility of the recommendations from this project.

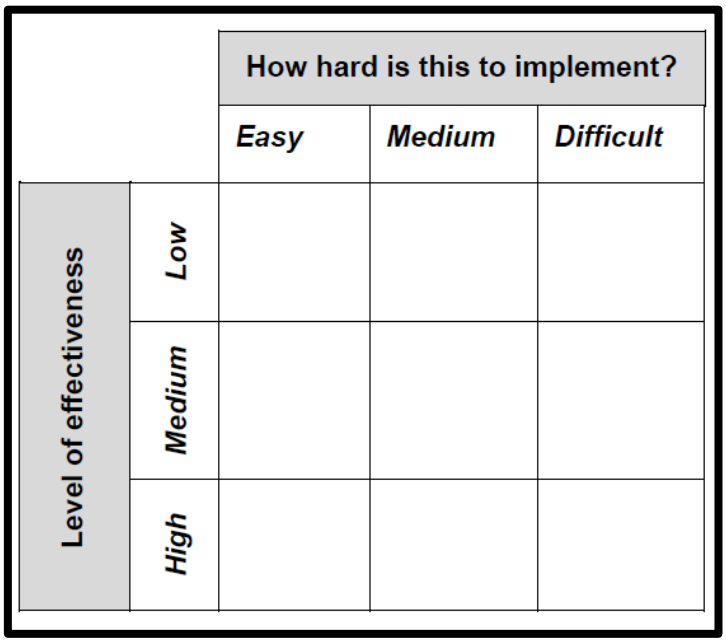


Figure 8: Matrix used to refine preliminary findings and recommendations

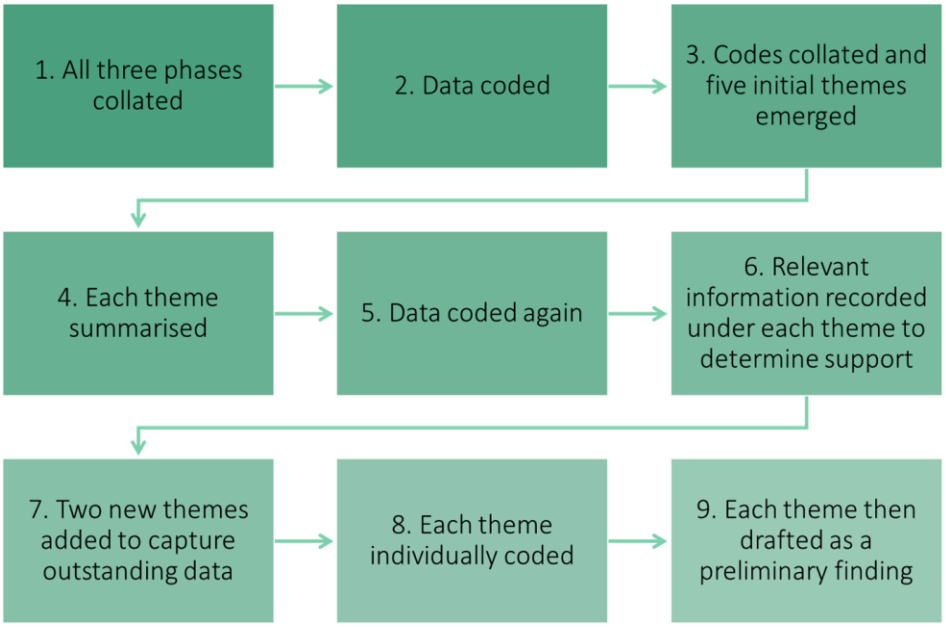
3.3.6. System maps

In alignment with the socio-technical systems framework used for this project, AcciMaps were used to graphically display data showing the causal interactions between system factors. The AcciMaps method is used to apply Rasmussen's framework to incidents by mapping the system element failures, decisions and actions that link together to explain the different levels of incident causation. Where appropriate, socio-ecological maps have also been included.

3.3.7. Data analysis methods

The result of this project's data collection efforts were three qualitative data sets: The document review, the FIW, and the case studies. Data from the SAG meeting and the two final

workshops were considered supportive data and used to refine the findings. The three main data sets were coded and analysed as outlined in the diagram below.



The data were first collated and then coded. The process entailed assigning a code to each section of the data - the code a key or summarising word to represent the section's content. The codes were then collated, and five initial themes emerged. Each of the five themes were summarised and all the data was coded once more, this time with key information recorded under each theme to determine support. At this stage, two new themes emerged to capture outstanding data. Then, each individual theme was interpreted, drafted as preliminary findings, and presented during the two follow-up workshops. The results of all activities are 13 Recommendations, presented at the end of this report.

Table 1 below is a summary of the project's activities showing the methods and outcomes for each.

Table 1: The project activities summarised

Activity	Description	Number of Participants	Sampling Method	Collection Method	Data Produced	Analysis Method	Key Outcomes
Stakeholder Advisory Group	Initial engagement with identified key stakeholders to inform about the project and gain support for the FIW.	39 excluding the WorkSafe and Mackie teams.	Primarily snowballing from industry group collaboration and working with existing contacts.	Online zoom meeting	Engagement and data to populate preliminary AcciMaps.	-	Engagement initiated with key individuals, some of whom went on to make up the participant selection group and attend the FIW.
Document Review	Review of online published documents pertaining to the project aim.	-	Documents sourced through methods outlined in Appendix One.	Semi-systematic review using search terms in various configurations.	A collection of academic articles, websites, industry documents, and media articles on areas of intervention approaches.	The documents were read, coded, summarised, and written up by one researcher supported by several other researchers who checked the search methods and the coding process.	Series of intervention areas from local and international, online published sources.
Case Studies	Five, two-page case studies which detail an individual, organisation, or a group working to manage risks across the supply chain.	Five case studies.	Participants sourced through project stakeholders, FIW participants, contacts of the research team, the WorkSafe Engagement team, or from the SAG.	Online zoom, semi-structured interviews.	Transcripts from recorded online interviews.	Each case study transcript was summarised and written up by predominantly one researcher, aided closely by another. The final two-page studies were thematically coded by one researcher, checked by others.	Five case studies from individuals, groups, and organisations within a New Zealand context.
Participant Selection Group	The Participant Selection Group were chosen as stakeholder representatives selected carefully to define	8 Stakeholders.	Participants volunteered or were asked specifically by the research team to	Data was not the primary action for this group. Two	-	-	The system was defined and used to develop the FIW participant list. The Selection group managed the

Activity	Description	Number of Participants	Sampling Method	Collection Method	Data Produced	Analysis Method	Key Outcomes
	the system and develop the FIW participant list, among other actions.		ensure broad system coverage.	three-hour online meetings were held.			participants to the point of attendance. This group further participated in the secondary workshops.
Future Inquiry Workshop (FIW)	A one-day workshop, based on the Future Search method, bringing the whole system together in the room to find common ground and take responsibility for future action.	67 participants from 8 stakeholder groups	The FIW participant list was created by the Participant Selection group, based on the defined system they created. Participants were approached by the selection team.	One-day, in person workshop. Data was collected using prescribed Future Search worksheets, written, and noted by the participants, typed by members of the research team.	A report containing all notes, including worksheets, charts, post-it notes, and diagrams produced by the participants on the day.	The report was thematically coded, with specific focus given to the final strategy statements which gained consensus from the whole group.	A data set outlining actionable plans.
Secondary Workshops	Two smaller, final workshops.	10 in the first, and 11 in the second workshop.	The first included the research team and the WorkSafe team, and the second a group of stakeholders roughly representing the FIW groups.	An online zoom presentation and meeting.	Transcripts from the recording.	Key points highlighted by one researcher and discussed with the wider team.	Refinement of the preliminary findings.

3.3.8. Ethical considerations

Ethical principles were considered in the design of the project and the development of the data collection methods. As all participants had autonomy over their involvement, the primary ethical issues that arose were privacy and confidentiality.

Privacy and confidentiality were addressed accordingly in each data collection activity. Given the secondary nature of data collection during the document review, this was not considered an issue. During the case studies, the interviewee(s) were offered confidentiality both personally and for their organisation or group. In such cases all identifying factors were removed from the data. To ensure material reflected interviewee(s) perspectives, drafts were regularly sent back to them for consideration. Some agreed to have their organisation or group mentioned but this was only done with their permission.

During the FIW, Chatham House rules applied. This meant that individual's views were not identified but anything that was written on the large sheets, on the worksheets, or said during the plenary sessions was considered public information. The plenary sessions were recorded using a hand-held camera by one of the workshop assistants, the participants were informed of this in the invitation email and again on the day. The recording was kept on a separate SD card and the recording shared only among the research team; it was not shared with the WorkSafe team or wider advisory group. The recording was for the purpose of research notes only and has subsequently been destroyed. In addition, all information discussed during smaller group sessions/activities, during break times, or between individuals was to remain confidential. Further, the participants were not required to answer all the questions or participate in any exercise/session if they felt they could not or did not wish to. Research team members participated in the FIW as stakeholders with unique experiences and viewpoints in the same way as other participants.

The researchers did their utmost to fulfil the following principles in all phases of data collection and reporting. Aroha ki te Tangata: to show respect for people. He kanohi kitea; value placed on meeting face-to-face. Kaua e takahia te mana o te Tangata; not to trample on the mana or dignity of a person. Kia mahaki; to show humility.

Above: Stakeholder Groups in discussion at the Future Inquiry Workshop

4. DOCUMENT REVIEW

This is a summary of the key intervention approaches and surrounding findings identified through a wider review process.

Consistent with previous research, the review of documents revealed that there is a growing awareness of how contextual factors, that is forces that are external to the individual, impact individuals working in and around vehicles. Despite this, there is still wide use and recommendation for interventions that predominantly target the individual and the immediate work environment.

Seven areas of intervention that aligned with the objectives of the project emerged (listed below). These intervention approaches are not all proven concepts but rather examples that may provide exemplars or inspiration for what could be done, if not already started, in New Zealand.

1. Safe Rates, Australia
2. Chain of Responsibility Law, Australia
3. Heavy Vehicle National Law, Australia
4. Accreditation and Recognition Schemes, and Procurement, International
5. Work time hours, International
6. Social provisions, Europe
7. Social dialogue, International

As the project progressed, additional literature and documentation was sought to, for example, support information included in the case studies or back up suggestions made in the workshops. A summary of the document review (section 4.9) has been included after the seven intervention approaches are detailed.

4.1. Safe Rates – Australia

System levels covered: Government, Regulatory, Industry, Organisation

What is it?
The Safe Rates campaign seeks to hold the customers at the top of the transport supply chain, who have market power to set the rates and conditions, accountable for safety along their entire transport supply chain.

Where does it originate:
Campaign issued by Transport Workers Union (TWU) Australia.

Key points:

- Certain groups argue that there is a safe rate for drivers.
- It has been argued that with an increase in rates, the level of safety also increases.
- Compensation is said to influence work hours which in turn influences safety outcomes (Belzer & Sedo, 2017).

Problem attempting to be solved:

- Drivers are working excessively long hours.
- There is a tension between piecework and speeding, drivers are encouraged to work long hours to provide short-term economic benefit/relief.
- Low pay encourages illegal and dangerous work.
- Piece rates coupled with enforceable work-time regulations limit the income of drivers (Belzer & Sedo, 2017).

Solution proposed:

- Discussion, review, and potential regulation of pay rates to ensure a safe rate for drivers.

4.1.1. Background

In an industry focused on reducing costs and increasing efficiency, workers' wages are often adjusted to meet the needs and demands of consumers. Although many agree that wages for workers are too low in the transport industry and throughout the wider supply chain (e.g. warehouse and distribution workers), there is resistance to change and disagreement about what, if anything, can be done. The Safe Rates campaign set out to address these issues for heavy vehicle operators in Australia.

Belzer and Sedo, (2017) investigated "Why do long distance truck drivers work extremely long hours?" (p.59). The findings from their data analysis suggested that truck drivers work long hours because they have "target earnings" (p.74), that is, there is an amount they require each week. Truck drivers were able to make a more comfortable living during a time of economic regulation and strong union representation in the United States (Saltzman & Belzer, 2007). However, deregulation and subsequent de-unionisation have, according to Belzer and Sedo,

(2017) reduced compensation by more than half. They go on to say that the changes to the structure of the industry have intensified competition having an impact on the supply chains and their governance.

Current market structures have allowed for certain groups throughout the supply chain to gain substantial economic power, delivering lower prices to customers but lowering the conditions for the drivers (Tedestedt George, 2018). The low operating margins leave the operators and drivers with limited resources to operate with; various actors within the system have tried to create a more level playing field by regulating this competition (International Transport Workers Federation, 2014). Such campaigns have focused on large retailers because their economic weight gives them the market power to set rates and conditions that affect the wider transport industry.

In Australia, the Transport Workers Union (TWU) have spent decades campaigning for 'Safe Rates', calling for wider coverage of employment regulation to cover all drivers, including owner-drivers, mandating minimum industrial practices. In 2012, the Gillard Government set up a Road Safety Remuneration Tribunal - an independent body to oversee the road transport industry in Australia. In 2016, with increasing pressure from owner-drivers and the road transport industry the tribunal was abolished just prior to when the Tribunal's pay order had been due to come into effect.

However, Safe Rates as a concept has reached international level attention. The International Trade Union Confederation, the International Transport Workers Union, the International Organisation of Employers and the International Road Transport Union, and the International Labour Organisation (ILO) hosted a tripartite sectoral council meeting on road transport safety and health. The ILO then produced a report (ILO, 2015) showing how negotiations had led to a resolution implying the need for safe rates to level the playing field for commercial owners and drivers.

4.1.2. Non-paid waiting time

Drivers who are paid by piece rate are not often compensated for non-driving worktime. In an earlier study, Heaton (2005) examined the policies related to truck driver hours of service regulations that affect occupational and public health and safety in the United States. Her analysis resulted in policy recommendations suggesting that truck drivers must be paid for all non-driving work. This included the time spent on vehicle maintenance and repair, administration, fuelling and waiting time, and loading and unloading if imbedded in their work.

She also called for mandatory detention clauses to be imposed if drivers are delayed at shippers' or receivers' warehouses because of insufficient operations at the pick-up and delivery sites.

4.1.3. Those opposed

Criticisms over the Safe Rates regulations have come predominantly from industry, particularly small business owners and owner-drivers arguing that the link between pay and safety is marginal, if proven at all (Smyth, 2016). Owner-drivers in Australia, in response to the proposed regulations, argued that pay orders by the Tribunal could threaten the livelihood of small operators by pricing them out of the market, further suggesting that it makes them uncompetitive with larger businesses. Reports commissioned by Turnbull, prime minister at the time, showed there was no clear link between safety and pay however, one of the reports highlighted that even having the tribunal in place would potentially reduce truck crashes.

In their inquiry, Quinlan and Wright (2008) found that several large trucking clients did not believe there was a connection between the safety and pay but admitted they had not specifically investigated the issue. They did not agree with government intervention on rates, with one interviewee indicating, "driver shortages would remedy any discrepancy in rates" (p.36) and arguing that all had individual responsibility to stay safe. However, in her submission, Professor Ann Williamson concluded that:

> "…driver payment systems were incompatible with good fatigue management… Over the intervening 15 years, there has been no change to way drivers are paid… it is essential that the government takes a role to intervene to make payment systems for long distance truck drivers more compatible with safety" (as cited in Quinlan & Wright, 2008, p.47).

Evidence collected by Quinlan and Wright (2008) revealed that freight forwarders or loading agents may negotiate a rate with a client or larger transport operator and then subcontract the task out at an unviable rate. Given the intensity of the competition in this industry, there is always "someone who will eventually take the load" (Hensher & Battelino, 1990). This may indicate an opportunity for regulation to design ways to even the playing field, avoiding the continuing race to the bottom.

4.1.4. Other industries

Lollo and O'Rouke (2020) conducted a two-year quasi-experiment in an operating apparel factory where they assessed the effects on productivity and profits of raising workers' wages. Their experiment and subsequent analysis showed that even under the tight constraints and low margins of factory operations wage gains are not only possible but also profitable. Their study showed that profit increased by 8 to 10 percent, while there was a marked decrease in worker turnover. Workers showed increased engagement and expressed a sense of fair compensation, this resulted in a reduction in quality defects and tardiness - two outcomes largely controlled by the workers. Concluding, the authors noted that the manufacturing industry demands a more engaged workforce with lower turnover and their research provides early evidence that compensation systems can be a tool to address such needs.

4.2. Chain of Responsibility – Australia

System Levels covered: Government, Regulatory, Industry, Organisation

What is it?
The Chain of Responsibility (CoR) is a policy used in Australian transport legislation to place legal obligations on parties in the transport supply chain or across transport industries generally. The concept was initially developed to apply in the heavy vehicle industry in regulated areas such as speeding, fatigue, and mass, loading and dimensions. It has since spread to other sectors, particularly in Victoria where it has been applied in laws which apply to the rail, bus, marine and taxi industries.

Where does it originate:
This specific law originates in Australia however versions exist in New Zealand and the United Kingdom among other countries.

Key points:

- The purpose of CoR is to ensure that all members in the supply chain share responsibility for upholding the requirements of the Heavy Vehicle National Law (HVNL)
- Some large transport companies report that they treat the CoR provisions under the HVNL as the detail that fleshes out the broad provisions of the primary duty in the Worker Health and Safety Acts.

Problem attempting to be solved:

- Risk and responsibility for OHS has in the past been shifted on to the individual driver, meaning no culpability for those higher up the supply chain. Invisible workers are lost throughout the supply chain and face greater potential for exposure to risk.

Solution proposed:

- Policy that places responsibility on all parties in the supply chain for the health and safety of the participants specifically linked to the heavy vehicle industry.
- Improved enforcement strategies to include, among other details, the protection of workers.

4.2.1. Background

Various parties throughout the supply chain have different motivations for engaging in health and safety practices. Considerations may be market-based or from Corporate Social Responsibility (CSR) agendas, however, more likely it is from external pressures such as legal requirements (Ustailieva, et al., 2012). On review of the literature around health and safety of supply chains, Ustailieva et al., found that successful attempts to influence the promotion of health and safety among organisations throughout their supply chains often involves a mix of regulation, market measures and initiatives.

The HVNL introduced in 2013/14 in Australia set out a chain of responsibility for all parties involved in road transportation work (Rawling, et al., 2017). The HVNL was introduced everywhere except Northern Territory and Western Australia.

In 2018 changes to the CoR policy were introduced in all territories in Australia except Western Australia and the Northern Territory Laws. Under the CoR policy, if you are a party in the chain of responsibility and you control or influence any transport task, or have the capacity to do so, you have the responsibility to ensure the HVNL is complied with (National Transport Insurance, 2020). The key areas of the CoR legislation are fatigue, speed, load/mass dimensions, vehicle standards and maintenance.

Those responsible include anyone that controls or influences the transport of goods as well as people operating both on-road and on-site. Including but not limited to:

- Employers
- Company directors
- Exporters / importers
- Primary producers
- Drivers (including owner-drivers)
- Prime contractors of drivers
- The operator of a vehicle
- Schedulers of goods for transport in or on a vehicle, and the scheduler of its driver
- Consignors, consignees, and receivers of the goods
- Loaders and unloaders of goods
- Customers
- Loading managers – the person who supervises loading or unloading or manages the premises where this occurs (Rawling et al., 2017)

Each party in the supply chain must consistently uphold the safety expectations of the HVNL and do their part in managing the risks. Businesses are required to comply by identifying their risks and developing measures tailored to the circumstances in which they operate. Under the HVNL, independent advice should be sought to assess those circumstances.

In their report, Thornthwaite and O'Neill (2016) called for a review of resources currently available to enforcement agencies to improve compliance. Further, they called for the addition of a Whistle Blower protection clause made available to truck drivers and organisations. This is

particularly important as raising safety issues can cost drivers their jobs in unhealthy contexts (Tedestedt George, 2018; Smyth, 2016).

It is not enough for employers, client organisations and contractors to adhere to occupational health and safety legislation if, simultaneously hidden groups of drivers are excluded from organisational policies and work systems. High levels of competition have led to ambiguous, marginal, informal, or illegal employment relationships where workers have different levels of outcomes (Cruz Ross, 2019). Groups such as sub-subcontractors or labour hire drivers are often hidden and hence not covered by CoR, given the complex structure of this industry. This is potentially a significant gap given the number of subcontracted and casual labour arrangements in transport operations in New Zealand.

4.2.2. Examples from other places

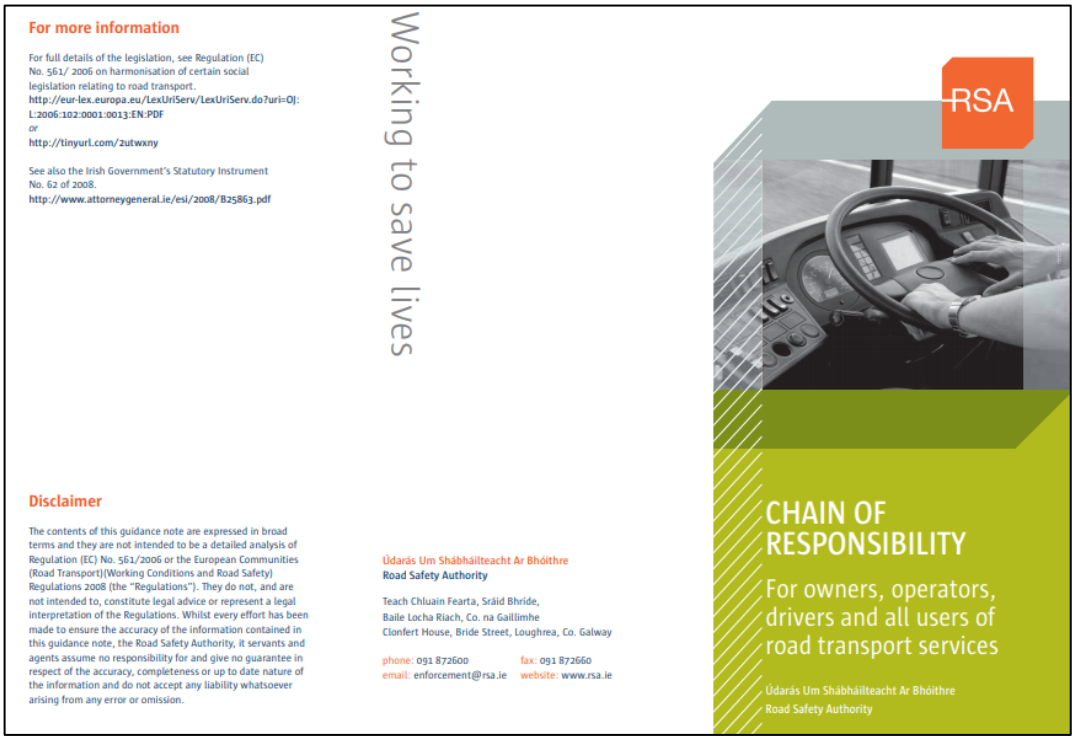
The European Union have several legal frameworks that exist to improve road safety but also to ensure fair competition between road transport operators throughout the single European market. Among these is regulation (EC) No.561/2006 which entered into force in 2007. This regulation is designed to make transport companies liable for infringements committed by the drivers and thus legally responsible if plans are schedules are generated in a way that drivers do not have time for compulsory rest periods (Goel, 2018).

In New Zealand, Waka Kotahi (NZTA, 2020) state on their website that if you employ or control drivers who are subject to work-time requirements, and you knew or should have known that a driver under your control did or was likely to breach work-time provisions, you could face fines of up to $25,000 if convicted. They have listed this information under the heading “Chain of Responsibility” on their page regarding work time and logbooks (NZTA, 2020).

Upstream duties in the United Kingdom

Employers under the Health and Safety at Work Act 1974 must ensure the health and safety at work of their employees and others who may be affected by their work activities as far as reasonably practicable. Under the Management of Health and Safety at Work Regulations 1999, where two or more employers share a workplace, they must co-operate with each other to make sure all parties comply with their legal duties.

As a brief side note, the Ireland Road Safety Authority Guidance on Chain of Responsibility[10] has created a simple two-page leaflet (see below). It underlines the rules for those involved in the transport industry explaining the chain of responsibility and the consequences for breaches of rules on driving time, breaks and rest time.



For more information

For full details of the legislation, see Regulation (EC) No. 561/ 2006 on harmonisation of certain social legislation relating to road transport.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:102:0001:0013:EN:PDF
or
http://tinyurl.com/2utwxny

See also the Irish Government's Statutory Instrument No. 62 of 2008.
http://www.attorneygeneral.ie/esi/2008/B25863.pdf

Working to save lives

Disclaimer

The contents of this guidance note are expressed in broad terms and they are not intended to be a detailed analysis of Regulation (EC) No. 561/2006 or the European Communities (Road Transport)(Working Conditions and Road Safety) Regulations 2008 (the "Regulations"). They do not, and are not intended to, constitute legal advice or represent a legal interpretation of the Regulations. Whilst every effort has been made to ensure the accuracy of the information contained in this guidance note, the Road Safety Authority, it servants and agents assume no responsibility for and give no guarantee in respect of the accuracy, completeness or up to date nature of the information and do not accept any liability whatsoever arising from any error or omission.

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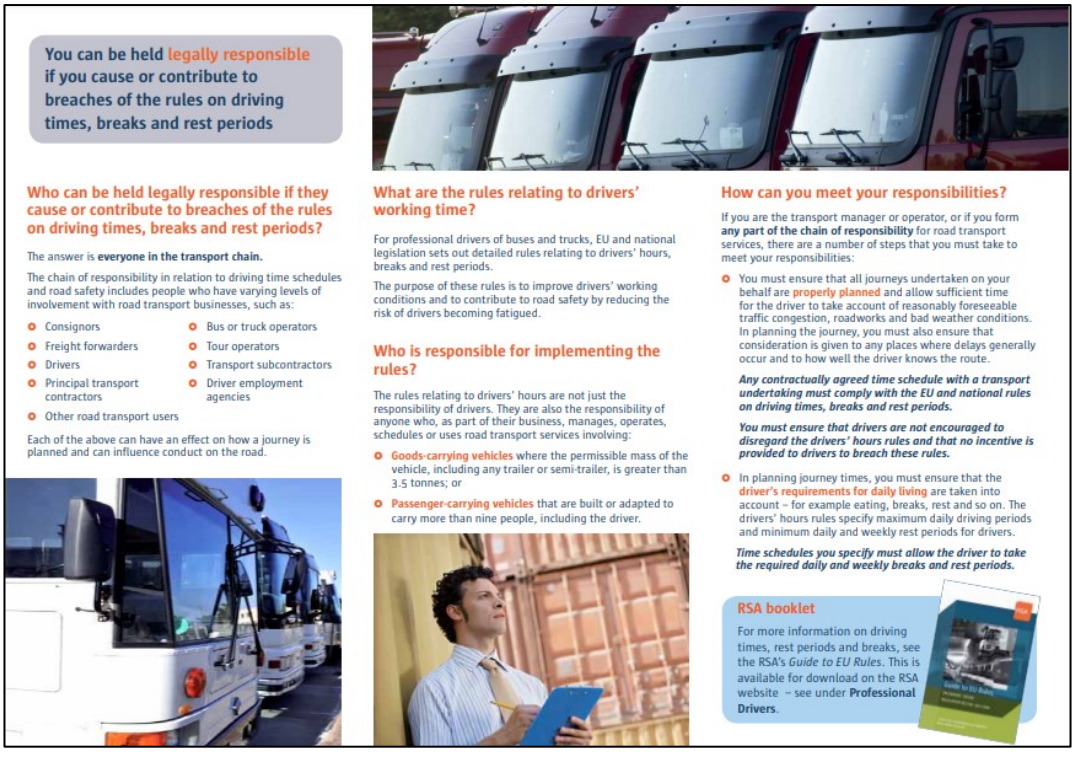
RSA

CHAIN OF RESPONSIBILITY

For owners, operators, drivers and all users of road transport services

Údarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority



You can be held legally responsible if you cause or contribute to breaches of the rules on driving times, breaks and rest periods

Who can be held legally responsible if they cause or contribute to breaches of the rules on driving times, breaks and rest periods?

The answer is **everyone in the transport chain.**

The chain of responsibility in relation to driving time schedules and road safety includes people who have varying levels of involvement with road transport businesses, such as:

- Consignors
- Freight forwarders
- Drivers
- Principal transport contractors
- Other road transport users
- Bus or truck operators
- Tour operators
- Transport subcontractors
- Driver employment agencies

Each of the above can have an effect on how a journey is planned and can influence conduct on the road.

What are the rules relating to drivers' working time?

For professional drivers of buses and trucks, EU and national legislation sets out detailed rules relating to drivers' hours, breaks and rest periods.

The purpose of these rules is to improve drivers' working conditions and to contribute to road safety by reducing the risk of drivers becoming fatigued.

Who is responsible for implementing the rules?

The rules relating to drivers' hours are not just the responsibility of drivers. They are also the responsibility of anyone who, as part of their business, manages, operates, schedules or uses road transport services involving:

- **Goods-carrying vehicles** where the permissible mass of the vehicle, including any trailer or semi-trailer, is greater than 3.5 tonnes; or
- **Passenger-carrying vehicles** that are built or adapted to carry more than nine people, including the driver.

How can you meet your responsibilities?

If you are the transport manager or operator, or if you form **any part of the chain of responsibility** for road transport services, there are a number of steps that you must take to meet your responsibilities:

- You must ensure that all journeys undertaken on your behalf are **properly planned** and allow sufficient time for the driver to take account of reasonably foreseeable traffic congestion, roadworks and bad weather conditions. In planning the journey, you must also ensure that consideration is given to any places where delays generally occur and to how well the driver knows the route.

Any contractually agreed time schedule with a transport undertaking must comply with the EU and national rules on driving times, breaks and rest periods.

You must ensure that drivers are not encouraged to disregard the drivers' hours rules and that no incentive is provided to drivers to breach these rules.

- In planning journey times, you must ensure that the **driver's requirements for daily living** are taken into account – for example eating, breaks, rest and so on. The drivers' hours rules specify maximum daily driving periods and minimum daily and weekly rest periods for drivers.

Time schedules you specify must allow the driver to take the required daily and weekly breaks and rest periods.

RSA booklet

For more information on driving times, rest periods and breaks, see the RSA's *Guide to EU Rules*. This is available for download on the RSA website – see under **Professional Drivers**.

[10] Sourced from https://rsa.ie/Documents/Tachograph_Enf/drivers_hours_dl_low_res.pdf

Upstream duties in New Zealand

Businesses in the supply chain also have a duty under New Zealand Law. The New Zealand Health and Safety at Work Act is intended to "provide for a balanced framework to ensure the health and safety of workers and workplaces" based on "participation, leadership, and accountability by government, business, and workers" (Health and Safety Reform Bill, 2014). It, therefore, places obligations on those that the create risk and can manage them.

WorkSafe (2018) in New Zealand outline that business who are in the supply chain also have a duty to ensure that the work that they do or provide to other workplaces does not cause health and safety risks, so far as reasonably practicable. Upstream businesses are required to consider the impact on downstream businesses and their workers[11].

To read an analysis of how the Health and Safety at Work Act in New Zealand applies to roads and whether the road is a place of work see King (2016).

[11] For full details see: https://worksafe.govt.nz/managing-health-and-safety/getting-started/understanding-the-law/upstream-duties/

4.3. The Heavy Vehicle National Law – Australia

System Levels covered: Regulatory, Industry, Organisation

What is it?
There is a current review of the Heavy Vehicle National Law (HVNL) in Australia. Ministers have asked the National Transport Commission (NTC) to lead the review of the HVNL and its supporting regulations. The review has provided insight into current issues facing the heavy vehicle industry in Australia from members of the system. This section outlines the key points of the law and the key areas of concern from the submissions and review.

Where does it originate:
Australia

Key points:

- Submissions from a wide range of participants in the heavy vehicle industry have been included in the law review.
- The submissions were summarised into seven main categories giving indication about key areas of focus in the industry. These submission documents gave useful insight into the views of employers, workers, and regulators.
- The seven categories are: risk-based regulation, effective fatigue management, access to suitable routes, safe people and practices, vehicle standards and safety, effective enforcement, and assurance models.
- Finalised policy options will be presented to Ministers in May 2021.

Problem attempting to be solved:

- To ensure a law exists that will improve safety for all road users, support increased economic productivity and innovation, simplify the administration of the law, support the use of new technologies, and offer more flexibility in compliance options.

Solution proposed:

- A law that addresses issues specific to the heavy vehicle industry, formed in consultation and collaboration with stakeholders.
- Provide a clear link to the CoR and health and safety law for the heavy vehicle sector.

4.3.1. Background

Operators of heavy vehicles in most Australian jurisdictions (Queensland, NSW, the ACT, Victoria, Tasmania, and South Australia) must comply with the HVNL, which places regulatory obligation on drivers, operators, and others involved in the road transport industry. In May 2018, the Transport and Infrastructure Council directed the NTC to review the HVNL. The NTC released issue papers seeking feedback on the HVNL and opportunities to improve it.

It is planned that these laws will more closely align with the Australian Work Health and Safety (WHS) law to ensure that both sets of laws will include a primary duty for road traffic safety risks to be eliminated or minimised. The HVNL recognises the relationship with the WHS law,

operators must comply with both sets of laws, however if it is not possible the person must primarily comply with the WHS law (WorkSafe Queensland, 2019).

In the submissions made, Government representatives suggested that there needs to be an acknowledgement in the law over the conflict (real or perceived) between safety and productivity outcomes. There was shared agreement among government representatives, regulators and enforcement, heavy vehicle drivers, and peak bodies that safety, efficiency, and productivity should be the end goal of the law, however there was disagreement of how that should occur.

The review began in November 2018 and through until 2019 the NTC consulted with governments, regulators, heavy vehicle drivers, large and small operators, peak industry bodies, technology providers and the wider community to collect evidence on problems with the current HVNL. In September 2019 they shifted from identifying issues to generating solutions and they canvased ideas for the future law seeking feedback on their proposals. In January 2020 they released a summary of consultation outcomes and they are using this to develop a list of options for the future HNL.

Between March and September 2019, the NTC released a set of seven issue papers seeking submissions. The categories identified as key issues were:

1. Risk based regulation
2. Effective fatigue management
3. Access to suitable routes
4. Safe people and practices
5. Vehicle standards and safety
6. Effective enforcement
7. Assurance Models

Consultation on these issues is now closed however the categories indicate key areas of interest and focus identified by the key stakeholders in the heavy vehicle industry. As above, finalised policy options will be presented to Ministers in May 2021.

4.4. Accreditation and recognition schemes – International

System Levels considered: Regulatory, Industry, Organisation

What is it?
Accreditation and recognition schemes are formal recognition of an operator's competence to conduct or carry out certain activities. Fleet Operator Recognition Scheme (FORS), as one example in transport, is a voluntary accreditation scheme for fleet operators requiring them to meet a set of safety standards.

Where does it originate:
FORS originates from London, United Kingdom. Examples from other countries are provided.

Key points:

- FORS aims to raise the level of quality within fleet operations and to demonstrate which operators are achieving exemplary levels of best practice in safety, efficiency, and environmental protection.
- This is a scheme initiated by Transport for London.
- Consigners of goods can now specify FORS in their tender documents to ensure certain standards are maintained throughout the supply chain.
- The FORS scheme currently runs across 17 countries.

Problem attempting to be solved:

- Schemes such as FORS resulted from the recognition that everyone in the transport supply chain needs to be held accountable to the same safety standards.

Solution proposed:

- An industry-led accreditation scheme.
- Large, economically powerful members within the industry encouraged to sign up which then encourages others throughout the supply chain to sign up.
- Translates the requirements of the laws into practical steps for the industry.

4.4.1. Background

Accreditation schemes and other related safety certification programmes have become important instruments used to promote health and safety practices in the supply chain (Ustailieva, et al., 2012). The Fleet Operator Recognition Scheme (FORS) is an accreditation scheme for recognising those fleet operations who show legal, safety, efficiency, and environmental protection compliance (FORS, 2012). The process of accreditation requires fleet operators to be assessed by an approved FORS certification body. There are four key areas to the standards:

1. Management
2. Vehicles
3. Drivers

4. Operations

Management: Operators are required to have a description of the responsibilities and links between senior management and daily operations personnel, this includes those who have ongoing responsibility for the transport operations. The purpose of this is to ensure that there are tangible links between senior management and daily operations so that business information can be effectively and adequately communicated, acted on, and reviewed. Further evidence should be provided showing how the company policies are communicated to the daily-operations personnel, management systems are required to be reviewed every 12 months, and a complaints system set up that feeds into organisational decision making.

Vehicles: Fleet operators are required to have an inspection and maintenance plan that includes plans for daily vehicle inspections. Under this section, operators are required to ensure vehicles have up to date, specialist equipment and full insurance. This section also covers loading specifications and checks that must be done to ensure that any fall risks are assessed and accounted for.

Drivers: The section on drivers covers requirements for licencing and individual qualification checks, compliance with driving standards and ongoing staff training. Knowing that distracted driving is a leading cause of road accidents, the standards require that measures are taken to ensure drivers are not required to use cell-phones while driving, and that no other potential distractions occur in-cab. Additionally, specific OHS policies require evidence and demonstration and importantly they sit alongside the management of work time hours.

Operations: Fleet operators are required to ensure that the most efficient, safe, and appropriate vehicles and routes are used. Operators are required to effectively deal with the causes of fines and charges incurred, abide by the law for example regarding the movement of hazardous chemicals, waste, and abnormal loads. If anything does occur on the road, the operators are required to record all near misses and incidents and ensure that any involved personnel are fit to return to work before further work is carried out.

These are the minimum requirements to obtain the accreditation, there are further silver and gold standards that go above and beyond what is outlined above.

Although these above requirements focus mostly on the immediate tasks for the involved individuals and the organisations, the standards offer a way to demonstrate to customers and others in the supply chain a commitment to agreed industry standards. Using responsible fleet operators can ensure all reasonably practicable steps have been taken in the management of

work-related road risks. To manage work-related road risk, the city of London requires that operators adhere to several standards and schemes including FORS with the aim of reducing the risk of collisions, save lives and protect communities (City of London, 2020).

Those developing the standards recognise the importance of monitoring and understanding the market, to include the whole system, and to always consider the ramifications from actions taken. In a recent webinar, Peter Binham from Transport for London (TfL) recommended national standards for road risk management, with input from all key stakeholders but led by industry, happen early on in a development process. He went on to note that contracts and the procurement process can be used as leverage and those in positions of power should lead the way. TfL International Consulting shares information internationally with FORS running across 17 countries (NRSPP, 2020).

4.4.2. Other international examples

TruckSafe, Australia

In Australia, the TruckSafe Accreditation Program is a voluntary programme based on a minimum set of standards a trucking business should meet for it to be a safe, responsible operation. Accreditation shows that they are meeting their due diligence and duty of care and gives customers the confidence that operators have responsible work practices.

The Truck Safe Accreditation Program is built around the following core modules:

- Management
- Risk management
- Driver health and well-being
- Speed management
- Fatigue management
- Mass, dimension, loading and load restraint management
- Vehicle standards management

And one additional module:

- TruckSafe animal welfare (Livestock)

The standards have been designed to align with the Maser Code and the 2018 CoR updates (TruckSafe, 2020). The Master Code supports the objectives of the HVNL and provides practical guidance to assist all parties in the chain of responsibility. It also translates the requirements of

the HVNL into practical steps for the wider industry and suggestions controls to manage safety and compliance, it explains what and why things must be done but does not specify how.

Construction Logistics and Community Safety (CLOCS) – London

The CLOCS standard is the direct result of collaboration between the construction and fleet sectors to address shared issues. It is an industry-led project sponsored by TfL to reduce injuries and deaths due to work-related road risk. It draws together best practice information from several standards, policies, and codes of practice to provide one industry standard that can be implemented by regulators, clients, principal contractors, and fleet operations (CLOCS, 2019).

The standard outlines a common road safety framework for use by the construction and logistics industry with the aim of changing the way the industries manage potential dangers to other road users. The standardisation is aimed at increasing the understanding of road risks through shared information between organisations. The primary goals of the standard include safe construction vehicle journeys, zero collisions between construction vehicles and the community, improved air quality and reduced emissions, fewer vehicle journeys, and reduced reputational risk. A notable inclusion with CLOCS is that it places responsibilities and duties on the regulator, the client, the principal contractor controlling the construction site and the supply chain including the operator of any road-going vehicles servicing that project.

Australia has identified CLOCS as internationally recognised programme for best practice and it is being applied to large scale projects such as the Sydney Metro projects. In a recent webinar[12], Jon Lamonte, Chief Executive of the Sydney Metro projects said they consistently scan domestic and international research and CLOCS comes up time and time again as a recognised best practice approach.

Lamonte explained that tier one and tier two contractors were responsive to the programme once they understood why – it was dependent on the delivery from the project leaders. Smaller organisations faced challenges (as supported by international literature e.g. Moschitz, 2005), but they were the ones the project leaders wanted to capture and help raise their operating standards. Lamonte said that the smaller organisations knew that if they wanted to work on this project, this is what they had to comply with. There was no competitive advantage, it was a requirement. Adopting CLOCS has, in his opinion, helped to level the playing field across major public infrastructure projects.

[12] The webinar can be found at: https://www.nrspp.org.au/resources/webinar-adapting-uks-construction-logistics-and-community-safety-initiative-to-australia/

The Petroleum Driver Passport – United Kingdom

The Petroleum Driver Passport (PDP)[13] is a scheme that requires drivers of road tankers to possess a passport, indicating their safety competence, if they are to collect or transport fuel in the United Kingdom's oil distribution industry (Heery, Gooberman & Hauptmeier, 2017). The scheme was launched in 2014 and has the following features:

- The scheme involves all drivers of road tankers involved in the transport of fuel to end users, all substances transported are considered hazardous
- At its heart, the scheme has an industry training standard which specifies levels of competence required to obtain the passport including standards of performance
- The passport is valid for five years, annual refreshment training is required
- Training is conducted by accredited providers

It is a voluntary scheme and the downside to this is that it can prove ineffective due to a lack of enforcement. However, drivers cannot enter refineries or fuel storage depots without the passport and these facilities have accepted the responsibility of ensuring this is enforced. The successful outcome of this scheme, therefore, relies on the positional power of the retailers.

Road Transport Management Systems (RTMS) – South Africa

The RTMS scheme was set up to promote self-regulation and complement law enforcement efforts in South Africa. It was initially set up to manage overloading but evolved into a more holistic scheme for managing road transport operations (Nordengen & Naidoo, 2016). The scheme comprises of:

1. Loading control
2. Safety and compliance
3. Driver wellness
4. Training and development

Larger players in the supply chain were encouraged to sign up with the hope of a knock-on effect to other transport operators. According to the authors, companies that have embraced the RTMS scheme have experienced improvements in compliance and safety performance, including a reduction in overloading and crash rates. The scheme is industry led, government supported, and voluntary, encouraging consignors and consignees to implement a set of standards that demonstrate compliance with road traffic regulations.

[13] For more see: Heery, Gooberman and Hauptmeier (2017) and https://www.pdpassport.com/pdpassport/Home

4.4.3. Accreditation schemes in New Zealand

There are many existing accreditation schemes relevant to the New Zealand context some of which are industry led and others government initiatives. For example, ACC, MBIE and WorkSafe New Zealand have developed an audit/assessment product called Safe+, this is not transport specific. Government agencies have had initiatives in the past including Fleet Saver and Fleet Safety, other initiatives include the Operator Rating System. The Road Transport Forum have a Crate Accreditation & NZ Livestock Transport Assurance Program, and the New Zealand Land Transport Association have a programme for livestock management.

Internationally, New Zealand organisations can apply for ISO standards including 45001 on OHS management systems, 9001 on customer focused, consistent delivery and quality services, as well as ISO 20400:2017 which provides guidance to organisations, independent of their activity or size, on integrating sustainability within procurement, as described in ISO 26000. The Sustainability Council of New Zealand also have developed guidelines to help organisations meet some of these standards.

Some of these initiatives have had poor uptake particularly in transport and were removed due to unclear Return on Investment (ROI) issues or a lack of central collaboration from the government agencies. Additionally, there is often a significant compliance cost. Some industry members have called for fewer, cost-effective initiatives.

4.5. Work-time rules – International

System Levels included: Global, Industry, Organisation

What is it?
Work-time rules stipulate how long heavy vehicle operators are permitted to be working and when and for how long rest breaks should be taken. These provisions vary between countries.

Where does it originate:
Work-time laws from the European Union (EU), Sweden and New Zealand have been outlined.

Key points:

- In Sweden the road transport work-time legislation stipulates that the ordinary work week should not exceed 40 hours. There are exemptions to this.
- The Swedish law stipulates that if you work for more than one employer, the maximum working time hours must be split between jobs. This implicates employers as they must record all working activities for their drivers even if the work is for another company.

Problem attempting to be solved:

- Fatigue is a predominant health and safety concern among heavy vehicle operators identified by many institutions as a key priority to be addressed.
- Work-time rules are thought to be one way to curb the long working hours drivers are working.

Solution proposed:

- This is an on-going issue, not yet adequately addressed in any country.

4.5.1. European Union

EU regulations aim to set minimum working standards for road transport workers and include the enforcement of driving time and rest periods. For example, across the EU, daily driving shall not exceed 9 hours, with the exemption of twice a week when it can be extended to 10 hours. A total work week of driving may not exceed 56 hours and total fortnightly time may not exceed 90 hours. Daily rest periods shall be at least 11 hours with an exception of going down to 9 hours, maximum three times a week. Daily rest can be split into three hours rest followed by 9 hours rest, making a total of 12 hours rest per day. Breaks of at least 45 minutes should be taken after four and a half hours. Weekly rest is 45 continuous hours which can be reduced every second week to 24 hours. Compensation arrangements apply for reduced weekly rest period. Weekly rest is to be taken after six days of working.

4.5.2. Sweden

Sweden, as an EU Member State, and one of the world's safest countries from a road safety perspective, has the following requirements for heavy vehicle operators. The road transport

work-time legislation in Sweden (Vägarbetstidslagen, lag 2005:395 om arbetstid vid visst vägtransportarbete) applies to employed mobile workers and drivers that are owner drivers, however through collective agreements exemptions are permitted to this law but exemptions cannot be made for the total average working time, to break times, or the requirement to register work time.

The road transport work-time rules stipulate that the ordinary work week should not exceed 40 hours, above the ordinary working time, 200 overtime hours can be worked during a calendar year. The working time can, on average, be a maximum 48 hours per week during a period of four months. The total working time shall not exceed 60 hours during any individual week. All work with one employer should be totalled, for example if you work part time as a driver and part time in the warehouse (for the same employer) your total working time is counted and should not exceed 48 hours per week during a period of four months. If you work for more than one employer, the 48 hours must be split between the jobs. Each employer, or principal organisation, must investigate if the workers have more than one employer recorded in written form.

Work time should never exceed more than six consecutive hours without a break. If a driver works between six and 9 hours, the break should be at least 30 minutes. If the workday exceeds 9 hours, the rest time should be at least 45 minutes. The rest time can be divided into 15-minute periods. The working time for owner-drivers may exceed 60 hours per week if the maximum work time, including breaks, does not exceed 84 hours per week.

Any type of work that is conducted between the hours of 1am and 5am, and not necessarily for this entire time period, shall not exceed 10 hours during the 24-hour period. A 24-hour period which includes night work must be preceded by a rest according to the rest time rules.

4.5.3. New Zealand

Waka Kotahi (NZTA, 2020), in their work time rules for commercial drivers outline that work time considers all work-related duties including driving, loading and unloading, maintaining and cleaning vehicles, administration or any other work required. Drivers must take a break of at least 30 minutes after five and a half hours. This is already less rest time and longer working hours than stipulated by the EU. During a workday period (24 hours) a driver can work a maximum of 13 hours and must then take a break of at least 10 hours as well as the standard half hour breaks after every five and half hours. Drivers can accumulate worktime of up to 70

hours before they must take a break of up to 24 hours. The time between one 24-hour break and the next is legally described as a cumulative work period.

4.5.4. A general note on rest time

Wang and Pei (2014) investigated the effects of driving and rest time on the driving performance and recovery of commercial coach drivers in China. They found that driving time had a significant effect on the subjective fatigue and driving performance measures. After two hours of driving, subjective fatigue and driving performance began to deteriorate. After four hours of driving, all driving performance indicators reduced except depth-perception. They found that a certain amount of rest time reduced the negative effects of fatigue, for example 15-minutes rest allowed drivers to recover from two hours of driving and needed to be extended to 30-minutes after driving for three to four hours.

Work time rules are inter-related with sleep duration. In a study by Mackie (2008) the researchers found that most truck drivers do not get the sleep needed which has a flow-on effect leading to fatigue and related issues. They further found that the drivers were working or resting at times that are incompatible with circadian rhythms.

4.6. Social provisions – European Commission

System Levels included: Global, Regulatory, Industry

What is it?
The European Commission has set out a framework of social provisions for road transport operators to improve working conditions and road safety.

Key points:

- The European Commission acknowledges that road safety is improved by addressing working conditions.
- Social protection, fair competition, and road safety and averting fatigue are key elements considered.
    - All road transport workers should be covered by social protection measures regardless of employment status.
    - Fair competition between companies should be regulated.
    - Road safety and averting fatigue are managed through work time regulation.

Problem attempting to be solved:

- Social protection is not consistent across worker groups including contractors and employees, or citizens and non-citizens.
- There is not fair competition between organisations; competition is high and there is a 'race to the bottom' because there are groups of workers willing to accept sub-standard conditions.
- Organisations that abide by the regulations are disadvantaged.
- Fatigue is a serious issue of concern in the transport industry. Work time rules seek to address fatigue, they vary across countries.

Solution proposed:

- When road safety goals are set, working conditions need to be considered.
- UN Framework, Sustainable Development Goal no.8.

4.6.1. Background

The European Commission identified a link between the working conditions of transport operators and road safety. Across the EU, there are almost 5 million people working in the transport industry. A key principle of the European Union is the free movement of goods, capital, services, and people. A single market within the European Union is fundamental in how business is conducted, and road transport is no exception. An expansion of the European Union to include new member states has highlighted the variation of working and living conditions between regions. Central European Member States have lower wages and rates in comparison to western European Member States. Drivers could, for example be employed in Lithuania under national regulations, while driving trucks through countries such as Sweden. While in Sweden, time could be spent working domestically. Political discussion over the previous

decades have failed to include road transport workers under the Postal Workers EU directive. This has led to social dumping.

In continuing efforts, the European Commission have established a framework of social rules for goods and passenger road transport operators to ensure all transport workers operating in the single market are covered by uniform regulation. The goals outlined in this framework are:

1. to ensure the adequate social protection of road transport workers (e.g. health care, income security, unemployment and sickness benefits)
2. to guarantee fair competition between undertakings (companies within the single market can compete fairly with each other)
3. to improve road safety by averting road fatigue

Given New Zealand's geographical isolation, it may seem irrelevant to include issues occurring in the European Union which is made up of neighbouring countries and linking territorial borders. However, there are similarities between contextual factors that subsequently lead to poor road safety that are worth noting. Currently, protections for workers are inconsistent among employees, contractors, migrants, and non-migrants in New Zealand (Tedestedt George, 2018). There are gaps in legislation that mean no level playing field in the transport industry has been achieved. Consequently, road safety is compromised because of factors linked to high competition. Research has documented the strong incentives, driven by market pressures and pay schedules, for drivers to engage in dangerous driving behaviours (Tedestedt George, 2018). These social provisions have been set to draw attention to such issues.

Fair competition between companies and protection for workers are essential contextual factors that need to be addressed in order to improve road safety (European Commission, 2020). Under the social provisions, contractors, for example, would have access to social security and employment protection. This increases job security among workers which then may alleviate exposure to health and safety risks linked to precarious work.

In April 2020 the EU Council adopted a major reform of the EU transport sector known as the Mobility Package. The directive (to be adopted by the EU parliament by a second reading) sets out to create a safe, efficient, and socially responsible road transport sector. The directive stipulates that it is necessary to ensure adequate working conditions and social protection for drivers but also suitable conditions for business and fair competition for road transport operators also. It will also make enforcement more efficient.

As cited by the Council of the EU:

> The package consists of a regulation governing access to the road haulage market and to the profession of road haulage operator or road passenger transport operator; a regulation on maximum work and minimum rest times for drivers and positioning by means of tachographs; and a directive revising enforcement requirements and laying down rules on posting of drivers (Council of the European Union, 2020).

4.6.2. Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations (UN) Member States in 2015, has, at its heart 17 Sustainable Development Goals[14], which are an urgent call for action by all countries - developed and developing - in a global partnership. Each of the 17 are integrated and indivisible and balance three pillars of sustainable development: Economic, Social, Environmental (United Nations, 2015).

Sustainable Development Goal number 8[15] entails indicators and targets for the promotion of sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. The goal considers COVID-19 implications including the impact on the informal economy. Of relevance are two sub-points, 8.3 and 8.5.

> 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro, small and medium-sized enterprises, including through access to financial services.
>
> 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.

It is understood by the researchers that Victoria University are looking at New Zealand's role in achieving the UN's Sustainable Development Goals.

[14] For more on the Sustainability Development Goals see: https://sdgs.un.org/goals
[15] For more on Sustainable Development Goal no.8 see: https://sdgs.un.org/goals/goal8

4.7. Increasing social dialogue – International Labour Organisation

System Levels included: Global, Government, Organisational, Industry, Worker

What is it?
Social dialogue encourages tripartite or bipartite discussion which can initiate the reconciliation of market competition, worker occupational health and safety, and road safety (ILO, 2015a).

Where does it originate:
Most recently discussed at the International Labour Organisation (ILO).

Key points:

- Promotes consensus building on relevant national policies that impact on employment and decent work strategies and programmes.
- Dialogue and stakeholder consultations take place between the regulator and employer organisations with the intention of increasing democratic representation.
- Consultation efforts should bear in mind owner-drivers as research shows their low profit margins make them vulnerable to regulatory actions.

Problem attempting to be solved:

- Social dialogue is not frequent enough between workers, employers, and the state.

Solution proposed:

- The development of tripartite social dialogue.
- The "employment relationship constitutes the centrepiece of labour protection. At the same time, all workers, regardless of their contractual arrangement or employment status, must equally enjoy adequate labor protection to ensure human working conditions for everyone" (ILO, 2019 as cited in Cruz Ross, 2019, p.124).

4.7.1. Background

Social dialogue is any type of negotiation, consultation, or exchange of information on issues of common interest relating to economic and social policy (ILO, 2020). Social dialogue can be either bipartite or tripartite and can occur at different levels, including within the organisation between the employer and the trade unions, or at the industry level between government and employers for example. For it to be considered social dialogue it must at least be between employers and trade unions (bipartite). Sometimes government representatives are involved.

The ILO (2015b) writes in their report on health and safety issues in road transport:

> OSH concerns need to be addressed at the global level by tripartite action to promote decent work in the road transport sector… Social dialogue plays a critical role in achieving the ILO's objective of advancing opportunities for women and men to obtain decent and productive work in conditions of freedom, equality, security and human dignity (p. ix).

Throughout the document review, worker participation has been raised in both the literature and industry-specific documents. The importance of social dialogue has been included in this section to ensure worker participation continues to remain a focus for all levels of the system. It is acknowledged that worker participation in health and safety is regulated in both New Zealand and Australia. With the review of the HVNL occurring in Australia currently, workers are encouraged to have their say over how the new law is written[16]. It was noted in response to the law review that gathering feedback from truck drivers was crucial as they are the ones interacting and dealing with the law on a daily basis; the drivers have complained that they are not being given the right opportunities to share their thoughts (Australian Trucking Association, 2019).

4.7.2. Social dialogue to improve stakeholder buy-in

The OECD have created a set of guidelines through a multi-stakeholder process with in-depth engagement from business representatives, trade unions and civil society, chaired by a multi-stakeholder advisory group. The guidelines are designed to ensure that if followed, the operations of enterprises are in line with OECD aims and government policies, with the intention to strengthen the basis of mutual confidence between enterprises and the communities in which they operate (OECD, 2017).

[16] For more from the NTC see https://www.hvnlreview.ntc.gov.au/have-your-say

4.8. Additional supporting literature

4.8.1. Leadership and management practices

Management's commitment to safety has been identified as a contributing factor to the increase of a positive safety culture (Rowland, 2018). WorkSafe New Zealand's recent Workforce Segmentation and Insight Programme (WSIP) showed that workplace safety culture is a combination of both employers' involvement and workers' engagement inOHS (Colmar Brunton, 2019). The work shows a connection between positive self-reported worker engagement and OHS practices, and how mature the safety culture of their workplace is perceived to be. This then has a positive correlation with workers' reported perceptions of management engagement and them leading by example.

Safety Culture

The terms 'safety culture' and its cousin concept 'safety climate' are sometimes used interchangeably and although it is outside the scope of this review to discuss the differences in detail, definitions are offered below.

Safety climate, as described by Huang, et al. (2013) refers to "workers' shared perception of their organisation's policies, procedures, and practices as they relate to the value and importance of safety within the organisation" (p.5). By comparison, safety culture is described as identifying values and attitudes that interact with organisational structures that then form understandings of risk and safety influence the working environment (Grytnes et al., 2016).

For simplicity, the following paragraphs consider the two concepts as interchangeable as clear definitions were not always provided in each of the reviewed articles.

Research has shown that safety climate is a strong predictor of safety outcomes (Huang, et al., 2017; Newnam et al., 2017). It was found to be a leading indicator of accidents and injuries in industries including the transport industry (Huang et al., 2013). Studies have shown that organisations with low incident rates were reported by those with clear driving standards, comprehensive training, and a reporting policy. Comparatively, the poorest rates were found in organisations with no clear training, ambiguous rules, and ineffective lines of communication (Cole, 2005).

Short (2007) states that top to bottom safety communication, recognition of safe behaviour and certain reward systems, driver experience and driver retention, policies and clear safety messages from managers help increase safety culture. Ensuring the formalisation of safety rules and the regularity in which they are communicated is additionally important. Short continues by

suggesting that accident and incident reporting should be rewarded. However, the most important indicator of safety culture is management commitment, particularly senior management (Nævestad et al., 2018; Rowland, 2018; Thornthwaite & O'Neill, 2016). Nævestad et al. (2018) suggest there are mechanisms that transport operator managers can use to shape culture including what managers pay attention to, measure and control on a regular basis, how they react to incidents, resource allocation, role modelling, recruitment and teaching and coaching.

In New Zealand, Transport, Postal and Warehousing (TPW), despite the high-risk nature of the industry, was found to be one of the top industries for having a mature safety culture at work. Over half of the TPW employers stated that health and safety at work is their top priority and around 80 percent of employers reporting having a strong safety culture, where everyone is looking out for each other's health and safety. This is reflected in the responses from the workers, where nearly 70 percent said they always have a say in decisions that affect their health and safety and 94 percent are confident they have the right knowledge and skills to keep safe at work (WorkSafe, 2020a).

4.8.2. Technology

Feedback, goal setting, and coaching is suggested to make the implementation of in-vehicle technology more effective (Pyta, et al., 2020). Strong leadership is called for when introducing safety technologies including clear communication with the drivers, so they understood what was being implemented, what issue it aimed to resolve, and how it worked. Pyta et al., concluded that organisations should have well documented policies for handling the data, that they trial the minimum level of any system first and give the chance for driver feedback, and that critical incidents be analysed with the driver as soon as possible.

Many work incidents sustained by goods transport drivers are related to loading and unloading. One organisation in Denmark recognised this problem. The managers worked together with the drivers to collect information on 500 different loading zones and entered this information into the company's IT system so that the information was available to the delivery drivers. The information included was designed to account for literacy level variation among the drivers and the limited time they had for deliveries.

Technology for collecting data on contextual factors

A key component of safety management is learning from past near misses and incidents; reporting systems support such efforts through the collection and analysis of incident data

(McClean, et al., 2020; Goode, Salmon, Lenne, Finch, 2018). Systems analysis methods are widely accepted as the most appropriate way of understanding and informing the prevention of adverse incidents and are increasingly being adopted across multiple domains (Hollnagel, 2016).

In response to increasing numbers of serious incidents in the Led Outdoor Activity (LOA) sector and to improve safety across Australia, an incident report system was developed in 2014 called UPLOADS (Understanding and Preventing Led Outdoor Accidents Data System). The UPLOADS system includes a reporting tool for collecting detailed information on incidents that support the application of the AcciMap framework and provides a tool for coding the relationship between the contributory factors (McLean et al., 2020). As LOA providers submit their data through the UPLOADS application, a repository of information is formed and used to analyse incidents, contributory factors and then provides reports back to the sector about the frequency and characteristic of incidents, injuries and illnesses, and the network of factors involved in incident causation (The UPLOADS Project, 2021).

4.8.3. Procurement

Procurement is a way in which minimum standards can be set and industry standards raised. Further, accreditation schemes such as the ones mentioned in section 4.4 can be used during the procurement process to pre-qualify those submitting a bid. For this reason, clients procuring services play an important role.

As the initiators of projects and purchases of services, clients are often able to drive OHS standards and improvements. They make decisions about the performance criteria, contracting strategy and project delivery method, of which are likely to impact OHS (Lingard, Oswald & Le, 2019). The public sector spends large sums on purchasing goods and services, and commissioning works and therefore can use their purchasing power to set standards for responsible procurement practices (Moschitz, 2005). This is supported by Donaghy (2009) who states, “public procurement is important because of its size and potential for insisting on driving up standards including health and safety” (p.12).

Lingard, Oswald and Le, in 2019, conducted a study exploring the approaches used by government agencies, as the client, to drive OHS performances in publicly funded infrastructure projects in Australia. They spoke to clients and contractors with direct and recent experience of delivering large infrastructure projects. Both the clients and the contractors alike expressed that projects employing a collaborative delivery method such as alliance or delivery partnerships fosters an environment in which OHS is a shared responsibility, where common goals are

developed, and greater resources are allocated to areas of OHS innovation. As the client they became part of the strategy and of the solution, creating shared commitment to OHS between all project participants, everyone was working towards agreed Key Performance Indicators (KPIs) because that was how success was defined. An interviewee in their study explained how they took more ownership in an alliance compared to a price-driven contract where they might shift the risk to the contractors. The interviewee acknowledged that all of them were in this together, so if one failed, they all did.

Not all clients in the study saw the value of these arrangements. Some contractors saw that clients were often too heavily involved or too heavily focused on procedural aspects of OHS reporting, and not enough on actual safety outcomes. Government clients were seen to require heavy paperwork and reporting, of which one project manager deemed ineffective and time consuming and called for a more agile, dynamic approach to management systems.

An important aspect of success, according to the interviewees in Lingard et al.'s study was the ability for project leaders to choose their own supply chain. An OHS director declared from the outset their commitment to high OHS standards and asked contractors who were bidding "what will you contribute to enable us to do that?" (p. 574), which, they argued, helped them find the best when building their supply chain. Others spoke of not being able to choose the contractors themselves, the client choosing often based on low price, causing increased project management costs in the long run.

According to Lingard et al. clients have used financial penalties for poor OHS performance in which contractors are penalised for having incidents or injuries on their worksites. This was perceived by the contractors to negatively impact project performance and did not foster collaboration, rather negative conversations. However, on the other side and favoured by contractor representatives, was the incorporation of financial incentives for OHS performance. Client representatives in the study did not support such incentives, citing it was the law and contractors should not be paid extra to be law-abiding. Secondly, they felt it encouraged falsified information and therefore undesirable behaviour.

Price competition has led to the development of hybrid procurement practices in the Australian construction industry. Under, what is called a dual TOC arrangement, two potential non-owner groups are selected based on non-price related criteria and then the two groups are invited to submit competitive prices. The final selection is then made on cost. This approach was not widely favoured by contractors in Lingard et al.'s study citing reasons such as the undermining

of innovation and improvement in the OHS space. However, it shows the potential for procurement arrangements to balance both safety and efficiency.

Lingard et al., conclude with three main implications for practice:

- Clients could build project teams for success with a broad focus on value for money which may not necessarily be the lowest price and consider what price competition does to non-financial aspects of the performance while balanced against responsible public spending.
- Clients could be actively involved in project OHS activities, though avoiding a predominantly bureaucratic approach, facilitating relationship building between the client and contractor. Collaboration is key, with each party learning from the other through transparency and knowledge sharing.
- Incentive schemes should be carefully considered to avoid unintended consequences, while actively encouraging innovation in OHS.

Internationally, there are examples of how government agencies have worked to consolidate, standardise, and promote responsible procurement practices. Examples from Australia, London, and the EU feature below.

Australia: The Model Client Framework was a resource designed to help Australian Government agencies to promote safe construction, incorporate OHS into their procurement and project management practices (Lingard, Blimas, Cooke & Cooper, 2009). The framework allows government agencies to operate consistently with respect to OHS management in construction projects. The approach centres on ensuring that OHS information is fed through the supply chain from the client, to the designer, the constructors and then to the end-user. Imbedded into approach is the idea that client-led decision making that prioritises the integration of OHS into all aspects of the project can improve OHS performance in construction projects (Lingard, et al., 2009).

London: At a regional level, Transport for London (TfL) as an example, has adopted a responsible procurement approach which include Work Related Road Risk (WRRR) requirements in all contracts with suppliers and has been given top level support by the Transport Commissioner. Tfl have changed more than 400 contracts to include WRRR requirements. Operators can use FORS, developed by TfL, to demonstrate that they meet the WRRR requirements and are a quality operator.

The EU: The Swedish Transport Administration have together with five major buyers of transport developed a tool for the procurement of transport process called *Systole*. A platform has been provided for goods owners and transportation companies that value sustainability and safety to facilitate ongoing dialogue during contract negotiations (Bidasca & Townsend, 2015).

Also in Sweden, the Public Employees' Negotiation Council (OFR) together with the Swedish Confederation of Professional Employees (TCO) put together a handbook[17] on public procurement in accordance with the procurement laws LOU (Law for public procurement) and LUF (EU directive on procurement by entities operating in the water, energy, transport and postal services sectors (2014/25/EU)) and in accordance with the law on valfrihetssystem (LOV – Law allowing for free choice over who delivers the service). The guide helps trade union representatives, in collaboration with their employers, to set standards in the procurement process that ensure minimum working standards are met.

A similar type of guide has been created by the EU (Cities As Responsible Purchasers in Europe) CARPE project 'CARPE Guide to Responsible Procurement'[18] which addresses, amongst other issues, how working conditions can be safeguarded through public contracts. These include technical specifications that detail health and safety standards to be fulfilled by the contract; purchasing authorities can use selection criteria to filter out companies that do not comply with legislation concerning protection of employees; assessing (using the award criteria) the quality of contract delivery, which often is closely linked to staff motivation and working conditions; in the contract performance conditions, buying authorities can underline the supplier's obligation to adhere to social standards.

4.9. Summary of the document review

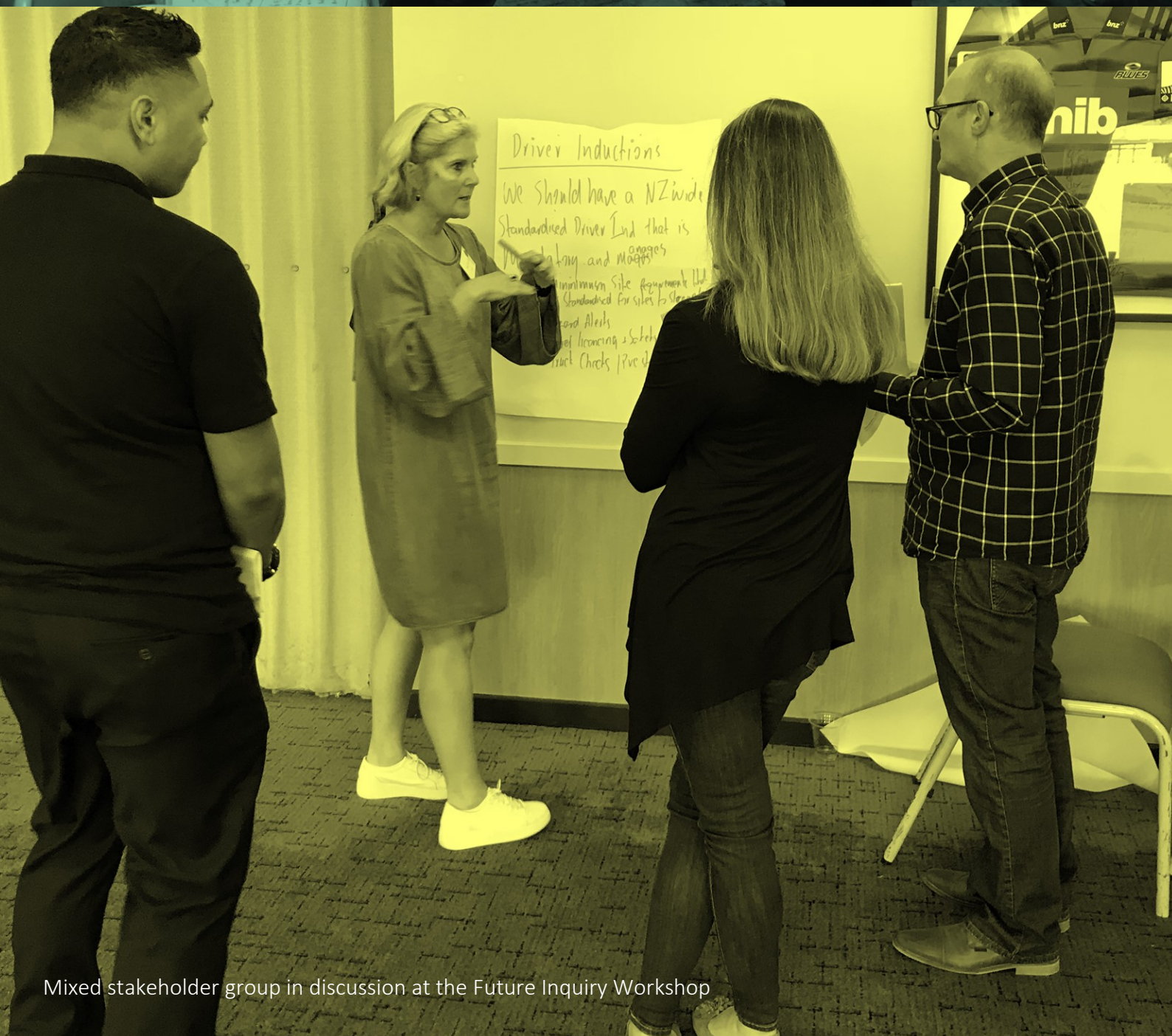
The areas of intervention described above were predominantly focused at a regulatory level and in some cases consider the industry and organisational levels. Though they used different terms, many sources mentioned the importance of collaboration (e.g. Lingard et al., 2019; ILO, 2020) in efforts to reduce harm. Issues where there is little agreement such as Safe Rates, will require

[17] https://www.ofr.se/wp-content/uploads/2019/01/ofr_offentlig-upphandl_final.pdf
[18] http://nws.eurocities.eu/MediaShell/media/CARPE_guide_to_responsible_procurement_secondedition-SMo_2722.pdf

greater co-ordinated efforts to first agree on a way forward. Weaving social dialogue through all areas of intervention is one way to facilitate such efforts.

Absent from the document review are specific details on how organisations manage risks across the supply chain. The case studies in section 5 below provide that detail, placing the information in a New Zealand context. Many of the organisations adopted approaches discussed above such as social dialogue and worker participation, the chain of responsibility, and the setting of their own safe rates and safe working hours (surpassing their legal and regulatory duties).

Stakeholder group in discussion at the Future Inquiry Workshop



Mixed stakeholder group in discussion at the Future Inquiry Workshop

5. CASE STUDIES

The case studies included in this research provided insight into approaches currently used by individuals, organisations, and groups in New Zealand who are working to manage risks across the supply chain. Each case study takes a close look at one or several approaches used, nesting the approach in context. Some have requested anonymity and hence the names of people and organisations are not used in all cases.

There are five case studies included in this project.

1. A distribution centre integrating safety across the supply chain
2. The Log Transport Safety Council – Co-ordinating safety efforts across the supply chain
3. Forklift loading and site management – Engagement and safety across the supply chain
4. A transport company – Improving culture and consistency of working conditions across the supply chain
5. Using information and technology to support safety outcomes

Accompanying case study maps

Each of the five case studies has accompanying map(s) used to display how various factors interact. In-depth interviews and access to public information gave the researchers the detail required to complete these maps.

Given the various nature of the interviews and the varying role of the interviewees, either a socio-technical or a socio-ecological map has been chosen for each. If, for example, the interview was based solely on the perspective of one manager, then a socio-ecological map has been used as the interventions centre on their experience. If, on the other hand, information was shared about company policies, procedures, plans or the like, a socio-technical map was chosen.

5.1. A distribution centre integrating safety across the supply chain

The problem

The management team in a large distribution centre were prompted to review their approach to safety due to a significant injury. This operation was busy and complex.

There was some awareness across the organisation of the presence of potential hazards around vehicles. However, a review of the wider system identified several factors that needed attention:

- The complex arrangement of contractors and sub-contractors in and out of the production site meant that inductions and safety messages were inconsistent.
- There was also inconsistency in how workers operated across different shifts.
- This was an extremely busy operation, with constant pressure to meet demands for outgoing and inwards goods movement.
- The loading area was old and poorly designed.
- There was an assumption among management that the safety of the operation was adequate, and as no serious accidents had occurred action was not perceived as urgent.

The risks associated with such factors can be compounded by:

- *An organisational culture which was reactive rather than proactive towards safety.*
- *Inadequate and inconsistent communication between supply chain members.*

The solution

The serious injury and investigation were catalysts to initiating and implementing changes within their organisation and across the supply chain.

- The managing director and senior management team offered **immediate and total commitment**, trust, and support to turn intended good practice into clear actions.
- Safety was explicitly **integrated and prioritised** in day-to-day operations and an environment created that was conducive to safe behaviour.
- **Consistent communication** was key, and inductions were reviewed and updated for all employees and contractors, and across all shifts. Improved criteria for contractors were imposed.
- The **leadership team** underwent training to develop key competencies and enhance the consistency of actions and messages towards safety.
- **Immediate site improvements** were made including driver safety zones, clear loading instructions, and improved supervision.
- **Quick responses** to identified risks improved trust between workers and management.
- **The urgency and commitment to safety** was reflected in adjustments to accompanying policies and procedures.
- **Active engagement** with all levels of the supply chain was employed to identify strengths and weaknesses of operations and to identify areas for collaborative improvement.

The impact

- There were clear improvements in the organisation's safety culture including greater **worker participation** in safety matters.
- **Consistent communication** meant everyone's opinion and actions counted - all workers, contractors or employees, were informed and involved, **preventing incidents** like the one above.
- A shared mission to maintain high safety standards was adopted in large part due to a **committed and skilled management team** placing safety as critical and urgent.
- Potential incidents were **prevented** when managers responded to identified risks **immediately** including, when necessary, a stop to production.
- **Buy-in and adherence** to safety procedures, processes and revised inductions increased because they were **developed collaboratively** with key, partaking members.
- There was **increased reporting** of relevant incidents and hazards among operators and contractors. Visible and timely responses from management improved the frequency of reporting.

Wider application

Four areas of focus highlighted by this example are supported by international literature[19]:

1. *Organisational culture*
   To develop a strong culture of safety, involve stakeholders across the supply chain (including owner drivers, contractors, employees, and management) in identifying and addressing critical risks, to strengthen relationships, as well as increase buy-in and adherence.

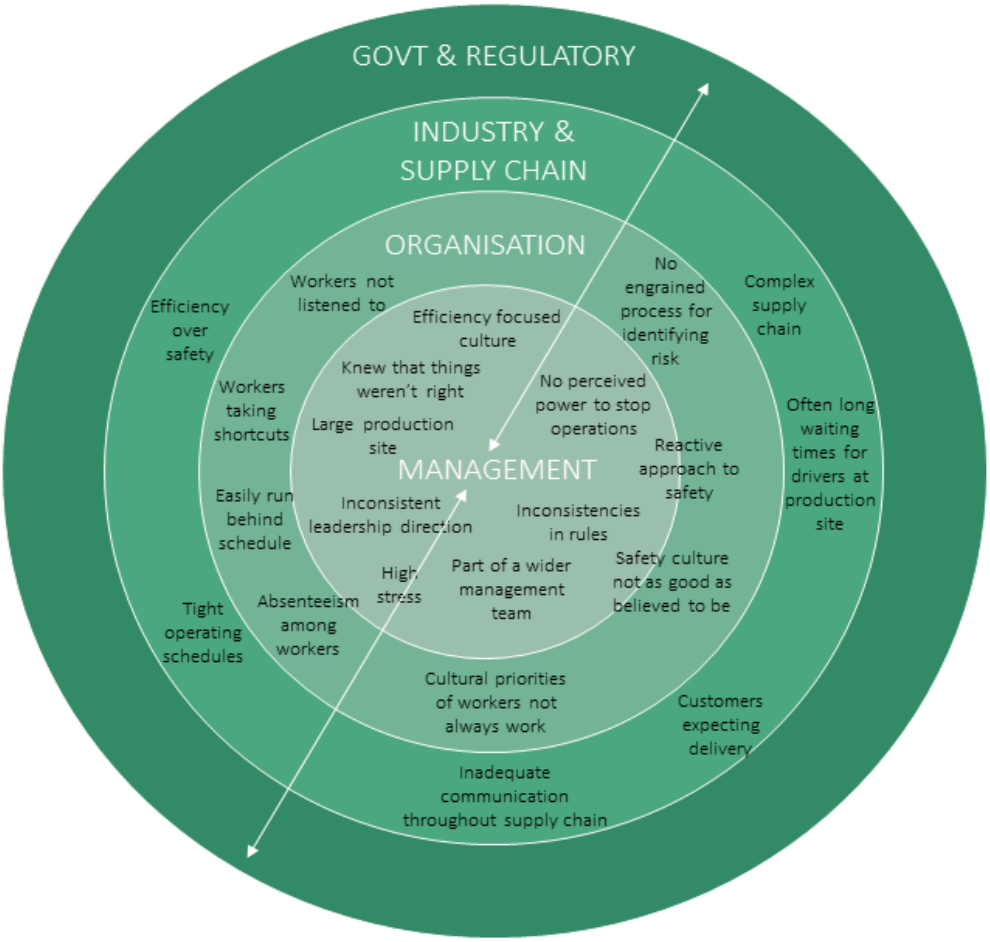
   Management trust, support and commitment is essential.
2. *Communication*
   Deliver clear, consistent messaging and education, developed by those who stand to be most impacted by safety measures as well as those able to enact them (senior and middle managers, contractors, operators, drivers, and employees).
3. *Upskilling*
   Take obvious and immediate action in response to reported or observed risks and hazards without delay where possible. This requires equipping staff with the necessary skills to react appropriately.

   Provide leaders and workers with the skills and means to:
   - Prioritise and integrate safety across the whole supply chain
   - Be involved in safety conversations
   - Measure performance
   - Facilitate positive culture
4. *Management competencies*
   Provide senior management and leaders with information and tools to:
   - Develop their safety knowledge and appreciate the impacts of different roles across the supply chain
   - Act on safety breaches and understand information and metrics
   - Facilitate their understanding of what drives behaviour
   - Enable them to measure and improve safety culture
   - Develop internal trust among the management team so each are supported in their decisions and actions

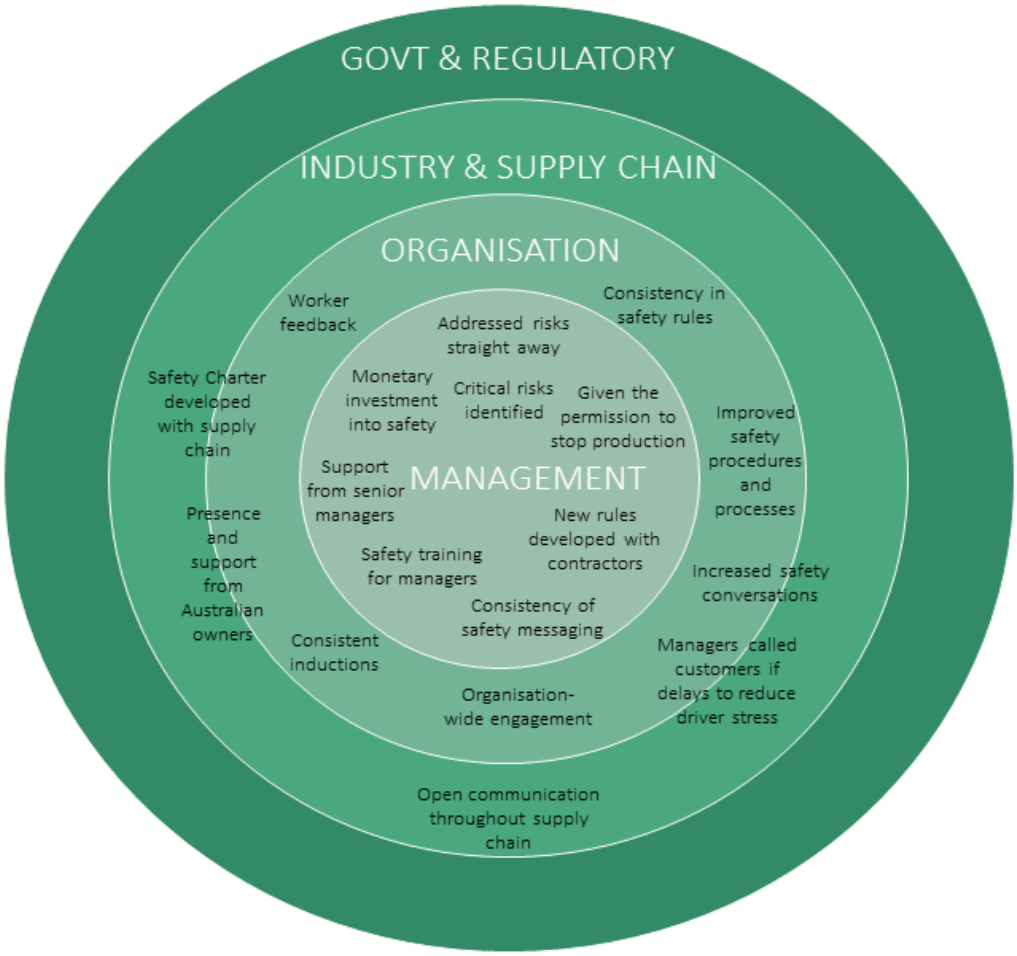
[19] For example, Thornthwaite and O'Niell, 2017; Nævestad, Elvebakk & Phillips (2018)

Case study one: Two socio-ecological maps

The below socio-ecological maps depict a before and after; the first (Map 1) showing factors that led to poor safety outcomes, the second (Map 2) showing where the implemented interventions feature within the system. At the centre of the rings sits an experienced General Manager of Logistics, offering their insight into firstly what was wrong and then what was improved. The arrows in the first map depict how the decisions made at the managerial level impacted the organisation and the industry/supply chain, and vice versa. In the second map, it was not as clear where the arrows sat, changes were predominantly made by the senior managers, though influenced by information collected from workers and supply chain member engagement.



Map 1: Case study one: Areas of concern



Map 2: Case study one: Solutions implemented

5.2. The Log Transport Safety Council – Co-ordinating safety efforts across the supply chain

The problem

In the mid 1990's, there was considerable concern about the disproportionately high numbers of logging truck rollovers, with an estimated 60 logging truck rollover crashes every year.

It was clear that the poor stability of logging trucks was of significance, as well as many other factors impacting on log truck safety.

Despite some attempts at implementing risk management measures, rollovers and other log truck related injuries were ongoing due to:

- Poor truck and trailer design
- Unstable loads
- Limited and piecemeal knowledge about safe practice and design
- Compromised infrastructure
- A wide range of stakeholders with different knowledge, goals, and challenges

The risks associated with such factors can be compounded by:

- *Little coordination of design or other intervention measures across the supply chain*

The solution

To address the number of rollovers, forest owners, log transport operators, trailer manufacturers the Road Transport Forum (RTF), transport engineers and researchers met to develop a plan; and the Log Transport Safety Council (LTSC) was established.

Over time, the LTSC has been restructured, with an executive team representing log transport operators and forest owners that leads activities. The role of the LTSC is to work with Waka Kotahi to develop measures and strategies to improve the safety of log transport. The LTSC has four key strategic goals:

- Provide **leadership** in all areas of the Log Transport Industry
- Develop **Sector Guidelines** to promote safety in the workplace
- Provide a **reliable source of accurate sector-specific information**
- Develop **clear and effective communication** with the wider community

The executive team coordinates industry initiatives, each having an area of responsibility. Meetings with the larger body of members facilitates feedback and communication, for ongoing work and to stimulate new projects.

Activity focuses on key areas of interest including:

- Research and development and industry standards
- Publicity and promotion
- Legislation
- Driver training and education.

The impact

The LTSC is an effective and collaborative group covering all areas of the supply chain, and a primary source of research and industry knowledge.

A key component for its success is having **representation** of and **communication links** with key supply chain groups, including the Forest Owners Association, RTF, government bodies and research organisations, manufacturers, and operators. Successful outputs include:

- A decline in the rate of log truck rollovers, and improved safety in other areas of log transport.
- Research and investigation into vehicle design and other technology leading to improved truck and trailer designs.
- Implementation of industry standards for log transport equipment and design.
- Training and education initiatives in Transportation of Logs - an accreditation programme for log transport operators driving heavy combination vehicles.
- LTSC training pathway designed by industry for industry.
- 'Fit for the Road' programme.
- A focus on Health and Welfare.
- Sleep apnoea programme.
- Training and moderation of Log Bolster Attachment certified engineers.
- LTSC Contractor Certification.
- Consistent messages and information; and regular communication among members via newsletters, safety alerts and reports.
- Strengthened links with community through a 'Share the road programme'.
- Development of a shared database of incidents, representing the whole supply chain, which is used to facilitate injury prevention analysis and target safety improvement initiatives.

Wider application

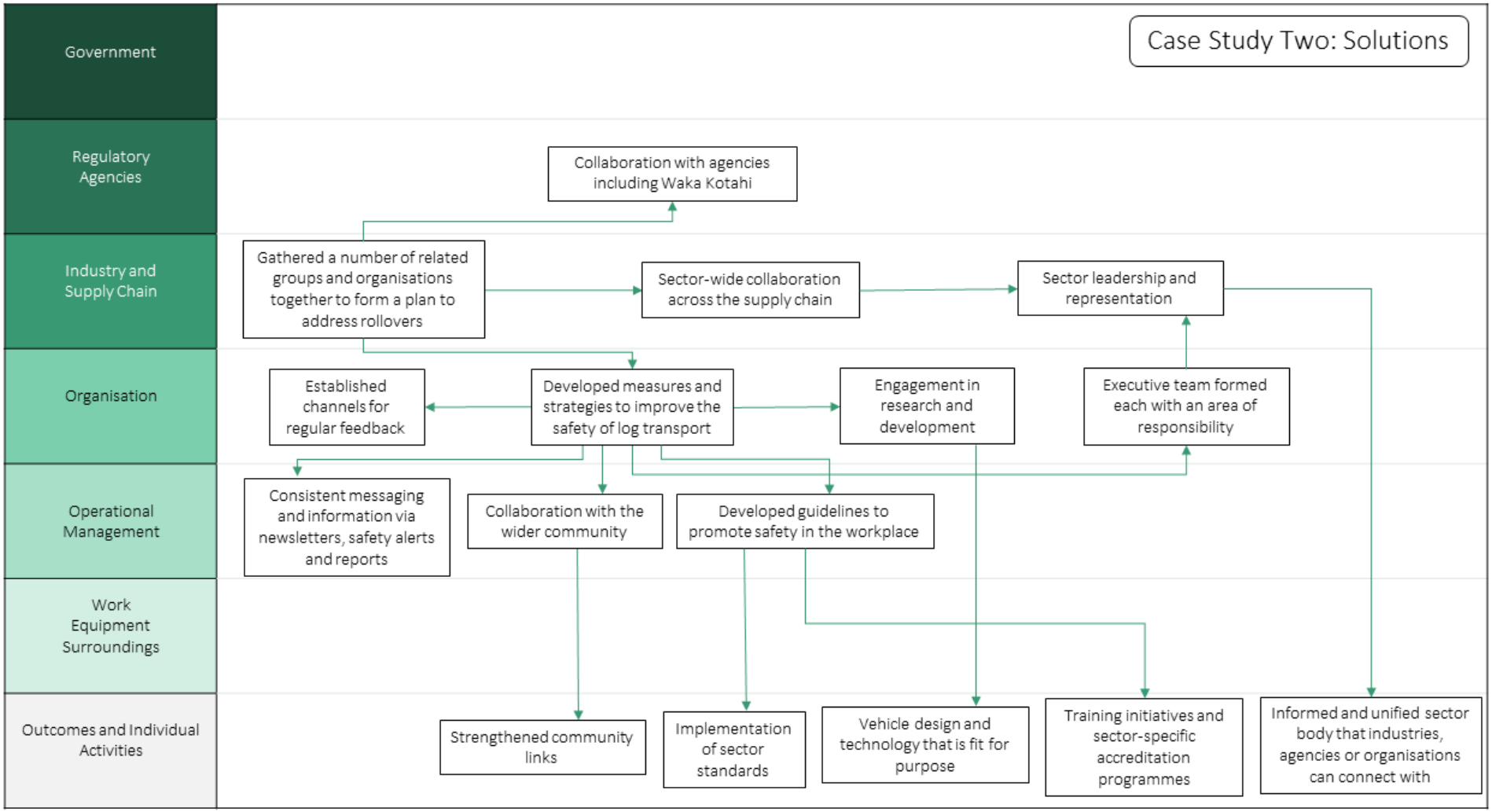
- Effective **communication strategies** and practices are recognised internationally as being an important factor in facilitating a sustainable and socially responsible supply chain.
- In New Zealand, **sector leadership** and collaborative cohesive representation of the supply chain has been identified as an important step for improving vehicle safety.
- The LTSC model is one example of a mechanism for sector groups to work with different stakeholders within the and also outside a supply chain.
- Developing structured links between sector groups such as LTSC offers a way to **connect nationally** and draw upon existing experience and representation, whilst retaining sector identity.

Key means to implement change:

- Involve the right people: an effective group needs **supply chain representation** including members with the authority to act.
- Establish **key goals and planned actions**; use an iterative process to measure success, allow the group to adapt to change and to introduce new projects and solutions.
- Establish means for **regular feedback**, for example by working alongside other groups, to keep relevant and focused.

Case study two: A socio-technical map

The map below (Map 3) shows how the reported impact of the Log Transport Safety Council reaches across many levels. Each of the factors included in the map have, according to the interviewee, contributed to a decline in log truck roll overs and an increase in safety throughout the sector. Key to their success, and central within the map is the collaboration between a wide number of key supply chain members and their combined efforts to develop sector specific measures and strategies. Another key element to their success is the strong system leadership they display, giving external groups, agencies, or organisations a sector-specific body with which to consult or partner.



Map 3: Case study two: Positive impact of the Log Transport Safety Council

5.3. Forklift loading and site management - Engagement and safety across the supply chain

The problem

A serious injury occurred in a large distribution centre during the loading of a truck and trailer by forklift. The truck driver, an employee of a sub-contractor, was hit as a second forklift assisted with loading. The truck driver was unaware that a second forklift was operating and was hit whilst moving around his trailer.

This incident stimulated a need to better understand some of the wider systems factors that might have led to this outcome, and to address a range of issues such as:

- A reactive approach to risk
- Inconsistent rules for different shifts and workers
- The varied pressures among people working in different parts of the supply chain, which impacted their work practices
- Limited engagement with supply chain parties
- Variation in technologies, training and practices adopted among carriers and drivers
- Significant variations in the design of loading areas and approaches.
- Inconsistent approach to traffic management plan, line marking and exclusion zones

In summary, key issues included:

- Inconsistency of information, training, and procedures
- Minimal engagement between members of the supply chain
- Reactive safety management

The solution

The organisation, a large influential player, made an active move to examine their activities across the supply chain, to identify areas where they could influence change, including:

- Vehicle specifications and use of safety related technology
- Safety specifications embedded into contracts
- Increased engagement and involvement of carriers in the creation of policies and procedures
- Executive level involvement in risk management planning and operation
- Active management of driver fatigue and wellbeing
- Speed management
- Identification and implementation of improved design for loading areas
- Traffic management plans, line marking and exclusion zones
- Driver training and induction

Key to all activities was an effort to **develop strong engagement** between the organisation and all parts of the workforce. This included: store owners, senior managers, the board, carriers, individual contractors, and drivers. **Collaboration** helped to overcome initial push back from the carriers and develop a shared commitment to safety in way that worked for the parties involved.

A **Safety Charter** was developed to improve consistency of operations across the different carriers and contractors. This detailed minimum standards for vehicle design, training and operation and introduced an expectation to meet certain components as part of tenders and ongoing contracts.

Specific areas of risk were identified and addressed, resulting in **physical design improvements** and introduction of new **equipment**. A cross section of people representing the different aspects of the supply chain were involved in developing interventions, including transport experts, contractors, engineers, and senior managers. This **engagement** resulted in good outcomes for all affected parties.

Chain of Responsibility principles were adopted despite any potential commercial disadvantage, reflecting the organisations understanding of the costs to carriers associated with implementing safety measures.

The impact

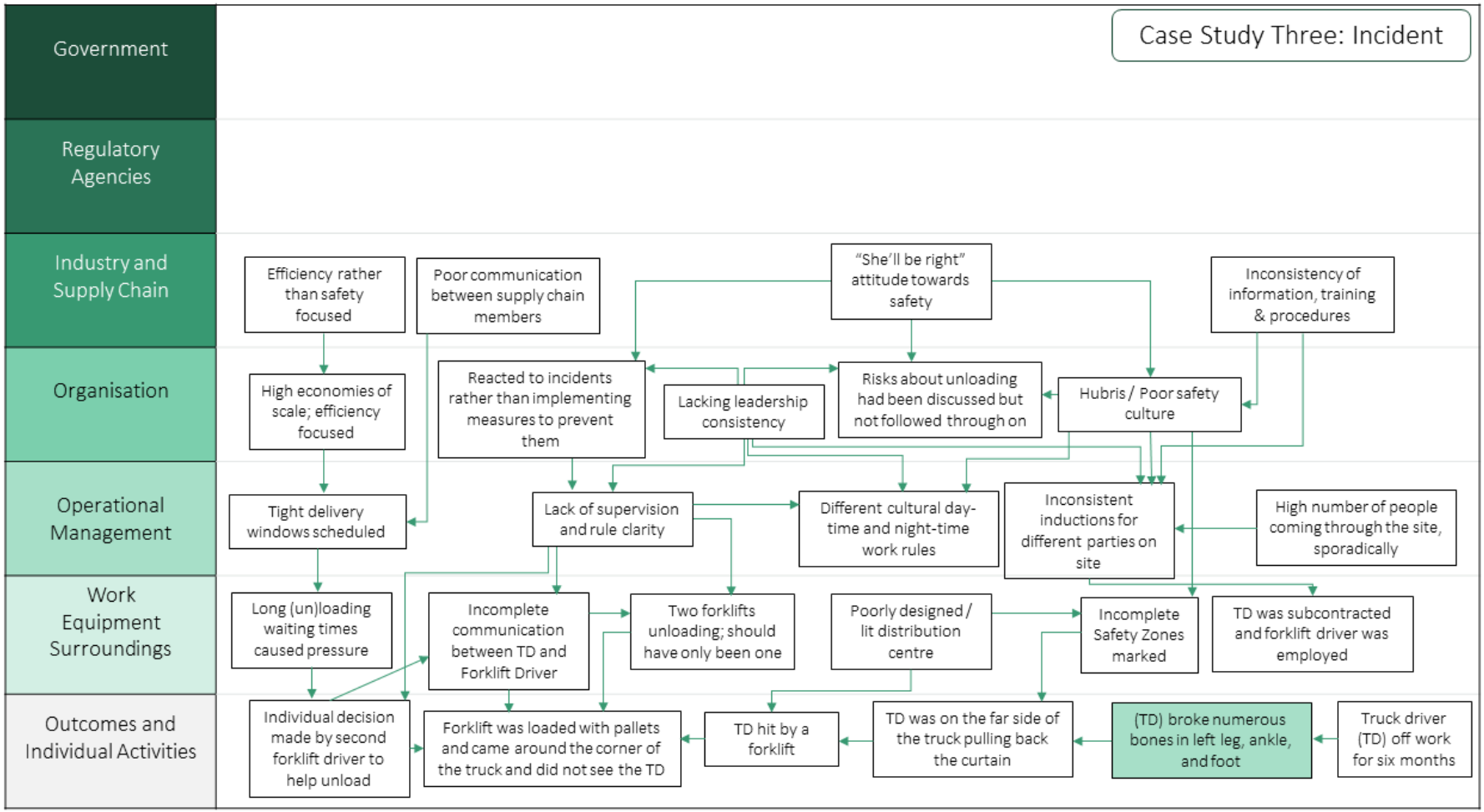
- Road safety and vehicle risk management is becoming more **embedded as part operations** as they look to continue to improve their overall approach to safety.
- Visible developments in **physical site design**/layout also resulted in increased reporting and communication – further facilitating an **iterative** process of improvement. This helped to reduce stress among drivers, reduced the number of minor damages to the fleet and benefited the carriers who were losing money to such damages.
- Better **communication** with stores allowed development of localised improvements and exploring ways to make the job easier, for example in loading areas. This has resulted in a reduction in minor vehicle damage.
- A wider understanding of safety across the whole system among **senior managers**, accompanying 'safety charter' requirements, led to better outcomes for route planning and management of vehicle risk. Additionally, it ensured decisions made for safety reasons were widely supported.
- Coaching and targeted interventions occur following a reported event.
- Ongoing contracts and tenders account for safety costs and provisions associated with charter requirements.
- Driver awards ensure that safety is acknowledged and rewarded and that the contractors are considered a part of the team.
- Data is reviewed by the senior management team all the way up to the board level.

Wider application

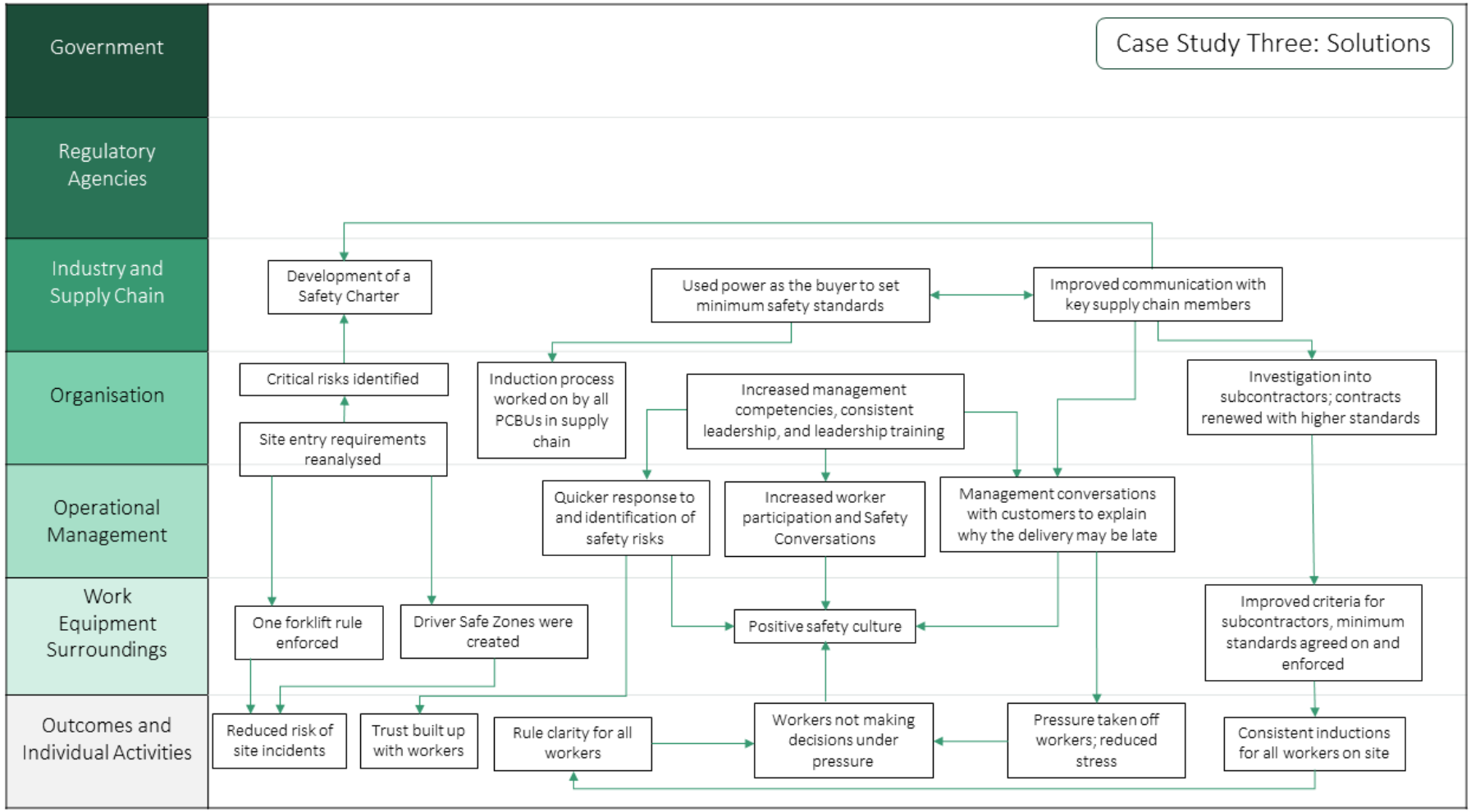
- There is international support for use of charters or minimum standards/ specifications for vehicles and driver education and induction, to facilitate consistency across different supply chain parties.
- These can relate to tasks, people, and vehicles - for example, incorporating maintenance programmes; vehicle specifications; induction and other training.
- Specific fleet management systems can be used to monitor preventative maintenance and consistent training – especially when embedded into tenders and contracts. Long-term contracts can help the business case for carriers and drivers to invest.
- Management systems or schemes can include keyless access control and ensuring that only authorised drivers with current training credentials can use specific equipment.

Case study three: Two socio-technical maps

The two maps below show how a series of factors led to a serious incident between a truck driver outside the cab and two forklift drivers unloading the truck. The first map (Map 4) displays the incident and has been created using information from a publicly available WorkSafe Enforceable Undertaking with the addition of information from several interviewees. The second map (Map 5) shows how the organisation reportedly implemented certain changes, how the changes interact, and at which levels they were rolled out to avoid such an incident occurring again.



Map 4: Case study three: Incident



Map 5: Case study three: Solutions

5.4. A transport company - Improving culture and consistency of working conditions across the supply chain

The problem

In addition to the long shifts allowed with in the work time rules, commercial pressures, industry culture and individual decisions can impact on the length of time drivers work as well as the demands placed on them to complete the job.

The sorts of factors that can contribute to decisions that lead to long hours and driver stress or pressure include:

- Inconsistency of expectations and behaviours across different roles in an organisation and across the supply chain.
- Contractors operating under different working conditions to employees.
- Strong incentives for drivers to engage in risky driving behaviours, driven by customer pressures and pay schedules.
- Macho culture and a lack of awareness about potential consequences arising from decisions.

The risks associated with driver fatigue can be compounded by:

- *A culture of disregard for the legislation*
- *A lack of awareness among different roles in the supply chain about how their decisions impact on potential risks and outcomes*

The solution

One company embarked on an extensive programme to change the culture of their whole workforce, including contractors and employees. They identified a need to improve communication and trust between different areas and operators of the supply chain; and to develop a better understanding of the implications for all decisions.

This involved a commitment from management to prioritise the physical and mental health of the whole workforce:

- A **driver committee** was set up to facilitate communication and participation.
- All workers – employees and contractors – were expected to meet the same safety standards and requirements.
- **Consistent rules, policies and procedures** for contractors and employees were implemented. All contractors are required to have these in place.
- The company made a commitment to **share their resources** with contractors and **assist** new contractors to meet the standards.
- The health and safety of the driver and the ability to complete a job within a reasonable timeframe, were embedded alongside legal requirements rather than managed as separate issues.
- The allocation of work explicitly **considers the implications for drivers** and is adjusted with changing conditions.

The impact

- Drivers given sufficient hours to meet their expectations and needs, and the culture and communication allows flexibility and **adaptation to conditions and changes**.
- Dispatch are regularly in touch with drivers and support them to stand down if they identify problems; they **communicate** delays down the line across the supply chain to help relieve driver pressure.
- **Communication** between different team members, in particular dispatch and drivers, is routine, supportive, positive, and effective.
- The **driver committee** group meets monthly and quarterly, further contributing to the **communication** and strengthening the understanding of the challenges faced.
- **Worker participation** and **feedback** helps the company meet legislative and moral requirements and has enhanced trust and pride across the organisation.
- A 'speak up' policy **supported with technology** such as i-pad communications supports ongoing improvement, trust, and worker engagement.
- Whilst contractors are paid by the km rather than a salary, the regular **communication** and **feedback** ensures that the allocation of their work is suitable, achievable, and safe.
- The organisation can operate as a safe, efficient, and socially responsible company.

Wider application

Making cultural and procedural changes requires **consistent treatment of employees and contractors**, ensuring all workers are safe and healthy at work. Research has shown a connection between contract work and poor health and safety outcomes, due to a lack of involvement / participation, limited organisational support and OHS information, increased workload, low opportunity for training, and long working hours linked to payment structures[20]. The company in this case study successfully put provisions in place to protect the drivers they contract.

Other important components include:

Champions*:* recruit or upskill an individual or team that is knowledgeable, motivated, and resourced to identify suitable interventions and barriers to implementation.

Engagement of **subject matter expertise:** worker participation and involvement of people that understand the work is essential.

Management commitment and support: to promote and facilitate implementation of changes.

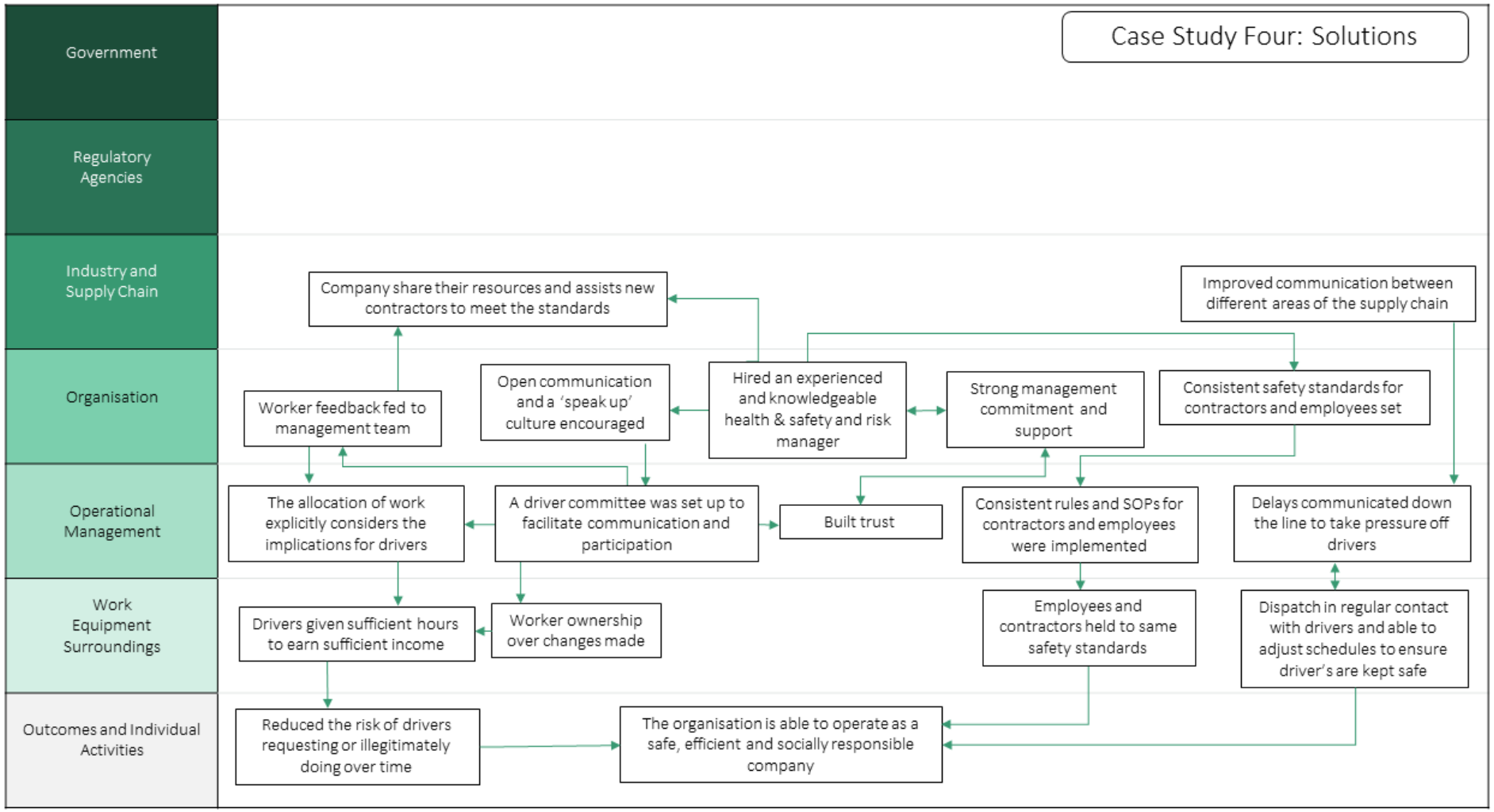
Dialogue between representatives of government, employers, and workers to improve road safety.

Extending organisational responsibility to ensure suitable conditions for drivers across the supply chain, e.g. facilities at loading areas.

[20] Quinlan, Bohle & Lamm (2010); Mayhew & Quinlan, (2006); Underhill & Quinlan (2011); Walters & James (2011); Tedestedt George (2018)

Case study four: A socio-technical map

The map below (Map 6) shows how a series of interventions reportedly improved safety standards for both contractors and employees alike. Sitting at the centre of this map is the hiring of a health and safety expert who, as a previous truck driver herself, gained rapport with the workers, and was a key catalyst for change. It was quickly realised that contractor management was key to improving safety. The organisation assisted contractors with meeting the safety standards, provided resources and worked with the contractors to ensure fair work allocation.



Map 6: Case study four: Solutions

5.5. Using information and technology to support safety outcomes

The problem

A company with many service providers on the roads reviewed their organisational reports and New Zealand data to identify mechanisms that were leading to crashes and incidents. Factors they identified included:

- Exposure to risk was high, with many staff on the road every day.
- Routes and destinations were not always planned, particularly as work includes emergency and urgent call outs.
- Staff work across the country, often travelling through isolated areas.

- *High exposure to vehicle-related harm due to number of vehicles and workers on the roads*
- *High degree of variation with little control over workload and destination*

The solution

A holistic approach was taken, to consider the whole system to develop a Safe Driving Policy that was relevant, fit for purpose and incorporated across all areas of the business.

As part of this solution, the organisation implemented a telematic solution, initially designed to record vehicle location and activity. Components that were key to implementing the Safe Driving Policy included:

- Active involvement and **communication** with drivers. It was important to promote engagement between **employees and senior managers**, and to communicate a clear purpose – be 'open' about goals and expectations.
- **Education** and **information** to support implementation of technology and policies/procedures.
- Positive **feedback** and reinforcement of safe driving messages. Input from **workers**, led to development of a positive reward system (as opposed to a focus on negative feedback).
- Working with a telematics company to determine and implement a tailored system – able to meet specific criteria according to the organisation and employees.
- The formation of, and engagement with, an **Employee Committee**.
- The development of suitable **policies and procedures**, and resources to support drivers.

Implementing the technology

The process involved initially setting up a trial among a small team, then adding functionality according to feedback and needs.

As usage was developed, the technology was disseminated and built into more of the fleet.

- Functions included safety checks run prior to a job starting, with results fed back to managers.
- The use of an app for the vehicle checks facilitated daily quick checks and more detailed monthly inspections.

The impact

- The number of crashes and the number of infringements reduced. This includes a 60% reduction in reversing incidents, and 55% drop in 'at fault' crashes.
- Feedback from the telematics along with other organisational markers is used to identify top drivers for quarterly rewards ($100 gift voucher).
- Employees are actively engaged and regularly seek further information and feedback or make suggestions.

Wider application

International evidence indicates that there can be **significant safety benefits** in using technology to **support a systems approach** to managing vehicle-related risk[21]. Examples of technologies include telematics, vehicle safety systems such as Intelligent Speed Assist, collision warning systems, and Drowsiness and Distraction Recognition (DDR) systems.

Technology can effectively provide employers with **relevant information** about safety related events or driver behaviours.

1. Communication and feedback
Evidence suggests that **strong leadership** and **early worker engagement** is essential. Using a system that involves management **feedback**, rather than relying on in-vehicle feedback, is critical. Positive engagement and goal setting, for example by using a rewards system, is more effective than in-vehicle alerts alone.

2. Clear purpose for use of data
Focused and user-friendly data reporting systems are essential. It is important to identify what indicators are most useful to assist in management of vehicle-related risk specific to the organisation, and the frequency of analysis. For example, it is useful to analyse detailed data quickly following an incident, to help determine contributing factors; conducting a routine review of key indicators will help to identify trends.

As well as providing feedback to drivers, and assisting in investigating incidents, data can also be used to **inform management decisions**. Examples include to:

- help inform planning work schedules or routes e.g. to better account for periods when drivers are most fatigued, or eliminate unsafe routes
- stop employees from driving if fatigued
- improve or update route planning
- ensure weight / mass management
- ensure fleet maintenance is carried out
- monitor stop and idle times as well as driver hours and fatigue

3. Documented policies and procedures
Policies and procedures need to be supported with relevant resources and developed in **consultation** with drivers. In particular, the management and storage of data needs to be planned in consultation with drivers, carriers, and other supply chain members. It is important to consider worker safety (for example with respect to video footage) and privacy.

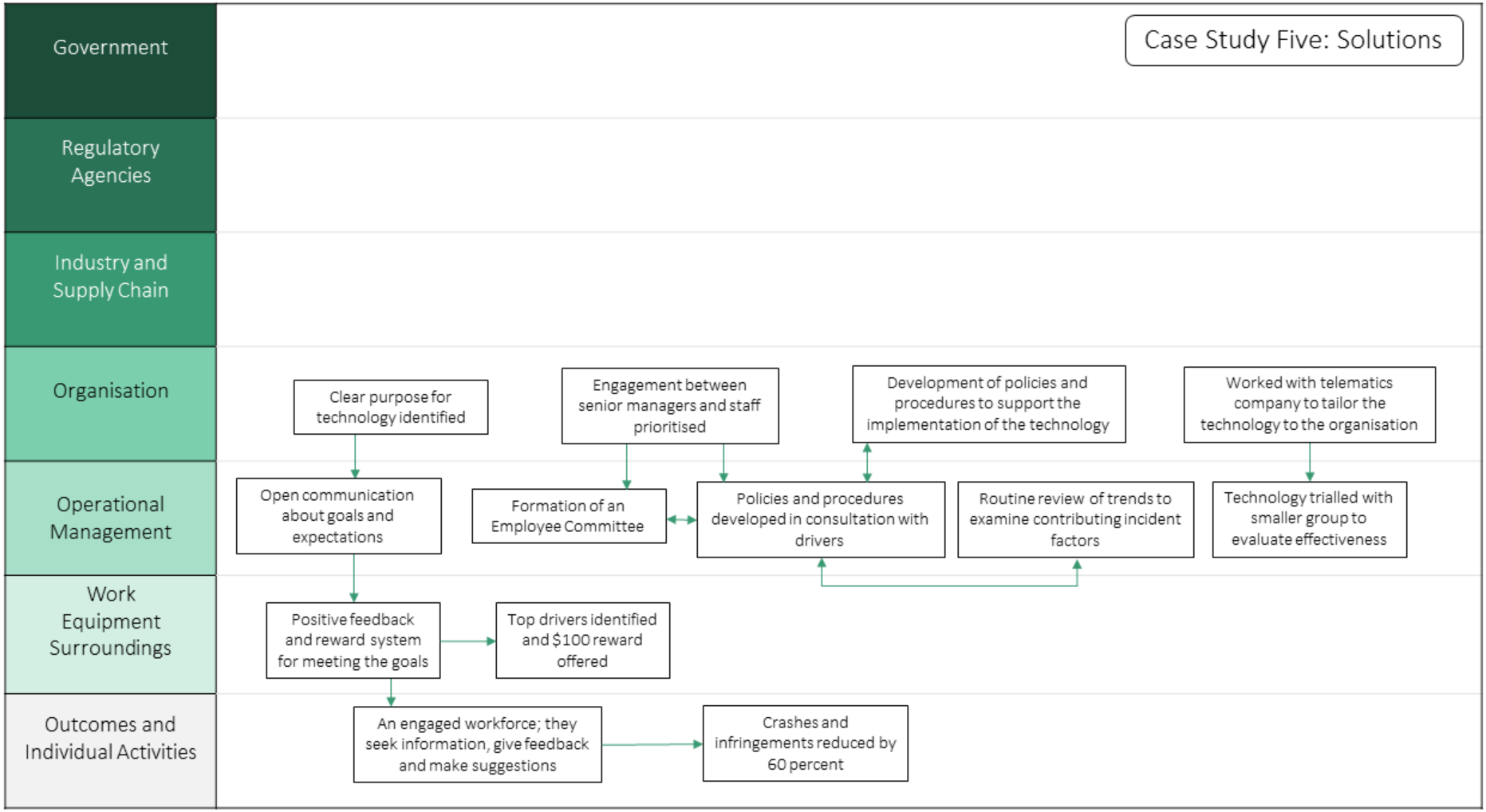
4. Trialing and development
Trialing a system within a defined group allows **evaluation** of what functions might be required and can help determine what further features might be valuable if a lager rollout is implemented. An **iterative process**, involving driver feedback, facilitates development of a tailored – and cost effective – system.

Evidence suggests it is preferable to monitor the smallest number of indicators to enable effectively managing the risks – this initially may include: speed, harsh braking and acceleration, swerving and cornering. Further, overly complex data and systems result in underutilisation and dismissal of potentially useful information. It is important to therefore focus on only what is needed to address the specific safety risk.

[21] Pyta, et al. (2020); Sullman, (2020); Krum et al (2019).

Case study five: A socio-technical map

This map (Map 7) shows how the organisation used technology alongside safety policies and procedures manage risks. There are a series of multi-directional arrows featured in this map as the organisation understood the importance of worker engagement and feedback when introducing and operationalising technology. The use of a reward system was, according to the interviewee, only effective because they had a healthy safety culture prior to the introduction of the vouchers. This is supported in the literature; Oswald, Sherratt and Smith (2019) that safety rewards are only effective if the protocols around them are deemed fair. The interviewee noted that it was the drivers themselves who suggested the reward system be put in place and frequently the health and safety manager receives phone calls from the drivers to ask for information on how they can better their performance and get higher up the leader board.



Map 7: Case study five: Solutions

5.6. Summary of the case studies

Consistently throughout the case studies, participants noted the importance of senior management commitment, supply chain and worker engagement, leadership, consistency and communication, technology, and management competency as being key to harm reduction. Their acknowledgment of supply chain pressures was evident, particularly as the participants sought to engage widely when implementing change.

Strong leadership both at a system level (leadership among supply chain members or within a sector) and within organisations was a key component employed by participants consistently throughout the case studies. Within organisations, commitment from senior management to safety meant that top-level, strategic decisions and actions aligned, and a positive safety culture could unfold from the top. Under such management, health and safety champions were supported financially and in other ways and taken seriously when difficult decisions had to be made. Quick action could therefore be taken when harm was identified; training and upskilling also meant identification was happening more often also. Engagement and trust among workers grew as safety and potential harm incidents were responded to swiftly. Engagement among with supply chain members meant, in most cases, improvements for all parties involved.

Inclusion of supply chain members and engagement with workers required clear, consistent, and regular communication. Communication was mentioned frequently throughout the studies, woven through interventions such as technology implementation, worker participation, trust building, and growing a positive safety culture. Managers mentioned how consistent communication with both employees and contractors alike ensured safety policies were understood, effective, and relevant to the parties they sought to protect.

Safety policies went hand-in-hand with the implementation and successful adoption of technology. Where technology was a feature in efforts to manage risks, organisations ensured drivers and workers were supported in their use of the equipment and were clear on how the data was being used. Participants were using data, in some of the organisations, to better inform their decisions and ensure risk management efforts considered wider, supply chain factors.

Notably, many of the organisations that participated would be considered large in size and as a result held a level of positional power in the supply chain. Participants interviewed took this role seriously, understanding the responsibility and influence they had particularly when setting minimum standards

in contracts and site inductions. The participants and their group or organisations had actively chosen to make safety a priority, in some cases no matter the cost.

These case studies were designed to examine in detail how individual organisations or groups worked to manage risks across the supply chain. It is, therefore, of little surprise that the maps are more densely populated at the levels of the industry and supply chain, organisation, and operational management rather than the top two tiers, regulatory agencies and government. They are subject experts in their respective areas and are less likely to blame external forces of which they have little control.

6. THE WORKSHOPS

This section features the findings firstly from the Future Inquiry Workshop (FIW) (sections 6.1-6.4) and then the two final (and much smaller) workshops (6.5). The findings from the FIW are divided into three sections reflecting the structure of the workshop programme. The day was structured around the *past*, *present,* and *future*, designed to engage participants in developing solutions for managing vehicle-related risks that result from supply chain pressure, business models, contracts and contracting.

It is important to note that what is featured below in the findings from the FIW is the exact wording used by the participants. The researchers have not modified the text to eliminate duplication or to clarify any points nor offered any form of analysis.

Not all ideas shared during the workshop made it to the final synthesis of the FIW data. For an idea to be recorded it must have been noted in written format using the specified Future Inquiry methods. According to the agreement laid out at the start of the workshop, anything not recorded in written format was considered confidential. Agreement was sought from the whole group on any list or data called 'Common features/ points' that is, to determine what the participants commonly want and what they are prepared to work for (Blewett & Shaw, 2008). Common ground is sought as a basis for action "knowing that people are more likely to take action where they have shared commitment" (Blewett & Shaw, 2008, p.3) and making it more likely that difficult areas can be addressed.

6.1. The past

For this session the participants worked in their stakeholder groups. Past issues ranged between the groups however there were common areas of concern. There was broad agreement among the participants about certain aspects of the past that were positive. These included:

- Industry adoption of technology
- The uptake and usage of modern vehicles
- That the vehicle requirement standards had improved
- Evidence of a new willingness to change by government bodies including regulators
- The quality of new roads
- An increasing awareness of business responsibilities

The participants also agreed on several aspects of the past that have not worked well. These included:

- Time pressures compounded by commercial and organisational pressures and a lack of accountability when things went wrong – this was seen to result in a lack of investment (i.e. Training, OHS, technology, equipment) across the system
- An inconsistency in training and site inductions
- Poor procurement processes in buying transport services; siloed government agencies
- Regulations that are not fit-for-purpose; technology not reaching its potential
- Poor road conditions, inadequate infrastructure, and the duration of roadworks
- Inadequate data sets and lack of data sharing

Generally, there was agreement across the system, from the regulators to the workers that commercial pressures and the siloed nature of regulatory agencies were key issues of concern from the past. Equally, there was agreement that poor infrastructure including the high number of road works, and poor data capturing, sharing, and analysis were, in the past, problematic.

6.2. The present

Participants were asked to identify trends, barriers, and supports that they could see in their environment. These were collected as a large group mind map (Figure 7 above) and each participant voted on which of the trends they regarded as most significant. The priority themes from the mind map were (in order of those which received the highest vote):

1. Regulatory stagnation
2. Drivers bearing brunt of pressure
3. Pressures of night shifts on families, individuals, and their health
4. Mixed attitudes to training
5. Road conditions and design not fit for purpose and dangerous
6. Driver shortages
7. Driver fatigue and well-being
8. Limited or no input from workers in Health and Safety programmes

Future Inquiry Workshop participants voting on and discussing the mind

In stakeholder groups, participants examined the mind map and chose a few trends that were important to their group, some listed above, some not. They discussed what they were doing now in response to that trend.

The first stakeholder group: **Drivers and their Advocates** responded to "Drivers bearing the brunt of supply chain pressures" by saying that they were campaigning for Safe Rates, lobbying government to improve supply chain regulation, negotiating agreements that consider responsibility throughout the supply chain, including with large corporates in forestry, oil, and supermarkets.

Stakeholder group two**: Regulators and Government Authorities** responded to "Fatigue" suggesting they are committed to reviewing logbook and work time regulations under the Land Transport Act with a focus on fatigue and maximum driving hours. Further they noted in response to "Regulatory Stagnation" that they are using case law to give clarity on legislation, Waka Kotahi is rebuilding and reviewing rules, and the agencies are taking steps towards joining up and emphasising collaboration.

The third Stakeholder group: **Business Leaders and Advocacy Groups of Non-transport Providers** responded to "Fatigue" suggesting they are reviewing driver wake-up times, focusing on reporting delays to stores, lowering working hours for drivers, randomised testing for contractors, increasing access to toilet facilities, providing rest stop areas, and monitoring health and fatigue levels among drivers. In response to "Setting Standards" they are increasing driving training, vehicle standards, pre-qualifications and setting rules for traffic management. In response to "Clarity of Responsibility" they

are improving traffic management on site including site inductions and working to follow the Australian standard in the form of the Master Code. They further noted they are setting and maintaining standards and incurring the costs.

Stakeholder group four: Educators and H&S Champions responded to "Training" by saying they are partnering with insurers to reduce costs, holding up heroes in the industry and providing sector leadership and guidance on best practice.

Stakeholder group five: Business Leaders and Advocacy Groups of Transport Providers suggested that in general they were running roading campaigns and working to highlight the problems, they were investing in fatigue technology, checking drivers' eating habits and increasing access to facilities. Responding to "Training" they highlighted scholarships they offered, engagement with government, wider sector groups, and drivers, and looking to improve shift patterns and job sharing.

The sixth stakeholder group: Workers and their Advocates responded to "Regulatory Stagnation" through union pressure to improve regulatory standards, encouraging cooperation between stakeholders to change and improve regulations. Additionally, they are working on promoting fair wages in the industry.

Stakeholder group seven: Community, People in the Road Environment and On-road Support said they were increasing public awareness, positively encouraging education and sharing knowledge.

Lastly, group eight: Equipment and Data Providers spoke specifically about how they are creating stocks of data relating to certain aspects of the supply chain.

Common ground between groups was established. Collectively the participants agreed that:

- There is common recognition of the problems and the need for change, but acknowledgement that collaboration, cooperation, and responsibility is lacking
- Sharing data, knowledge, and intelligence was thought to be key and that this collaboration should be interest-led. This collaboration could lead to consistency in training, the development of commonality of standards throughout the industry, and a common model about what is needed for health and safety that does not come from a competitive perspective
- Driver fatigue and health (both physical and mental) were identified as areas of serious concern

- Procurement, processes, and commercial constraints are leading to poorly remunerated drivers and lower safety standards. However, there is little reward or recognition of best practice in the industry, therefore reducing incentive to comply
- Collaboration between government, industry, and community groups is desirable and essential, but is not yet realised
- It was suggested that there was a need for better regulatory support and leadership and that any approach developed needs to be less reactive and more proactive

6.3. The future

Participants were asked to project themselves ten years into an ideal future; to treat 29 October 2030 as the present where vehicle-related risks from supply chain pressures were effectively managed. In mixed groups, participants described the transport sector with its ideal management of vehicle-related risks from supply chain pressures. They were asked to consider what was: feasible (people could do it if they wish); desirable (the whole community would benefit); and motivating (you would work to make it happen).

Many of the groups highlighted zero deaths and zero harm from working in and around vehicles by 2030 as their vision. To do this they promoted increased fatigue management and mandated fatigue management systems plus an increase in safety-related technology, reduced driver hours, increased training, and improved infrastructure for all transport modes. The latter with a desire to see the movement of goods optimised and made more efficient in New Zealand. Another theme was about the need for safety and well-being to be more embedded throughout industry practices, with the need for a clear chain of responsibility. Ultimately there was a genuine desire among the participants for positive change. They suggested that such changes would help to increase the appeal of the industry and make driving a more attractive career path.

It was agreed that reaching the desired goals required more cross-agency, cross-industry, and community collaboration. Levelling the playing field through procurement regulation was identified as important, as was celebrating those buyers of transport who ensured the health, safety, and well-being of their workers. Participants wanted to see data being shared and integrated, health and safety standards incorporated into contracts, and the regulation of safety features, with larger organisations taking the lead. In addition, autonomous vehicles were discussed along with technological improvements which would transform a driver's role and reduce the strain of the job. Improvement to infrastructure and rest stops would further contribute to this as would, vehicles with lower emissions to reduce the health impact on drivers.

6.4. Action planning

From the array of proposed steps outlined above, participants identified 18 broad action themes that they saw as important to work on to achieve the 2030 vision. In no particular order:

- Driver induction (onto sites)
- Safety features in vehicles and improving them over time
- Evidence Cycles: Establishing a comprehensive and shared data stream
- Driver's pay, conditions, and well-being
- Cooperation between government and industry
- Legislative and regulatory review and action – removal of silos – have a common purpose
- Cross-industry and agency collaboration
- System leadership – coherent, collaborative, cohesive industry body
- Preparing for autonomous vehicles
- Infrastructure quality
- Improving procurement for safety
- Fatigue management
- Road to zero/ zero harm
- Sharing information and perspectives
- Road safety actions by government
- Toolbox for sector initiatives
- Sustainable vehicles
- Vehicle safety standards

Self-selected groups worked together to turn some of the action themes into strategy statements and identify the first do-able steps from these actions. Importantly, names were assigned to carry out the first stage of each step and if someone outside the room was nominated, someone in the room took responsibility for informing them. Participants were encouraged to take action on these strategies, independent from the project's formal recommendations, however there may be overlap. Note that not all action themes were addressed on the day – however, this does not mean they were not important – only that the participants in the room did not give them priority on the day of the workshop. The Strategies and people who participated in them reflect the people who are motivated to see action in these areas. The Strategy Statements below are in no order of priority and are in the words used by participants.

Strategy One: Fatigue and well-being

For improvement in this area, background work is needed to understand the nature and extent of the problem. A leadership committee will be set up to facilitate the work to implement this first step. Further, legislative changes are required as well as systematic monitoring to ensure a level playing field. Participants agreed that this was to be an industry and regulator collaboration.

Strategy Two: Digital app-based driver inductions

The development of standardised inductions for drivers on sites requires firstly an investigation of the existing tools, the development of minimum safety standards for sites and drivers, and then collaboration between government agencies and industry to create the equivalent of Site Safe for trucks: Truck Safe. For this, funding is required as well as buy-in from industry and the agencies. The first step is to bring a working group together which includes government and industry.

Strategy Three: Procurement, and driver's pay, conditions, and well-being

To improve the conditions for drivers around pay and well-being, and to address current procurement concerns, a tripartite forum or group will be set up. This group will enlist the assistance of procurement specialists and facilitate research to better understand international standards, best practice, the viability of potential solutions, and the economic impact.

Strategy Four: Improving vehicle safety over time

To improve the quality of the vehicle fleet over time, safety standards and vehicle design regulations need to be introduced. The implementation of vehicle design regulations should encourage early adoption which will reduce the number of incidents related to driver inattention and incidents caused by other road users. These two issues were considered to cause a high number of incidents. The first steps were to contact the relevant people at Waka Kotahi (this conversation was initiated the day after the workshop).

Strategy Five: Industry leadership

An Industry/System Leadership group will be formed that could help drive other initiatives. The group will be coherent, collaborative, and cohesive, and known and trusted as a voice with a mandate for change. The group, representative of the system (as it is actually evolving – not how it was in the past), is to include MBIE, Unions, RTF, WorkSafe, Waka Kotahi, ShopCare, IRTENZ, in addition to other key individuals and organisations in the industry. This group will be led by industry and facilitated by government agencies. Their role is to be clear on why initiatives go ahead and be active and engaged – no waffle! The first step is the formation of this group and the writing of a Strawman Plan.

Strategy Six: Infrastructure quality

To assist in improving infrastructure quality in New Zealand a group will engage with the relevant authorities, industry groups, and the community to better understand what material, data, and information already exists and how it can be disseminated to the relevant parties. The formation of a working group which includes local and central government, Waka Kotahi, transport companies, NZ Police, FENZ, rail, NGOs, National Road Carriers, insurance companies is the first proposed step.

Strategy Seven: Regulatory, Road to Zero, data sharing

This strategy combined three action themes: regulatory reform, reducing vehicle-related deaths, and the integration, sharing and improvement of data streams. The group opted for small steps and early wins to prove the value of working together. A stocktake of data streams is required. Data currently is not easily combined, accessed or usable. Waka Kotahi was nominated to loop in the other regulators to form an internal community onto which an industry group can be attached. Industry groups are to identify leaders. The first step is to bring a working group together which includes government and industry.

The data from the FIW shows a snapshot in time, representative of the carefully selected system representatives who were there on the day. Not all of what resulted from the workshop sits at the level of this project brief, but the findings were rich nonetheless and gave insight into the perspectives of those within the system. This data may be the focus of deeper thematic analyses if needed.

6.5. The second workshops

Two final workshops were held during Phase Four of the project, at this point all the collected data had been analysed, and preliminary results were emerging. The first workshop was held with the WorkSafe project team and the Mackie research team. The second was a gathering of individuals reflective of the FIW stakeholder groups. The aim for each session was to present and refine the preliminary findings and develop them into tangible and specific interventions while still ensuring fidelity to the data. Below is a summary of the transcribed discussion and the zoom chat data from both workshops.

- There are many accreditation schemes available, but they all give different results. The ORS needs to be revisited.
- All members of the supply chain need to do things differently, not just the transporters.
- Collaboration is key, sequencing, and prioritising important. Representative nature of the system group more novel than it should be.

- There are leaders out there doing these things, show benefit from reduction of incidents and insurance costs.
- Power imbalance.
- Carrot and stick dilemma if trust with industry to grow.
- Train leaders on performance management skills, lacking in capabilities in all areas of change management.
- Safety culture – driven by a strong leader at the top who treats employees like family. It comes from the heart. Financial and non-financial incentives.
- Need to educate on the importance of a positive safety culture and look at Return on Investment (ROI).
- Take OHS out of the procurement process but cost needs to be embedded. Need to educate on the benefits of procuring a safe carrier.
- Training required right through to management level.
- Industry needs to lead, they are the experts – they set the standards, lift their own and regulators can focus on those at the bottom.
- Evaluation to show the impact of past interventions and why they have or have not worked.
- Is the system working well if we follow it all the way through? What are the stated aims of public sector leadership? How does that translate into accreditation and how is it evaluated? How is that information made available to the system?
- Improve the evidence cycle around the supply chain generally, make sure the data is collected in a useful way.
- Make contextual information visible to operators. Disproportionate focus on incidents, not health or mental health. Need to do a better job of gathering themes from incidents and events.

Participants placing their post-it notes on the reverse history timeline during the Future Inquiry Workshop

Participants presenting broad action themes

7. SYNTHESIS OF THE FINDINGS

This section is a synthesis of all the data sets in the form of seven themes. To reach these themes the data collected through each stage were brought together, coded, and analysed as outlined in the Method section above. The themes from each stage are shown in Figure 9 below.

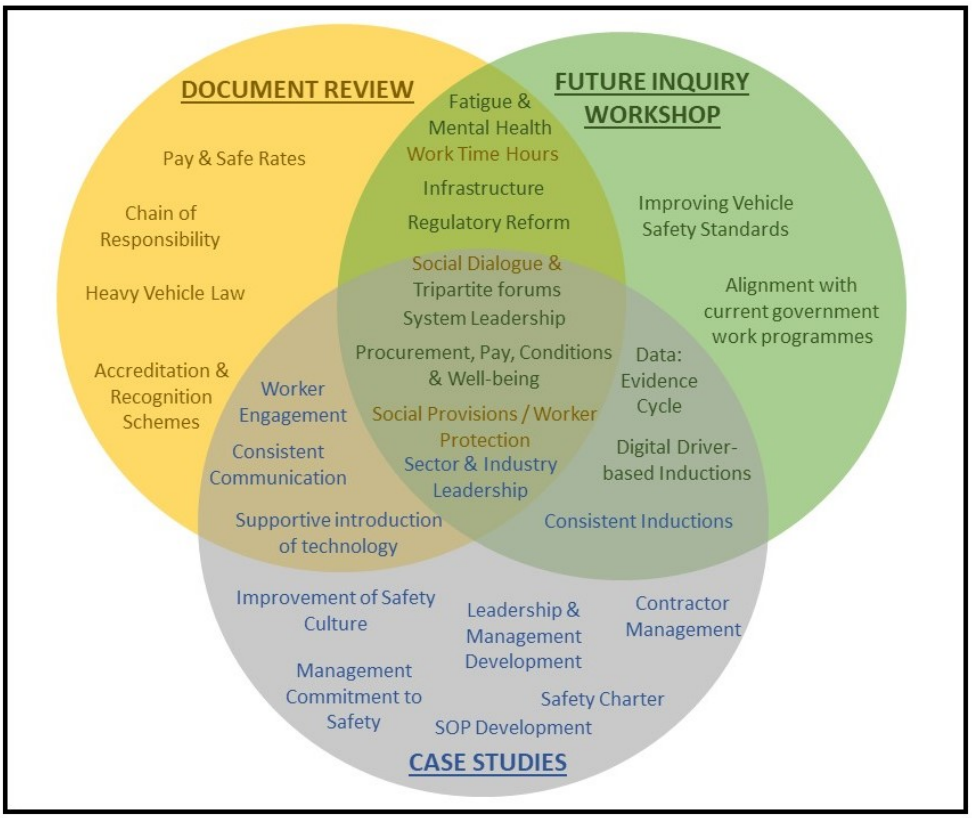


Figure 9: Venn Diagram of the three main data sets

Certain concepts such as collaboration show up in various ways within the research stages including social dialogue, tripartite forums, and system, industry, and sector leadership. The first theme distilled from all the research stages is therefore titled *collaboration*. Similarly, the second theme is the *regulator and regulations*, which incorporates the call for regulatory reform by the FIW participants and discussions on the applicability of the Australian CoR legislation in New Zealand from the document review. It is important to note that the centre section of Figure 9 was used to help identify the most overlapping and main themes, although all the concepts mentioned in the diagram are incorporated into the discussion in one way or another.

The seven themes are:

1. System collaboration – This theme discusses how collaboration at various system levels has led to reduced harm and the betterment of supply chain relationships. Further it explains how system-wide collaboration is a crucial next step so the experience of the system can be used to inform future intervention and activity.
2. The regulator and regulations – Discussed here is the role of the regulators including their relationship to each other and to industry. Also discussed is the setting and reviewing of certain legislation and regulations.
3. Safety culture and management practice – The importance of senior management commitment to OHS and the link to positive safety cultures within organisations came across strongly in the data and is detailed in this theme.
4. Procurement, contracts and contracting – Public procurement practices emerged in the data to lift OHS standards. Private procurement practice requires further work, according to the FIW participants, as does ensuring fair and decent work for all throughout the system. This theme concludes with details about how case study members in particular found ways to improve working conditions for their contractors.
5. Technology – Improved management practices around the use of technology are discussed, showing that to overcome drivers' mistrust of technology, support, feedback, and coaching is required. Further, organisations have begun exploring ways to use technology to help them meet their chain of responsibility requirements. Digital driver inductions are also included in this theme.
6. Evidence cycle and data – Discussed in this theme is the potential benefit of sharing, collation, and a stocktake of current data to better understand the harm landscape from a systems perspective.
7. Fatigue and well-being – Fatigue is an ongoing and commonly agreed risk, there are many contextual factors linked to fatigue including long hours, pay, low margins, and high pressure. Two AcciMaps are included to show the interrelated nature of these factors and how interventions such as a fit-for-purpose work time rule can have a system-wide impact.

Table 2 below is designed to show how each of the seven themes are supported by the data. The seven are listed down the left-hand side and the data sets are along the top of the table. The table gave the researchers confidence that each theme was based solidly on the data and that any resulting recommendations would therefore also be evidentially supported.

Table 2: Supporting evidence for the seven main themes

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
1. System collaboration	**Accreditation and recognition schemes** developed through system-wide collaboration (NRSPP, 2020). Designed and led by industry. **Alliance** teams set up in public-private procurement contracts to collectively work towards safety (Lingard, et al., 2019). **Social dialogue** encourages tripartite discussion, promoting consensus building (ILO, 2015a).	Active **engagement** with all levels of the supply chain to identify strengths and weaknesses (CS1,3,4). **Sector collaboration** and leadership through formation of Safety Councils (CS2). Increased engagement and involvement of carriers in **policy and procedure development**. Aimed to understand their business and help them (CS3). Development of a **Safety Charter** to improve consistency of operations across the supply chain (CS3).	Common recognition that there is need for change and collaboration and cooperation is required between **government, industry, and community** groups. Call for greater system leadership – a **cohesive, collaborative body led by industry and supported by government**. The group will be representative of the system. Clear initiatives. Strawman Plan first. Collaborative creation of **minimum safety standards**, government and industry to create the equivalent of Site Safe for trucks: Truck Safe. This will require a working group. Collective action among workers and their advocates for promoting supply chain responsibility and **negotiating supply chain responsibility agreements**. NRC are running roading **campaigns** and highlighting the problems.	Evaluation of **accreditation schemes** New Zealand-wide. **Collaboration**, co-ordination, sequencing, and prioritising of interventions is key. Question what does a healthy system look like? Where is the health and opportunity? Explore power imbalance from an employment relations perspective.

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
2. The regulator and regulations	**Chain of Responsibility** (CoR) review and its unrealised potential; lack of enforcement; whistle blower protection (Thornthwaite & O'Neill, 2017). Clear link between CoR and a specific **Heavy Vehicle** National **Law**. **Public procurement** to drive up OHS standards (Donaghy, 2009). The **work time** rules.	**CoR principles adopted** despite the potential commercial disadvantage (CS3).	Called for better regulatory support and leadership, an approach that is proactive. Call for **removal of silos**, for transport agencies to share in a common purpose, and increase collaboration. Agencies making steps towards this. Waka Kotahi (NZTA) as a regulator is rebuilding. Regulators and government authorities could be executing a more efficient MOU between CVST, WorkSafe and Waka Kotahi. Improvement of **infrastructure** quality including roads. Road to Zero. Acknowledgement and recognition of **best practice**. Government committed to **reviewing logbook and work time rules** under the Land Transport Act. **Union pressure** to improve regulatory standards.	**Carrot** and **stick** dilemma if trust with industry to grow. Clarification of WorkSafe's role and relationship with industry. Open **dialogue** between departments at WorkSafe so that organisations feel they can ask for help without penalty.

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
3. **Safety culture and management practice**	**Safety climate** is a strong predictor of safety outcomes (Huang et al., 2017; Newnam et al., 2017). Organisations with low incident rates featured clear driving standards, comprehensive training, and a reporting policy. Top to bottom safety **communication**, recognition of safe behaviour and some reward systems, policies and **clear messages from managers** increase safety culture (Short, 2007). The most important indicator of safety culture is **management commitment,** particularly senior management.	Immediate and total **commitment from Senior Management** (CS1,3,4,5). Consistent, clear **communication** (CS1,3,4) OHS **training** for the **leadership** team (CS1,3). Increased **Worker Participation**; increased trust (CS1,4,5). Driver Committee set up (CS4,5). Shared mission and purpose in the organisation for high safety standards (CS1). Improved driver training and induction (CS3). Driver awards to ensure safety is acknowledged (CS3). Knowledgeable OHS individual or team (CS4,1).	**Senior management support** is key. Consistency in driver inductions and driver training. Safety features in all vehicles. KPI reporting. Following Australian standards e.g. the Master Code. Educators and OHS champions are holding up heroes of industry. Business leaders and advocacy groups of transport providers are providing **scholarships** for training, **talking to drivers**, creating a **no-blame culture**, and looking at **innovative employment scheme**s such as shift patterns and job sharing.	**Train leaders** on performance management skills, lacking in capabilities in all areas of change management. Safety culture – critical that it is **led from the top**. Strong leader who treats employees like family. Need to educate on the importance of a positive safety culture and look at **Return on Investment** (ROI). **Training** required right through to **management** level.
4. **Procurement, contracts, and contracting**	**Safe Rates** to reduce long hours and the need of meeting target earnings (Belzer & Sedo, 2017). **Paid waiting time** (Heaton, 2005). **Public procurement** to drive up health and safety standards (Donaghy, 2009). Resources and **guidelines** set up to aid in the procurement process	**Safety specifications embedded into contracts** (CS3). **Contractors and employees** were held to the same safety standards, rules, and policies (CS4). **Allocation of work** considered the implication for drivers, contracted and employed; an iterative process (CS4).	Agreement that procurement and commercial constraints leading to poorly remunerated drivers and low OHS standards but no reward or recognition of best practice so **no incentive to comply**. Improvement of **safety standards** in the procurement process.	No compromise on the OHS part of the tender. **OHS costs to be embedded.** Reprioritising procurement criteria. **Industry** needs to lead in setting **standards**, they are the experts – lift their own and regulators can focus on those at the bottom.

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
	(e.g. Lingard et al., 2009; Transport for London, Swedish handbook on public procurement, CARPE (in Moschitz, 2005). Social provisions including social protection measures for workers and **promoting fair competition** (European Commission, 2020).	Organisation **shared resources** to assist new contractors to meet the standards (CS4).	Set up a tripartite forum to enlist the assistance of **procurement specialists and** facilitate **research** to understand international standards, best practice, potential solutions, and economic impact. Drivers and their advocates were campaigning for **safe rates**, challenging dangerous conduct, encouraging **cooperation**, promoting **supply chain responsibility**, and engagement. Transport operators are setting standards and paying for it e.g. brake alarms. Educators and OHS champions are providing **guidance on best practice**. Workers and their advocates are pushing pressure up the chain to manage driver hours and for a **fair wage.**	Need to educate on the **benefits** of **procuring a safe carrier**. How do we **incentivise** people to procure safely?
5. Technology	Feedback, goal setting, coaching, strong leadership, clear communication, and consultation found to be key to the successful implementation of safety-monitoring technology. Organisations needs to have supportive policies and	**CoR** principles were adopted and integrated into technology monitoring (CS3). **Coaching** and targeted interventions after an event (CS3,5). **Communication** and early **worker involvement** (CS5).	Preparation for autonomous vehicles. Digital app-based driver inductions requiring an investigation of the available tools and then development of safety standards; **collaboration** with industry and government.	Likely to be a contentious issue, divergent views within the system.

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
	procedures in place and trial the minimum level of any system first then gain driver feedback. Critical incidents should be analysed with the driver as soon as possible (Pyta et al., 2020).	Development of supporting policies and procedures (CS5). Open about **goals and expectations** for technology (CS5). Education and information to support implementation (CS5). Worked with telematics company to **tailor the technology** (CS5). **Trial technology** with a small group, evaluate and use functions only when required; **clear purpose** (CS5).	Equipment and data providers are **creating stocks of data** relating to some, but not all, aspects of the supply chain.	
6. **Evidence cycle and data**	The Heavy Vehicle National Law (HVNL) Review sought **feedback from stakeholders**. **OHS knowledge sharing** key in alliance procurement strategies (Lingard et al., 2019). The **UPLOADS** system was developed to enable the recording of contributory factors and the relationships between them (McLean et al., 2020)	Data is reviewed by **senior management** and at the **board** level (CS3). Clear **purpose** and use for the data; management and storage discussed with drivers, carriers, and supply chain members (CS5). Data used to **inform management decisions** around work schedules, routes etc. (CS5). Consider **privacy** and worker safety with respect to footage use (CS5).	**Sharing data, knowledge,** and **intelligence**. Could lead to consistency in training, standards, and OHS model not from a competitive perspective. Establish a comprehensive and **shared data stream**. A **stocktake** of public and private data streams; work to make data easier to **combine, access and use.**	Need better **evaluation** to show the impact of past interventions and why they have or have not worked. Improve the evidence cycle around the **supply chain** generally, make sure the data is collected in a useful way. Need to make **contextual information visible** to operators. Paul Salmon and co. working on this. Disproportionate focus on incidents, not health or mental health.

	DOCUMENT REVIEW	CASE STUDIES	FUTURE INQUIRY WORKSHOP	SUPPORTING DATA (Workshop 2 & SAG)
				Need to do a better job of gathering themes from incidents and **events**.
7. Fatigue and well-being	**Driver payment methods are incompatible with good fatigue management** (Quinlan & Wright, 2008). A core model of the Truck Safe Accreditation Program is fatigue management. Fatigue management was raised during the HVNL review process as a key category for consideration and is a key area under the CoR legislation.	-	A **leadership committee** set up to facilitate this work background work to understand the nature and extent of the problem. Legislative changes required and systemic monitoring to ensure level playing field. Store owners suggested a review of **wake-up times**, focus on **reporting delays** to customers, drivers to work **below work maximum hours**, randomised contractor **testing**, provide toilet **facilities** and rest stop areas. Government committed to **reviewing logbook and work time requirements** focusing on fatigue management and maximum driving hours, the use of e-log books and telematics. Educators and OHS champions are making rosters flexible with staff's personal life.	-

7.1. System collaboration

7.1.1. Introduction

The need for continued system-wide collaboration came through as a strong theme in all data sets. There was a strong and urgent call for change by the FIW participants, especially at the higher levels. However, as suggested by the second round of stakeholder workshops, any collaborative efforts that result from this project should build on efforts currently underway by industry or sector groups, government agencies, or others. It is the hope that resulting activities will be shared, discussed, and supported by those within the system who stand to benefit equally from the success of any outputs or outcomes.

7.1.2. Collaboration across the supply chain

Participants mentioned various forms of collaboration that had led to improved risk management and health and safety outcomes, but also productivity and efficiency. For example, case study participants explained how collaborative efforts with other supply chain members such as store owners, transport operators, contractors, and site managers meant they were able to better understand difficulties faced by each and work together to solve areas of concern. Consistently, they reported that through collaboration, efforts could be made to reduce costs through sharing data on where and why minor damages were occurring and what could be done to reduce them, as one example.

One case study reported how working with various store owners and drivers to redesign the layout of their delivery site meant fewer minor damages to trucks and eliminated the need for drivers to reverse out onto busy roads. This apparently resulted in drivers reporting incidents, near misses and making suggestions more frequently because of visible immediate action taken by senior management. In such a case, the collaborative action required leadership from the larger PCBUs in the supply chain but also required a willingness from others such as the store owners and the drivers to partake. This example highlights the importance of ensuring all areas of the system, or all members along the supply chain, collaborate and not just key decision makers or those in positions of economic or market power. It also highlights the need for strong PCBU leadership.

However, this task is not always simple when the supply chain becomes complex and long, as is commonly the case. It is easier to collaborate with parties that are visible and have more direct contact with the principal organisation. Case study participants mentioned their increasing

efforts to collaborate with tier one contractors – those similarly large organisations who also had dedicated personnel to engage with. Less frequently mentioned were efforts to collaborate with tier two, three or four contractors or workers. These individuals are, according to the literature, the most vulnerable to poor OHS outcomes. Practical tools and methods are needed to identify, engage with, understand, and help develop OHS and well-being gains for this group.

According to the Logistics Manager interviewed in case study one, consistent communication and messaging for all who worked or entered the site was a way of connecting with lower tier contractors. The manager and their team actioned this by engaging with the contractors, handing them information packs, and communicating with other delivery points on their behalf. Similarly, the OHS manager in case study four reportedly spent time with their contractors, discussing their workplaces, offering ongoing OHS advice and support, and ensuring they were able to earn sufficient income within safe hours. Poor OHS outcomes are experienced by non-standard workers such as contractors, according to the literature, for numerous reasons including a lack of OHS messaging, access to OHS resources, and a lack of contact with the principle company. The efforts mentioned above align with the principles underpinning methods such as alliance procurement strategies which strive to foster an environment of shared OHS responsibility, the development of common goals and a greater allocation of resources to OHS and innovation. Therefore, and according to the data, efforts such as these require dedicated leadership, senior management commitment, and a willingness of those who do have contact with lower tier contractors to take opportunities for engagement.

While acknowledging the current efforts of PCBUs and their adherence to the New Zealand Health and Safety at Work Act, there is evidence to show from this data that organisations in TPW&M in New Zealand could go further in efforts of collaboration. However, the need for greater collaboration does not stop with organisations directly engaged in the supply chain. Increased collaborative efforts are also needed among industry and sector groups, and government agencies.

Many of the supply chain issues or contextual factors that interact to create high-risk environments for workers sit across industries and across sectors. Economic pressure from customers, pay structures, and high levels of competition are not unique to one sector or industry. Nor are the resulting symptoms such as fatigue, speeding, unsafe behaviour, or low operating margins. The Log Transport Safety Council, as featured in case study two, highlighted the benefit of sector leadership, providing a body in which other sectors could collaborate with. In the Log Transport sector, collaboration between the log truck sector and forest owners is

very proactive and is facilitated by the Log Transport Safety Council. Collaboration reportedly resulted in commercial benefits for both, in ways mentioned above. This prompts the suggestion that continued and supported sector leadership is required, and subsequent cross-sector collaboration should be encouraged.

7.1.3. Collaboration across the whole system

A very tangible action to foster collaboration is to have System representatives come together in the future, in a similar fashion to the FIW. Future whole-of-system gatherings could build on areas of concern such as pay, procurement, PCBU leadership, fatigue, or technology. The process of defining the 'system in the room' is something to work on. Including those who have seemingly little influence on creating the conditions for success, but who are vulnerable.

Having the entire system together in the room provided a platform for participants to hear the experiences of others at the FIW. Participants were able to see immediate reactions to suggestions, indicating likely support or opposition to initiatives. Additionally, the well-established method of the Future Inquiry process facilitated carefully designed activities to draw out the viewpoints of individuals who may not traditionally have had a voice. Issues of conflict were handled appropriately and quickly, in accordance to the method, to ensure the focus remained on reaching solutions and a collective way forward. It makes sense to build on the considerable effort in developing the System Group (see Appendix two) and apply the FIW method and use this in future collaboration activities.

A system group can be an important resource for government, industry, and others to gauge whole of system responses to various issues, and to represent the voices of all those who are in the system.

7.1.4. Why are improvements in this area important?

- To improve feedback loops within the system, ensuring actions are better informed and are based on the real-time possibilities and constraints faced by those throughout the whole system. The likelihood of overcoming constraints is higher when they are brought into awareness.
- The facilitation of shared experiences, ensuring top-level decisions makers are there to learn as much as those from other levels.
- Decisions made without full-picture information can negatively impact workers in more vulnerable positions, traditionally unable to respond when shifts in the system occur.

- Similarly, current efforts may be targeting siloed aspects of the system, reducing the likelihood of significant change.
- There is a need to keep defining and redefining the system as new forms of work occur. Such a group would allow for real-time response and reaction.
- To increase support, connection, and trust, and to dissolve historical feuds with the intention of open and honest feedback, discussion, and action.

7.1.5. Implementation

Initiating such a group may not be difficult due to system-wide agreement by the FIW participants that this was important and urgent. The challenge will be deciding what to do next. The level of effectiveness in managing risk across the supply chain will only be as effective as the group's plan, motivation, and membership. Keeping the focus on wider, contextual factors may be a challenge for the group.

7.1.6. Potential barriers and challenges

- Disagreement over the potential benefits of such a group
- Concerns about duplication of effort
- Lack of data to work with
- High level support for the long-term commitment needed to tackle systemic issues involved multiple agencies and legislative frameworks
- Time-poor participants being asked to volunteer their time
- Fatigue from frequent requests to participate in similar initiatives
- Disagreement over what the issues are and how to solve them
- Challenge of seeing the whole system and keeping the pressure on to focus upstream
- It will require funding and leadership
- Long-standing divisions in the system may present barriers to collaboration

7.2. The regulator and regulations

7.2.1. The FIW and the regulator

The term *regulatory stagnation* was a theme that came out of the FIW, with some participants calling for more regulatory support, greater leadership, a proactive approach from the government agencies, and more protection and reward for best practice.

The group representing the regulators at the FIW had less decision-making power compared with other groups such as the Business Owners, for example. It would have been impractical to get the most senior people from each agency in the room but may have brought more balance to discussions. Greater collaboration is achievable and effective, the COVID-19 response is one example, but to divert resources has to come from the top otherwise time and money must be taken from other things. Therefore, reprioritisation and allocation of resources are needed for regulatory enhancement, and this sits with within the Executive level, who were not represented at the FIW.

7.2.2. Clarification of roles

In their ideal future, the FIW participants saw greater communication between regulatory agencies, and their roles and responsibilities clarified. Such initiatives may already be in place however the goal was to reduce the perceived silos between regulatory agencies and clarify how mandates for one agency do not overlap with those of others. In response to 'Regulatory Stagnation', the Regulators and Government Authorities group at the FIW said that they could be doing more joint operations, they could execute the MOU between CVST, WorkSafe and Waka Kotahi more efficiently, and that currently they are reviewing rules and powers of regulators, for example designating Waka Kotahi as a Health and Safety at Work regulator.

A clear signal of intentions around investigation and prosecution where appropriate was raised in the data. Enforcement is an important part of the system and the whole system should have a clear understanding of how this works and what the intent is. Therefore, any actions towards collaboration would be greatly enhanced if efforts were made to clarify rules and regulations, safeguard that they are fit for purpose, clarify enforcement processes, and ensure punitive actions are directed at those generating adverse risks across the supply chain.

7.2.3. Health and safety advice

Participants that had interacted with WorkSafe either during an investigation or an enforceable undertaking expressed the desire to seek advice, education, and guidance during that process but were in fear of adverse consequences if WorkSafe was approached for help. The issue is linked further to difficulties the researchers had during recruitment for the case studies particularly. Some organisations, many of which were known to be doing innovative and good things, were not willing to participate in fear of airing potentially 'dirty laundry' along the way. This understandably creates a carrot versus stick dilemma for WorkSafe but unfortunately limits

the potential for collaboration and the collective development of innovative approaches to risk management. Through collaborative efforts, insights may be gained into the effectiveness of interventions and then be captured as best practice which could be fed back to the industry, closing a feedback loop. This is an intended outcome of the system-wide group discussed in the previous section (section 7.1).

7.2.4. Rules, regulation, and legislation

According to the data, it is perceived that the work time rules in New Zealand are not fit for purpose as fatigue remains a prevalent area of concern and drivers were seen to be bearing the brunt of long working days and unsustainable work patterns. It is the regulator who 'sets the rules of the game' and therefore has a significant leadership role in this area. Likewise, with Chain of Responsibility (CoR) legislation.

Despite New Zealand's legal framework placing responsibility on Persons Conducting or Undertaking Business (PCBU) some participants believed the CoR laws in Australia go further in protecting all members of the supply chain. Organisations who adopted aspects of the CoR felt they were at a commercial disadvantage. Unfortunately, the data revealed no more detail on what such details are however, the question is posed – what aspects of the CoR policy are relevant in New Zealand, what incentives drive their inclusion, and what enforcement resources are necessary?

7.2.5. Why are improvements in this area important?

- The system brought together for the FIW voted this the most important issue to address in the minimisation of current vehicle-related risks from supply chain pressures. This elucidates a strong desire from the system for change in the regulatory arena.
- A clearer signal on intentions around investigations and prosecutions where appropriate are needed so the whole system has a clear understanding of how it works and what the intent is. This is important in ensuring punitive actions are directed at those generating adverse risks across the supply chain.
- Reviewing the work time law is an important step in reducing the likelihood of fatigue. It is important that consideration be given to the system when any changes are proposed. Reviewing the CoR relevance for a New Zealand context is important because its benefits have been reported by some case study participants, but they report to suffer

commercial disadvantage for doing so. Reviewing each under a systems-approach lens is important.

7.2.6. Implementation

The researchers acknowledge that there are potentially actions currently being taken towards much of the above, though, given its frequent mention in the data, felt it was important to highlight, nonetheless. The roles of each agency could be made clear relatively easily, though the review of regulatory and legal frameworks require significantly more effort, though this is perhaps better decided by the agencies themselves, who have a clearer understanding of the process and it's feasibility.

7.2.7. Potential barriers and challenges

- A carrot and stick dilemma; a challenge to find the balance between the two
- Resource allocation
- Involvement of executive level representatives of regulators
- Those who are external to the government agencies do not always understand what is required to make changes/improvements at this level

7.3. Safety culture and management practice

7.3.1. Senior management commitment and training

The policies and procedures in place within an organisation are only as effective as the degree to which they are implemented and managed. Executives and managers play a crucial role in overseeing their implementation within the organisation but, according to the participants in this project, also have the power to extend such provisions to their contractors and others throughout the supply chain. To effectively manage risks across the supply chain, managers need to be supported by senior management and those making crucial strategic decisions, as reported by many of the case study participants. The Independent Taskforce on Workplace Health and Safety (2013) reinforces the importance of strong leadership in reducing risk-tolerant cultures. In support, there is evidence from the data to show the importance of immediate and total commitment from senior management to health and safety and in supporting lower level managers to turn it into practice. This suggests that adequate training for managers at all levels is required to ensure they have the skills necessary to not only identify

immediate OHS risks but understand implications that result from certain business models and contracting strategies.

Advancement in safety technology, including driver monitoring and safety features in vehicles, is happening quickly and is creating a new domain in which managers are required to remain informed. With rapid development comes an increasing potential for risk management but also can mean an increasing number of changes to work for drivers. The impact of this was evident in the data which showed resistance to technology from certain parties. Other parties, such as some business owners, were in full support. Managing the disconnect is key and will be discussed in section 7.5. Support and specifically training is needed for managers on how to support drivers in using and learning from new technology and on how to handle the data in a useful way.

7.3.2. Why are improvements in this area important?

- Ensuring managers are supported, informed, and involved is important because management and senior management commitment to OHS have been identified as a key contributor to safety culture, which impacts safety behaviours.
- As identified by the Independent Taskforce, strong organisational leadership helps to reduce risk-tolerant cultures. Strong leadership by senior managers in larger PCBUs is important because of their position in the supply chain and influence over the OHS standards of contractors and sub-contractors.
- As reported by case study participants, commitment from senior managers made the single biggest difference to the OHS performance of the organisation. Those managers who prioritised OHS saw the value and need to extend the resources to contractors, supporting them in making positive OHS actions.
- It is important that support be offered to managers and senior managers in data handling and management, risk identification and correct action, contextual factor consideration, and the benefits of supply chain collaboration. Their operating environment may not always be conductive to positive OHS action, thus highlighting the need for greater support and higher-up corrective action.

7.3.3. Implementation

From the Workforce Segmentation and Insight Programme (WSIP), there are signs showing that organisations have a strong safety culture within TPW in New Zealand (WorkSafe, 2020a). Half

of New Zealand's TPW employers state they have formal health and safety training for at least half of their workers, however there is no information given about how often they, themselves engage in training. In saying that, 77 percent stated that they make time and effort to keep updated with changes in the health and safety legislation. This information helps to inform the readiness of managers to develop their skills in this area.

The statistics above indicate there is a willingness and openness to engage in health and safety improvements, however, the data from this project indicated there are still many barriers managers face, including tight margins, resource allocation decisions, and pressures from customers, consumers, and others. Unless there is strong senior support within the organisation and unless there are incentives to work safely, further training may not have the desired results. Equally, the literature has criticised training programmes as a solution that is individually targeted and does not always consider the relevant contextual factors.

7.3.4. Potential barriers and challenges

- The data came mostly from managers of large organisations where there are, perhaps greater resources to support training efforts and utilisation of sector leadership groups.
- System-wide change needs to happen at the same time as managers increase their health and safety capabilities.
- Prioritising health and safety is not always commercially advantageous.
- Best practice is not always rewarded or recognised, there may be insufficient incentive to upskill and improve.
- Training in the management practices required to support workers through any change including technology implementation is a big task, though one much needed.
- Managers may have difficulty in allocating resources including time to training, the pressures managers are already under to consider a wide range of factors is high.

7.4. Procurement, contracts, and contracting

7.4.1. Public procurement

Contracts and the procurement process can be used as leverage for raising health and safety standards (Donaghy, 2009). It is argued that those in positions of power could lead the way, which include the public sector (Moschitz, 2005). A review of public procurement of freight services with a focus on who is winning contracts and why, drawing on overseas leading

practice, is one way to determine how well New Zealand public agencies are doing in this space and where there is potential for improvement.

It is acknowledged that government agencies have a responsibility to be disciplined with tax-payers money and so understandably cost must be considered. Lingard et al., (2019) found that clients should seek to select teams for success, focusing on a broader concept of value for money, which may not be the lowest price. The practical outcomes of price competition on non-financial aspects of project performance should be carefully weighed up against the need for careful public spending.

One approach mentioned in the literature is the dual Target Outturn Cost (TOC) approach in which potential non-owner groups are selected based on non-price related criteria and then the two groups are invited to submit competitive prices. The final selection is then made on cost. This approach was not widely favoured by contractors in Lingard et al.'s study, however, is an alternative to consider or explore further.

The document review highlighted accreditation and recognition schemes as a way of ensuring minimum standards are met. Such schemes could ensure only pre-qualified project teams tender for government work. Also highlighted in the document review was a collation of all relevant national laws, regulations, and rules pertaining to public procurement in the form of one guide or handbook. In the Swedish example above, a handbook was distributed to all the trade unions to guide them in procurement practices.

Reviews and engagement with public procurement practices may already be underway by agencies such as the Ministry of Business, Innovation Employment (MBIE) and the State Services Commission, however evidence of such activities did not emerge in these data sets, so it therefore remains an area to consider.

7.4.2. Private procurement

As agreed by the FIW participants, a tripartite forum should be created to enlist the expertise and assistance of procurement specialists, facilitate research to understand international best practice, potential solutions, and economic impact. Coming together to discuss reward, best practice, and incentives will be key to improving procurement practices in TPW&M in New Zealand. The call is for industry to lead as they are experts able to lift their own practices. This is one area that could be addressed by the system-wide group discussed in section 7.1.

7.4.3. Fair and decent work

A healthy system allows for fair and decent work for all, where new organisations come in and bring innovative ideas, where employment is productive, and ultimately some businesses fail. Guidance on fair and decent work has been developed by the United Nations (UN) in their Agenda 2030 goals under which 17 Sustainable Development Goals sit. Goal number 8 specifically, entails indicators and targets for the promotion of sustained, inclusive, and economic growth, full and productive employment, and decent work for all. Specifically, 8.3 calls for the promotion of properties that support productive activities, job creation, entrepreneurship, creativity and innovation, and the support and growth of small to medium-sized enterprises.

The reason this is linked to the broader heading of procurement is that the literature has highlighted that supply chains and the procurement of supply chain members can be one way in which innovation and creative OHS responses can be fostered (Lingard, et al., 2019). Organisations in Lingard et al.'s study were found to be actively encouraging creative, agile OHS management systems into the way they procured their supply chain.

7.4.4. Contractors and contracting

Organisations and individuals featured in this project showed how they were working to help improve the conditions for contractors within their network and supply chain through efforts of collaboration. Case study four illustrated how the organisation was reportedly assisting contractors by sharing OHS knowledge and offering whatever support was required to meet the principle company's safety standards. Reportedly, in case study three, contractors were consulted to improve safety standards at distribution sites which helped to lower their (the contractor's) costs from damages to the vehicles. Business leaders at the FIW told how they were paying to have their contractors' vehicles fitted with the required safety technology.

Organisations such as the above were asked about why they engage in such practices and what incentives they have to consult, procure safely, and actively engage with their contractors. Moral duty to the safety of their supply chain was a frequent answer, prioritising safety no matter the cost, with one manager explaining that it comes from the heart.

More work is needed to determine incentives for organisations that go beyond moral duty. This is important because transport companies can be placed in a difficult position where buyers of transport services are controlling rates and terms, which then in turn impacts the resources

available to pass on to workers. Within TPW&M in New Zealand there are organisations smaller in size who verge on viability. Fair and decent work is not only about ensuring conditions are right for the workers but also about creating a system where employment is productive and sufficient returns can be made to permit organisations and their dependents sufficient income, no matter the size of the operation.

A healthy system does not produce the kind of contractor relationships we are seeing in New Zealand within commercial transport, particularly among courier drivers and the like. Contractors, the self-employed, and small business owners are frequently operating on precarious terms and many not afforded the independence suggested in their title. Further research and work are required to understand what is prohibiting fair competition, where support for start-ups and small businesses is coming from, how to further promote innovation in the industries in New Zealand, and how to foster productive employment for all.

7.4.5. Why are improvements in this area important?

- It is understood that this issue has been raised previously, so this highlights another call to make progress in this area.
- This area of focus is important because the procurement process can have strong leverage over the OHS standards across the supply chain. Those in positions to influence the procurement standards have a responsibility to lead the way.
- It is important to analyse and be aware of who is winning contracts and why to better understand what types of contract activities are rewarded within the system. Additionally, it is important to analyse such information to see patterns, trends, and constraints.
- Education on procuring safely is important, though it may not be well understood throughout the system. Such rhetoric may include what is considered value for money and what a truly successful outcome looks like.
- Procurement processes can be used to encourage creative and agile solutions to OHS.
- Working to achieve the goals of productive employment, fair competition, and decent work are likely to have a wide-reaching impact on a great number of people.
- It is important that work in this area is ongoing to ensure that productive employment considers all forms of work, and that the procurement process of supply chains be used as a tool to facilitate it.

7.4.6. Implementation

Review and improvement of public procurement practices have the potential for a wide-reaching impact; collaboration with industry and industry groups is again a next step in the development of what those standards look like and then, if not already happening, the creation of a resource or handbook to ensure consistency of procurement in public entities.

Elements within this approach appear relatively easy, for example consultation with supply chain members including contractors to collectively determine standards, efficiencies, and ways to minimise harm. However, supply chains can be long and complex, with some parties invisible. For consultation to involve an entire supply chain, visibility, resources, and time are needed. Equally, the sharing of knowledge with contractors may seem easy however, the nature of the industry is competitive, and the exchange of such information may be commercially disadvantageous.

7.4.7. Potential barriers and challenges

- The environment is not yet ready or supportive for such initiatives and there are few clear steps in how to achieve, for example, fair and decent work for all in the system.
- There is little clarity from the data about how and what to use as incentives for engaging in safety focused procurement, supply chain consultation, knowledge sharing and the fair treatment of contractors.
- Some parties in the supply chain are invisible and therefore difficult to reach.

7.5. Technology

7.5.1. Management practices

The use of technology, for example driver monitoring, vehicle design, and truck safety features, is not a complete solution in and of itself, nor does its implementation mitigate supply chain pressures alone, and yet technological advances may be very useful if positioned correctly.

Technologies such as fatigue monitoring should be used in conjunction with clear policies and supportive practices while acknowledging the disparate views between drivers and managers. Coaching drivers during the implementation and use of technology was found to be more useful comparted to punitive action and, as a sport coach uses video footage to help an athlete improve, so should managers use safety footage with drivers (Pyta, et al., 2020). It is important that feedback is constructive and sits within a supportive, positive safety culture.

It was recommended both in the document review and the case studies to trial technology with a small group first, use the minimum options to start, and ensure there is a clear purpose for any technology implemented. Additionally, managers should actively seek and review the data from the technology and consider feedback from the workers before additional changes/technology is implemented.

7.5.2. Chain of responsibility in technology

Organisations interviewed for the case studies understood their responsibilities as a PCBU and were looking to technology to help manage them. One case study organisation had begun collecting information on safety events that they suspected led to further adverse events down the supply chain. This allowed for preventative rather than reactive action to occur. An example they gave was that if there was a delay at one point in the schedule of 30 minutes or more, it was registered as an event to investigate as they knew it could lead to speeding and longer hours for the driver.

An idea was raised within a stakeholder group at the FIW (shared with permission of a group member) about a concept they referred to as 'UBER for trucks' whereby technology was used to improve scheduling and therefore the productivity of companies by avoiding excess waiting times at delivery points. It was suggested that this could make companies more profitable and hence drivers could be paid more. This, as an approach, has not yet been fully developed but shows how scheduling technology, as one example, could have flow on effects for organisations and drivers.

7.5.3. Digital driver inductions

FIW participants came up with and agreed on the idea that standardising and digitalising driver inductions on to sites would help to manage risks across supply chain pressures. Specifically, the FIW participants called for a New Zealand standardised driver induction which manages minimum site requirements, hazard alerts, includes pre-start checks, and potentially has a licencing component to it also. Agreeing on the standards and rolling out such an initiative will require collaboration between industry and government, as requested by the FIW participants.

A similar concept was noted in the document review. In an organisation in Denmark the managers worked together with the drivers to collect information on 500 different loading zones and entered this information into the company's IT system so that the information was available to the delivery drivers. The information included was designed to account for literacy

level variation among the drivers and the limited time they had for deliveries (Copsey et al, 2011).

There is evidence to show that contractors or those in non-standard forms of work do not always receive vital information before entering a site, do not receive adequate OHS training, and given the complexity of some supply chains, can be invisible to those in charge of managing their OHS (Underhill & Quinlan, 2011; Quinlan & Bohle, 2009). While acknowledging the challenges in developing and rolling out such an initiative, it may be one way to manage risks associated with inadequate messaging to end-of-supply chain parties, so long as they are somehow supported during installation and use.

7.5.4. Why are improvements in this area important?

- With the rapid advancements in technology and the popularity among business owners and others to utilise it, it is important that supportive policies and management practices are in place to reduce the mistrust and stress caused to drivers and workers. Further, practices such as positive feedback, coaching, and appropriate reward structures can ensure the greatest benefits result from technological advancement.
- Technology can be used to support PCBUs in their efforts to ensure the safety of their supply chain.
- Consistency and the digitalisation of driver inductions is important to ensure OHS messaging reaches all workers safe, no matter their position in the supply chain. Those lower down the supply chain do not always receive vital O

7.5.5. Implementation

Safety technology was a popular choice among participants; training for managers is therefore required to ensure successful use of the equipment. As above, managers are the focus of a great deal of training, and it costs. However, it is important that drivers are assured that the data is being properly handled, used for improvement rather than punitive action, and can be relied on protect them during a potential safety event.

Including CoR in technology is in development and use in other industries and sectors. Collecting and analysing the data, knowing what to collect and how to collect it, and ensuring it is useable will be the key to making this an effective approach to managing risks. Further information on collecting contextual information through technology is discussed in section 7.6.

Digital and standardised driver inductions will require investment. Standards and site requirements would need to be developed, collectively, and then a plan for distribution and financing.

7.5.6. Potential barriers and challenges

- Technology is a contentious issue.
- Technology costs and ensuring necessary vehicles are fitted with such equipment is a big and expensive task. Large investment is required.
- Knowing how to handle data can be difficult and requires, at times, expert knowledge.
- It is another thing for managers to train in.

7.6. Evidence cycle and data

7.6.1. Data collation

While we have a reasonable sense of who is getting hurt and where, we do not always understand the contextual factors to crashes and onsite incidents. There is potential to better inform intervention decisions when more contextual information around safety events is collected, analysed, and proactively used in safety initiatives.

Participants at the FIW identified the collating and sharing of data as a key strategy to help manage risks across the supply chain. They called for a review of current data (both public and private sources) asking, what do we need to know, what do we already know, and how are we allowed to use it? A stocktake of public and private data streams was recommended by the participants. Some of the private companies offered to present their data inventory to seed discussions. It is acknowledged that this is not an easy task. However, the FIW participants have shown there is a will to move past the challenges collectively.

7.6.2. Contextual data collection

As above, the potential benefit of a stocktake and collation of data will mean better informed decisions and a more rounded understanding about the nature of risk in TPW&M. However, if the data currently being collected ignores contextual factors then any advancements to risk management may remain proximal and potentially flawed.

Technology-based data collection methods are being developed in other sectors with the purpose of better understanding wider, contributory causes to incidents. UPLOADS is one

example from the outdoor education sector where Led Outdoor Activity (LOA) operators feed incident information into an app and the data is collated at a nation-wide level. The information can then be fed back to the operators, and research analysts can begin to identify trends in contributory factors (for example see Salmon et al., 2020) thus opening the potential for a full feedback loop. Salmon et al., (2020) highlights the importance of the feedback loop. Those entering the data stand to benefit from seeing their data in a national context. Such information can aid in strategic decision-making, corrective actions, and analysis of industry trends.

The UPLOADS app focuses on incidents and injuries, perhaps missing is the opportunity to learn from events both positive and negative. Further, it is only as good as the data entered by the operators. Based on the experience from this project, members of the system are not easily able to identify contributory factors above and around them (as evident in the white space in some of the AcciMaps, or the gravitation of FIW participants to focus on safety elements at the individual level).

7.6.3. Additional points to note

A series of points were raised during this project regarding data, and although not fully developed through to evidence-based interventions, they are worth noting if progress in this area is to be made.

- More thorough evaluation tools are needed to show the impact of past interventions and why they have or have not worked.
- How do we better collect data on contributory factors in TPW&M? How do we include events, not just incidents and injuries, and even collect information on best practice?
- How can we then make contextual information visible to operators?
- How do we learn from the best practice data collected to begin efforts on decent work in the system?
- How can health and mental health be incorporated into such data collection and how do we do that over the long-term?
- Who would co-ordinate, store, manage and distribute the data once collated?

The suggestion that stems from these questions and points above is that further work is required on effective tools and methods for collecting contextual data in New Zealand, with consideration given to various factors, not just high-impact incidents but also positive, best practices. In exploring these questions, consideration can be also given to how we support

managers in using the data to inform their decisions around, for example, routes, work schedules, and fatigue management.

7.6.4. Why are improvements in this area important?

- Richer data on contextual, contributory factors to harm events would mean industries and sectors could focus on system areas that will have the greatest impact.
- A stocktake of data sets is important, as highlighted by the FIW participants, to grasp what is known and to ensure duplicating efforts are not occurring.
- National data on contextual factors will help us to identify trends and will allow organisations, groups, and individuals to see their data in a national context. Systems to routinely collect contextual data are also needed.

7.6.5. Implementation

Bringing together all relevant data streams is no easy task. Data is collected using various methods, strategies, structures, and programmes making compatibility difficult. Privacy and ethical considerations must be factored in, including what form of permission was given by the participants when the data was collected. Although there was some willingness from private organisations to share their data sets, this is not the case with all as some consider the information commercially sensitive. However, the impact on harm reduction would be high if a full and comprehensive data set was available, allowing for targeted interventions that consider contextual factors.

7.6.6. Potential barriers and challenges

- Compatibility of current data sets.
- Privacy and permission considerations of the data sets.
- Cost, leadership, and management of the process.
- Readiness of the system to adopt, use, and receive data on contextual factors

7.7. Fatigue and well-being

7.7.1. An ongoing and commonly agreed risk

WorkSafe New Zealand recently released figures showing that around 60 percent of workers reported work-related stress had been damaging to their mental well-being and 32 percent of

workers reported experiencing work-related depression or anxiety in TPW&M (WorkSafe, 2020a). Fatigue has been identified as a serious concern, particularly among transport and shift workers, globally and locally (Blower & Woodrooffe, 2012; Apostolopoulos, Lemke & Sönmez, 2014, Mathern, 2019).

The FIW participants identified fatigue and well-being as one of the seven strategies needed to effectively manage risks across the supply chain. The sub-group focusing on fatigue stated that their first do-able step was to set up a leadership committee to co-ordinate the collection of background information designed to understand the nature and extent of the problem currently, to bring together existing knowledge, understand what the industry is doing in response to the problem, and facilitate collaboration between industry and the government. Desired action from this group includes a review of the legislation, proper consideration of work time and patterns and the implications on workers' health, and better, systematic health monitoring. It was suggested that the group be cross-agency represented and include various stakeholders from across the system.

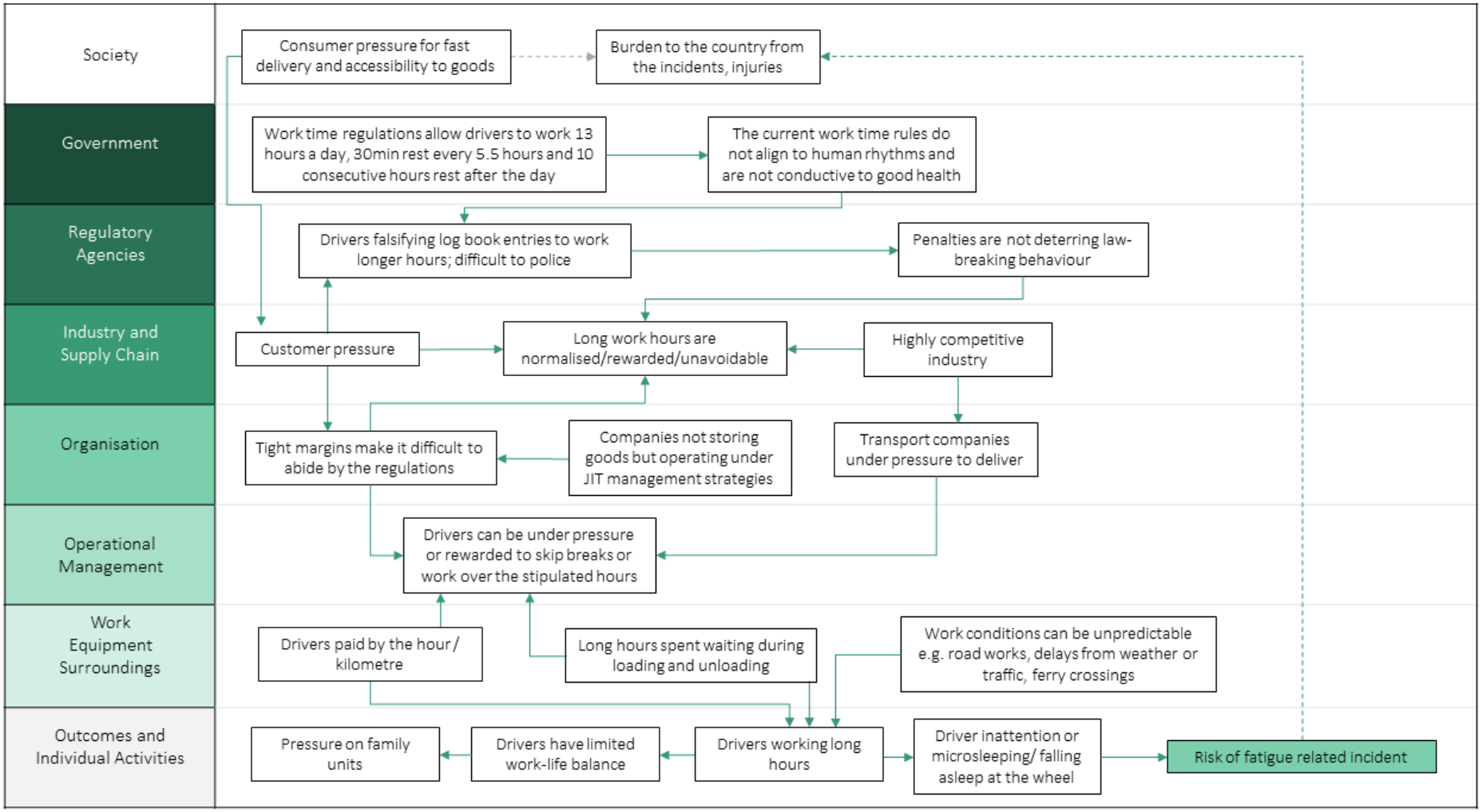
7.7.2. Working conditions and fatigue

The literature highlights that driver payment methods are incompatible with good fatigue management (Quinlan & Wright, 2008). Payment methods are woven through various recommendations and approaches in this report, highlighting the need for a proper and thorough investigation of pay, payment methods, fair wages, and safe rates in New Zealand and the impacts of poor pay on other outcomes.

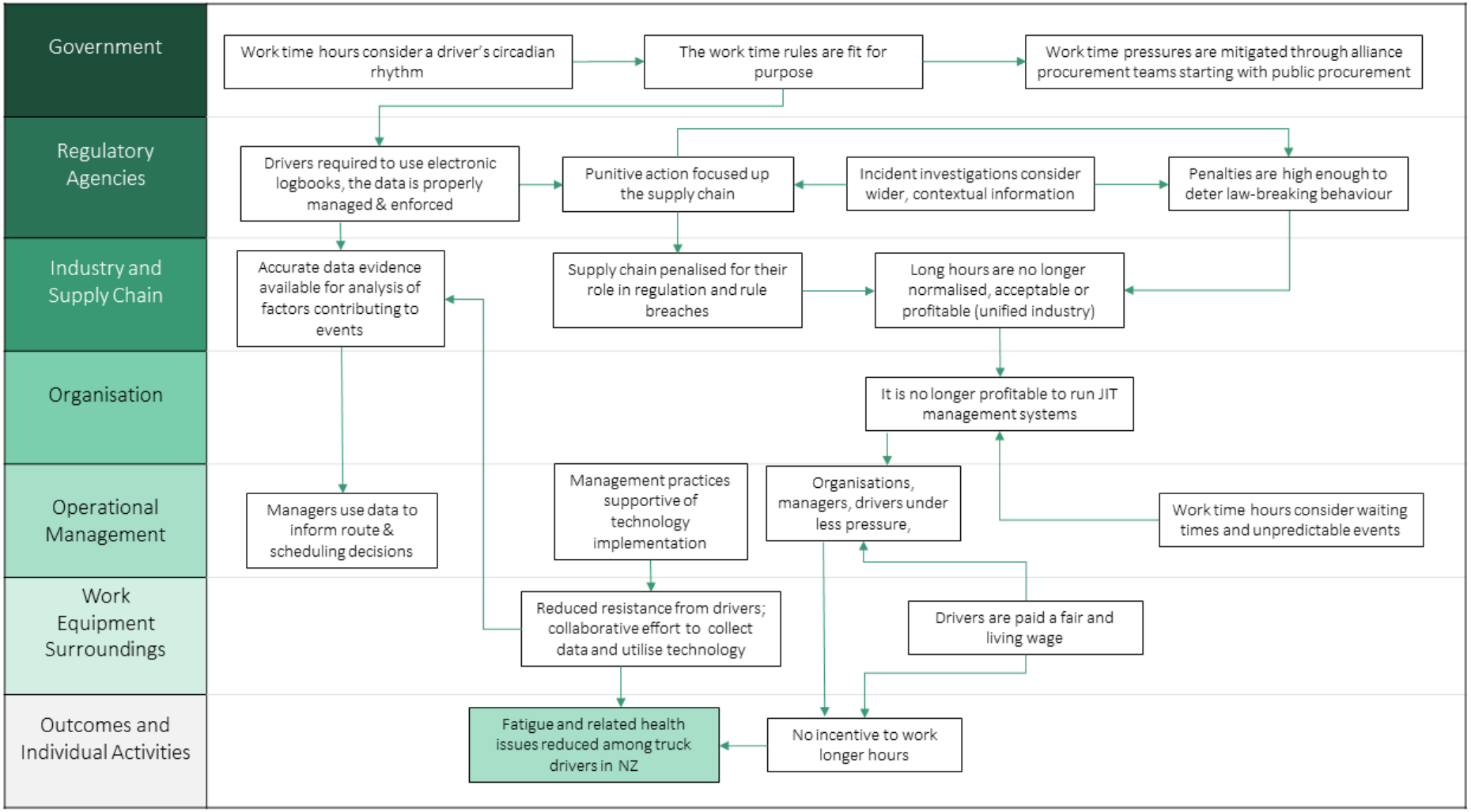
Also mentioned, predominantly in the FIW, was the need for improvement to infrastructure, including rest stops and facilities ensuring they promote rest in a healthy environment for drivers. This is supported by the work of Apostolopoulos et al. (2016) who found rest stops commonly to be void of options conducive to healthy eating, movement, or positive mental health. The Business Leaders group at the FIW suggested that as organisations they were reviewing the time drivers were waking, expecting drivers to work below the legal driving hour time, improving facilities and providing access for drivers including rest stops, toilets and cafes to improve driver fatigue and well-being.

This highlights the potential for organisations to invest in solutions that help address fatigue however, this requires again that we look at the profitability of small and medium companies and the customer arrangements that determine this. In between fatigue and pay is the fact that people are doing long hours. Pay is one causal factor. Most importantly, a system view of

fatigue is needed to better understand the interrelated factors that lead to it. An AcciMap (Map 8) has been used to show how factors such as the above interact resulting in fatigue related incidents. A second map (Map 9) shows how interventions such as addressing the work time rules may have a system-wide impact to reduce the fatigue-related issues.



Map 8: Contextual factors contributing to fatigue-related incidents



Map 9: Intervention approaches that may reduce fatigue-related health issues

7.7.3. Why are improvements in this area important?

- Despite decades of attention, drivers are still often fatigued. Collaborative efforts are required to understand what is known but also what the constraints to progress are.
- The fatigue leadership committee suggested by FIW participants could be a spinoff from the system-wide group discussed in section 7.1. It is important that the fatigue-focused group represent the system as per the first point above.
- Addressing fatigue requires that we address a host of other, higher-up and systemic issues such as pay, payment methods, and the work time rules, among others. As fatigue is generally accepted across the system as an area of serious concern, it could be used it as an entry point to discuss the impact of systemic factors such as those just mentioned.
- Well-being was not mentioned frequently in this data. However, WorkSafe's recent activities collecting data on psychological harm to TPW&M workers has given us an idea of the size of the prize if we address mental health in this area. Given the high number of workers suffering from work-related stress and anxiety, there is much to gain with further work in this area, with a particular focus on contextual, contributing factors.

7.7.4. Implementation

The suggestion of a leadership committee was supported as a strategy for action by the FIW participants, with specific participants putting their hands up to initiate the first steps. For this reason, the formation and activities of the group should be reasonably easy to implement. The actions of the group would require funding, support, and expert leadership but could also be considered an action point or spinoff group from the system-wide group in section 7.1

7.7.5. Potential barriers and challenges

- Fatigue over conversations about fatigue.
- A preference to solve fatigue-related harm and risk factors with safety technology and behaviour modification only, rather than managing upstream risk.
- Significant gap in perception about psychological harm between workers and employers.
- The system is run on tight schedules, long hours, and often adverse normative behaviour.

- Any efforts in this area would have to strongly challenge the well-entrenched operations of the system.
- Such a group will require expert leadership and funding.

7.8. Summary of the synthesis of findings

The data has revealed seven themes that capture various suggestions of action to manage and minimise risk across the supply chain. Although presented individually, they are each a part of the system that impact and interact with each other. Collaborative effort is required, no one party is responsible for the actions, and feedback must be bidirectional and ongoing.

Concluding this section on the synthesis of findings is a table (Table 3) summarising the potential barriers that are present within the system, which is then followed by the Discussion chapter.

7.8.1. Summary of the barriers

In each of the seven themes above, potential barriers and challenges were alluded to that may impede intervention implementation. Table 3 below shows a thematic summary of the barriers from the themes above with the addition of further quotes and detail from the data.

Table 3: Thematic summary of the barriers

Barriers	Detail
The readiness of the system	• The wider system is not yet ready or supportive. • The desire for change is there but there is no easy or obvious answer to some questions. • "There is a lack of protection for best practice, the industry is required to take the risk for stepping up" (FIW participant). • "Lack of clarity over who has responsibility" (FIW participant). • "Different values and agendas across the system" (FIW participant). • "Partnerships, not competitive tenders" (FIW participant). • Lack of data to understand issues and progress.
Cost and Reward	• "Many operators want to do the right thing but cannot afford to" (FIW participant). • There can be a high cost to compliance for example, in the accreditation schemes. • Some saw that there was no point investing in OHS because they are not rewarded. • Large organisations were willing and able to put safety before cost.

Barriers	Detail
	• Reliance on OHS champions, organisations can be lost when they leave. • Rowland (2018) found that a lack of resources, including time and money, have been found to be major barriers to the implementation of a range of health and safety initiatives by managers. • Disagreement about a fair day's work and pay.
Disagreement and disconnect	• Technology was a contentious topic; some emphasised the cognitive load and distraction that was not being addressed by the increasing (over)use of technology; others saw huge safety improvements. • Safe rates and pay generally incited a similar response, with most agreeing it needed to be addressed, there was little agreement on how to move forward and where the money would come from. • "There is disparity between groups, in general" (FIW participant). • "Disconnect between management priorities and OHS staff priorities" (FIW participant). • Statistics from a recent Colmar Brunton (2019) study for WorkSafe show that there is a discrepancy in perceptions between employers and workers about mental health as a problem. • Concerns over duplication of efforts.
Regulators and regulations	• Few understand the operations and workings of government agencies, including how resources are distributed and how changes are made. • Government agencies are limited in what they can say or do publicly, this resulting in interventions put forward that may already be operationalised or in the process by such agencies. • If something big happens in the country the event is likely to take resources from other divisions. This year the implications from COVID, the White Island investigation and other major events will have had an impact on Government resources. • Some groups are lobbying for a new category of contractor to get around regulation. • "Reluctance of sites to step up to best practice minimum standards, if there is only industry enforcement, that is not enough policing" (FIW participant). • High- level support for the long-term commitment needed to tackle systemic issues involving multiple public agencies and legislative frameworks.
Wider factors	• "Consumers expectation and demand for immediate supply" (FIW participant).

Barriers	Detail
	• "COVID placing pressure on e-commerce and other financial pressures" (FIW participant). • "Poor customer attitudes" (FIW participant). • OHS training for managers came up often but unless there is a strong culture within the organisation and incentives to work safely, educating them is not going to work. • Vision zero and other approaches to safety, zero accident programmes and performance targets have been noted by Dekker (2014, Dekker et al., 2016) to misdirect efforts to the prevention of all harm rather than focusing on the harm that matters most, and they are unrealistic in the context of existing work practices, which then remain unchallenged. • Financial incentives that advocate for zero harm should be questioned.
Evaluation efforts	• Some of the interventions might have been tried before with either positive or negative outcomes, but without continuity. Evaluation and data feedback are important to ensure resources are used constructively, with plays for continuous improvement, rather than cancelling projects as soon as something does not work.

8. DISCUSSION

The reviewed literature showed that supply chain pressures can be forces that both positively and negatively impact the outcomes experienced by workers (Walters, et al., 2011). In the same vein, business models such as outsourcing and contracting can either deteriorate conditions for workers or allow them space to trade and operate independently. Somewhat dangerously, against a backdrop of commercial pressures, demanding customers, low operating costs and a trend towards decentralised business models, managers and organisations are expected to operate within supply chains whilst also trying to positively influence how harm is managed (Walters & James, 2011).

The success of any interventions proposed from this project requires a healthy system, without which the responsible use of such strategies is reliant on the resilience, moral standards, and voluntary compliance of managers and leaders with positional power to make a difference. People at the end of the supply chain are vulnerable to decisions made higher up, which is why many intervention approaches in this report are targeted at the level of the regulator, industry, and organisational levels of the system and why so many of the approaches first require collaboration before further steps can be made. It is essential that collaboration also includes those at the end of the chain.

This chapter provides discussion based on the researchers' observations during data collection, analysis, and write up. The headings below emerged through conceptualising and discussing the interconnected nature of the above seven themes, gaps identified, and reflections on the project overall. This chapter has been included to explain links between the approaches and their connection to supply chain pressures, busines models, contracts and contracting. It further serves to provide context to the upcoming chapter which contains the final recommendations.

8.1. Collaboration

The importance of system-wide (or supply chain-wide) collaboration was mentioned repeatedly throughout the data to address, or at least begin addressing, many of the harm-causing factors. The data showed that if supply chain pressures are to be a force for good, it will require each party along the chain to work collaboratively.

Such a suggestion may seem trivial, but the evidence shows that collaboration is not widespread. The significance of bringing together the whole system was witnessed at the FIW

where participants made headway in first finding common ground and secondly agreeing on actionable ways forward. Not all the suggestions fit the brief of this project, but the activity proved how collaboration can propel action, and this occurred in just one day. Much is owed to the method in which conflicts were managed, progress encouraged, and disagreements over ways forward addressed, acknowledged and for the most part, overcome reasonably fast.

The selection of the FIW participants was done deliberately and carefully. The method requires that only one or at the most two representatives from each part of the system are invited to ensure no one party is over- or under-represented. The organic development of the discourse during the day meant that those able to make decisions about certain topics were not necessarily present. There may be value in having a follow up FIW with specific or individual groups, allowing the freedom to discuss sensitive matters in a structured and protected environment.

This raises the point that there was a collection of topics people wanted to talk about but for various reasons could not. The inability to be open with each other prevented the progress of issues that were visibly important to some groups and which were potentially vital to managing risks across the supply chain. One clear example was incident investigations, prosecutions, the consistency of enforcement, and the MOU between the New Zealand Police/Commercial Vehicle Safety Team, WorkSafe and Waka Kotahi. This is an unfortunate limitation of this study, though understandable, it curbs the potential for wide reaching, and truly system-wide impact when certain topics cannot be discussed.

In a similar vein, pay received mixed attention in the data. Concerns over low pay for workers were raised at the FIW, though and it was met with resistance from some of the business owners when argued that drivers should be paid more. Pay has been linked to adverse OHS outcomes for workers in the literature (see Quinlan & Wright, 2008). However, if there is no agreement or solution on how to move forward, then progress is likely to be slow. There was a similar reticence to discuss fatigue in detail, but this seemed more because people had been talking about it for decades, but with no real progress, and hence a sense of resignation may exist here.

It is with anticipation that a group like the one convened for the FIW, albeit smaller, will come together (as recommended by the participants) to keep the momentum going. The potential impact is high if other issues such as perceived regulatory stagnation, conflicting OHS discourses, and inconsistency in safety standards can be solved together, in continued dialogue.

The researchers suggest that the FIW data is returned to in the near future to uncover many more gems that did not receive further evidential support in this project.

Not all parties agreed with the premise of this project, with the FIW method, or that we could make progress with this work. For these reasons and others, not all parties wanted to participate and therefore were not represented in the data. This is an obvious limitation, however, reinforces the importance of full-system collaboration when developing interventions to ensure results accurately reflect the views of the whole system. For further reflection and learnings on engagement during this project see Appendix Four.

8.2. Organisations and the supply chain

Senior management and management commitment to OHS were singled out as factors likely to impact positive safety culture and OHS outcomes for workers. This is supported widely throughout the literature and was illustrated in the system maps for case study three, in particular.

The managers spoken to for this project were able to better manage risks across the supply chain because they had the support of their senior managers to make autonomous and, at times, difficult decisions. In addition to this, an OHS champion helped to ensure the organisation remained informed and clear in their direction towards a positive safety culture. Given the impact managers and senior managers are likely to have over OHS, the question that still needs consideration is, how do we continue to support them to make decisions with OHS in mind?

Managers at all levels must also operate within the system which means they too are surrounded by factors likely to place them under pressure. And the examples in this project were from managers in larger organisations who may, perhaps, have greater access to resources and positional power. For owner-drivers, the self-employed, contractors, small business owners or small businesses in general, prioritising safety may come at the cost of winning a contract where their priorities are necessarily on price and efficiency; so approaches need to recognise and account for that.

This research has shown, albeit tentatively, that there are several strategies or tools that may encourage and support the prioritisation of OHS among organisations. These include procurement practices and the selection of contractors, accreditation schemes, and the

regulatory framework however, further work is required on their effectiveness, pitfalls, and potential leverage. For example, procurement practices such as alliance teams appear proactive and show how parties can work together to raise OHS standards. However, those most likely to be adversely affected by supply chain pressures, are least likely to be involved in alliance teams.

A further incentive is the use of accreditation schemes. Such schemes can be valuable in ensuring all parties meet certain competencies, but they can be expensive. Again, this potentially excludes invisible, lower end supply chain members. And if the regulatory framework is to be relied upon alone to incentivise OHS, then a great deal of pressure is placed on regulatory agencies to achieve a balance between the carrot and the stick, avoid being overly prescriptive but also function to support all parties. This is no easy task given the various and often conflicting discourses around OHS. A combination of industry and regulatory forces is therefore required.

8.3. Regulators

In addition to the relatively 'hands off' regulatory approach taken historically, a possible explanation for the attention 'regulatory stagnation' received at the FIW is a perceived gap between what the regulator is currently working to do and what the industry perceives they do (based on historic experience). It is perhaps also that those operating within the law, regulations, and rules want to see those who are not, adequately dealt with.

There are often parallel discourses in OHS, some of which are contradictory. For example, calls are made for less regulatory interference exemplified by the New Zealand culture that often resists 'red tape'. On the other side, some participants called for clarity, precision, and instruction on how to better manage OHS, for more regulatory involvement, and more guidance. International research (for example see Rydén, 2015) has shown that the most important thing to do when multiple discourses exist is identify which are present and talk about them, precisely as the FIW facilitated and is recommended here.

8.4. The system

There are global efforts to increase fair and decent work with a focus on job creation, entrepreneurship, and innovation (United Nations, 2015). Using these factors as a guide, it is possible to create a shared goal for the TPW&M system. What is clear from this project, and

work done in the past by others, is that a healthy system looks different to one in which OHS is challenging to prioritise.

Some signs of health were present throughout the system. It was seen in organisations where contractors were considered equal parties and engaged with to solve issues that were causing harm (case study three). In case study four, the organisation worked with contractors to ensure their income met their target earnings, so they did not need to engage in longer hours. In case study one the managers were encouraged to stop production when needed, no matter the cost, and managers would ring ahead if delays occurred, taking pressure of the drivers who might have otherwise had to engage in unsafe behaviour. There were examples of procurement practices that facilitated innovation, agility, and a dynamic approach to OHS. Many of these were one-off examples, and those involved acknowledged that their efforts were often against the norm. In any case, the more that positive, proactive, and innovative examples of addressing vehicle-related risks through good system design can be show-cased, the more likely good practice will follow.

8.5. The challenges

This was an ambitious project, as system-based work tends to be. Affording consideration to all relevant contextual factors can take the researchers down a rabbit hole and can result in complex ideas that often never feel complete. Drawing the boundaries around this project was a challenge but important; some issues such as pay emerged as significant, but the data provided limited confidence in a way forward. With this in mind, it is important to note that this project provides a broad sweep of a complex system, giving initial indication about direction.

Some aspects of the project scope such as supply chain influences on vehicle risks in TWP&M are well researched and there is confidence in the way forward. For other areas, much less is known and there is backfill work that needs to be done. This incomplete understanding and articulation of the system is a natural limitation to the research.

To get the industry to take a system view is difficult as many are, for a variety of reasons, focused on their own space within the system, busy surviving. Therefore, relying on them to come up with systemic level solutions is perhaps still premature. This project is a step in that direction, testing the readiness of the system and gauging their willingness to move towards systems-thinking, but it operates under the assumption that they agree that this approach is both beneficial and possible. Collaboration, trust building, and measured progress will help.

8.6. Questions to be considered alongside the data

The questions below are pertinent to look at when implementing any recommendations that result from this project. Although the upcoming recommendations are based on the data collected, they require further development with consideration given to these points.

- What is the aim of the system, and what does good work look like within the system which has tight margins and strong norms?
- How do we incentivise responsibility for the health and safety of workers across the supply chain? What are the incentives? And who distributes them?
- How do we ensure a living wage for drivers and workers in this system, where does the money come from and do funds need to be distributed? Will an increase in pay reduce harm to workers in and around vehicles?
- How do we assist contractors without taking away their commercial freedom?
- How can we work with large organisations and use their economic power in the supply chain for positive influence over OHS standards?
- What should be included in accreditation schemes to ensure they are not reinforcing limited behaviour change interventions or individually focused interventions?
- How can we support managers with their efforts to improve safety culture in organisations? How is it that recent statistics show high levels of safety culture maturity, but the harm levels are still high? What have we missed?
- How can all data collecting entities with relevant information on TPW&M workers come together to paint the whole picture, so that when an incident, injury or event occurs we can place it in context? How do we do this and respect individual's privacy?

8.7. Summary of the discussion

Collaboration is crucial and the formation of a system-wide representative group will provide a starting point from which to design a co-ordinated way forward in managing risks across the supply chain. The next steps must be designed by those who have impact over and stand to be most impacted by any interventions proposed. The groups and proposed actions started by the FIW participants is a good place to begin. Collaboration may also help address the conflict in OHS discourse found within the system, particularly in relation to 'regulatory stagnation' (as referred to by the FIW participants). Conflicting discourses can be addressed when they are talked about.

Those organisations that used supply chain pressures as a force for good had chosen to prioritise safety no matter the cost. It is important that incentives and a support system are in place to back organisations in that decision.

Industry led initiatives such as procurement practices and accreditation schemes are beneficial because they are processes designed by industry and can lift and acknowledge/reward the parties willing to meet the requirements. This leaves those who are underperforming to the regulators; however, this is dependent on resource allocation, agency collaboration, and enforcement.

9. RECOMMENDATIONS

This section details how the recommendations were formed, how they aim to reduce harm from supply chain pressures and who is best placed to take ownership of each. Concluding this section is a matrix used by the researchers to determine the feasibility of each recommendation.

9.1. How the recommendations were formed

The recommendations resulted from a synthesis of the seven themes and the discussion chapter. The researchers identified the key elements from each theme and looked at how they interconnected, then discussed whether several issues could be housed within one recommendation. Lastly, the draft recommendations were refined to ensure they were tangible and actionable. As a result, some recommendations draw on more than one theme and this is the nature of a systems approach.

Some concepts were discussed heavily throughout the data collection, but no clear solution resulted. Pay is one example of this; it was discussed often throughout the report, however, no consistent or evidentially based recommendation emerged. Where there was disagreement over a particular issue or inadequate support for a recommendation, the researchers have recommended that further work be done or that the system-wide representative group (Recommendation 1) be supported to address it. Recommendation 1 is suggested as a starting point as many of the other recommendations would benefit from the presence of a system-wide representative group.

9.2. How these recommendations address vehicle-related harm from supply chain pressures

The harm data has shown that poor OHS in TPW&M results from incidents such as collisions, slipping from a vehicle, vehicles overturning, and being hit by a moving vehicle. The risk of harm is intensified when industries are operating under various pressures. Resulting symptoms such as risk-taking behaviour leading to a collision are often viewed in isolation, with interventions targeting collision-reduction rather than addressing the background pressure which facilitated the undesirable behaviour.

All the stakeholders that are involved in reinforcing the structures that perpetuate system pressures must be given a seat at the table to explain where the constraints to change lie.

System-wide improvement demands that all system-levels address constraints and explore possibilities together, otherwise we revert to targeting the symptoms. Changes across the system must therefore start with collaboration, leadership, and the definition of a vision of good work. To make informed decisions on interventions we must have data across all system levels. Those in positions of economic and structural power have a responsibility for leadership throughout the supply chain, including the regulator and regulatory system. We must also look closely at the most vulnerable, invisible, and those verging on viability with the aim of improving productive employment, fair competition, and decent work for all. They are the ones most likely to experience harm from an ill-functioning system.

The scope of this work could have been boundaryless, and there is still backfill work that needs to occur before more detailed interventions can be designed and enacted. The dynamic nature of the system requires constant inquiry and investigation, but the important part is that it is carried out in a collective manner. These recommendations are designed to catalyse this work.

Many interesting and very specific solutions were raised during this project, and indeed have merit for further consideration and action. A list of all the solutions, interventions, and recommendations mentioned throughout are featured in Appendix five.

9.3. The recommendations

<table>
<tr><th colspan="2">Defining a healthy industry and developing leadership</th></tr>
<tr><td rowspan="2">Recommendation 1 – Ongoing use of the ‘system in the room’
Building on the engagement carried out through this project and existing industry initiatives, the formation of a system-wide representative group (hereafter called the System Group) is recommended. This group would be well placed to focus on continuous learning and directions, dissemination of information, and informed support for high-quality public and industry-led initiatives. The Future Inquiry Workshop participants that put up their hands for this initiative would be a logical initial group, with others added as needed.

With this group in place, the experience of the system can readily be shared with government agencies and others tasked with creating solutions.

This recommendation is linked to and will influence the progress of many of the following recommendations.</td><td>Ownership: As agreed by the Future Inquiry Workshop participants, this group should be industry led and government supported, with a revolving Chair style of governance.</td></tr>
<tr><td>Impact: If adequately resourced and with clear terms of reference, the potential impact is high and could result in short- and long-term improvements. Benefits include evidence-based interventions based on system level issues and ideas, improved communication, and less siloed thinking.</td></tr>
<tr><td>Recommendation 2 – Establishing an intervention logic for ‘good work’
The system requires a clear line of evidence, logic, and action to reach defined outcomes and an overall vision. Put simply, what is the industry aiming for and how will it get there? As a basis for designing and implementing solutions across the supply chain, and building on existing effort, a work programme is needed to define what ‘good work’ is in a supply chain context. Consideration should be given to specific areas identified through this project such as:
- Fair pay, payment structures, and remuneration
- Safe work duration and shift patterns</td><td>Ownership: It is suggested that this work be facilitated through the System Group with a work programme initiated by relevant government agencies.</td></tr>
</table>

- Reduced exposure to harm and Occupational Health and Safety risks - Social dialogue and supply chain collaboration - Productive employment for everyone - Leadership by Persons Conducting a Business or Undertaking (PCBU), sectors, and government - Fair competition and decent work underpinned by clear regulation - How best practice is recognised and rewarded The 'Future' component of the FIW data is likely to provide a good starting point for this work.	**Impact:** Defining what 'good work' looks like is required to ensure everyone is working towards an agreed vision. This work is likely to take time but the benefit of collaboration and setting this programme of work in motion is likely to have a high impact.
Recommendation 3 – Clarification of Government Roles Clarification of the roles and co-operation between government transport-related agencies (principally WorkSafe, Waka Kotahi, Ministry of Transport and Police/Commercial Vehicle Safety Team). There should be a focus on clearer communication with industry and co-operation around regulation, Occupational Health and Safety leadership, education, prosecution, and enforcement.	**Ownership**: The regulatory agencies and others involved in designing work and safety systems **Impact**: Short-term: clear action and leadership from the agencies. Longer-term: compliance with regulations, clear expectations of Occupational Health and Safety duties, and improved health and safety.
Recommendation 4 – PCBU and Sector Leadership Strong leadership at the sector level, and senior management/director level within PCBUs, was found to improve Occupational Health and Safety across the supply chain. Leadership at each of these levels should be incentivised, building on models such as ShopCare, the Log Transport Safety Council, and the PCBU examples shown through the case studies in this project. Strong leadership at these levels would encourage worker input into Occupational Health and Safety, supply chain engagement, clear and consistent communication, senior and board level support and visibility, active management of health, safety and well-being, trust building, and ownership of supply chain responsibilities including overlapping duties. The research highlights a strong need for manager and leadership training. Focal areas to consider may be Occupational Health and Safety related data and technology management, safety culture	**Ownership**: Sector groups, PCBUs, managers and leaders in organisations, with support and guidance from the regulators. **Impact**: Improved safety standards, culture, and actions at organisational and sector levels, and across the supply chain.

development, change and performance management with regards to Occupational Health and Safety, contemporary risk identification methods, supply chain engagement, and the importance of their role as leaders. Sector group and larger organisational leadership provides support for small businesses and contractors who may not have resources for specific Occupational Health and Safety capabilities. Best practice from the case studies showed leaders who: - Displayed strong collaboration with contractors - Shared safety resources - Included safety specifications in contracts - Aided contractors to meet the set standards and absorbed the cost where possible - Ensured consistent safety expectations for employees and contractors - Worked closely with contractors to ensure fair work allocation and adequate income without intending to compromise their commercial freedom	
Recommendation 5 – Improved methods for monitoring and mapping risk and harm Improved methods for monitoring risk and harm through the supply chain are needed. A fuller picture of how pressure and harm flow through the supply chain will aid in proactively preventing harm and holding appropriate actors to account when harm occurs. For this to be realised, contextual information about incidents, near misses, and routine activities need to be designed into data collection processes based on systems that have been demonstrated overseas. Socio-technical methods can then be used to map the context around harm and identify failures in system components including the people and processes within the system.	**Ownership**: Initiated by government agencies with planned industry engagement and eventual ownership. **Impact**: More effective harm reduction by addressing higher level contributing factors.
Specific areas of focus	
Recommendation 6 – Responsibility across the supply chain Further develop Health and Safety legislation and enforcement of it, with a specific focus on PCBU responsibility and regulatory enforcement throughout the supply chain, building on existing related initiatives and drawing on chain of responsibility frameworks present in other countries such as Australia. This research highlighted that organisations who endeavoured to adopt and prioritise chain of responsibility principles found	**Ownership**: Regulatory agencies. **Impact**: A greater focus on the upstream causes of harm in line with contemporary health and safety theory.

themselves at a commercial disadvantage, highlighting a gap in the New Zealand system. Equally, efforts to campaign for improved supply chain regulations and a discontent over inadequate supply chain enforcement by participants suggest further investigation is required.	
Recommendation 7 – Safety first in public procurement Review of public procurement of freight services and guidelines for procurement that places Occupational Health and Safety at the forefront of service agreements procured by government. With a priority on social dialogue, explore how good practices can be adopted by the wider industry. This may lead to guidelines on the benefits of safe procurement, education on what is value for money – that it is not always about cost – and the positive outcomes of procuring safely throughout the supply chain.	Ownership: Government agencies with input from the System Group. Impact: The data highlighted the impact public procurement could have on raising Occupational Health and Safety standards. A review is relatively low impact but action from this review could result in consistent improvement over time.
Recommendation 8 – Vehicle safety technology management Develop guidelines for proactive use of vehicle safety technologies, focusing on education and coaching, worker engagement, and communication throughout implementation and on-going usage. With the rapid advancements in technology and the popularity among business owners and others to utilise it, it is important that supportive policies and management practices are in place to optimise vehicle safety technology and reduce the mistrust and stress caused to drivers and workers caused by poor use.	Ownership: Industry and organisations. Impact: Supportive policies and management practices can reduce mistrust and stress caused to drivers and workers. Practices such as positive feedback, coaching, and appropriate reward structures can ensure greater benefits result from technological advancements.
Recommendation 9 - Standardised and digitalised driver inductions Standardisation and digitalisation of driver inductions to sites in New Zealand. This would help to reduce misinformation to parties not always visible throughout the supply chain. As the information on what thorough induction looks like is collected, consideration should be given to the design of sites including loading areas and driver safe zones, traffic management plans, adequate access to and allowed use of toilet facilities and rest areas, among other required elements.	Ownership: Industry and organisations, as suggested by the Future Inquiry Workshop participants. Impact: The biggest impact could be seen if all members of the supply chain receive consistent Occupational Health and Safety information.

	Additionally, site improvement could, in the short- and long- term, reduce harm so long as the resources and the will are there. Standardised, digital inductions are likely to take time.
Recommendation 10 – Data Sharing and use Establish 'ways of working' between government and data providers to leverage wider benefit from data that could contribute to understanding and addressing vehicle-related workplace harm. Start with a stocktake of relevant data, agreements for data sharing and use. There is a desire from data providers to begin this process and work collaboratively with government. From the government perspective, overall value, principles, and ways of collaborating with industry would need to be determined initially.	**Ownership**: Government agencies and sector/industry groups, with support from organisational level leaders. **Impact:** This is a long-term goal for the system as there are constraints to overcome, however the benefits include accurate intelligence for intervention, planning, and innovation.
Recommendation 11 – A system view of fatigue Building on the large existing body of work on fatigue and fatigue management, establish a programme of work to map the system determinants of fatigue to better understand the structural arrangements that are driving fatigue. Fatigue is a tangible exemplar of how underlying factors interconnect to result in harm to workers, and therefore could be used as a digestible starting point to approach other issues taking a system view such as pay, payment structures, long working hours, and infrastructure quality. In a collaborative effort with industry and government, the work time rule should be reviewed as a specific area of concern within the wider system that is driving fatigue.	**Ownership**: In consultation with the System Group. Government supported and funded. **Impact**: A high impact if fatigue interventions consider contextual determinants such as working hours, shift structures, and pay. The mapping could begin immediately, building on the conceptual examples from this research.
Recommendation 12 – Overcoming operational barriers to low pay The literature highlights the link between low pay and poor Occupational Health and Safety outcomes, yet there remains disagreement throughout the system as confirmed in this project.	**Ownership**: Either government agencies or the System Group working with trade unions and industry if supported to do so.

Working through stakeholders' concerns and constraints is therefore a necessary place to start. Further work and research are required to understand the concerns, constraints, and operational barriers that system stakeholders face in considering driver pay. With the system in the room, methods laid out in this project could be utilised, but this time with a specific focus on pay and overcoming operational barriers for all those involved.	**Impact**: Overcoming system fractions is necessary to see progress. Collaborative work done by the System Group may produce progress not seen before if traditional constraints can be overcome.
Recommendation 13 – Review of the raw data A significant amount of 'gold was left in the river' through the sheer volume of information collected through this project. A scan of the raw data for specific nuggets that could be considered for action is suggested. Appendix five includes a list of all solutions mentioned throughout the entire project, in varying levels of detail.	**Ownership**: WorkSafe as owners of the data and then collaborative efforts with the System Group. **Impact**: Potentially unexpected benefits from good ideas that might gain sudden traction.

The suggested owners of each recommendation should see themselves as a nexus point, rather than solely responsible, as the nature of a systems approach prescribes the involvement of all levels. In saying this, all the recommendations require cross-system expertise and effort, so a logical outcome is that the group suggested in Recommendation 1 has a high-level oversight of all the recommendations.

9.4. Recommendations on a matrix

Taking the above information into consideration, a matrix (Figure 10) has been used to graphically display the feasibility and effectiveness of each recommendation. Whilst the researchers have made judgements for each recommendation using the matrix, the strength in its application lies in collective feedback. Further refinement of the ease and effectiveness of actions, and the recommendations that should be prioritised should be carried out by stakeholders as part of an activity plan.

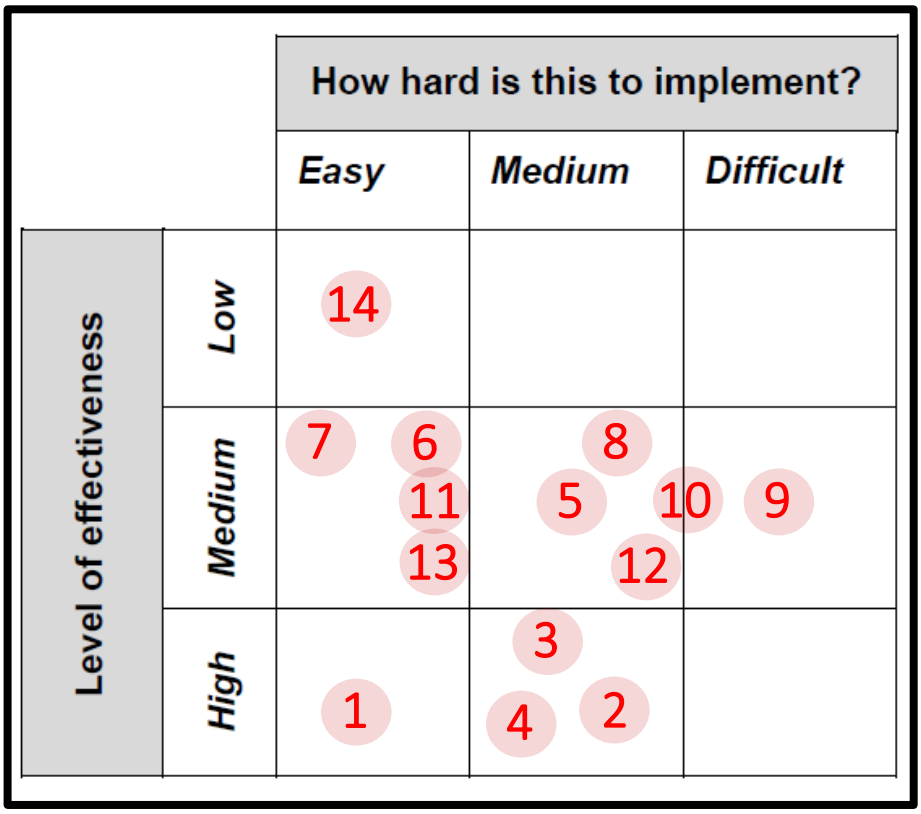


Figure 10: Matrix to determine feasibility

The first four recommendations have been listed at the top of the recommendation table because they are most likely to have a wide-reaching impact given focus on and inclusion of many system levels. The matrix shows that all four have the potential to be highly effective, though, given they require system-wide collaboration, may be more challenging to implement. In saying that, the FIW was evidence that there is a willingness for collaboration, what is therefore required is leadership. Other recommendations are more specific areas that should be addressed taking a system view.

As suggested earlier, Recommendation 1 is the logical starting point. There is willingness from throughout the system for collaboration and many of the above recommendations will require system-wide oversight and input. It is recommended that the system group carry out Recommendation 2, of which the potential impact is high. However, overcoming mistrust and reaching agreement on a way forward makes this recommendation more challenging, but of high priority.

Recommendation 3 is of equal priority; the FIW participants voted regulatory stagnation to the issue of greatest concern. Efforts that result from collaboration have the chance to greatly impact enforcement, data collection, effective use of resources among other outcomes, and it is believed that there are programmes underway to improve this.

10. LIMITATIONS

As in every research project there are limitations. Here are ours.

Despite strong support for the project and excellent participation by most invitees, there were some groups not willing to participate, citing they were not ready or did not want their "dirty laundry aired". Others were not willing to collaborate with other groups participating, some did not see the point in the project. For this reason, certain voices may not be present in the data.

Some groups included in this project gravitated towards solving problems at the individual level or focusing only on safety elements. The researchers acknowledge the difficulty of focusing on wider, contextual factors however, for us as researchers it signified the readiness of the industry to engage in such discussions.

Only documents published online were included in the document review. This is an obvious limitation as the authors suspected that other initiatives may be occurring throughout the industry that were unpublished. In response, individuals, groups, and organisations were sought for case studies to provide insight into approaches being used within the New Zealand context.

The full potential from the FIW data has not yet been fully realised. Various ideas, suggestions and intervention ideas were not incorporated into the final recommendations of this report because they sat outside the brief of this project in which WorkSafe asked for specific focus on wider, contextual factors. This is also true of potential interventions that arose during the document review and case studies. There are potentially very interesting and feasible intervention ideas that sat outside of this brief but are worth noting, nonetheless.

The COVID-19 pandemic raised challenges in various forms including some of the team members and experts unable to return to New Zealand. It was not only the project team impacted by the pandemic but the participants and the whole of the TPW&M system. Though not necessarily a limitation, the pandemic affected the project. Another limitation is a very limited appreciation of how COVID-19 has affected people using vehicles within supply chains.

11. SUGGESTED FURTHER RESEARCH

The priority for action from this project should be developing an action plan to implement the recommendations. There are, however, further areas of enquiry that would greatly benefit our understanding of risk and harm, taking a systems approach within a supply chain context, and these are listed below:

- Taking the systems methods that have been introduced through this project, further effort is needed to conceptually embed the concept of systems approaches, apply them to more specific contexts, set up data collection methods to supports systems methods, and hence carry out more detailed investigations of harm pathways. This could be done at an aggregate level or to better understand individual events.
- While this research has necessarily taken a generalised view of harm pathways, there is more detailed work needed to understand specific vehicle uses including short- and long-haul truck driving, forklift operations, and other vehicle uses including light commercial vehicles. Although not strictly part of the supply chain, service providers (e.g. rideshare), fleet vehicles, trade vehicles, and other vehicles used on workplaces are examples that require a better understanding of the context around risk and harm.
- Tracking progress across the System to improve OHS, as it has been conceptualised in this study, would help to ensure continuous improvement. For example, industry leadership culture might be an emerging strength and yet specific issues such as fatigue or pay are left unaddressed. With an agreed definition of what good work looks like, and an associated intervention logic for achieving this, progress can be tracked.

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13. APPENDICES

13.1. Appendix one: Document review search methods

Search Terms		
Term	**Expanded Term**	**Exclusion**
Work* OR Occupation	(Qualifiers in broad searches)	
Vehicles	Vehicle Heavy vehicle Truck / Lorry Motor Carrier	personal-use cars/ tractor / farming vehicles /quadbike / fire engines / ambulances / bicycles / motorcycles / caravans
Safety and health - Harm	Harm Risk / Hazard / Risk Assessment Injury / Fatality / Near-miss Disease (Acute / Chronic) Accident / Road Accident / Site Accident Exposure Mental health / Psychosocial / Pressure / Stress Fatigue	
Industry	Road freight / Road transport Work zone / work site	
Upstream factors	Upstream / contextual factors	
Specific upstream factors	Employment practices Supply chain pressures Regulator / regulations Regulatory, Government (External), Industry. Organisational, Management, Staff / Work	
In and around vehicles	Sites / Depot / Forecourts / Delivery sites / Client / customer sites Truck stops / Roadside Cab / Seat / Information display	

Search by terms *(non-academic, semi-systematic search)*		
Terms	**Site Searched**	**Useful Results**
Supply chain and harm and drivers at work	GOOGLE	• OECD Due Diligence Guidance for Responsible Supply Chains in the Garment and Footwear Sector • Mont & Leire (2009)
Supply chain and harm and commercial drivers at work	GOOGLE	• ILO (2015) Priority safety and health issues in the road transport sector
Vehicle and harm and "commercial drivers" and work	GOOGLE	• Hanowski, Hickman, Wierwille, & Keisler (2007 • ILO (2019) Guidelines on the promotion of decent work and road safety in the transport sector • Work Safe Alberta (2010) Driving for work: Developing safe practices for employers and workers
"Work in and around vehicles" AND harm	GOOGLE	No new findings
Upstream and safety and driver and work	GOOGLE	• WorkSafe NZ (2020) Understanding the Law: Upstream duties
Accidents and harm that happen on forecourts or delivery sites for workers in and around vehicles	GOOGLE	• Health and Safety Authority (2020) Vehicle Risks • WorkSafe NZ (2020) What Risk Looks Like in your Industry: Petrol Station • HSE (2020) Delivering Safely
In what ways can accidental injury be reduced in areas where vehicles operate?	GOOGLE	• IOSH (n.d.) • Main Types of Hazard Caused by Vehicle Operations, hseblog.com (2018) • HSE (2013) Workplace transport safety: A brief guide
What are the risks associated with working around vehicles?	GOOGLE	• HSE (2020) Working Under Vehicles • HSE (2020) Controlling the risks in the workplace
Heavy vehicle industry harm to drivers	GOOGLE	The Conversation: • Young drivers don't know how to be safe around trucks. • Don't just blame the driver.
'The Conversation' articles yielded six new findings as referenced in the articles above		• National Transport Insurance (AUS) National truck accident research centre – major accident investigation report • National Transport Insurance – chain of responsibility • Abc – charges laid against driver in tanker crash • **Newnam et al. (2017). Reforming the road freight transportation system using systems thinking • Newnam and Goode (2015)

Search by terms *(non-academic, semi-systematic search)*		
Terms	**Site Searched**	**Useful Results**
		• Belzer and Sedo (2017)
Heavy vehicle harm upstream factors	GOOGLE	* Macquarie University report Thornthwaite and O'Neill (2017) Thornthwaite and O'Neill (2016)
Heavy vehicle industry harm reduction truck drivers	GOOGLE	*RTMS - Blanquart, Clausen, Jaccob (2016)
Upstream factors impacting vehicle safety	GOOGLE	• Department of Health (AU) Interventions to reduce risk and increase protective factors. • Worksafe Australia – Vehicles as a workplace (2019)
Upstream factors impacting truck driver safety	GOOGLE	No new findings
Upstream factors causing harm among truck drivers	GOOGLE	Oregon State University (2017)
Upstream factors causing accidents among truck drivers	GOOGLE	• EU-OSHA – review of accidents and injuries • OSH-WIKI • Fleetsafe - Europe
The Fleetsafe site yielded four new findings		• European Agency for Safety and health at work (EU-OSHA) (2001). Factsheet 18 – preventing road accidents involving HGV • IRU. Driver Checklist • *EU-OSHA (2011) Managing risks for drivers • Schneider, E. & Irastorza, X. (2011). EU-OSHA
Upstream factors causing fatigue among commercial drivers	GOOGLE	• Anund, Fors, Kecklund, van Leeuwen & Åkerstedt (2015) • European Road Safety Observatory (2018) Fatigue 2018 • CDC (2020) Driver Fatigue on the Job
Upstream factors causing fatigue among truck drivers	GOOGLE	No new findings
Site accident management commercial drivers	GOOGLE	Brock (2005) Motorcoach Industry Hours of Service and Fatigue Management Techniques
Site accident management truck drivers	GOOGLE	Short (2007) Safety culture
Harm reduction "commercial drivers" upstream factors	GOOGLE	• WHO Violence and injury prevention, road traffic activities, road safety training • Wang & Pei (2014)

Search by terms *(non-academic, semi-systematic search)*		
Terms	**Site Searched**	**Useful Results**
Harm reduction truck drivers upstream factors	GOOGLE	(Many were health focused) • Hege et al (2019) • Hege et al. (2018) • Rolison et al (2018) • NIOSH – website
Commercial driver exposure to harm in and around vehicles	GOOGLE	No new findings
Commercial driver health and safety in and around vehicles regulation	GOOGLE	No new findings
Worker health and safety in and around vehicles regulation	GOOGLE	No new findings
Worker exposure to harm in and around vehicles	GOOGLE	ILO (2000) Mechanic and automobile hazard datasheet
Safety risks for commercial drivers regulatory response	GOOGLE	No new findings
Truck driver exposure to harm in and around vehicles	GOOGLE	No new findings
Truck driver health and safety in an around vehicles regulation	GOOGLE	Belzer & Saltzman CDC (2007) Conference document
Truck drivers safety and health prevention	GOOGLE	No new findings
Truck driver harm in and around vehicles	GOOGLE	ILO – international hazard datasheet on occupation
Safety risks for truck drivers regulatory response	GOOGLE	• Eric Tucker Book • BTM law blog • Commercial Motor Vehicle driver fatigue book • Penney & Associates – trucking accidents
Road freight transport risks to truck drivers	GOOGLE (Found the book on Scholar)	Goel (2018) Legal aspects article
Trucking and harm to truck drivers	GOOGLE	No new documents
Industry practices linked to commercial driver harm		United States Department of Labour: Occupational Health and Safety Administration (2020) • Trucking Industry, health and safety related info • Guidelines for Employers to Reduce Motor Vehicle Crashes
Industry practices linked to truck driver harm	GOOGLE	Behrens Pape (2012) Report
Supply chain and harm and driver	GOOGLE	Saeed & Wolfgang (2019)

Search by terms *(non-academic, semi-systematic search)*		
Terms	**Site Searched**	**Useful Results**
Supply chain pressures linked to commercial driver harm	GOOGLE	No new documents
Supply chain pressures linked to truck driver harm	GOOGLE	• Financial Times: Australia • Ross Cruz (2019)
Management practices linked to commercial driver harm		• Krueger (2007) Health and wellness programs for commercial drivers • Knipling & Bergoffen (2011) Driver selection tests and measurement • Poore & Hartley (n.d.) Driver Fatigue Update
Management practices linked to truck driver harm	GOOGLE	Mejza, Barnard, Corsi & Keanne (2003)
Organisational practices linked to commercial driver harm	GOOGLE	Ministry of Transport: Vehicles as a Workplace (PDF) (n.d.)
Organisational practices linked to truck driver harm	GOOGLE	Graham, Scott & Nafukho (2008)
Regulatory practices linked to commercial driver harm		Stuckey, Pratt & Murray (2013)
Regulatory practices linked to truck driver harm	GOOGLE	Heaton (2005)
Regulatory practices linked to truck driver health and safety	GOOGLE	Farrell (2016) Assessing daily driving hours
Organisational practices linked to truck driver health and safety	GOOGLE	Arboleda, Morrow, Crum & Shelley (2003)
Management practices linked to truck driver health and safety	GOOGLE	Crum & Morrow (2002)
Supply chain pressures linked to truck driver health and safety	GOOGLE	• Mayhew & Quinlan (1997) – dated reference but maybe worth considering. • *Australian Supply Chain Regulation (2017)
Industry practices linked to truck driver health and safety	GOOGLE	No new findings

Specific Sites		
Terms	**Site Searched**	**Useful Results**
NIOSH National Survey of Long-haul Truck Drivers: Injury and Safety / Health and Injury: Health Behaviours	NIOSH website	• Chen et al (2015) • Birdsey et al. (2015)
TruckSafe	trucksafe.com.au	• Business Rules and Code of Conduct • The Master Code • Chain of Responsibility

Specific Sites		
Terms	**Site Searched**	**Useful Results**
		• Truck Safe Accreditation
Safe Rates (Transport Workers Union (TWU))	twu.com.au	• Safe Rates lobbying • The 2020 Fight • Coles signs ground-breaking agreements (2019) • The Sydney Morning Herald (2016) • Exploitation on-demand (2019)
National transport commission	www.ntc.gov.au/transport-reform/HVNL-review	*Heavy vehicle national law reform
Heavy vehicle national law review	www.ntc.gov.au/transport-reform/HVNL-review	NTC Issues Paper 1. Effective Enforcement 2. Assurance Models 3. Vehicle standards 4. Safe people and safe practices
ATA safety management council (American Trucking Associations)	https://www.trucking.org/safety-management-council https://www.trucking.org/news-insights/ata-welcomes-new-hours-service-rule	Safety Management Council "Modernized Regulation Will Provide Flexibility While Maintaining Safety"
Canadian association of road safety professionals	www.carsp.ca/research/research-papers/	• Commercial Vehicles and vulnerable road users (2019) • OHS risks in Canadian long-haul truck drivers (2019) • Evaluation of the road safety impact of Ontario's speed limiter legislation for large trucks (2017)
Safety Driven: Trucking safety council of BC	safetydriven.ca/safety_topic/occupational-health-safety/	-
Transport safety research centre Loughborough Design School	https://www.lboro.ac.uk/departments/design-school/research/human-factors-complex-systems/	Underwood & Waterson (2013)
Transportation Association of Canada	www.tac-atc.ca/en/councils-and-committees/safety-design-operations-council	Safety, Design & Operations Council

Specific Sites		
Terms	**Site Searched**	**Useful Results**
International Transport Workers' Federation	www.itfglobal.org/en/sector/road-transport/safe-rates	• Safe Rates • Scalop Logistics in Supply Chains
HSE	https://www.hse.gov.uk/research https://www.hse.gov.uk/workplacetransport/ https://www.hse.gov.uk/pubns/indg382.pdf https://www.clocs.org.uk/	Characteristics and factors ensuring a safe build for the Olympic Park Vehicles at Work *Driving at Work: Managing Work-Related Road Safety A Guide to workplace transport safety Also read: fors-online.org.uk/cms/ CLOCS - CLOCS Standard
Liberty Mutual Research Institute		-

Academic Articles *(peer reviewed and journal articles only)*		
Terms	**Database**	**Useful Results**
"supply chain" AND harm AND driver* AND (work* OR occupation)	AUT Library	Saaed & Wolfgang (2019)
"supply chain" AND harm AND "commercial driver" AND (work* OR occupation)	AUT Library	Lloyd (2020) LeMay & Keller (2019) Cantor, Macdonald & Crum (2011)
Vehicle AND harm AND "commercial driver*" AND (work* OR occupation)	AUT Library	Choo & Grabowski (2018) Cantor & Terle (2010)
Harm AND worker* AND vehicle AND "supply chain"	AUT Library	Soundararajan, Brown & Wicks (2019) Lollo & O'Rouke (2020)
Upstream AND safety AND driver* AND (work* OR occupation)	AUT Library	Jiang et al., (2020) Heery et al., (2017) Belzer (2018) Jaffee & Bensman (2016)
"Work zone" AND safety AND driver* AND (work* OR occupation)	AUT Library	Raddoui, Ahmed & Gaweesh (2020) Koilada, Mane & Pulugurtha (2020) Bharadwaj, Edara & Sun (2019)
"Work site" AND safety AND driver* AND (work* OR occupation)	AUT Library	Apostolopolous, Lemke, Sönmez & Hege (2016) Lippel & Walters (2019) Cruz et al., (2018)

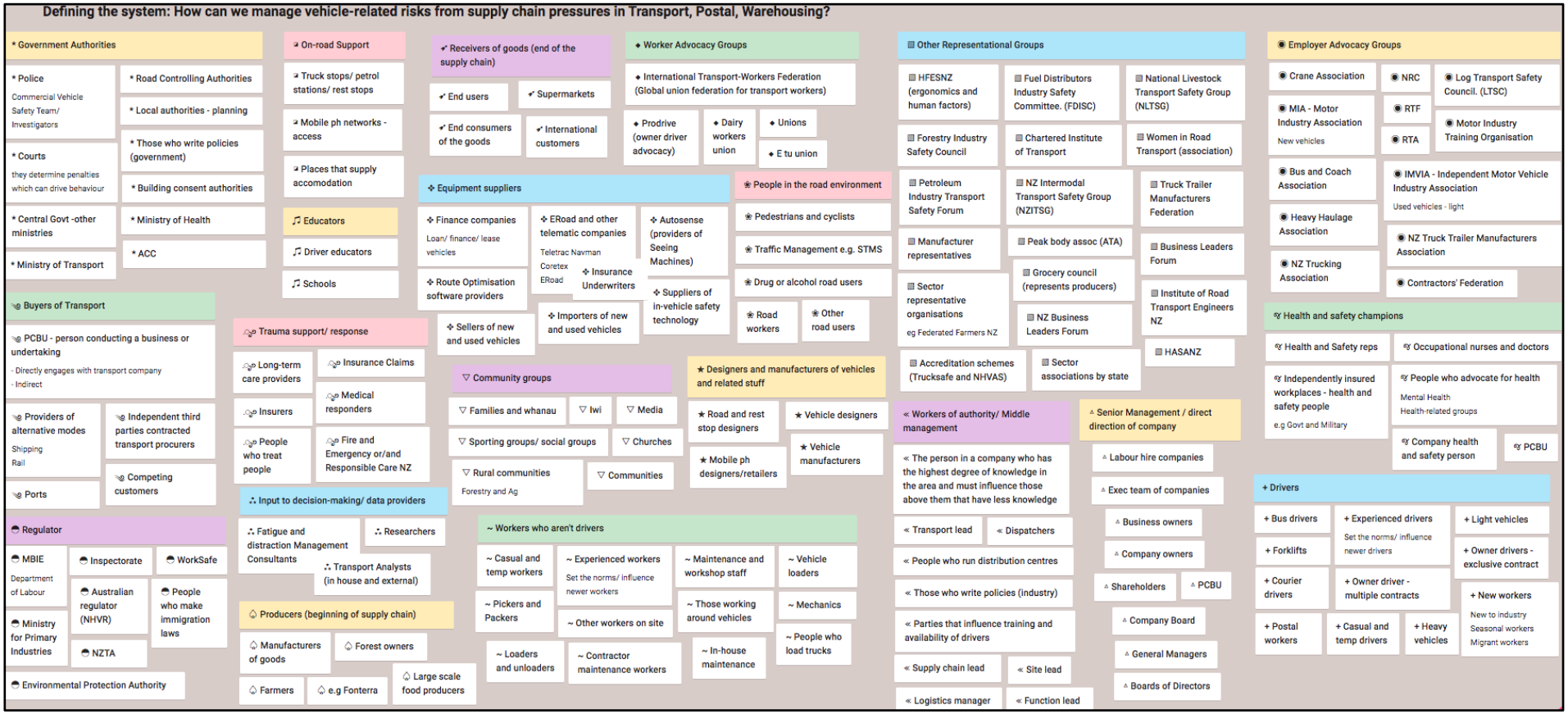
Academic Articles *(peer reviewed and journal articles only)*		
Terms	**Database**	**Useful Results**
		Conway et al., (2017)
“heavy vehicle*” AND harm AND upstream	AUT Library	No new documents found
“upstream factor” AND “vehicle safety”	AUT Library	No documents found
"upstream factor" AND safety AND "truck driver"	AUT Library	No documents found
"heavy vehicle” AND "health and safety" AND "contextual factors"	AUT Library	Edwards, Davey and Armstrong (2014). Not solutions focused but provides contextual factors in HV industry
"truck driver" AND "harm reduction" AND "health and safety"	GOOGLE Scholar	No relevant documents found
"heavy vehicle" AND "harm reduction" AND "upstream factors"	GOOGLE Scholar	No documents found
"heavy vehicle" AND "harm reduction" AND "contextual factor"	GOOGLE Scholar	No documents found
"truck driver" AND "harm reduction" AND "contextual factors"	GOOGLE Scholar	No relevant documents found
"truck driver" AND "accident" AND "contextual factors"	GOOGLE Scholar	Matthews (2010) Reiman, Forsman, Målqvist, Parmsund, and Norberg (2018)
"latent factors" AND "truck drivers" AND "safety"	GOOGLE Scholar	Huang, et al. (2014) Cantor et al. (2011)
"industry practice" AND "truck drivers" AND "safety"	GOOGLE Scholar	Quinlan (2001) Friswell and Williamson (2019) McClean (2016)

Exclusions

- Non-English sites/articles/documents (Select few in Swedish)
- Looked briefly over documents/sites from pre- 1990 but focused more on those from the previous 20 years and preferably the previous 10 years
- The first two pages of a GOOGLE search were scanned only

13.2. Appendix two: Working process in defining the system

The map below shows the working process the participant selection group went through when attempting to define the system. It is important to note that this does not show the final groups they settled on, rather a step in the process. It should be read as a draft and seen as one tool used by the group to reach the final stakeholder groups.



13.3. Appendix three: The Future Inquiry raw data

Managing vehicle-related risks from supply chain pressures

Future Inquiry Workshop – 29 October 2020

Please note, participant's names have been taken out of this data.

Introduction

In 2019, formative research performed by WorkSafe to inform the Working In and Around Vehicles (WIAV) programme identified that supply chain pressures (and contract models) were important contributing factors to vehicle-related harm, particularly in relation to the transport industry

In April 2020, a consortium led by Mackie Research was contracted to research supply chain pressures as they relate to the use of vehicles on the job.

To date, the research has involved:

- A document review of available information;
- The establishment of an industry Stakeholder Advisory Group;
- A Future Inquiry Workshop (29 October 2020)
- A series of case studies to explore examples of success in managing vehicle-related risks from supply chain pressures

The work above will be used to inform the findings of the research, and development of recommendations. Any intervention needs to consider pressures from across the supply chain.

On the day of the Future Inquiry Workshop, a message of welcome to participants was delivered by Phil Parkes – CE of WorkSafe via video. The video can be viewed here:

https://youtu.be/TwN2dTs-UBE

A Future Inquiry Workshop was held on the 29th October 2020 in the West Lounge at Eden Park, Auckland with 67 participants from across the industry and community. It was facilitated by Dr Lily Hirsch and Dr Adrian Field with assistance from Rebekah Thorne and Ali Raja. There were 67 participants representing 8 stakeholder groups, each identified by a colour:

1.	Drivers and their advocates n=9	**Neon green**
2.	Regulators and government authorities n=8	**Yellow**
3.	Business leaders and advocacy groups of non-transport providers n=7	**Pink**
4.	Educators and health and safety champions n=9	**Dark green**
5.	Business leaders and advocacy groups of road transport providers n=11	**Orange**
6.	Workers and their advocates n=8	**Neon yellow**
7.	Community, people in the road environment, on-road support n=9	**Blue**
8.	Equipment and data providers n=6	**Red**

Purposes

The purposes of the workshop were to:

- Identify participants' shared common ground
- Inform the preparation of solutions for managing vehicle-related risks from supply chain pressures

The workshop was designed to engage the diverse stakeholder groups, which represent 'the whole system', in helping to develop the strategies that are likely to lead to solutions for managing vehicle-related risks in the transport sector.

Ground rules

A list of ground rules was developed by the group to adhere to for the day. They were:

- Let others speak
- Don't be afraid of hard truths
- Be present
- All opinions are valid
- Respect the rules
- Find solutions not problems
- No question is a dumb question
- Be open-minded
- Everybody has the right to change their mind

Programme

- The past
- The present
- The future
- What first steps can we take?

The past

In stakeholder groups, participants identified what worked well and what did not work well in the transport sector with respect to vehicle-related risks. They discussed what is worth keeping, changing and discarding. They asked: What have we achieved up to now and what are the gaps we need to address? They completed **Worksheet 1**.

Stakeholder Group 1— Drivers and their advocates

Existing trends

- Commercial pressure
- Delivering on time
- Amount of road works
- Sharing of roads/infrastructure with public

Do well (what has worked well)

- Individuals taking responsibility for themselves -> not being micromanaged
- Low tech environment drives initiative (driver)
- Dispatchers had been drivers and reduced pressure on their drivers – empathy and respect
- Managers had industry experience: understanding
- Using RT's & talking to drivers (culture and personal) vs phones/tablets = removed, distracting
- Health & safety can drive positive behaviour

Not well (what hasn't worked well)

- Time pressure to deliver
- Delivery time slots
- Financial focus on deliveries by a driver (volume)
- No culpability at all levels
- Lack of investigation of accidents
- Lack of health & safety training/information

Stakeholder Group 2— Regulators and government authorities

Do well (positive difference)

- Including vehicles as a workplace
- Acknowledging work-related road safety -> increased conversation, especially between different bodies
- Clearly defined roles and responsibilities
- Looking forward, having electronic and accurate time keeping/logbook records

Not well (negative difference)

- In the past, really siloed thinking
- Lack of engagement between regulators to action MOUs
- Lack of capability and experience (regulators) and capacity
- Regulatory structure and funding structure not fit for purpose -> and driving negative outcomes
- Capture and analysis of data

    - Purpose of journey? e.g. work or personal
    - Breadth of supply chain and multiple roles carried out
- Commercial contract pressures

Stakeholder Group 3— Business leaders and advocacy groups of non-transport providers

Do well (working)

- New roads that have been built
- Major roading projects bring safety *
- TMP intent to improve *
- Work Act 2015 - responsibility work well
- Specific industry standards *

Not well

- Lack of consistency *
    - e.g. drivers having different inductions
    - too many variations to training
- Chain of responsibility *
- Different standards for sites
- Quality of roads *
- Industry leading brings inconsistency
- If not working on the road why are you doing this on the site?
- Implementation of Health & Safety at Work Act not / distractions (implementation of the Act not always consistent)

Stakeholder Group 4 — Educators and H&S champions

Do well

- Tech adoption
    - Equipment standard
    - Add-on vehicle tracking and cameras
    - Speed control
- Training
    - Some do e.g. logging
- Industry standards (unit standards)
- Associations working together better

Not well (negative features)

- Regulation not fit for purpose
    - Over-regulated/not relevant regulations
    - Logbook rule doesn't work, doesn't manage fatigue
- Different agendas/low system maturity.
    - Insufficient graduated licence process
    - No regulations/guidance around working and driving
    - Overlapping PCBUs with different systems and processes – system at low maturity
- Different values; end customer; manufacturer: supply chain

- Transport viewed as a cost not value

Stakeholder Group 5— Business leaders and advocacy groups of transport providers

Do well (worked well)

- Technology Guardian System /E-road
- Vehicle standards requirements
- Driving hours
- Independent contractor model
- Technology
    - Logistics planning software
- Strong culture and performance

Not well (not working)

- Too much pressure on system
- Demand to meet tight time constraints
- Operator rating system
- Driver shortage
- Moonlighting – bus and uber
- Increasing driver age
- Industry perceived as not desirable, low wage
- Complexity and standards - inductions/training required
- Industry does not market itself well
- Accountability of non-compliant operators
- Disconnected regulatory framework (ACC/NZTA/WorkSafe etc)
- Customer pressure

Stakeholder Group 6— Workers and their advocates

Do well

- Health & safety groups, discussions
- Toolbox meetings/ SOPS
- Recording near misses and hazards
- Health and safety reps
- Risk reviews
- Site inductions/ signing in
- Simple practices

- Enforcing/ empowering workers to speak up

Not well

- Not enough resource in health and safety
- Education/ training
- Health and safety not used the correct way
- Not enough reporting
- Need more paperwork trail on incidents
- Repercussions
- Disconnect

Stakeholder Group 7— Community, people in the road environment, and on-road support

Do well (what works well)

- Tech improvements (GPS/telematics)
- Logbooks and fatigue management
- ERoad and other tech suppliers
- Ongoing driver training
- Public awareness – driver accountability
- Specialist training/situations e.g. cycling/Share the Road
- Skills/awareness of professional drivers
- Helmets
- Seatbelts (in some vehicles)

Not well (what hasn't worked well)

- Comms between agencies
- Poor public awareness around crash scenes/certain situations
- Driving as a right rather than privilege
- Poor accessible data – farm/rural data, at-work crash data
- Allocation of space in road environment
- Licensing process doesn't prepare drivers to mix with vulnerable road users
- Lack of health and safety resources

- No designated fleet/safety person in companies (person is also human resources/procurement/all health and safety)
- Penalties too low

Stakeholder Group 8— Equipment and data providers

Do well (keep)

- Accidental gains in getting tech into fleets/good data out of them
- Standards and ratings/what little encouragement is in place now

Context

- Helping respond to time pressures -> identifying and managing constraints -> planning

Not well (change/lose)

- Resistance to investing in better/appropriate equipment.
- Lack of understanding of the outcome (e.g. on time delivery) and of how to get to the outcome
- Government focus that pushes attention/investment in other directions (e.g. emissions) -> change signals in contracts/priorities
- Elevate safety priority within companies, standards -> vehicle ratings
- Use of incident data/ways to access it and put it to work -> research protocols
- Access to supply chain/context data

Common to all groups

Do well (Positive)

- Technology adoption
- Training e.g. companies getting into it
- Government /regulations new willingness to change
- New roads (quality)
- Vehicle requirement standards
- Modern vehicles
- Increasing awareness of business responsibilities

Not well (Negative)

- Insufficient resources
- Time pressure
- Technology not reaching potential
- Training
    - Lack of training/lip service
    - Inconsistency
    - Complexity
- Induction – inconsistency
- Siloed regulation/agencies
- Regulations not fit for purpose
- Poor procurement processes in buying transport services
- Commercial pressures – incentive NOT to invest
- Accountability – accepting where went wrong
    - Organisational pressure
    - Cycle of pressures (time, consumer, commercial)
- Poor condition of roads
- Upstream pressures
- Roadworks (length of time)
- Variability in different entities
- Lack of incentives to invest across system
- Clouding of statistics
- Data that is fit for purpose/accessible

The Present – Our Mind Map

- **Trends in the present environment**

Participants identified current trends in the environment that impact on managing vehicle-related risks from supply chain pressures. Participants were asked to identify trends, barriers, and supports that they could see in their environment. These were collected as a large group mind map. Each participant was given 5 sticky dots in the colour of their stakeholder group and asked to spread these as votes over the trends they regarded as most significant.

As a filter for voting they were asked to consider which trends were

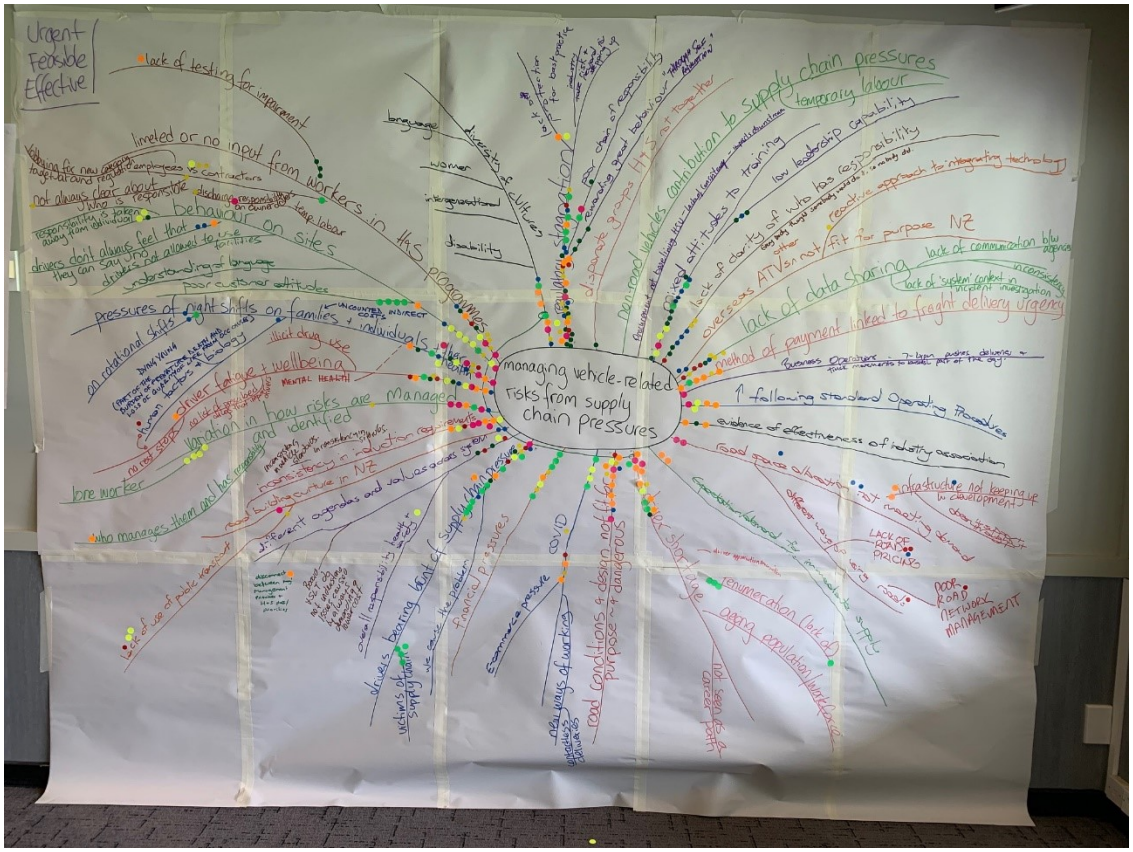
- Urgent – it's critical to deal with this matter straight away
- Feasible – it's possible to do something about this
- Effective – if dealt with, this will make a difference.

The trends and the voting are listed here.

It is important to note that those trends that received *no* votes may still be significant; they were just not accorded *relative* significance on the day.

There were eight stakeholder groups:

1.	Drivers and their advocates n=8	**Neon green**
2.	Regulators and government authorities n=8	**Small yellow**
3.	Business leaders and advocacy groups of non-transport providers n=7	**Pink**
4.	Educators and health and safety champions n=7	**Dark green**
5.	Business leaders and advocacy groups of road transport providers n=11	**Orange**
6.	Workers and their advocates n=9	**Big yellow**
7.	Community, people in the road environment, on-road support n=8	**Blue**
8.	Equipment and data providers n=6	**Red**



Managing vehicle-related risks from supply chain pressures	**All**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Regulatory Stagnation	**36**	**4**	**7**	**2**	**9**	**5**	**1**	**5**	**3**
● Lack of protection for best practice	**2**					**1**	**1**		
● Industry take risk and reward for stepping up									
● Poor chain of responsibility	**3**	**1**		**1**	**1**				
● Rewarding great behaviour "through safe regulation"	**3**				**3**				
Disparate groups H&S not together	**1**				**1**				
Non-road vehicles contribution to supply chain pressures									
● Temporary labour									
Procurement not baselining HSW – lack of consistency – impacts downstream									
Mixed attitudes to training	**15**	**2**		**1**	**5**		**3**	**4**	
● Low leadership capability	**3**				**2**			**1**	
Lack of clarity of who has responsibility (Everybody thought somebody would do it, so nobody did)	**8**		**2**		**2**			**3**	**1**
Overseas ATVS (and other vehicles) not fit for purpose in NZ	**2**							**2**	
● Reactive approach to integrating technology	**1**		**1**						
Lack of data sharing	**9**		**4**		**1**			**1**	**3**
● Lack of communication between agencies									

Managing vehicle-related risks from supply chain pressures	All	1	2	3	4	5	6	7	8
● Inconsistency									
● Lack of 'system' context in incident investigation									
Method of payment linked to freight delivery urgency	6	1	1			4			
Business operations – 7-4pm pushes deliveries & truck movements to busiest part of the day	1			1					
Increase following standard Operating Procedures	5			1		2	2		
Evidence of effectiveness of industry association	3				1	2			
Road space allocation is not meeting demand	2			2					
● Infrastructure not keeping up with development	5					2		3	
- Doesn't support throughput									
● Different ways of using roads	1							1	
- Lack of road pricing	3							1	2
- Poor road network management									
Expectation/demand for immediate supply	2					2			
Driver shortage [Links with "Diversity of cultures"]	14	3	1	2	1	6	1		
● Driver appreciation/recognition									
● Remuneration (lack of)	4	4							
● Aging population/workforce									
● Not seen as a career path									
Road conditions and design not fit for purpose, and dangerous	14		2	2		6	1	2	1
COVID	5	2	1				2		
● E-commerce pressure	4		1			2			1
● New ways of working									
- Contactless deliveries									
Financial pressures	8	4	2			1	1		
Drivers bearing brunt of supply chain pressure	19	7	3	1	2	2		2	2
● Victims of supply chain	4	4							
● We cause the problem									
Different agendas and values across system	5				2		1		2
● Overall responsibility health + safety									
● Disconnect between management priorities and Health and Safety staff priorities	1					1			
● Board and Strategic Leadership Team do not understand issues caused by always demanding a lower cost									
Road building culture in NZ	3			1				2	
● Lack of use of public transport	4		1				2		1
Inconsistency in induction requirements	8			3		2	2		1
● Inconsistency in vehicle standards									

Managing vehicle-related risks from supply chain pressures	All	1	2	3	4	5	6	7	8
● Inconsistency in site rules									
Variation in how risks are managed and identified	7	1	1	3		1		1	
● Lone worker	4						4		
● Who manages them and has responsibility	1					1			
Driver fatigue and well-being [Links with "Pressures of night shifts on families, individuals, and their health"]	14	1	1	1	2	3	2	2	2
● Illicit drug use									
● Mental health [Links with "Pressures of night shifts on families, individuals, and their health"]									
● No list of prescribed drugs that impair drivers									
● No rest stops	1					1			
Pressures of night shifts on families, and individuals, and their health [Links with "Driver fatigue and well-being" and it's sub-branch "Mental Health"]	16	1	2	4	2	2	2	2	1
● Uncounted indirect costs									
● On rotational shifts	3	1						2	
● Dying young (part of the burden of premature death and loss of quality of life from occ. causes									
● Human factors and biology	2							1	1
Behaviour on sites	9	1	1	1			5	1	
● Responsibility is taken away from individual	3				1		2		
● Drivers don't always feel like they can say no	3					1		2	
● Drivers not allowed to use facilities									
● Understanding of language									
● Poor customer attitudes	5	4				1			
Limited or no input from workers in H&S programmes	11		3	2	2	1	1	1	1
● Employees vs contractors	4	1	2				1		
- Lobbying for new category to get around regulation									
- Not always clear about who is responsible	2						2		
- Discharge responsibilities on owner drivers	2		1	1					
▪ Temporary labour									
- Lack of testing for impairment	4				3	1			
Diversity of cultures [Links with "Driver shortage"]	9	2	1	1		3		2	
● Language									
● Women									
● Intergenerational									
● Disability									

Priority themes from Mind Map

1. Regulatory stagnation
2. Drivers bearing brunt of pressure
3. Pressures of night shifts on families, and individuals, and their health
4. Mixed attitudes to training
5. Road conditions and design not fit for purpose, and dangerous
6. Driver shortages
7. Driver fatigue and well-being
8. Limited or no input from workers in H&S programmes

Stakeholders' response to the mind map

In stakeholder groups, participants examined the mind map and chose a few trends that were important to their group. They discussed what they are doing now in response to that trend and what they (*not others*) are not doing now about that trend. They completed **Worksheet 2**.

Stakeholder Group 1—Drivers and their advocates

Drivers bearing brunt of supply chain pressures

Doing now (what is being done)

- Speaking truth to power
- Directly challenging poor and dangerous conduct
- Encouraging cooperative culture vs conflict
- Campaigning for safe rates

- Lobbying government regarding supply chain regulation
- Promoting supply chain responsibility
- Negotiating supply chain responsibility agreements with large corporates in forestry, oil, supermarkets
- Health and safety focus and engagement with staff -> empowered to be safe
- Collective action groups – greater awareness of

Stakeholder Group 2— Regulators and government authorities

Fatigue

Doing now (happening now)

- Government committed to reviewing logbook and work time requirements under the Land Transport Act
    - Focusing on fatigue management e.g. maximum driving hours
    - Use of tech e.g. e-logbooks, telematics

Could be doing

- Improve data collection and sharing between agencies within the sector
- Review coronial files, collect purpose of journey info on crashes
- Redesign ACC levy usage
- ACC investing in health and safety initiatives

Regulatory stagnation

Doing now

- Labour inspectorate using case law to give clarity on legislation
- NZTA as regulator is rebuilding -> reviewing rules and powers of regulators e.g. designating NZTA as Health and Safety at Work Act regulator
- Making baby steps to join up regulators -> Public Service Act encouraging / emphasising collaboration
- Shift from physical safety -> broader well-being focus e.g. mental health
- Support best practice and capability

- Workforce development - HASANZ

Could be doing

- Joint operations
- Could also execute MOU more efficiently between CVST and WorkSafe/ NZTA

Stakeholder Group 3— Business leaders and advocacy groups of non-transport providers

Driver fatigue and well-being

Doing now

- Looking at time driver is getting out of bed
- 24/7 pickup and delivery
- Focusing on vendor and customer delays -> store to report if they delay
- Expecting drivers to work below legal drive time
- New facility improvement testing designed with driver facilities
- Improved testing
- Contractor randomised testing
- Provide port-a-loo
- Sleep apnoea support
- Access to facilities
- Overnight park
- Provide rest stop areas
- Health monitoring -> level of fatigue
- Pre-loading

Setting standards

Doing now

- Set golden rules for traffic management
- MHE (Materials Handling Equipment) standards
- Competency testing
- Driver training
- Safety systems
- Pre-qualification
- KPI reporting
- Vehicle standards

Clarity of responsibility

Doing now

- Traffic management on site
    - Visibility
    - Signage
- Site induction
- Pre-qualification
- Following Australian standard
    - Master code

- As a non-transport operator setting and maintaining standards and paying for it e.g. park break alarm

Stakeholder Group 4 — Educators and H&S champions

Training

Doing now

- Mixed attitudes to training
- Providing the dollar value / ROI of training – could do more
- Programme of training
- Partnering with insurers to reduce costs linked with training
- Holding up heroes of industry
- Providing sector leadership and guidance on best practice
- Shift rosters to be flexible with staff personal life pressures

Not doing now

- Could collaborate more
- More robust evidence for training
- More personalised and functional training

Stakeholder Group 5— Business leaders and advocacy groups of transport providers

Doing now by National Road Carriers in relation to road quality

- Running roading campaigns
- Highlighting problems

Doing now by transport operators regarding driver shortage/ welfare/ remuneration

- Spending more on suspension
- Rolled out Guardian System (fatigue cameras)
- Checks driver eating habits
- Provide access to customer facilities e.g. café/kitchen

Training

- Doing now by industry groups in relation to improve/ promote training
  - Scholarship for training
  - Lobbying
  - Engage with government and sector
- Operator/Engagement
  - Talk to drivers
  - Toolboxes
  - Educate on nutrition/financial management/fatigue/ drug and alcohol/ employment assistance programmes (independent – relate to driver shortage/ welfare)
  - Support payment for repair
  - Lot of respect between contractors/drivers/owners
  - No blame culture
- Innovative employment scheme
  - Shift patterns
  - Job sharing

Stakeholder Group 6— Workers and their advocates

Regulatory stagnation

Doing now

- Union pressure to improve regulatory standards
- Need for cooperation between stakeholders to increase pressure to change and improve regulations

Driver fatigue and well-being

- Pushing pressures back up the chain to manage drivers hours
- Not pushing the envelope
- Fair wage

- Fatigue policy

Input from workers

- Very limited reports

Stakeholder Group 7 — Community, people in the road environment, and on-road support

Positive

- Public awareness
- Advocate for staff and public
- Education and enforcement – in a positive way
- Sharing knowledge
- Role models
- Personal testimony and support

Negative

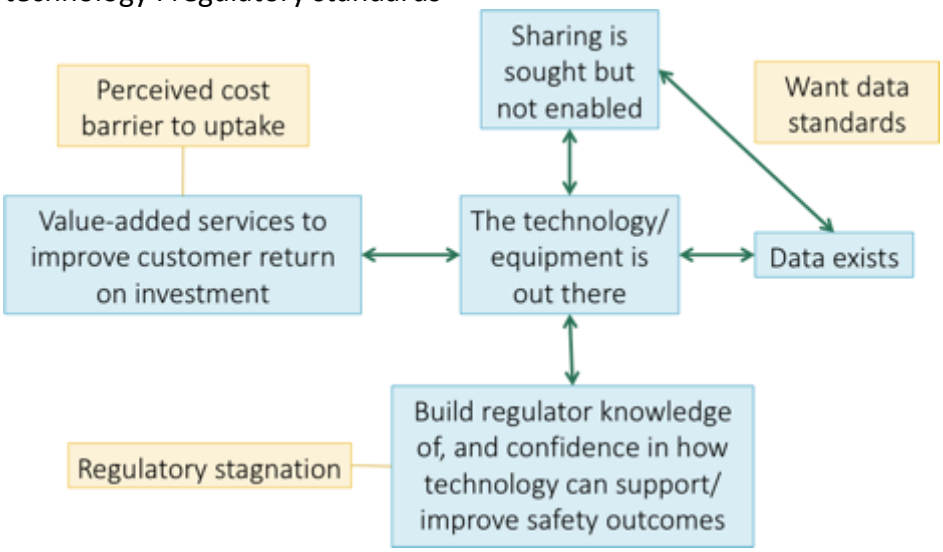
- Fear of communication
- Ownership for wrongs (ripple effect)

Stakeholder Group 8 — Equipment and data providers

Making/getting best use of data

We are creating significant stocks of data relating to some, but not all, aspects of the supply chain.

- Not enough WS resource → regulatory stagnation, lack of action → lack of data technology I regulatory standards



Common to all Stakeholder Groups

- Fatigue and health (physical and mental) of driver
- Lack of cooperation between stakeholders
- Need for data and knowledge sharing
- Desire for collaboration/cooperation, but not yet coming through

- Common recognition of problems
- Common recognition of a need for change
- Recognition of the need for collaboration – government, industry, and community interest-led
- Recognition of need for responsibility
- Valuing the consistency and quality of training for continuous upskilling
- Need for commonality of standards
- Procurement, processes and commercial constraints leading to poorly remunerated drivers and lower safety standards
- The need for regulatory support and leadership
- Need for proactive not reactive approach
- Rewarding and recognising best practice
- Need for more sharing of intelligence and knowledge

  Need for a common model about what is needed for health and safety – not from competitive perspective

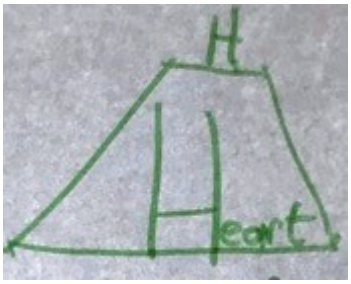
Our ideal future – *Newsletter 2030*

Participants were asked to project themselves ten years into the future; to treat 29 October 2030 as the present. In mixed groups, participants described the transport sector with its ideal management of vehicle-related risks from supply chain pressures. The groups drafted up the front page of a feature article for a combined celebration issue of *NZ Trucking* and *NZ Truck ad Driver* to tell everyone about this great achievement, describing the approach used to deal with future development. They were told that what they describe should be:

- **feasible** (people could do it if they wish),
- **desirable** (the whole community would benefit), and
- **motivating** (you would work to make it happen).

Group 1

Driving Success: Transport Sector Hits 0 Road Deaths for First Time Ever!!



(Barriers: lack of safety standardisation, no regulations and low tech uptake. Absence of forum. Low knowledge base)

Milestones

2021: Cross-sector agreement and standards and principles signed by government and industry *(kicked off by workshop)* – industry collaboration, putting lives above profit

2023: Agree, design, implement, evaluate, review

2025: Integrated multimodal approach to transport, 50% more volume, 30% less trucks on the road. Technology used to improve efficiency.

2029 : All trucks fully connected with full suite of ADAS (advanced driver assistance system)

90% reduction in serious harm accidents

Transport has become a sought after career path. Staff salaries included as high skilled job and valued by their business. 30% + living wage.

Quotes

"Privilege to have been part of this journey"

"The future is the future, the past is the past"

"Transformation in the sector has yielded benefits for everyone"

"Everything gets where it needs to be when it needs to be there"

"We could only have done this together"

"The combination of technology and great people achieved all our goals"

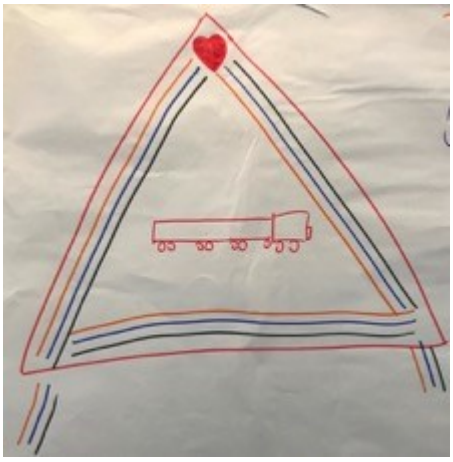
"Safety in harmony"

Outcomes

1. Infrastructure and maintenance costs reduced along with traffic (less freight by truck)
2. Societal improvements from improved wage and less serious accidents
3. Healthy and safe people, drivers, staff
4. All heavy vehicles full ADAS
5. Cross agency/whole of government regulatory approach
6. Integrated, multimodal approach to transport
7. Goal-led approach to government involvement and investment – "Sector road deaths hit 0 for first time ever"- serious injuries fallen year on year
8. Vision Zero fully implemented
9. Transport industry sought after career path with happy and health workers! Staff can speak up openly
10. Use of data and technology to tailor training, help and support staff. Dispatcher and transport managers software

Group 2

Autonomous Golden Triangle



Worker groups contributing to solution

Milestones

2021: Mandatory induction system

- Working group established to develop autonomous vehicles
- Driver -> vehicle managers
- Infrastructure development – trackless tram technology
- Increased use of public transport - incentivise

2022: Development of regulatory framework to improve driver well-being – improving well-being, remuneration, hours -> high performance drivers

2023-2026: Mandatory safety improvements and staged gradual replacement of old fleets

2030: The first vehicle applying the route

Quotes

"Allowing drivers to enjoy their retirement, being physically fit"

"I feel safer sharing the road with heavy vehicles"

"As a driver, great job satisfaction"

"Consistent safe service levels in the safest possible way"

"Peace of mind"

"Delivered the fastest supply chain while reducing the health and safety risks"

"Management and trainers finally on same page"

"Human factors considered in the chain of responsibility"

Group 3

365 Days and Zero Commercial Vehicle-Related Deaths

Milestones

- 2021 transport – industry, government, and interagency
- Uniform agreement and introduction of unifying transport regulation
- Signature prosecution

Method from 80+ to Zero

- Living wage accord across industry
- Tripartite agreement
- Government procurement leading the way
- Standardised induction and traffic management

Barriers

- Working in silo
- Regulator accountability
- COVID-19

Group 4

Industry Achieve Zero Road Toll

Method

By understanding and appreciating the issues, collaborating, and lobbying

Timeline

Oct 2020: Campaign to educate public on value of supply chain to everyday life and the challenges it faces – to understand and appreciate the issues

July 2021: Government agencies consolidated

- Government subsidies for training

July 2022: Road congestion pricing introduced –collaborative lobbying

July 2023: Industry groups collaborate and deliver uniform induction/training program (NZQA)

- Government incentivised transition to new technology

July 2026: Truck lane Hamilton to Auckland to Tauranga – PPP roads/toll roads

July 2028: PCBU/CoR reformed and responsibilities clarified – users of transport pay full cost

July 2030: Zero road deaths and faster and more efficient deliveries

Barriers

- Bureaucracy
- Too many players
- Government will
- Money (need reduced social cost and spend e.g. ACC levies)

What changed and with whom?

Regulatory

- Fewer and clearer communications between agencies
- Roles and responsibilities clarified
- "Don't they work well together" – industry and regulators

Supply chain

- Greater % e-commerce
- Increased visibility

Training

- Standardised induction
- Standardised training
- Drivers trained in school

Procurement

- Social considerations e.g. well-being/wages built into contract

Drivers demographic

- Reduced demand
- Different capability
- Better conditions

Infrastructure

- More tightly managed access (e.g. congestion demand)
- Much more real time road condition info
- Change in living leads to demand on roads have better distribution

Vehicle/technology

- 40% of urban fleet electric
- Safer vehicle systems
- Autonomous light vehicles
- New ownership model drives faster fleet turnover and accelerated rate of technology uptake

Culture

- Safety and well-being

Quotes

"Thank God they listened"

"Driver is #1 desired job"

Group 5

Torque It Up!

How we got here (milestones)

2020: Recognise best health and safety awards

2022: Supply chain knows its responsibilities

2023: Skills-based licensing system for professionals

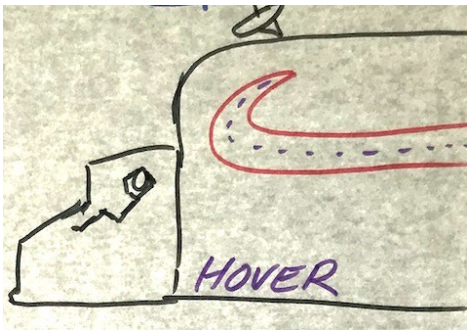
2025: Health and safety top feature of tenders (block/barrier: ease of understanding)

2027: Gold licence recognises success career (30% now)

2027: National network of service hubs

Outcomes

- Success: NZ roads are all high quality!
- NZ-wide professional driving schools (one induction standardised visibility of risks and controls) – stakeholder collaboration
- All benefit from coordinated view of risk and benefit
- Zero road toll
- Automated-only night shift delivery



Quote

"Drive collaboration – deliver change"

Group 6

Vision Zero: A Future of Zero – Everyone Goes Home Well

2021: Great work conditions for drivers, happy drivers

- Comms – bidirectional
- Flexible workdays, superannuation
- Marketing to end user to pay more

2022: Collaboration of industry and regulators and customers, national and international

- Standardisation across the board
- Remove competition on the collaboration

2022: Promotion of best practice, world class

- Award system
- Celebrate success -> shared success stories

2025: Adoption of safe vehicles

- Government incentives for newer trucks – Australian policy
- Safety standards for trucks and all vehicles WOL

2028: Dedicated lanes for commercial vehicles

- Safer journeys
- Responsibility on developer and councils
- Review laws

Barriers

- Removing financial constraints

Quote

"Beneath all complexity lies simplicity"

Group 7

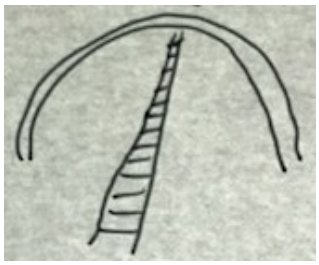
Improvement in Intermodal Transport

- Investment in roadside facilities
- Mandatory in-cab fatigue management
- World class fatigue management system
    - Responsibility awareness
- Clear chain of responsibility Act
    - Clear legislation
- Common industry induction
- Diversity accepted and attracted
- 14 hour days is an exception
- Drivers are paid well
- Better integration between NZTA/WorkSafe/ACC/CVST
- Buyers of transport are celebrated
- Purchasing charter that incentivises investment e.g. WISMP
- Mandatory fleet age management
- All forklifts competency/licence as per vehicle
- Career path for drivers
- Workforce development plan for supply chain
- Upstream investigation of incidents
- Incidents sharing at industry level
- Imported vehicles managed – age/system > stop aged/obsolete fleet
- Weight system on trucks – load balancing
- Better use of experience
- Common standards
- Buyers are incentivised and reprimanded to include HSW in purchasing – through whole supply chain

- Hydrogen and electric vehicle wide deployment (linked to respiratory/ health)

Group 8

Zero Work-Related Road Deaths



Light at the end of the tunnel

Milestones

- Increase use of public transport and active modes
- Coherent government (wider) strategy (working together/collaboration)
- EV rebate scheme promotes safety outcomes/safer vehicles
- Infrastructure built for purpose including roads and rail
- Speeds limits fit for roads
- Regulation of commercial contracts that impact health and safety
- Minimum health and safety standards when working in and around vehicles
- Worker reps on boards
- Wider collaboration between industries and agencies including unions (internal and external)
- Better data sharing
- Strength chain of responsibility

Barriers

- Money (safety is a good economic investment)
- Cultural (shed – safe name everyday, united belief "the right thing to do")
- Suspicion (finding common ground)

Quotes

"A journey without an end"

"Continuous improvement is essential"

"We didn't know how it was going to be done but we all had the same goal"

"Road safety on the right track"

"Zero deaths is the light at the end of the tunnel"

What is being delivered

- Safe industry where people are not dying or getting injured for the job

Newsletters - Common Features

- Vision Zero
- Need for cross-agency, cross-industry collaboration
- Increase in safety-related technology
- Fatigue management
- Increased training
- Desire for positive change

- Clear chain of responsibility
- Embedded safety and well-being
- Mandated fatigue management systems
- Reduced driver hours
- Improved infrastructure for all transport modes (optimised and efficient)
- Procurement regulation
- Making driving a more attractive career (remuneration and health/well-being)
- Buyers of transport who include health and safety and well-being are celebrated
- Cleaner transport (EV) – health and environment

Getting to our ideal future – Timeline

Participants thought back from 2030 to 2020 (ten years ago) and considered what they remembered as key events, milestones, and how they overcame barriers to getting to 2030. They were asked to specify the details and record the year they happened. These were collected on sheets year by year as a reverse history.

2030

- Milestones: Modifying of tramless track technology for roads. Barriers: Quality of roads
- Truck manager: automated driver
- AI Vehicles
- Effective implementation of the NZ national road safety strategy (Road to Zero) for 2020 -2030, and progress on the focus area of work-related road safety (by government and key managing stakeholders)
- 100% Eco fleets
- Sustainable & Safe “Zero Carbon” emission roads
- Cleaner transport starting to be cost effective
- Retired
- Automated delivery systems in place. Automation has taken over 80% of the jobs that were human operated in the supply chain
- Still working
- Infrastructure complete road and rail
- Fatigue management programmes initialised as a common practice
- No work-related road deaths
- Fewer drivers on the road, better technology
- Zero harm, world class drivers
- Zero work-related road deaths
- Zero deaths
- Zero harm

- Zero harm Zero deaths

2029

- Milestone: Roll-out of safer vehicle fleet ready for autonomous operation. Barriers: Cost
- New road networks with by-passes, extended lanes/width and effective crash measures e.g. median barriers
- All trucks in NZ meet compliance regulations
- Jacinda's 5th term
- Green party has larger voting block
- HGU related crashes fall
- One simplified driver qualification for autonomous vehicles

2028

- Buyers of transport incentivised to reorganise H&W investment down supply chain
- Hub model for autonomous vehicles are in place for main haul lines i.e. Hamilton – Auckland
- All vehicles and bicycles are fitted with RF chips. They "talk" to one another to ensure safety outcomes
- Building of dedicated freight lanes serving major cities
- Driver fatigue no longer a concern because they can sleep at the wheel
- NZ hosts international driver mental and physical health event- as world leader
- Contracts are built on templates agreed by industry standards
- Full electrification and upgrade of rail
- NZ transport (system) integrated data system celebrates 5 years milestone
- Road transport automated & an industry of choice to be involved in
- Safety standards introduced for all roads in NZ. Transport lanes on major routes are introduced

2027

- Common goals across industry measured and regulatory and industry agree on any changes needed
- Agency cooperation
- Integrated transport system of the supply chain
- Inexpensive electrical engines more widespread and available country-wide
- NZ standardisation in logistics/transport used as model for international best practice
- Better roading
- Partnership not competitive tenders
- Commercial incentives for good H&S programmes
- Living wage + 15% achieved for drivers
- Cardiovascular disease down by 50% in truck drivers

- Autonomous vehicles across the transport industry

2026

- Autonomous vehicles
- Autonomous busses in Auckland
- First autonomous heavy vehicles on the road with associated regulations
- Integrated planning system coordinates pickup and deliveries, eliminating downtime and improving efficiency, cost, working hours. 'Uber for Trucks'
- Regulations have safety features in all vehicles compulsory. Barriers – cost
- Vehicle maintenance records kept electronic and shareable with agencies
- Intermodal transport at60%
- Self-regulation for the industry
- Data sharing
- Training is made mandatory
- Road pricing removes single occupancy cars from arterial urban roads
- Increased telematics
- Nationwide driver training programme released

2025

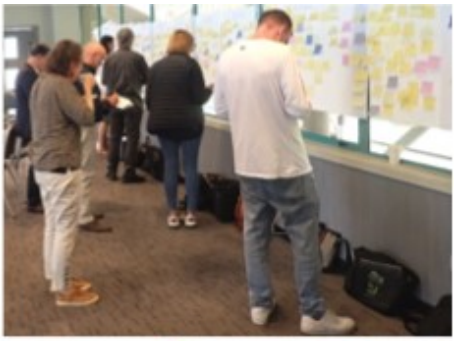
- Large companies implement changes first – regulations are staggered by T/O. New, fully connected trucks hit the road
- New trucks monitor drivers, their driving behaviour, and the road around them. They suggest rest stops and intervene to stop crashes
- Requirement to share data (like GPS etc) publicly
- Lower emissions – a more friendly way of transport
- Vehicle fleet no older than 15 years
- Standardisation of safety and quality of vehicles on the road
- Upgraded safety systems in vehicles – weight/ fatigue
- New vehicles (cars and trucks) require smart speed limiters (limit for all speed zones)
- Overhaul "2020" Operator Rating System for next step change in recognising good operators
- Certificate of Recognition standards are clearly defined and agreed upon within guides and implications. This involves all government bodies (WorkSafe, MBIE, NZTA etc and industry-relevant group)
- Businesses, suppliers, and customers are changing the H&S culture by only working with the those who have a strong H&S system that is nationally recognised
- Fatigue management systems mandated
- Incorporated required standards for H&S and well-being into all procurement contracts
- Fatigue Policy and Plan deployed

- 50% reduction in commercial road deaths
- Gold standard driver licence system – reward for a flawless licence = lifetime licence
- Virtual driver licence test simulates encounters with cyclists to ensure their safety on the road
- Incentivised Driver Schools – Skill-based licences
- Buyers of transport are celebrated when including HSW investment in SC (maturity)
- Plan developed for 2035
- Management and trainers finally agree on same page
- MBIE announce procurement policy
- Truck lane introduction between Auckland, Tauranga, and Hamilton
- Infrastructure timeline and plan aligned to autonomous operation is made available
- Dedicated truck lanes in the golden triangle
- All contracts have consistent conditions – whether contractor or employee
- Chain of Responsibility Act introduced
- An even playing field among the industry (even wage, hours)
- Introduced self-regulation for gold-standard operators
- Dedicated heavy vehicle lanes
- Heavy rail from Auckland Airport into city and to Hamilton for freight and passengers
- Self-regulation
- Individual accountability for their roles monitored and measured
- Cleaner transport with consideration to end impact including disposal of end of life components
- EV transition
- Hydrolysed fuel common in all truck fleets
- Road pricing powers legislated – implemented in Auckland, Christchurch, Wellington

2024

- Government funds businesses automating process in working towards a better health and safety environment when managing vehicle-related risks
- Joint Group lead by Government for Regulators, Manufacturers, and Industry to align on key milestones, targets, and standards
- Government incentive schemes for vehicle scrappage and safer gear on vehicles (through NZTA)
- Introduce freight procurement policies to level playing field
- Road deaths that are commercially related have halved since 2020
- Transport lane separation for urban roading

- All new vehicles fitted with road safety features e.g. crash detection, lane departure
- Compulsory worker representation on Boards
- New Road Toll policy for highways
- Driver wages are protected in service contracts
- Driver hours and HS&W Policy deployed after industry acceptance
- Standardisation of recruitment, induction, and continuing professional development
- Vehicle regulations are simplifying
- Central website for data – easy to navigate and digest
- Dramatic reduction I truck ad road fatalities
- Procurement of vehicles
- Making driving an appealing profession (top training, excellent equipment, safety lead by management, career progression)
- Eliminate regulator silos
- Fatigue and health of drivers is improved


2023

- Effective implementation of actions under the national Road to Zero first Action Plan (2020-2022) including: review commercial vehicle regulations (e.g. logbook and work time requirements); support best practice; improve data collection
- ACC/ NZTA/ WorkSafe/ NZ Police share data publicly
- Driving Act revamped to allow greater data sharing

- July: Government-industry data clearing house established to enable sharing and pricing of data for government, research, ad product development
- Industry lobbied for consolidation of government bodies
- All new buses are zero emission
- Transport known as a 'trade'
- Inner-city pedestrian zone with only 10pm-5am delivery
- Supply Chain Safety Act: Tribunal established to review commercial contracts for sufficient cost to cover fair wages, H&S, and repair and maintenance
- Minimum H&S requirements in all tendering for contracts
- New regulations on the Health and Safety Act in relation to vehicles operated in the supply chain are sent out which aligns with collaborative industry group wishes
- Industry expectations for Roles and Responsibilities introduces – expectation agreed by industry and regulators
- Capability build plan aligned to technology and new regulatory requirements
- Infrastructure development considers separate lanes or roads for autonomous vehicles
- Knowledgeable of information and guidance for workplaces (industry and government)
- Industry agrees to minimum truck safety standards (buyers and providers of transport, importers etc)
- Abolish night deliveries in destinations not offering good driver facilities
- Public Procurement Board established to specifically police and improve societal gains
- Rewarding great behaviour through self-regulation
- Reward/ recognition scheme for organisations in relation to health and safety in and around vehicles
- ACC introduces new levy incentives for supply chain safety
- Across industry driver H&S training initiated
- Drafted induction and training and developed NZTA standards
- eLogbooks mandated
- Introduce policy to encourage/ incentivise fleet refresh i.e. improve vehicle safety/ environmental standards
- Minimum safety standards for new heavy vehicles (autonomous emergency breaking, lane departure, lane change assist, Euro6 etc)
- 'Gold' licence initiated for good drivers
- H&S award scheme for transport supply businesses begun
- Adoption of improved internal, as well as standardised external training
- New regulations start to come into play (minimum vehicle technology standards, all connected by 2029, decreased driver hours)
- Government includes road investment and rest stops to help tired drivers

- Training made mandatory for all drivers
- Better roading: safer, more rest areas, truck stops. This helps to lower driver fatigue
- Diversity in workplaces
- Created common industry standards and language
- Milestone: Baseline of driver's health → ongoing monitoring → improvements noted. Barriers: buy-in from drivers
- Driver licencing overhaul – all drivers must be taught by an accredited driver trainer (for all classes)
- Cross-industry collaboration to ensure a top-notch safety record in transport
- Common recognition of a need for change
- Driver licensing qualification raised and minimum wage for drivers increased to reflect skill level
- Working hours guidelines updated (14-hour day the exception)

2022

- Roadside facilities systematically improved
- 'Marketing campaign' initiated around importance of truck drivers
- Health and safety has equal weighting as cost in procurement
- Joint industry and government campaign launched to publicise value of, and challenges for supply chain
- Transport safety accord agreed
- Procurement regulations approved
- Collaboration between companies and organisations to appoint representatives to create a 'Safety Union'
- Reward of subsidised internal company training schemes
- Annual meeting of the cross-agency, cross-industry forum to review the 2020-2021 goals and present on progress on all interventions. Repeated each year – opportunity to renew personal commitment across the sector
- Road pricing trials in Auckland, Christchurch, Wellington
- National Heavy Vehicle Regulator established
- National reporting on commercial transport harm ad causes (NZATRC)
- Telematics approval and data requirements and access framework legislated, supporting open market model
- Legislation reviewed
- Standardised health and safety/ fatigue policies
- One government agency by amalgamation of NZTA, WorkSafe, ACC
- Safety accreditation scheme ad standards for operator, driver, and vehicles introduced to replace ORS
- Vehicle safety standards (including emissions) introduced with schedule for tightening these and exiting old vehicles from the fleet
- Safer vehicles engineered, reducing driver stress. More automated systems

- Government re-introduces clean car discount, also amending it to include vehicle safety standard criteria to incentivise uptake
- Low emissions vehicles incentivised
- Road network optimisation plan in place
- Change management and consultation
- New chain of responsibility regulations introduced
- Industry-wide free application available for inductions and consistent H&S requirements on sites
- Sharing of industry: key wins; knowledge; best practice
- Review of driver hours and fatigue management plans in law
- Fair pay agreement for truck and bus drivers
- Minimum standards for driver well-being established
- Living wage commitment signed. Aiming for drivers to be LW+30% by 2030. Tied to sector productivity profit share. Less hours per truck standing idle
- Follow through and consequences when harm occurs
- Roles of the regulators clarified (Police/ MoT/ WorkSafe/ NZTA)
- Minimum requirements implemented (wage; max hours; skills etc)
- Forklift licence formalised to include competency and capability and HSW
- Less focus on time-based delivering
- Safety features mandated
- Mandatory electronic RVC for all heavy vehicles (except motorhomes)
- Minimum truck safety features declared
- Standardised site routes
- Driver programmes with career paths and training
- Develop driving skill uptake by incentivising skills with remuneration and extra holidays
- Mandatory eLogbooks replace paper logbooks
- Reduction in driving hours
- Reduce maximum hours for truck drivers ‘regulation’
- Driving hours capped at 10 hours. Start time no earlier than 6am – remuneration maintained to ensure quality standard of living
- A change in culture with vehicles in supply chain that has a positive impact on health and safety
- NZTA, WorkSafe, Police, ACC have integrated data system and insights
- Mandated fatigue management policies for all operators
- Milestone: Regulatory working group formed to address fatigue and pay. Barriers: commercial elements – cost to business
- Eliminate regulator silos and duplication and costs
- Fatigue management regulations in law
- Incident investigations scan the whole system

- Another or same working group comes together to further develop improvements
- Business/ industry adoption of driver fatigue improvements
- Rest stops for breaks and fatigue management
- Cohesion, collaboration, uniformed approach between WorkSafe, Policy, industry, unions – for the common good
- Reward health and safety influences starting with leadership styles
- More H&S standards for working in and around vehicles
- Contract regulatory body – regulates contracts to ensure H&S features are included

2021

- Drivers earn good wage p/hour, so don't need to extend hours to live. Great work/life balance
- Driver hours reduced to 9-10 per day
- Increased driver training on health and safety
- Increased driver empowerment
- Training to create high performing drivers – professional development framework
- Strong focus on reducing serious hard incidents
- Training fund setup by government for transport industry
- NZTA traffic modifications (bus lanes/ bike lanes) add capacity to roads, not reduce
- ACC levy reduction for health and safety minimum or Best Standards
- Tripartite group to establish wage regulation
- New regulations for vehicle imports – compliance for standards 'fit for purpose'
- Mandatory minimum level of truck safety systems
- Professional development pathways for drivers
- Change in procurement process
- Recognition of 'best' of class transporters
- New equipment to have 1-year tax write-off
- Involve government authorities and gain support
- Invest in public transport and rail
- Enforce chain of responsibility
- Universal direction WorkSafe/ ACC / industry mandate
- February: Working group set up following the 2020 Future Inquiry Workshop – use this as the base to pull people together
- Training and monitoring expectations starting to be developed. Completed by regulators and industry
- Job share and co-shift to reduce hours and become a lifestyle choice
- Handbrake alarms mandated

- Introduce best practice of freight movement- celebrate success
- Accountability across private and government sectors
- First cross-government, cross-sector forum MOU signed. NZ Transport Initiative – not all parties turn up but keep getting invited anyway. As people change, job change will come
- Industries are collaborating to set common standards and regulations for managing vehicle related risks
- Establish cross industry/ agency collaboration group
- Cross industry and inter-agency body is pulled together
- Industry/ government action plan signed by all
- Developed pan industry team to develop induction and general training
- Collaboration – government initiative to have all major players to hold annual meetings in interest/ of better safety practices
- Annual collaboration of industries and agencies
- Professionalism – raise worker and driver wages and increase profit margin
- Tripartite agreement introducing a driver living wage
- Industry charter of change plan developed
- November: "Respect" campaign launched
- Transport accord established (charter and working groups). Government/ industry partnership
- Infrastructure long-term plan approved and in budget
- Cross-industry and government working party on telematics data standards
- CAS and other data sources e.g. hospitalisation are coordinated to collect and share better data on at-work deaths and injuries
- Increased vigilance and prosecution of serious H&S breaches
- Re-draft policies and processes
- Government bodies and industry sign MOU for new, better relevant regulation to put lives before cash
- Standardised induction and traffic management controls introduced by WorkSafe
- Industry standard templates for: driver site induction; site signage
- Remove restrictions to do business
- National Fatigue Management Steering Group formed to lobby government to make changes to NZTA 'medical aspects' to include sleep studies for all drivers
- Government re-issues the Government Policy Statement on Road Transport: funding to reset speed limits; road improvement priorities; accelerated public transport expansion
- Regulator reform to ensure they add real value

2020 (November/ December)

- Australian inductions are standardised throughout all Transport Port/ Depots Hubs

- Better driver conditions
- Fatigue: Installing of seeing machines in trucks to manage fatigue
- Inductions are standardised
- Driver conditions improved
- Fleet conditions improved
- Interest-based forum setup to work a plan to create supply chain change by MBIE
- Research outcomes report from 2020 Future Inquiry Workshop is well received ☺
- Pull together more examples of existing good practice within industry
- Companies are operated responsibly
- Policies and procedures are reviewed
- Integrated government plan for transport across all transport sectors
- Working group formed
- Government and company cooperation
- One united team! Consumers, agencies, operators
- Have clear groups that are working towards specific collective goals and sharing responsibility
- Collaboration of regulatory enforcers and policy makers
- WorkSafe actually work
- WorkSafe investigate road deaths in workplace context
- Safer Journeys
- The government elevates road safety to highest priority, equal with COVID recovery
- New and safer health and safety regulations – making all agencies conform as one unity (uniformity)
- Road to Zero – communicated. Socialised to industry

Our Ideal Future – Broad action themes

The whole group identified common ideas from the newsletters and reverse history. These were worded as broad action themes. The name next to the theme represents the person acting as a focal point for discussion around that theme.

- Driver induction
- Safety features in vehicles and improving them over time
- Establishing a comprehensive and shared data stream
- Driver's paying conditions and well-being
- Regulatory reform
    - Cooperation between government and industry
    - Legislative and regulatory review and action
    - Cross-industry and agency collaboration

  Industry leadership – coherent, collaborative, cohesive industry body
- Preparing for driverless/ autonomous vehicles
- Infrastructure quality
- Improving procurement for safety
- Fatigue management guidelines

- Road to zero/ zero harm
- Sharing information and perspectives
- Road safety actions by government
- Toolbox for sector initiatives
- Sustainable vehicles
- Industry standards congestion pricing (this was not agreed)
- Regulatory reform – removal of silos – have a common purpose
- Vehicle safety standards

Our Ideal Future – strategies

Participants self-nominated to be the focal point for group discussion around some of the broad action themes. The aim was to develop strategy statements for that theme. Not all themes were worked on on the day – however, this does not mean they are not important – only that the group in the room did not give them priority on the day of the workshop.

Fatigue management guidelines

We are committed to addressing and creating a gold standard in fatigue management, using technology to identify and implement controls to help manage and support workers. We will identify upstream causal factors.

Driver's paying conditions and well-being

The issues:

- Greatest cost to company is labour
- Drivers not much above the living wage
- Wage compression
- Mixture of wage and salary
- Not necessarily of overtime rate
- Efficiencies = more $ or less time worked
- Need to work long hours to earn a decent wage

Strategy statement: We will change fair pay agreements. Tenders will include H&S and facilities for workers.

Road to Zero

We are committed to the safety of our working family = by identifying Raindrop effect.

We have to reward and recognise the 'Gold Standard'

We do have to change complacency within our work environment

We are retraining and up skilling (driver licencing → you get it once)

Industry Leadership

We are a coherent, collaborative, cohesive industry body.

We are the known, trusted industry voice with a mandate for change.

We bring together relevant stakeholders (e.g. government, industry, associations, unions etc) to achieve clear goals and 'better work'.

We are an active body → no waffle.

We represent the industry/ system and our people → no politics

Digital App Based Driver Inductions

We shall have only one NZ-side Standardised Driver Induction that is mandatory and manages:

- Minimum site requirements that are standardised
- Hazard Alerts – Push notifications
- Driver licencing and safety rating process?
- Truck checks/ pre start
- Links to NZTA alerts

Regulatory reform

We will connect the appropriate regulatory agencies and industry to each other and clarify roles and responsibilities based on joint outcomes agreed.

We will review our existing regulatory services – collaborate with industry partners and interested community groups – to ensure that they are fit-for-purpose and incentivising the right behaviours and can be effectively enforced.

Improving procurement for safety

We have a tribunal review tender for

- H&S framework
- Wages and conditions
- Repair and maintenance

We do mandate minimum vehicle standards.

We have contracts that allow for the volatility of traffic demand/ weather/ curfew, and ensure the transport provider gets a fair pay.

We have rates that allow for uncertain demand.

Improving vehicle safety over time

Encourage purchase of latest safety technology (overseas supplied vehicles – new)

- How?
- Remove options

Features:

- EBS
- ABS
- Collision avoidance
- Lane departure warning
- Stability
- Mirror camera
- Park brake alarm
- Disc brakes
- Reverse alarm
- Vision camera
- Pedestrian/ cyclist warning
- Seatbelt
- Air suspension
- Fatigue warning
- Tractor control

Environmental standards: We are buying where available already – but not all do. We need incentive for all.

We need regulation change.

We need to encourage fleet renewal – write off deprecation

We are buying ahead but this needs government facilitation.

Preparing for driverless/ autonomous vehicles

- Roads

    - We will reduce complexity within cities
    - We will reduce driving with non-autonomous vehicles
    - We have implemented truck corridors/ autonomous lanes
    - We will fully map NZ roads and lanes
- People
    - We have implemented a workforce development plan for ageing workforce, changing the job role
- Technology
    - Unlikely to be fully autonomous by 2030
    - More effective and lower cost driver assistance
    - Difficulty for driver to vehicle handover

Infrastructure quality

We want every road to have a gradient of <7.5.

We require wider shoulders and more passing opportunities.

We are advocating for improved and safer rural roads.

We need dedicated transport lanes on roads of significance.

We need more passenger systems.

We need more research into technology i.e. recycled products for roading surfaces

Establishing a comprehensive and shared data stream

Data from public agencies and private entities is pooled within a single clearing house. Joint ownership and governance.

Common data standards apply.

Ruling principles are:

- Integrity: data meets minimum standards
- Privacy: personal information and rights upheld
- Security: No loss or unauthorised access and use
- Liberty: No enforcement use without cause
- Purpose agnostic pool, but purpose sensitive access (data should be accepted "as is" without unnecessary additional working. However, use of the data needs to be purposive and take into account any constraints imposed by the nature of the data, including the permissions under which it was collected).

Built off a stocktake of current data holdings

- Gaps
- Constraints

Making the future happen

The strategies identified in the last section were divided up amongst the plenary group.
Self-selected groups worked on specific strategies that the whole group identified as

having priority. They discussed the first actions that should be taken to make them happen—the first do-able steps.

Some strategies were merged with others. Not all strategies were discussed, but this does not mean that they are not important to the group, just that they were not discussed in detail on the day.

Strategy 1 – Fatigue and Well-being

Background

- Gold standard fatigue and well-being management
- Need to start with a world-wide and local review
- What is industry doing now?
- Look to other sectors (including tech)
- Industry sort sh*t out and work with regulator
- Education process – what is fatigue management? (for drivers, businesses, unions)

Desired action

- Legislation – so it is fair for everyone including tech aids
- Proper consideration of work time/ patterns and implications on health
- Systematic health monitoring

First do-able steps

Develop a leadership committee

Who will be responsible for those first steps?

Industry and regulator

Strategy 2 – Digital App Based Driver Inductions

Approach

- Multi-agency/ sector
- Investigate existing tools
- It's like 'Site Safe' (construction access) but it is for truck drivers = Truck Safe
- Minimum safe standard for sites and driver

Barriers

- Lack of willingness to own that it is a problem
- Needs someone to champion this initiative
- Reluctance of sites to step up to best practice minimum standards

Steps

- Buy-in and agreement across the industry/ sector/ insurance/ WorkSafe/ NZTA etc
- Funding to finish a prototype
- Industry promoting, testing, feedback
- Staged rollout – large emphasis first launch
- Timeline for nationwide uptake

Do-able first steps

- Drive an Industry Group working group with government (e.g. ACC, WorkSafe, NZTA) to identify a tech solution.

Who will be responsible for those first steps?

Strategy 3 – Procurement, and driver's pay, conditions, and well-being

Actions

- Establish representative group
- Procurement experts
- Need input from Bus NZ, NRC, CTU

Barriers

- Not getting buy-in (suspicion)
- Economic impact
- Lack of control for external delivery/ pick up point

First do-able steps

- Establish a tripartite forum to manage:
    - Wage floor

    - Other employment conditions
    - Other influences
    - Sustainability
    - Repair and maintenance
    - Unpredictable events
    - All H&S issues
    - Environmental impacts
    - Volatility of demand
    - Fleet
    - Facilities
- Research
    - Urgent situation
    - Initial examples
    - Viability
    - Economic impact

Who will be responsible for those first steps?

Strategy 4 – Improving vehicle safety over time

Actions

Implement vehicle design regulations

- Determine a start date for this
- Allow exemptions for some vehicles
- Encourage early adoption (allow backup)

Outcomes

- Reduction in vehicle crashes though inattention
- Other motorist actions
- Autonomous flow-on after safety features
    - Roading/ mapping
    - 5G
    - Barrier: cost

First do-able steps

Contact Waka Kotahi

Who will take responsibility for those first steps?

Strategy 5 – Industry leadership

Actions

- Strawman Plan
    - Funding – multiple entities with skin in the game
    - Who develops the first steps?
    - Mandate
        - Who from?
        - How?
        - Lead?

    - Be clear on why we need other industry leadership

First do-able steps

- Create a working group with MBIE, Unions, RTF, WorkSafe, NZTA, ShopCare, IRTENZ
- Create a plan to develop
- Collaboration led by industry but facilitated by government agencies

Who will take responsibility for those first steps?

Strategy 6 – Infrastructure quality

Actions

- Engagement of relative authorities and industries and communities
    - Public consultation
    - Outcome – to identify common priorities
    - Research resourcing
- "Roadmap" - Road assessment
    - Priority roads
    - Traffic flow management
    - Surface quality
    - Passing areas
    - Official and unofficial fatigue stops
    - High crash areas
    - Statistical choke points
    - Problem areas
    - Grading roads
- Identify what is currently in place i.e. Mega Maps
- Consider other options i.e. rail, shipping, toll/ private roads
- Approach needs to be collaborative and needs information

Opportunities

- Public need and desire for improvement
- New employment opportunities in regional areas
- Quieter roads from road improvements
- Get agencies working together

Barriers

- Funding
- Decision-makers agreeing

First do-able steps

- Road assessment. Form a collaborative working group (local and central government, NZTA, transport companies, NZ Police, FENZ, rail, NGOs, National Road Carriers, insurance companies)

Who will take responsibility for those first steps?

Strategy 7 – Regulatory, Road to Zero, Data sharing

Actions

"Connect, Clarify, Review"

- Find the common ground (and mandate it!)
- Small steps for early wins to prove the value of working together:
    - Vehicle safety standards
    - Workers vulnerability – conditions, fatigue, training
- Experiment with ways for government and industry to work together to achieve common goals
    - Attracting and respecting co-investment
- Stocktake of data
    - Needs: What do we need to know
    - Holdings: What do we already know and how are we allowed to use it?

First do-able steps, and who will take responsibility for those first steps?

- NZTA looping in the other regulators to form the internal community of knowledge onto which the wider sector can be attached
- Industry (groups/ clusters) to identify its own leaders to work with government
    - [name] to help connect NZI with this work
- eRoad present its data inventory to seed discussion

13.4. Appendix four: Engagement

It was assumed that securing participation from industry members may be challenging given that previous activities and projects have struggled to secure attendance or had trouble accessing the people with the most to contribute such as the workers themselves. Aware of the potential challenges, the research team thought carefully about the industry groups in focus, respectfully addressing these challenges through the design of the research.

13.4.1. Challenges to engagement

There is perhaps fatigue among certain groups or organisations due to the frequent request for information about what they do and how they do it. Certain organisations, groups, or individuals are asked frequently to participate in activities because of their outstanding efforts in certain areas in, for example, contractor management, or safety initiatives. Additionally, certain groups may have felt that this project contributed nothing new, that the issues were already evident and that the resources could be spent elsewhere, concerned about ongoing commitment from WorkSafe.

Another challenge may be that positions/posts in the industry have been long protected and held by certain groups. Prior disagreements or feuds had the potential to inhibit the collection of data. Lastly, allowing us access to their initiatives required a level of industry maturity and confidence in the actions they were taking and even a level of consciousness about why. Some industry groups who were approached did not believe they were doing anything of significance, nor did they want to mistakenly air any potential dirty laundry. A level of trust was perhaps missing that would be required to ensure if the doors were opened, and no punitive actions taken. In addition to this point, the competitive nature of the industry may mean that organisations are reluctant to share information about cost-saving initiatives, especially in New Zealand's small market and perhaps the lower end of the market because it is their competitive edge. Smaller companies, especially owner drivers are susceptible to having their margins squeezed giving them low market power.

For these reasons and perhaps others, recruitment and participation in the past have been challenging. Consideration must be given to the above factors and acknowledgement to those brave enough to come forward. It is the trust-building and time spent in between such activities as this project that safely allow the participants to come forward. Further questions about

future activities may therefore consider which parties feel a lack of trust, why, and how do we begin building that bridge now? (Moore, Bayne, & Barnard, 2012).

13.4.2. High engagement

Certain factors came together which when combined resulted in a positive response to the events. Much of it came down to the years spent by team members, including those from the core WorkSafe team, building relationships with the TPW&M industry. The project brought together such team members, both formally and informally, who had taken the time to build trust with groups, organisations, and individuals over many years. This was a strategic decision made at the commencement of the project. The FIW participant selection group was the ultimate example of this, bringing together representatives from across the system and allowing them to select participants, and manage and plan the FIW. Their involvement meant the event was informed by those who had authority to make decisions, and the knowledge and contacts of those others who should be in attendance. Through their tireless efforts we were able to fill the room because again, they were willing to put forward contacts they had pre-established relationships with.

Despite the inference that this research subject is not new, the topic hit a cord with many which may also explain the higher than anticipated interest in the project. Organisations, groups, and individuals working to manage vehicle-related risks have typically focused on individual issues; it is a large task to consider or address the entire supply chain. Such people understood that efforts to address issues further up the chain would only support their current efforts for improvement though this initially required explanation. The approach taken aims to dilute the blame and shift it from one person, group, or organisation to the system as a whole. In other words, analysis of the contextual factors shows a fuller picture and provides explanation for barriers such individuals face. Taking blame off individuals who are already working hard for change and showing how both the problems and solutions are shared was an important message. One supported by the systems approach that underpins this project.

After interviewing key industry people, it was clear that many of them knew there had to be a better way to approach vehicle-related risk and supply chain pressures. Some suggested it was often luck that kept the workers safe. Such comments and further inquiry uncovered the fragile nature of certain operations and the fine margins between operating safely and a catastrophic incident occurring. By providing a forum for discussion, the anxieties could be aired, and participants could collectively share the responsibility and their desires for change/action. In

other words, it was important to say out loud what many are afraid to say without laying blame. The FIW was therefore the right and perhaps only method of choice because of its ability to foster full group participation in a safe and controlled manner.

The investment and support from WorkSafe in this research area were critical elements to its success. The desire for research outcomes could justifiably have been outweighed by the potential messiness and complex nature of asking such questions. However, WorkSafe did not shy away. The willingness of a government agency to follow a systems approach may have given others the courage to participate in the process. Certainly, having a government agency commission and put their name to the research aided in seeking and confirming participants. Further, having Phil Parkes open the SAG meeting and the FIW sent an important message to those in attendance and reinforced the importance of their contributions and the work.

The next step is to concretely show how these findings have led to action. Trustworthiness is maintained and strengthened by following through on a commitment to change by WorkSafe, and those from the FIW who have also committed to their part. The participants were asked to be vulnerable, to share details about their lives and their hopes for the future. This vulnerability should be treated carefully and honoured through a commitment to the action plan.

13.4.3. The feedback loop and ongoing engagement

A summary document was sent out to the FIW participants, participant sponsors, the wider SAG individuals, and others connected to the project two weeks after the FIW. The purpose of this document was to keep momentum up, secure ongoing engagement and conversation, and inform those not there of the key outputs from the day. Prior to this, the participants were sent a copy of the raw FIW data to check and confirm the contents to ensure what was captured reflected their intentions from the day.

The second workshop provided a space to return to the key people and refine the recommendations put forward to WorkSafe. The participants for the second workshop included the full Mackie Research team, the WorkSafe team, and members of the FIW participant selection group – as representatives of the stakeholder groups. They were asked to review the findings from each of the three research phases (document review, SAG and FIW findings, case studies and the system maps) and develop a set of priorities providing criteria for why. This final stage of engagement helped to refine and confirm the intervention approaches put forward.

13.4.4. FIW feedback from participants

The FIW participants offered feedback that would be pertinent to running similar events again and further offered points to be refined. Notably, this workshop followed the Future Inquiry method, with each session, exercise, technique, and tool used purposefully. The process, based on the Future Search method, has been well-tried and tested in various industries in numerous countries around the world. The below considers both the method and the participants' perspective.

Positive aspects

The process was commended by many of the participants who appreciated the pace, structure, and facilitation of the project. Getting the whole system in the room was an important feature of the process that the participants valued. Overall, there was a clear need and mandate for change and reaching that agreement across the system was seen to be a unique feature of this process.

A great deal of information was covered during the day and the participants said they worked hard. They were given strict time limits for discussion, keeping the discussions at a consistent level with no time to be diverting down tangents. Having only one-minute feedback slots shaped the discussions as only the peak points were reported, this keeping the focus tight. The various exercises and activities catered to all learner types ensuring continued engagement. It was a kinaesthetic experience with those who needed to move around could.

The structure of the past-present-future was valuable in giving time for all to reconstruct the context and work systematically through one exercise to the next. This provided a cleaner perspective to build from. In-built into the Future Inquiry process are phrases, techniques and tools used by the facilitators to manage conflict, avoid time delays, and seek consensus (or agree there is not). Participants commented that the use of certain key phrases were powerful and allowed the group to move on rather than reaching a dead end. Further, the discipline enforced a more respectful and proactive atmosphere.

Various exercises on the day received praise, including the use of the mind map and participant voting system with coloured dots. Visually the participants could see how each of the stakeholder groups prioritised the various trends and graphically this was especially useful. In addition, there was talk about the purposeful design on the name tags. Although some wanted more detail i.e. job / group affiliation this was left out for an important reason. Putting only names on badges forced participants to ask, and thereby test their assumptions about where people came from, which, according to one participant, were wrong often enough to be a

learning point in its own right. It also ensured that targeted and personal conflict could be managed. This is in line with the core principles of the Future Search and Future Inquiry method and process.

Given, at times, the flammable nature of relationships within the industry, the neutrality and impartiality of the facilitators was key. According to the participants spoken to, it created a safe and unbiased space where conflict was handled sensitively but consistently. This was aided by the safety of a structured process, having someone there to keep the discussion moving whilst acknowledging any disagreements that arose. Conflict was considered positive showing deep engagement from the participants.

Mindful of potential prior disagreements, this process gave participants an opportunity to potentially air out past differences. Such feels could have accumulated over a long period of time and any conflict that resulted seen as a waste of time, so the parties might keep out of each other's way. But according to the participants, much was learned from witnessing previous enemies talk to each other and find common ground. Although there was not always uniform agreement, people who would normally avoid each other had the chance to hear their thoughts.

Points for refinement

The participants invited were carefully chosen by the Participant Selection Committee using the Future Search process to guide their invite list. This is done to ensure that no one party is overrepresented, and each stakeholder group has a roughly equal number. Further it ensures that the numbers are made up of people who represent the system. Allowing people in at the door in could be seen as diluting the strength of the process if perceptions are that it shifts the carefully constructed make-up of the group for the day. Although this was mentioned very clearly in the email and the invitation it was not fully understood by all.

The Future Inquiry workshop is a one-day version of the full Future Search which takes two and a half days. Securing participants for the longer version was not deemed possible for this project and so naturally in the shorter version the session lengths were condensed according to the Future Inquiry process. Some of the participants suggested that more time was needed at the end to think carefully about which final Broad Action Themes were feasible, practical, and worth developing in more detail in the final session on the day.

The discussions among participants at times returned to previously tried or well-established interventions. These typically sat outside the brief of this project as the focus remained

proximal rather than on the wider supply chain. Although this allowed the researchers to capture the current mindset of the industry, it meant that not all final action points satisfied the brief of supply chain inclusion. Subsequent discussions between some participants showed varying viewpoints. Some suggested that an initial outline of the project and scope would have secured more focus during the day, however others believed that there was not the time, nor should the researchers/facilitators have more airtime than other participants. There remains disagreement on this issue.

As is sometimes common in large workshops, the loudest or slickest voices can dominate. Although tools were in place to manage the balance of viewpoints shared, there were decisions made during the day that impacted the issues that were taken forward to solutions. More time may have allowed for further deliberation giving all the participants a chance to think in more depth about which issues should be prioritised and why. Additionally, some participants would have liked more information about how their vote in one section would carry through to the action points in later stages, with more time to deliberate carefully. A full Future Search, two-and-a-half-day format, may have provided this required space and time and should be considered when next designing a similar workshop.

There were logistical challenges on the day like unreliable technology which meant the welcome from Phil Parkes was not fully audible and to minimise contact microphones were not used which meant some had trouble hearing in places.

The participants noted the magnitude of the task – getting the system in the room. There was a clear mandate for change that came from the day and the participants were keen to see what would follow.

13.5. Appendix five: A list of all solutions

The table below is an unedited version of all the solutions, interventions, ideas, and suggestions that emerged throughout the data collection for this project. Some were passing ideas, others were well-tried and implemented, and then others sat in between. No effort has been made to determine the feasibility of each, nor have the researchers eliminated duplication. The second column in the table shows how each point was either included, or a reason is provided for why it was not included in the final recommendations for this project.

Intervention suggestion	How it features in the report
Document review	
1. Safe Rates and the link between pay and safety.	Disagreement over impact and effectiveness. Not confident where the extra money will come from. No clear direction provided during FIW or CS. Further work to be carried out as suggested in Recommendation 2 and 12.
2. CoR legislation for consideration in New Zealand	Recommendation 6.
3. National Heavy Vehicle Law and the formation of a similar law in New Zealand	A specific Heavy Vehicle Law did not get support from other data sets so was not included in the final recommendations. However, the submissions during the law review highlighted the importance of collaboration when such changes are happening.
4. Accreditation and recognition schemes and their use to raise industry standards	Recommendation 1 and the proposed group are advised to review and consider the schemes that are relevant to a New Zealand context.
5. Work time hours	Followed through to recommendation 11
6. Social dialogue, tripartite communication	Features strongly throughout many if not all recommendations. That consultation with the system or supply chain occur.
7. Social provisions, decent work, fair competition, and productive employment for all, including equal opportunity to safe and healthy work for contractors.	Recommendation 2.
Case studies (Reported solutions by the case study interviewees)	
8. Immediate and total management support including and importantly senior management. This included a shared mission and trust building.	Recommendation 4.
9. Safety explicitly integrated and prioritised by management, and the organisation.	Recommendation 4.

Create an environment conducive to safety, quick responses to risk, this increased trust.	
10. Consistent communication including inductions for all.	Recommendation 4.
11. Leadership training to develop competencies and enhance OHS action.	Recommendation 4.
12. Site improvement.	Recommendation 9.
13. Commitment to safety reflected in adjustments to safety policies, collaborative development.	Recommendation 4.
14. Active engagement with the whole supply chain, collaborative improvement.	Recommendation 1 and 4.
15. Increased worker participation.	Recommendation 1, 4, and 8.
16. Develop strong organisational safety culture, collaborative efforts.	Recommendation 4.
17. Sector and industry leadership.	Recommendation 4.
18. Develop sector guidelines and be a source of accurate, up to date information.	Recommendation 4.
19. Sector group to include the right people, the group to be representative of those with skin in the game.	Recommendation 1.
20. Clear and effective communication with the wider community. Unified sector body and source of information.	Recommendation 4.
21. Contractor accreditation schemes.	To be investigated by group in Recommendation 1.
22. Sector groups to establish key goals and planned actions using an iterative approach to measure success.	Recommendation 1 and 4.
23. Establish means for regular feedback by working alongside other supply chain members.	Recommendation 1.
24. Safety technology and the use of safety vehicle specifications.	Recommendation 8.
25. Safety specifications imbedded into contracts.	Recommendation 4.
26. Engagement with carriers to create policies and procedures.	Recommendation 4.
27. Executive level involvement in risk management and planning.	Recommendation 4.
28. Active management of driver fatigue and well-being.	Recommendation 4 and 11.
29. Speed management.	Mentioned by a FIW participant as something being done to improve the safety of truck drivers.
30. Design of loading areas.	Recommendation 9.

31. Traffic management plans.	Recommendation 9.
32. Driver training and induction.	Recommendation 9.
33. Strong engagement between organisation and workforce to develop interventions.	Recommendation 1.
34. Collaboration overcame initial pushback, shared commitment to safety.	Recommendation 1 and 4.
35. Safety charter to improve the consistency of operations.	Could be worked on by group from Recommendation 1.
36. CoR principles adopted despite commercial disadvantage.	Recommendation 6.
37. Coaching and targeted technological interventions	Recommendation 8.
38. Driver awards.	Could be included in safety culture and management practice development or around technology use.
39. Data reviewed by senior management and all the way up to board level.	Recommendation 4.
40. Established communication and trust between supply chain members.	Recommendation 1 and 4.
41. Driver committee established.	Worker participation may result in such committees, as recommended where engagement or collaboration is suggested.
42. Consistent rules, policies and procedures for contractors and employees.	Recommendation 4.
43. Commitment to share OHS resources with contractors.	Recommendation 4.
44. Allocation of work considers implications for drivers.	Recommendation 4.
45. Employ a subject matter expert and OHS champions. Provide support from senior management.	This links to senior management support and leadership, and to organisations prioritising safety, as mentioned throughout numerous recommendations.
46. Management commitment and support.	Recommendation 4.
47. Education and information around technology implementation for all parties involved including drivers.	Recommendation 8.
48. Positive feedback and communication, input from workers with technology instalment, positive reward system.	Recommendation 8.
49. Tailored approach to implementation of technology, trialled first and feedback sought.	Recommendation 8.
50. Employee committee and policies to support drivers when technology is implemented and used.	Recommendation 8.

51. Driver reward schemes.	Could be included in safety culture and management practice development or around technology use.
52. Clear purpose for the collection of data, communicated to workers.	Recommendation 8.
Future Inquiry Workshop	
53. Campaigning for safe rates.	Recommendation 2, 11, and 12.
54. Lobbying government to improve supply chain regulations.	Reflected in Recommendation 6.
55. Agreements and contracts that consider responsibility throughout the supply chain.	Recommendation 4.
56. Waka Kotahi are reviewing work time rules and time regulations.	Recommendation 11.
57. Agencies are taking steps to join up.	Recommendation 3.
58. Agencies are using case law to give clarity on legislation.	For the agencies to determine best course of action but linked to Recommendation 5.
59. UBER for trucks to reduce waiting times and with the money saved, redistribute back to drivers.	A novel idea raised by a FIW participant to be explored further, perhaps as a part of the investigation on pay in Recommendation 12.
60. Organisations are reviewing driver wake up times, monitoring health and fatigue levels.	A part of what good work looks like in Recommendation 2.
61. Reporting delays to stores.	A part of what good work looks like in Recommendation 4.
62. Lowering working hours for drivers.	A part of what good work looks like in Recommendation 2.
63. Randomised testing for contractors.	Suggested by Business Owners at the FIW. Could be part of the work suggested in Recommendation 4.
64. Increasing the number and access to toilet facilities, cafes, and rest stops.	Recommendation 9.
65. Increasing training, vehicle standards, and traffic management rules.	Recommendation 9.
66. Improving inductions.	Recommendation 9.
67. Setting standards for contractors and absorbing the cost.	Recommendation 4.
68. Partnering with insurers to reduce training costs.	An idea to be explored further by relevant parties.
69. Guidance on best practice and sector leadership.	Recommendation 1 and 2.
70. Campaigns to highlight the problems.	There has been a great deal of research done in this space already.
71. Fatigue technology.	Recommendation 8 and 11.

72. Training scholarships.	Something that could be discussed by the group in Recommendation 1.
73. Engagement with government and with drivers (organisations).	Recommendation 1.
74. Reviewing shift patters and job sharing.	Explored when considering what is good work in Recommendation 2.
75. Promoting fair wages in the industry.	Explored when considering what is good work in Recommendation 2. Can also be found in Recommendation 11.
76. Increasing public awareness.	This could be part of the work programme in Explored when considering what is good work in Recommendation 1 however, it is believed that current work is happening in this space.
77. Sharing data, knowledge, and intelligence, for the development of common standards, consistent training, and a common model of OHS.	Recommendation 4 and 10.
78. Increased reward for organisations displaying good practice and providing incentives rather than disincentives to compliance.	Recommendation 2.
79. Greater regulatory support and leadership.	Recommendation 1 and 3.
80. Level the playing field through procurement regulation.	Could be considered in the work covered by Recommendation 7.
81. Celebrate the buyers of transport who ensure OHS&W of their workers.	Recommendation 2.
82. Regulation of safety features in vehicles.	To be worked out between industry and regulatory agencies based on conversations started at the FIW.
83. Large organisations taking a leadership role.	Recommendation 4.
84. Improvement of rest stops and infrastructure.	Recommendation 11.
85. Removal of government silos.	Recommendation 3.
86. System leadership.	Recommendation 1.
87. Preparing for autonomous vehicles.	Outside of this project's brief.
88. Fatigue and well-being leadership committee.	Included in the discussion on fatigue in Recommendation 11.
89. Digital app-based driver inductions.	Recommendation 9.
90. Tripartite group on pay, procurement, conditions, and well-being.	Recommendation 12.

91. Vehicle safety regulations improved.	To be worked out between industry and regulatory agencies based on conversations started at the FIW.
92. Industry leadership group.	Recommendation 1.
Second workshops and general feedback	
93. Revisit the ORS and accreditation schemes in New Zealand.	Recommendation 1.
94. Train leaders on performance management.	Recommendation 4.
95. Focus on improving safety culture in organisations	Recommendation 4.
96. Education on the benefits of safe procurement.	Recommendation 12.
97. Training required through to management level.	Recommendation 4.
98. Evaluation of past interventions.	Recommendation 1.
99. Define the aim of the system.	Recommendation 1.
100. Improve the evidence cycle along the supply chain.	Recommendation 1.
101. Contextual information visible to operators.	Recommendation 5.
102. Gathering contextual information about incidents.	Recommendation 5.
103. Regulatory enforcement up the supply chain.	Recommendation 5.
104. Higher number of prosecutions of parties higher up the supply chain.	Could result from Recommendation 5.
105. Define the aim of the system and define good work.	Recommendation 1 and 2.
106. Research and explore how to incentivise OHS for workers across the supply chain, what they are and who distributes them.	Further work needed in this area. Could be done by group in Recommendation 1 otherwise needs to be a separate inquiry.
107. Investigate further how to resolve the issue of pay, low wages, tight margins, where the extra money is going to come from, and whose responsibility it is.	Recommendation 2 and 12.
108. Assist contractors without taking away their commercial freedom.	Recommendation 4.
109. Work with large organisations in positions of economic power to positively influence OHS standards.	Recommendation 4.
110. Support managers in their efforts to improve safety culture.	Recommendation 4.
111. Develop a strategy for data-collecting entities with relevant information on TPW&M to come together to paint the whole picture.	Recommendation 5.

112. Engagement with interaction, and information to contractors.	Recommendation 4.
113. Analyse and explore the relevance of CoR legislation in New Zealand.	Recommendation 6.
114. Training for managers – skills to identify immediate OHS risks but also to understand the implications that result from certain business models and contracting strategies.	Recommendation 4.
115. Support for managers in learning new technology and how to handle data.	Recommendation 4 and 8.
116. More work to determine incentives for organisations to go beyond their legal duties.	Further work needed in this area. Could be done by group in Recommendation 1 otherwise needs to be a separate inquiry.
117. Further work on what is prohibiting fair and decent work, fair competition, support for start-ups, and to promote innovation.	Further work needed in this area. Could be done by group in Recommendation 1 otherwise needs to be a separate inquiry.

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