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Sustainable Business Council

Enabling Mode Shift & Increasing Modal Diversity

Final

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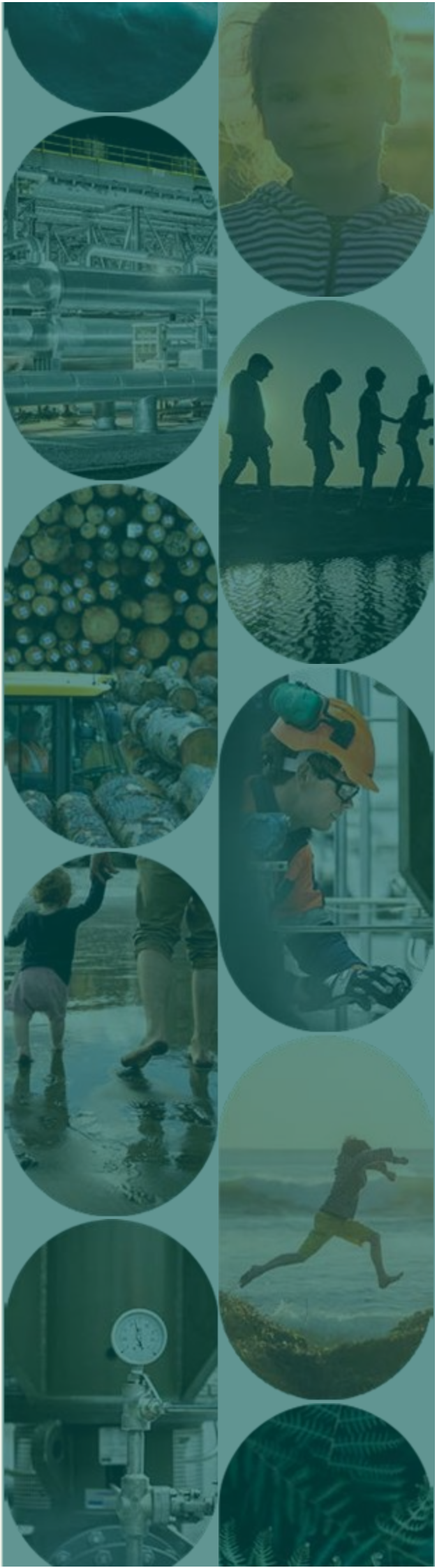

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Contents

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Executive Summary

In order to help decarbonise freight transport, many organisations are interested in increasing the modal diversity of their freight services, thus changing the mode under which their freight is moved, primarily undertaking mode shift from road to rail/shipping. The sections below outline the benefits and barriers of this change, as well as opportunities that will help increase the proportion of freight moved on rail and coastal shipping.

However, it should be noted that trucking provides many critical and required services and forms an integral part of the transportation ecosystem. Even with increasing modal diversity, there will always be a major role for trucking, including to provide time critical services, FMCG and Less than Container Load (LCL) services, modal integration services, first and last mile services, where there is a lack of rail and shipping infrastructure and where flexibility and response is key. It is important that New Zealand's transportation system operates as an integrated whole, recognising the value road, rail and coastal shipping can bring to the movement of people and goods in New Zealand achieving a resilient freight distribution system and meeting carbon emissions reduction targets.

Overall, increasing modal diversity is ideally driven by the users of freight services – if they are aware of the benefits and specifics of each mode type, and these can be meshed with their organisational requirements, material modal diversity will be easier to embed into operations.

Benefits of Mode Shift

Trucking provides a key role in the transportation network, but there are benefits of moving to other forms of transport, not least reductions in carbon emissions and air pollution. Road freight carbon emissions are almost four times higher than rail emissions and three times higher than coastal shipping emissions per tonne kilometre (tkm), therefore, there is significant opportunity in carbon emission reductions by transitioning to other modes of transport. This change also results in fewer vehicles on the roads, which can reduce road accidents, congestion, maintenance and other externalities.

Common Mode Shift Barriers

There are many barriers which prevent businesses from transitioning their freight from one mode to another mode. These include:

- **Lack of information:** While larger organisations are generally aware of the benefits and requirements of modal shifting, many smaller organisations are not.
- **Benefits of trucking:** Trucking is cost effective for many types of freight and provides good speed of delivery and flexibility – it is well suited to carrying time sensitive loads or loads that do not suit travelling in conjunction with rail or shipping.
- **Intermodal interfaces:** Intermodal interfaces can be barriers due to additional costs, road congestion around ports (rail use can help minimise this), geographical locations of ports, rail heads and volume and loading requirements.

- **Cost of service:** Rail and coastal shipping can involve additional costs due to the need for additional handling of freight, associated with modal integration services. Note that:
    - Freight aggregators can negate additional rail costs by combining multiple customers' loads and providing direct rail access at key depots where rail and road freight is aggregated for long-haul travel.
    - Rail and coastal shipping are cost-effective in many cases and are well suited to carrying bulk or heavy loads. Despite additional handling costs, the overall cost of the service can still be lower than trucking.
    - Externality costs, such as carbon emissions, air pollution, road accidents, congestion, and noise, are typically not accounted for by businesses when selecting freight modes (although this is improving with Climate Related Disclosure requirements) and not fully accounted for in NZ taxation or transport funding systems.
- **Customer expectations:** Customer expectations for delivery timeframes can be demanding, and customers expect to pay little for short delivery times and high levels of service.
    - **Frequency:** Coastal shipping is less frequent than road and rail, whilst having multiple services daily on key corridors, has a less flexible schedule than road transport.
    - **Reliability:** A barrier some businesses perceive to using rail is around disruption to service, primarily due to weather risks, natural disasters or equipment breakdowns and single-tracking in the event of breakdowns. Recent investments have seen rail reliability improve to around 90 per cent on key freight routes, but the perception remains.
    - **Speed:** KiwiRail's freight trains run at up to 80 km/hour on a dedicated network compared to trucks up to 90 km/hour navigating a network used by other transport users.
- **Volume:** Businesses with Less than Container Load (LCL) volumes can access linehaul networks (road and rail) but are often deterred due to minimum loading requirements. However, there are opportunities here for businesses to work together to amalgamate products, to obtain the benefits of economies of scale, or utilise third party logistics (3PL) providers to aggregate freight.
- **International shipping carriers:** International lines move about 75% of domestic coastal cargo, meaning that domestic freight is susceptible to the operating decisions of international lines. New Zealand coastal ships have to pay rates and levies that are much higher than the international ships they are competing with. Additionally, coastal shipping carriers sometimes struggle to get consistent berth windows and productivity from ports, who favour international or larger ships.
- **Infrastructure:** A key issue for all transport modes over the long-term is lack of consistent infrastructure investment and associated planning. For example, all freight modes have different constraints for container sizes and loading. There are larger infrastructure issues, such as lack of berth space in ports (the coastal ships have more capacity than what the ports are providing productivity for), single track rail lines and limitations of rail tunnels and

bridges, which all require significant capital investment for significant long-term growth. KiwiRail has sufficient capacity in terms of rolling stock to carry more freight now, and there is sufficient capacity on the coastal shipping network to increase freight carried.

Mode Shift Opportunities

There is a range of opportunities to help enable further mode shift:

- Providing clear and relevant information to:
    - Small and medium companies around how to approach mode shift. One of the key items with this is the consideration of cost - rather than looking at just base cost, the marginal abatement cost needs to be assessed to help account for the benefit of reduced carbon emissions. Other costs (such as externalities) should be communicated so more educated decisions can be made.
    - Businesses regarding the frequency, timing and actual reliability of the rail system and service as well as target service levels for each product. KiwiRail is continuing to improve its current service performance, with new rolling stock on order and a programme in place to deliver renewals to the rail network to improve reliability as funding allows. Where investment has been made into renewals, such as on the Main Trunk Line, reliability has improved. Since January 2023, reliability on key rail freight routes overall has risen to around 90 per cent. Continued funding and communicating successes through the Rail Network Investment Programme is needed to continue renewals and maintenance of the rail network and give businesses the confidence to invest and move to rail.
    - Businesses regarding capacity opportunities on the rail network. KiwiRail has capacity to make the locomotives and wagons available for additional freight movements.
- Additional coastal services that solely service core NZ ports would be valuable to many freight users. Particularly, making available additional services for ships travelling between Auckland, Tauranga, and Christchurch. Pacifica is the only dedicated coastal service, and they have recently increased their Auckland to Christchurch operation from once per week, to twice per week. Additionally, creating a door-to-door service makes for a seamless user experience, helping to increase uptake.
- More volume (using lightweight freight) could be placed on existing movements that contain heavy freight, allowing businesses to share the cost of a movement, while decreasing the number of containers required. This is a service already provided by freight forwarders, but there is further scope for utilisation.
- Deep collaboration and partnerships between KiwiRail, coastal shippers and freight owners around the timing and type of services provided that would help create a seamless freight service between the modes. Allowing for additional freight services and customer operational changes to better mesh customer demands with freight provider needs is crucial for increased modal diversity.
- Increased use of 3PL and 4PL organisations would drive further seamless mode shift. This is ideally driven by the freight services user, once they understand the benefits and

constraints of the freight modes. The provision of information to the wider market is crucial to enable this.

In terms of service improvements, there needs to be focused investment on key freight corridors, minimising overall investment in infrastructure while catering to significant freight volumes. There are a number of key routes, for which increased rail and shipping makes the most sense due to the significant volumes of freight being moved on these routes. These are:

- Additional volume moved on rail between Auckland and Palmerston North/Wellington, Auckland to Christchurch and Auckland to Tauranga, through better use of existing services, and additional daily rail services, as required. This will require large businesses in each location collaborating to provide additional freight for rail movements and to create balanced movements North and South. KiwiRail has capacity to make locomotive and wagons available for additional freight movements. Ongoing investment into the North Island Main Trunk Line and feeder routes will be required to ensure that reliability continues to improve. Note that some of this freight may originate on feeder lines that connect to these major freight lines.
- Increased volumes via coastal shipping between Auckland, Tauranga and Christchurch. This will require investigation from coastal shippers, to understand businesses that have freight suited to coastal shipping in each location. This will also require the Port of Auckland, Port of Tauranga, and Lyttleton Port providing additional berth time and productivity to coastal ships to enable them to load larger capacities on the weekly shipping route.

Government incentives and direction will be essential to increase modal diversity, along with funding directed to allow businesses to mode shift with less risk. Businesses require support for this transition, and there is a large opportunity for impact in the freight space, if the government is willing to play a contributing role. The new rail served Fairfield Freight Hub is a good example of the private sector, regional government and Central Government working together to increase modal diversity.

Provision of information is a key aspect increasing modal diversity, and is important to:

- Help inform organisations and users of the benefits of using alternative modes for some or all of their freight requirements.
- Outline where different mode options are most likely to be successful and how these might be integrated within a solution.
- Provide an avenue for users to effortlessly access alternative modes while not overly complicating their operations.

Key Actions

Key actions that should be undertaken include:

- Short Term – Immediate Actions:
    - Setting up working groups on key specific routes, such as those identified in Section 6. For example, KiwiRail and large freight users on the Auckland to Palmerston North route could collaborate in order to provide further load for rail, enabling additional services to be provided, with timing and conditions which are suitable for both the freight providers and KiwiRail.
    - Overarching collaboration and partnerships between KiwiRail, Pacifica, freight owners, trucking and logistics companies to share information and create opportunities for increased services on key networks and increasing freight moved on these services.
    - Increased, targeted and specific data provision to companies to enable them to make informed distribution choices to increase their use of rail and shipping. In particular, answering the question "why should I make this change?". How access to rail and shipping services can occur, how the benefits of this change can be realised and reported, what costs can be avoided and what emissions reduced.
- Medium Term
    - New Zealand wide adoption of ambitious targets for modal shift, alongside the provision of incentives from government to increase modal diversity.
    - Adjust cost recovery for international shipping lines, when compared to New Zealand flagged vessels (i.e. recovery of GST and ETS charges), to enable additional dedicated coastal services.
- Long Term (ongoing):
    - Increased and ongoing investment in the rail network, specifically the track infrastructure and rail sidings, on key routes.
    - Consideration of connecting infrastructure, such as motorways and fuel stations (electric, diesel and planned hydrogen), near ports or rail heads to ensure this supports the transport system as a whole minimising unnecessary additional freight movements.

1. Introduction

1.1 Project Objectives

In order to help decarbonise freight transport, many organisations are interested in increasing modal diversity, thus incorporating rail and shipping into their freight movements – this is called mode shift. In addition to carbon reduction, mode shift can provide other benefits to the roading network, such as reduced congestion, travel times, pollution, road maintenance needs and road accidents.

However, there are also potential challenges associated with the move, including regularity of service, increased handling costs and added time, perceptions of reliability, cost and policy settings. These issues can be a significant barrier to mode shift for many New Zealand businesses.

This project aims to:

- Enable collaboration between freight users and freight haulage providers, to increase awareness of the freight ecosystem and assist organisations in determining if and how increased modal diversity can be implemented for their freight movements (primarily through increased rail and coastal shipping).
- Investigate key barriers to mode shift for businesses, including cost, frequency, reliability, speed, and volume.
- Provide guidance to organisations on increasing modal diversity, including tools that will enable organisations to understand the best mode option for their specific operations.
- Provide a brief document outlining key opportunities identified by freight users and freight providers in New Zealand, for use by participants in discussions with governmental departments and national bodies in the freight sector.

1.2 Project Process and Participants

In order to facilitate understanding of the barriers and opportunities for increased modal diversity in New Zealand, discussions, research and workshops have been undertaken with a range of stakeholders.

Specific actions included:

- Two workshops with key organisations who use and provide freight services in New Zealand. Participants include SBC, CHEP, KiwiRail, LPC, NZ Post, OJI Fibre, Pacifica, Woolworths and DETA.
- Individual information and discussion sessions with each of the organisations.
- Research into mode shift projects to date.
- Research and assessment of transportation infrastructure associated with each mode.

The project participants offer a wide range freighting knowledge, in terms of how the freighting systems operate, how loads on rail/shipping can be increased and how trucking is, and will always be, essential to the freighting ecosystem in the country. Additionally, participants have been

instrumental in improving the sustainability and efficiency of the freighting network through such enhancements as inland freight hubs, colocation of trucking and rail depots and integration of low carbon trucking and shipping services.

The findings from the above are summarised in this report.

1.3 Definitions

Modal diversity is utilising a range of different modes for the freight task. In this study, modal diversity refers to incorporating higher levels of rail and shipping into the freight task, nominally with a reduction in trucking

Mode shift is a change from one form of transportation to another.

An **intermodal network** is defined as an integrated transportation system consisting of two or more unimodal networks.

An **intermodal interface** is the transloading facility between freight modes, for example a port, a rail siding or a container terminal, allowing containers to be transloaded between rail, trucks, or ships.

Intermodal freight transport is a system of interconnected networks involving various modes and facilities allowing transfer of commodities from one mode to another. The system aims to provide efficient, seamless transport of goods from the origin to its destination offering producers and manufacturers a full range of transportation modes and routing options.
In **multimodal transportation**, one contract covers the entire journey. One carrier takes sole responsibility and ensures door-to-door delivery is completed, even if other carriers are used in the journey. In **intermodal transportation**, there is a separate contract for each individual leg of the journey.

Externality costs refer to the economic concept of uncompensated social or environmental effects.

A **tonne-kilometre**, abbreviated as tkm, is a unit of measure of freight transport which represents the transport of one tonne of goods by a given transport over a distance of one kilometre.

A **freight forwarder / freight carrier** is a company that receives and ships goods on behalf of other companies.

2. Current National State

2.1 National Emissions Profile

A variety of studies and publications have covered emissions figures and transport/freight information in New Zealand. These have occurred over a range of dates and include different specific information. As such, we have referenced a number of key sources below. Some of these are dated and the figures have changed in the intervening years.

New Zealand's gross greenhouse gas emissions were 76.8 million tCO_2e in 2021[1]. Figure 1 shows the breakdown of total emissions in New Zealand. Transport is New Zealand's second biggest source of GHG emissions, making up almost 20% of NZ's GHG emissions[2]. Since 1990, there has been a 30% increase in energy-related emissions, and a 70% increase in transport emissions[3].

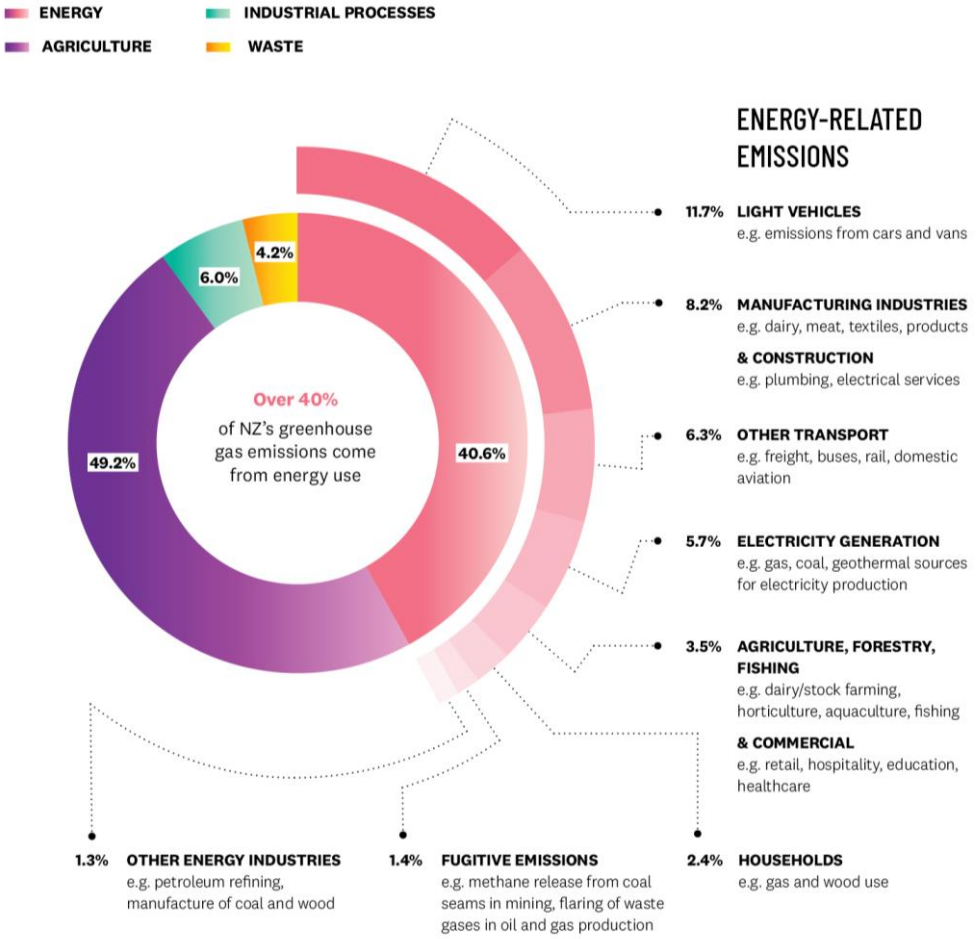


Figure 1: New Zealand Emissions Profile[4]

[1] New Zealand's Greenhouse Gas Inventory 1990-2021. Ministry for the Environment (2023).
[2] Green Freight – Strategic Working Paper. Ministry of Transport (2020).
[3] New Zealand's Emissions. Gen Less (2024).
[4] New Zealand's Greenhouse Gas Inventory 1990-2021. Ministry for the Environment (2023).

'Other Transport' emissions include freight, buses, rail, and domestic aviation. Trucks, trains, ships, and planes move about 280 million tonnes of freight a year around New Zealand[5]. The proportion attributed to freight alone has been estimated by the Climate Change Commission to total 3.9 M tCO_2e in 2021[6]. However, this category contributes 6.3% of NZ's total emissions. Therefore, 'Other Transport' emits approximately 4.8 million tCO_2e annually.

Approximately 91% of NZ's domestic transport emissions came from road transport in 2017, alongside 6% from aviation, 2% from marine and 1% from rail. Of the road transport emissions, 56% came from light passenger vehicles, followed by 17% from light commercial vehicles. A quarter of emissions came from trucks, despite the truck fleet representing only 6% of total vehicle kilometres travelled on NZ's roads[7]. Therefore, emissions from trucks are approximately 3.44 million tCO_2e annually.

Figure 2 shows that transport emissions have increased by 82% between 1990 and 2017. This is due to an increase of 93% in road transport emissions. Marine and rail emissions have not significantly changed over the reported period.

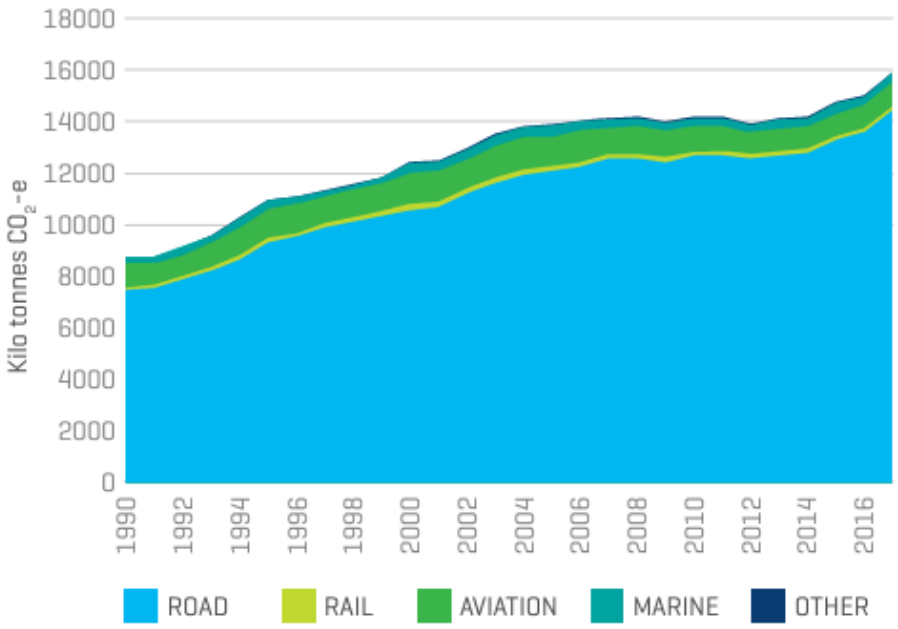


Figure 2: Domestic transport emissions by sector since 1990[8].

[5] New Zealand Freight and Supply Chain Issues Paper. Ministry of Transport (2022).
[6] www.climatecommission.govt.nz/public/Advice-to-govt-docs/ERP2/final-erp2/ERP2-Final-Advice-for-web.pdf
[7] Green Freight – Strategic Working Paper. Ministry of Transport (2020).
[8] Green Freight – Strategic Working Paper. Ministry of Transport (2020).

2.2 NZ Freight Network

Freight enables the movement of goods between producers and consumers. This includes the movement of New Zealand's domestic goods, as well as international imports and exports. Approximately 280 million tonnes of freight are moved around NZ each year as shown in the table below. Note that these figures come from the National Freight Demand study (completed in 2017/2018) and have now changed but they are generally indicative of overall trends and figures.

Sector	Volume of freight moved (% of total)	Infrastructure	Product Type
Trucking	92.8% of freight volumes within NZ are transported by trucks (75% of tkms).	NZ has 94,000 km of roads with over 4,200 bridges on the state highway network. There are approximately 4,700 trucking firms across NZ (privately owned).	All
Rail	5.6% of freight volumes within NZ are transported by rail (11.5% of tkms).	NZ has 3,700 km of railway owned and operated by KiwiRail (government owned) with more than 1,300 bridges and almost 100 tunnels. KiwiRail operates 16 container terminals across the country with connections to many major ports and rail sidings.	All, except short term time sensitive products.
Coastal	1.6% of freight volumes within NZ are transported by coastal shipping (13.4% of tkms).	There are around 13 vessels in NZ's domestic coastal shipping fleet (privately owned), of which only two are container ships. NZ has 15 ports of varying sizes and development. Nine of them are international container ports. The biggest container ports are Tauranga (39% of container volumes), Auckland (22%), and Lyttelton (14%). Tauranga is the largest bulk export port, while Northport (Whangārei) is the largest bulk import port.	All, except short term time sensitive products.

2.2.1 Volumes Moved by Each Mode

Road is the dominant mode for carrying freight in New Zealand, in terms of both total volume in tonnes transported (shown in Figure 4) and in tonne kilometres (shown in Figure 3). Freight moved annually amounts to approximately 280 million tonnes, and considering distance, a total of 30,100 million tonne-kilometres are moved[9].

[9] National Freight Demand Study 2017/18. Ministry of Transport (2019).

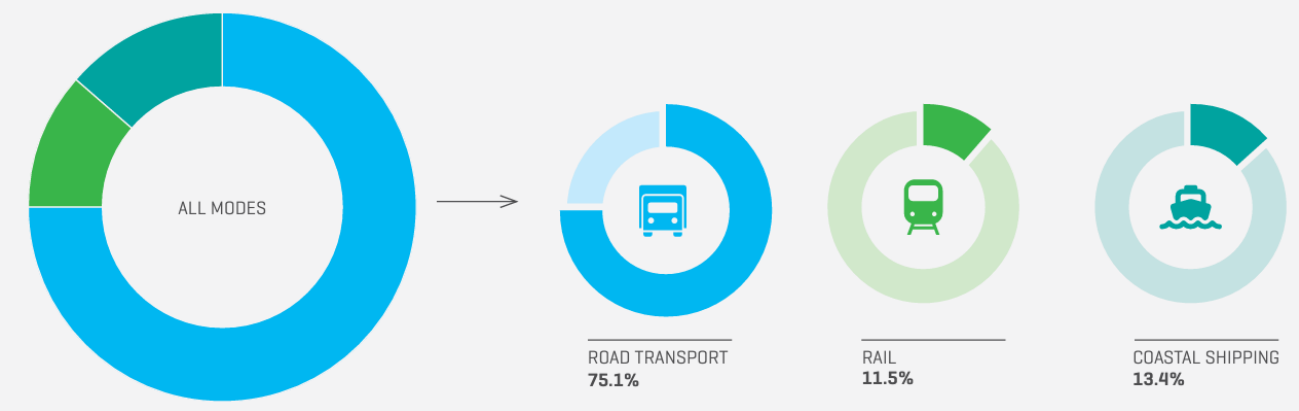


Figure 3: Breakdown of freight movements by mode in tonne kilometres (2017/2018)

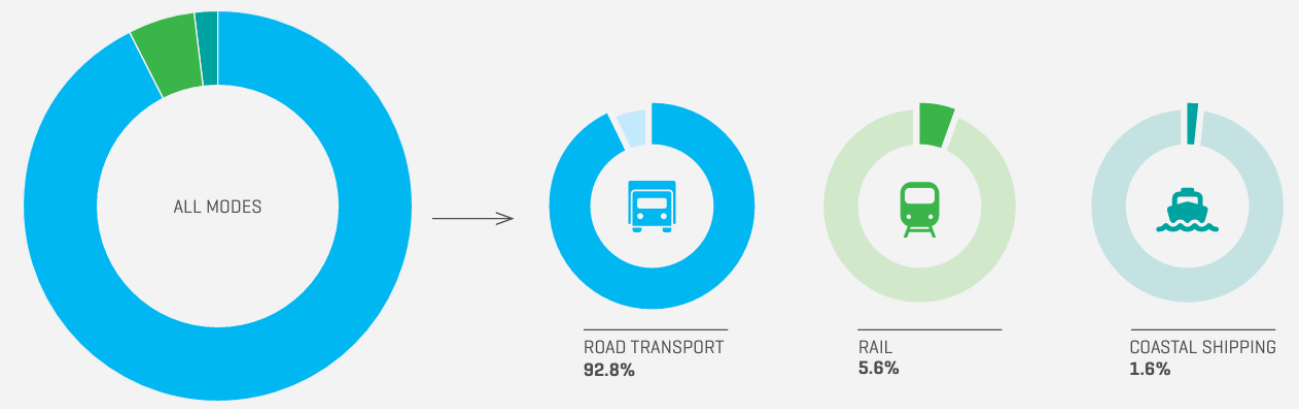


Figure 4: Breakdown of freight movements by mode in tonnes (2017/2018)[10]

2.2.2 NZ Freight Map

Figure 5 combines the national rail network provided by KiwiRail and the coastal shipping routes provided by domestic and international carriers. Additionally, some private rail sidings owned by freight forwarders have been included (private rail sidings owned by rail customers are not included). As shown, there are accessible rail sidings throughout the majority of population centres in the country.

[10] Green Freight – Strategic Working Paper. Ministry of Transport (2020).

Figure 5: NZ Freight Network

2.3 Road Freight

Trucking accounts for 75.1% of New Zealand's heavy goods transport (in tkm) and has a 94.5% share of the total emissions from freight transport. In 2017, there were just over 144,000 trucks on New Zealand's roads, travelling a combined total of nearly 3 billion kilometres.

The dominance of trucking follows the expansion and ongoing significant investment into the road network, which enables trucks to move relatively fast, travel to hard-to-reach locations and adjust routes and timing to meet the flexibility required for just-in-time deliveries. In 2010, the maximum allowable load carried by truck increased from 44 tonnes to 53 tonnes[11]. This resulted in road freight becoming much more competitive with rail.

Table 1 and Figure 6 show the utilisation of roads across the country. This indicates that state highways make up only 12% of our roads, however, 50% of kilometres travelled are on these roads. Additionally, Figure 6 shows that the most commonly used roads are between Auckland and Tauranga, followed by roads between Auckland and Wellington, and thirdly roads between Christchurch and Southland.

Table 1: Road Network Utilisation

Categories	Total Length	Percentage of Total	Percentage of Vehicle-kms travelled
State highways	11,000 km	12%	50%
Local roads	83,000 km	88%	50%

Figure 6: Road Network Utilisation[12]

[11] Change lifts truck load limit to 53 tonnes. NZ Herald (2010).
[12] Transport Dashboard, CC BY-ND

Trucking provides many critical and required services and forms an integral part of the transportation ecosystem. Even with increasing modal diversity, there will always be a major role for trucking, most notably to provide time critical services, FMCG and LCL services, modal integration services, first and last mile services, where there is a lack of rail and shipping infrastructure and where flexibility and response is key. It is important that the transportation system operates as an integrated whole, recognising the value road, rail and coastal shipping can bring to the movement of people and goods in New Zealand.

There is significant planning work currently being undertaken regarding the decarbonisation of the trucking fleet, specifically through the purchase and operation of Zero Emission Vehicles (specifically Battery Electric Vehicles and hydrogen fuelled Fuel Cell Electric Vehicles) and the use of biofuels. However, this work is in its infancy, there are significant technological and cost barriers, and it is likely to be many years before the overall NZ trucking fleet is operating at an average carbon emissions factor of rail and shipping. Further, the rail network has potential to electrify further, reducing net emissions and improving overall electricity/freight efficacy.

Table 2 and Table 3 highlight the following trends in road freight[13]:

- The largest freight hub is Auckland, which accounts for approximately 30% of in-region and ex-region freight quantity, travel and emissions.
- Canterbury, Bay of Plenty, Wellington and Waikato are also significant freight hubs.
- Over 80% of freight does not move outside the region of origin.
- When freight does move outside, the distances travelled are significant and this makes the tonne kms moved ex-region larger than those in-region.

2.3.1 Mode shift Potential

While more work would need to be done to identify the amount of freight which could be mode shifted, estimates can be made based off the information in the tables below. In general, *ex-region* freight is more suitable to increased modal diversity than *in-region* freight. While this is less than 20% in terms of freight tonnage, it is the largest in terms of tonne-km. If we assume that 25% of the *ex-region* freight could be mode shifted, then this roughly corresponds to:

- 5% of total road freight volumes (12 Mt).
- 15% of total road freight tonne-km (3,380 Mtkm).
- At long haul emissions values (as per Section 3.1.1), carbon savings of approximately 202 $ktCO_2e$ per year, 5% of total road freight emissions.

These figures are speculative only, but highlight the significant impact that could occur. Liaison with freight owners will be crucial to further develop this figure, but anecdotal evidence suggests this is feasible with the recommendations outlined in this report.

Further, KiwiRail provides an estimate around the amount of freight which is available to rail, as shown in annual reporting[14]. Current movements of 18 MT account for 36% of the available freight, therefore an additional 12 MT should be a conservatively feasible figure.

[13] National Freight Demand Study (2017-18).
[14] KiwiRail Integrated Report 2023. KiwiRail (2023).

Table 2: Regional Road Freight Totals

Region	Freight (Mt)				Freight (Mtkm)				Total				Emissions	
	In region		Ex region		In region		Ex region		Mt		Mtkm		$ktCO_2e$	
Northland	11.9	6%	1.6	3%	512	6%	617	5%	13.5	5%	1,128	5%	117	3%
Auckland	60.8	29%	11.6	24%	2,614	29%	4,329	32%	72.4	28%	6,944	31%	1,112	30%
Waikato	24.0	11%	9.5	20%	1,032	11%	1,293	10%	33.5	13%	2,325	10%	308	8%
BOP	16.7	8%	4.8	10%	718	8%	844	6%	21.5	8%	1,562	7%	416	11%
Gisborne	4.4	2%	0.6	1%	189	2%	194	1%	5.0	2%	384	2%	30	1%
Hawkes Bay	7.3	3%	1.8	4%	314	3%	537	4%	9.1	4%	851	4%	140	4%
Taranaki	5.4	3%	1.5	3%	232	3%	414	3%	6.9	3%	646	3%	113	3%
Manawatu / Wanganui	7.2	3%	5.3	11%	310	3%	1,162	9%	12.5	5%	1,472	7%	163	4%
Wellington	8.5	4%	2.2	5%	366	4%	843	6%	10.7	4%	1,209	5%	324	9%
Tasman / Marlborough	8.2	4%	1.0	2%	353	4%	337	3%	9.2	4%	690	3%	140	4%
West Coast	1.3	1%	0.4	1%	56	1%	73	1%	1.7	1%	129	1%	46	1%
Canterbury	38.3	18%	3.7	8%	1,647	18%	1,644	12%	42.0	16%	3,291	15%	492	13%
Otago	7.4	4%	2.0	4%	318	4%	617	5%	9.4	4%	935	4%	191	5%
Southland	9.6	5%	1.6	3%	413	5%	570	4%	11.2	4%	983	4%	122	3%
Total	**211.0**		**47.6**		**9,073**		**13,475**		**258.5**		**22,548**		**3,713**	

Table 3: Regional Road Freight Totals (in million tonnes)

		Destination														
		Northland	Auckland	Waikato	BOP	Gisborne	Hawke's Bay	Taranaki	Mana/Wang	Wellington	TNM	West Coast	Canterbury	Otago	Southland	Total
Origin	Northland	11.9	1.0	0.1	0.2	-	-	-	-	-	-	-	0.3	-	-	13.5
	Auckland	1.2	60.8	4.3	0.6	0.2	0.5	0.6	1.4	1.2	0.3	0.1	0.4	0.4	0.2	72.4
	Waikato	0.1	3.0	24.0	5.7	-	0.1	0.4	0.1	0.1	-	-	0.1	-	-	33.5
	BOP	0.1	1.5	2.6	16.7	0.1	0.1	0.1	0.2	0.1	-	-	-	-	-	21.5
	Gisborne	-	0.1	0.1	0.1	4.4	0.2	-	0.1	-	-	-	-	-	-	5.0
	Hawke's Bay	-	0.4	0.1	0.4	0.2	7.3	-	0.5	0.1	-	-	0.1	-	-	9.1
	Taranaki	-	0.3	0.2	0.2	-	0.2	5.4	0.5	-	-	-	-	-	-	6.9
	Mana/Wang	-	0.5	0.1	0.2	-	1.1	1.6	7.2	1.8	-	-	-	-	-	12.5
	Wellington	-	0.9	0.1	-	-	0.1	-	1.0	8.5	-	-	0.1	-	-	10.7
	TNM	-	0.1	-	0.1	-	-	-	-	0.1	8.2	0.1	0.5	-	-	9.2
	West Coast	-	-	-	-	-	-	-	-	-	-	1.3	0.3	-	-	1.7
	Canterbury	-	0.6	-	-	-	-	-	0.1	0.1	0.9	0.7	38.3	0.9	0.3	42.0
	Otago	-	0.1	-	-	-	-	-	-	-	-	-	0.6	7.4	1.3	9.4
	Southland	-	0.1	-	-	-	-	-	-	-	-	-	0.3	1.2	9.6	11.2
	Total	13.4	69.5	31.6	24.0	4.9	9.7	8.3	11.2	11.9	9.5	2.2	41.1	9.9	11.5	258.5

2.4 Rail Freight

KiwiRail is a NZ state-owned enterprise which is responsible for rail operations in NZ and operates the Interislander ferry service between the North and South Islands.

KiwiRail operates 40,400 mainline freight departures each year, and owns 240 locomotives and shunts, three inter-island ferries, and 3,700 km of track. KiwiRail transports around 19% of all NZ's exports and imports and carries 36% of the NZ freight task that is deemed to be available to rail[15]. Rail is ideally suited to a range of freight types, including bulk products, large shipments and long-distance freight.

2.4.1 Volume Moved

The following figures have been generated using summary statistics of national rail freight movements obtained from KiwiRail through the Freight Information Gathering System (FIGS)[16]. Note that 2023 data is incomplete and only accounts for 9 months of freight.

Figure 7 shows that KiwiRail's trains and ferries carry around 19 million tonnes of freight each year, and Figure 8 shows the tonne kilometres moved annually, which is 4,150 million tkm per year on average.

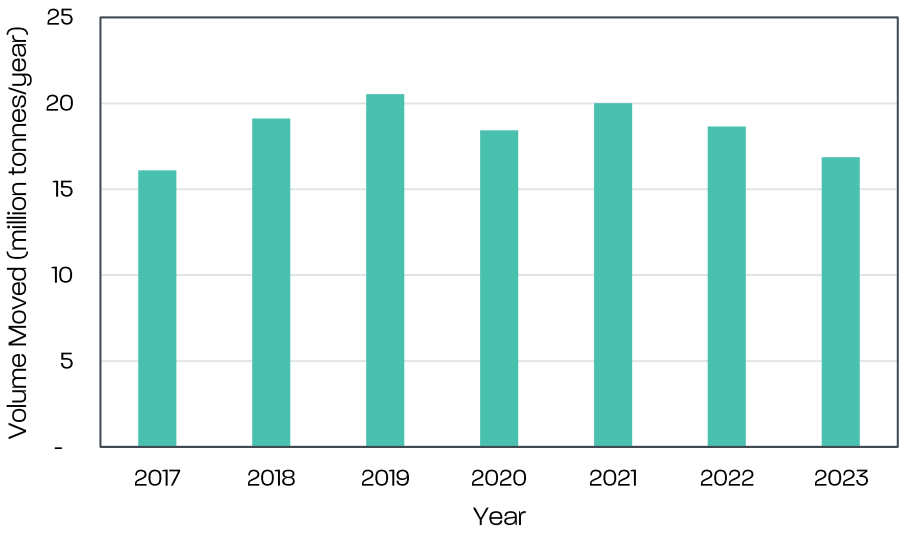


Figure 7: KiwiRail's Annual Freight Volumes Moved (in million tonnes)

[15] KiwiRail Integrated Report 2023. KiwiRail (2023).
[16] FIGS: Rail. Ministry of Transport (February 2023).

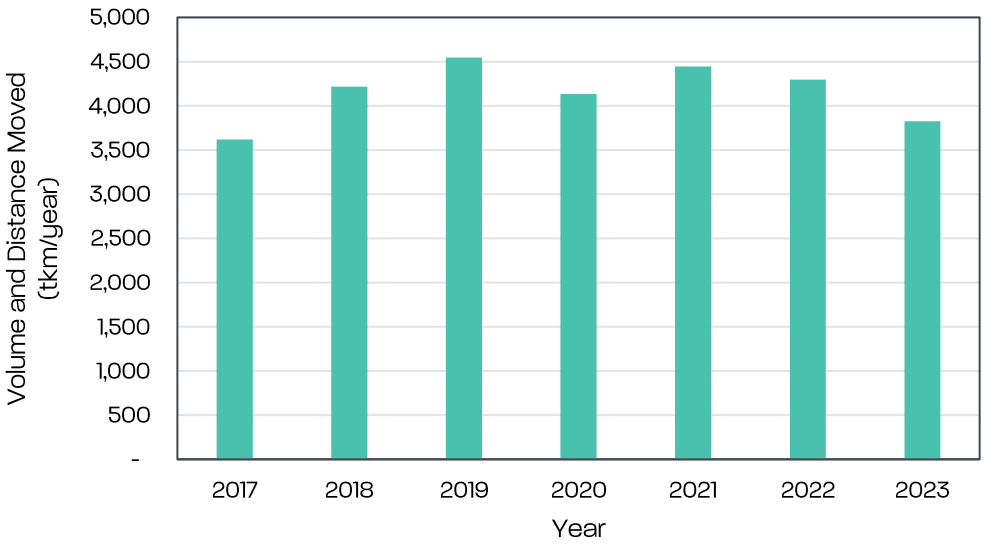


Figure 8: KiwiRail's Annual Freight Volumes Moved (in million tonne kilometres)

2.4.2 Freight Origins and Destinations

Figure 9 and Figure 10 present the percentages of freight that are moved from and to each location. This shows that greatest volumes of freight are moved from Bay of Plenty, Auckland and Waikato, with greatest volumes of freight arriving in Bay of Plenty, Canterbury and Auckland. The corresponding tkm figures show that freight leaving Auckland and the West Coast has higher percentages of the total tkm travelled, relative to the total volumes of freight leaving these regions in tonnes. Similarly, freight arriving in Christchurch has typically travelled greater distances than other freight movements, resulting in a higher portion of the total tkms travelled by freight.

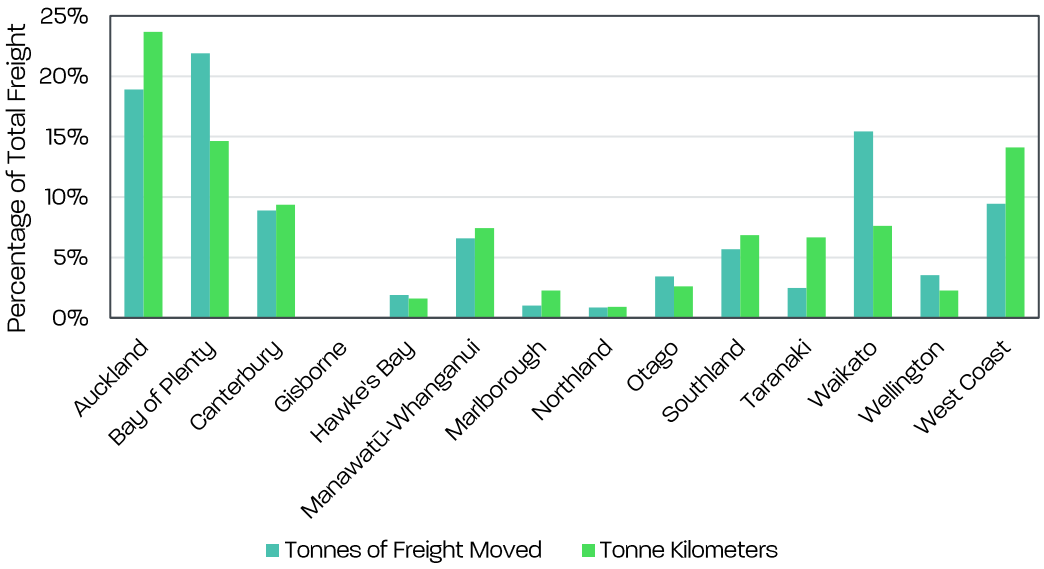


Figure 9: Breakdown of Freight Origins (for total tonnes moved and total tkm moved) for 2012-2023 period.

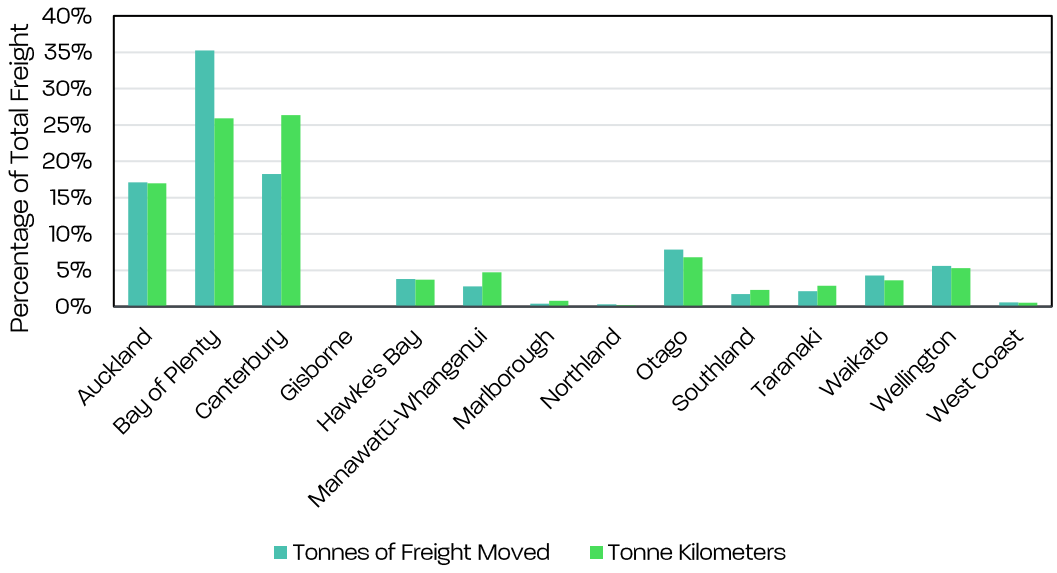


Figure 10: Breakdown of Freight Destinations (for total tonnes moved and total tkm moved) for 2012-2023 period.

2.4.3 Container Terminals

KiwiRail has 16 container terminals (details here from weblink), and there are a number of privately accessible sidings that freight users can utilise via freight companies and 3PL providers. These sidings are situated in the following cities/towns and cover the vast majority of areas in NZ:

- Whangarei
- Auckland
- Hamilton
- Tauranga
- New Plymouth
- Gisborne
- Napier
- Whanganui
- Palmerston North
- Masterton
- Wellington
- Blenheim
- Greymouth
- Christchurch
- Ashburton
- Timaru
- Oamaru
- Dunedin
- Invercargill

2.4.4 Investment and Reliability

After a 30-year period of limited investment into the rail network, recently more funds have been made available for renewals and track maintenance. From 2022 to 2024 over $145 million was invested into renewals on the rail network from Auckland to Christchurch with an associated improvement in on-time delivery performance to 90%.

2.5 Sea Freight (Coastal)

2.5.1 Carriers

The only domestic dedicated carrier is Pacifica, a subsidiary of Swire Shipping. There are six main international service operators carrying coastal cargoes (ANL/CMA CGM, Maersk/Hamburg Sud, Cosco, MSC, OOCL and PIL). Each carrier periodically moves transhipment cargos and empty containers, the numbers of which are shown in Figure 11. This shows that each carrier transports cargo and empty containers. International ships transport larger volumes than Pacifica. The greatest domestic volume (56%) is empty containers, mostly on international ships. Additionally, 74% of transhipment cargoes are full containers carried by international ships.

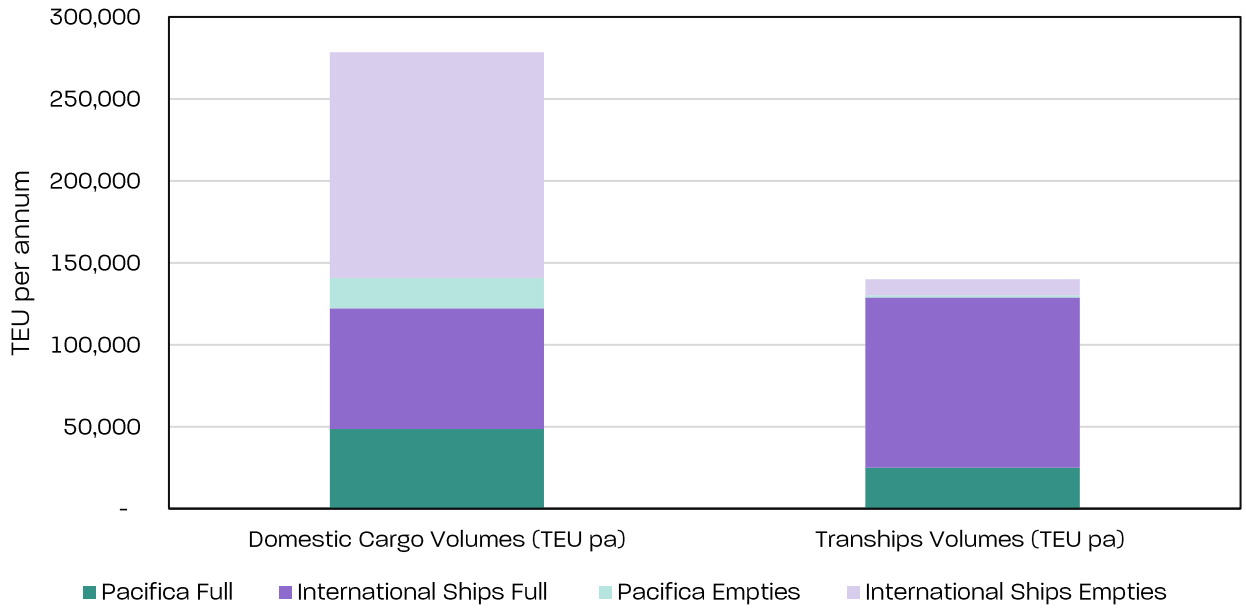


Figure 11: Movements (in number of 20-foot equivalent) of Domestic and International Sea Freight Carriers[17]

2.5.2 Product Moved by Coastal Shipping

The National Freight Demand Study 2017/18 (NFDS) sets out the New Zealand Freight Task. The total task in 2017/18 was 278.7 million tonnes and 30.1 billion tonne-kilometres. The total volume transported by coastal shipping is about 4.5 million tonnes, i.e. about 1.6% of the overall volume. Figure 12 shows the coastal shipping sector by type of product.

Containerised shipping allows large volumes of different types of goods to be packed and stacked in standardised boxes, and taken on and off ships, trains and trucks in a seamless way with less labour. Bulk shipping, where the cargo is transported in big quantities and without specific packaging, is generally used for commodities like logs, grains, cement, or coal. For this reason, this study is focussed on mode shift of containers from road to other modes only, not bulk transport.

[17] Coastal Shipping Investment Approach Report. Pacific Marine Management Ltd (2021).

There are two main bulk commodities shipped around the New Zealand coast:

- Refined petroleum products (2.7 million tonnes pa)
- Cement (1.3 million tonnes pa)

Other bulk cargoes include grain, fertilizer, and aggregate.

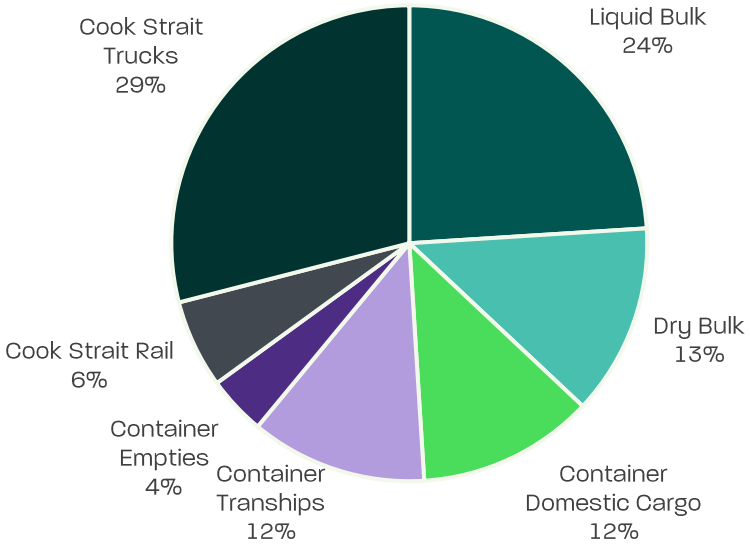


Figure 12: Coastal shipping breakdown by product type.

2.5.3 Ports

Key NZ ports, including type of shipping available at each port, are listed in Table 4, with additional information shown in Table 5.

Table 4: Key NZ Ports

Port	Location	Container Terminal	Port Type
North Port	Marsden Point, Whangarei, Northland	Yes	Small harbour
Port of Auckland	Waitemata Harbour	Yes	Large seaport
Onehunga	Manukau Harbour	No	Small harbour
Port of Tauranga	Sulphur Point, Mt Maunganui, Bay of Plenty	Yes	Medium seaport
Eastland Port	Gisborne, Poverty Bay	No	Small seaport
Port Taranaki	New Plymouth, Taranaki	Yes	Small seaport
Port of Napier	Napier, Hawkes Bay	Yes	Medium seaport
CentrePort	Wellington	Yes	Medium seaport
Port Marlborough	Picton, Marlborough	No	Small harbour
Port of Nelson	Nelson, Tasman	Yes	Medium seaport
Port of Westport	Westport, West Coast	No	Medium seaport
Port of Greymouth	Greymouth, West Coast	No	Small harbour
Lyttelton Port	Lyttelton, Canterbury	Yes	Medium seaport
PrimePort Timaru	Timaru, South Canterbury	Yes	Small harbour
Port Otago	Port Chalmers, Dunedin, Otago	Yes	Medium seaport
SouthPort	Bluff, Invercargill, Southland	Yes	Small seaport

Table 5: Key port services

	North Port	Auckland	Tauranga	Gisborne	Napier	Wellington	New Plymouth	Picton	Nelson	Westport	Greymouth	Bluff/ Invercargill	Dunedin	Timaru	Christchurch
Whangarei		RO/RA		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Auckland	RO/RA		RO/RA	RO/RA		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Tauranga	RO/RA	RO/RA		RO	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Gisborne	RO/RA	RO/RA	RO/RA		RO	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Napier	RO/RA	RO/RA	RO/RA	RO		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Wellington	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO/RA	RO	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
New Plymouth	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Picton	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Nelson	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO	RO		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Westport	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO	RO		RO/RA	RO/RA	RO/RA	RO/RA	RO/RA
Greymouth	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO	RO	RO		RO/RA	RO/RA	RO/RA	RO/RA
Bluff/Invercargill	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO/RA	RO/RA
Dunedin	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA	RO/RA
Timaru	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA		RO/RA
Christchurch	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	RO/RA	

Legend

▲	Direct Coastal Service
△	Transhipment Coastal Service
RO	Road
RA	Rail

Note: Some destinations may be connected through multi mode, ie coastal and road or rail.
eg; Nelson is not rail served but road ex Blenheim rail head and/or coastal connections.

Figure 13 shows the quantities of domestic and transhipment containers moved from each container port in NZ. This shows that Port of Auckland predominantly ships product from the North Island to other ports in NZ and the majority of this is domestic product. Lyttleton has the second largest number of containers leaving for other domestic ports.

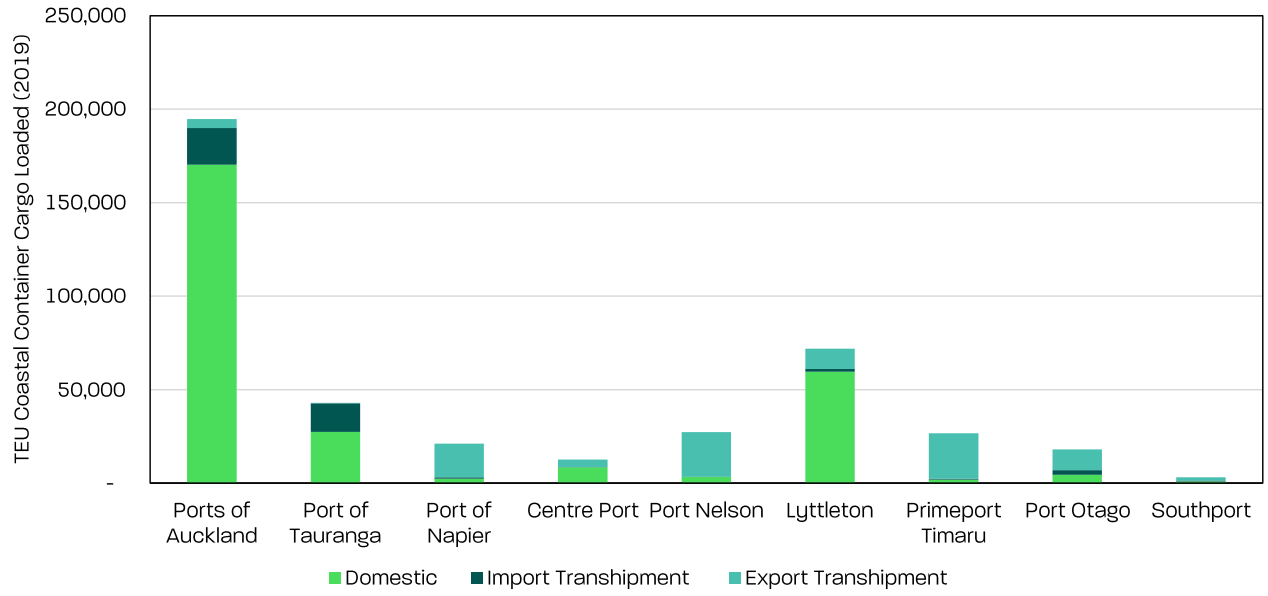


Figure 13: Quantities of containers moved from each container port by type of shipment.

2.6 National Targets

2.6.1 Targets and Emissions Budgets

New Zealand's legislated 2050 emissions reduction targets are:

- net zero greenhouse gas emissions (except biogenic methane)
- a 24-47% reduction in biogenic methane.

NZ is using a system of emissions budgets to meet the 2050 target. The Government published the first three emissions budgets (2022–2025, 2026–2030, 2031–2035) in May 2022. An emissions budget is a total quantity of emissions that is allowed to be released during an

emissions budget period. Each emissions budget covers a period of five years (except the first emissions budget which covers the period 2022-2025)[18].

The emissions budget permitted for the relevant emissions budget periods are expressed in megatonnes of carbon dioxide equivalent ($MtCO_2e$).

	Unit	Budget Period		
		2022-25	2026-30	2031-35
All gases, net	$MtCO_2e$	290	305	240
Annual average	$MtCO_2e$	72.5	61	48

2.6.2 Freight Sector

The Climate Change Commission's demonstration path details the actions needed within the freight sector to meet the second emissions budget, and to set up for the third[19].

- 36% of trucks entering the fleet and 3.6% of the total truck fleet are zero emission.
- 16% efficiency improvement in road freight per tonne-kilometre (from 2019)
- 3.5% of freight tonne-kilometres shifted from road to rail and coastal shipping.

The final action is relevant to this study. Based on the figures presented in Section 2.1 (for 2017/18), 3.5% of freight tonne-kilometres is approximately 1,100 million tonne-kilometres. Note that currently 75.1% of tonne-kilometres are transported via road freight, therefore only 4.7% of road freight tonne-kilometres require mode shift to rail or sea freight.

2.6.3 National Freight Strategy

The Ministry of Transport released a NZ Freight and Supply Chain Strategy, with a three-year horizon, a 10-year horizon and a 30-year horizon.

The 30-year horizon presents the desired outcomes of the supply chain system, which is zero emissions, productive and efficient, resilient and reliable, safe and sustainable freight transport system.

The focus areas for the three-year horizon are:

1. Ports and their connections to their communities
    a. Action to develop spatial analysis of port connections that supports future regulatory and investment decision-making. To do this we will identify strategic freight corridors and analyse the role they play in achieving different government objectives.
    b. Action to undertake analysis of alternative port models and strategic freight vulnerabilities.

[18] Emissions budgets and the emissions reduction plan. Ministry for the Environment (2022).
[19] 2023 Draft advice to inform the strategic direction of the Government's second emissions reduction plan. Climate Change Commission (2023).

2. Road freight decarbonisation
    a. Action to support the sector to overcome high total cost of ownership barriers to purchasing zero emissions (from the tailpipe) heavy vehicles by introducing a Clean Heavy Vehicle Grant scheme to support operators to purchase a zero emissions truck.
    b. Action to undertake a review of the regulatory system to better enable zero emissions heavy vehicles to operate on our roads.
    c. Action to partner with the Sustainable Business Council on a feasibility study into a market-led low carbon freight mechanism and next steps.
3. Data sharing and interoperability
    a. Action to identify and invest in freight data needs based on priorities of different public and private sector stakeholders. This includes both domestic freight and international freight resilience and productivity.
    b. Action to seek to establish partnership with the sector to support mutual data sharing.
4. International engagement
    a. Action to maintain collaboration with key international partners to share information and assessments and strengthen lines of communications for disruption preparedness.
    b. Action to support the establishment of green shipping corridors for zero emissions maritime freight by 2035.

Several of the discussions held with key stakeholders in the domestic freight industry in NZ, have made similar recommendations in regard to focus areas 1 and 3 in particular. These are discussed further in Section 5, which examines mode shift and domestic freight optimisation opportunities in NZ.

For area 2, there is also a particular focus on decarbonisation of first/last mile delivery, and a number of projects around the country are targeting this[20].

2.6.4 Industry Targets

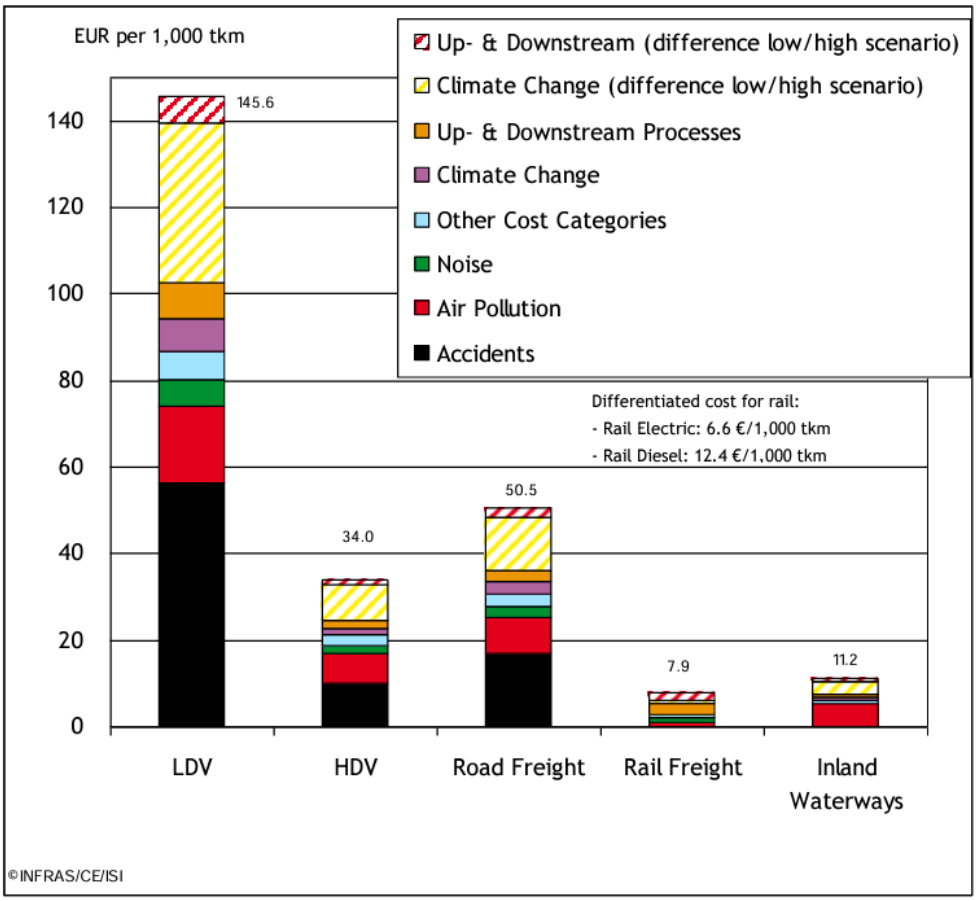
KiwiRail has carbon emissions reduction targets to reduce emissions by 30% by 2030 and achieve net zero carbon by 2050. KiwiRail's Rautaki Whakauka: Sustainability Strategy 2022-2025 has an objective to support achievement of local and national mode shift targets to reduce transport emissions and provide the public with greater access to commuter rail networks. KiwiRail has collaborated with Auckland Transport to develop a 30-year vision for Auckland Rail to achieve better services for passengers and freight customers through expanding the heavy rail network. If the projects outlined in the Auckland Strategic Rail Programme were delivered, this would avoid total emissions of 2.1 million tonnes CO_2e (over 30 years), with 95% of the savings coming from increased freight moving by rail.

[20] https://www.swireshipping.com/information/latest-news/pacifica-shipping-combines-battery-electric-trucks-with-coastal-shipping-for-low-emission-supply-chain/

3. Benefits of Mode Shift

Freight forecasts produced as part of a study completed by Stantec for Environment Canterbury in 2019[21] show that there is a considerable freight growth forecast in New Zealand, due to economic and population growth and increasing production for several agricultural products. Further, the number of other vehicles is set to continue to rise, and the increased number of vehicles on the roads will create pressure on transport infrastructure. As such, there are a wide range of benefits to increasing the amount of freight moved via rail and coastal shipping[22].

There are a number of externalities involved in transport modes that are (in general) unaccounted for in freight pricing. However, those for road transport are greater than those for rail or coastal shipping. A study completed by CE Delft on external costs of transport in Europe[23] shows that per tonne-km of freight movement, the average external costs of road freight are approximately five times those of rail freight and four times those of shipping using inland waterways (Figure 14). Note that LDV stands for light duty vehicle and HDV is heavy duty vehicle.



Other cost categories: Costs for nature and landscape, biodiversity losses (due to air pollution), soil and water pollution costs, additional costs in urban areas. Data do not include congestion costs.
Road Freight Total: The weighted average of all road freight transport modes.
* Data include the EU-27 with the exemption of Malta and Cyprus, but including Norway and Switzerland.

Figure 14: Average external costs for freight transport in Europe.

[21] Freight Study Report. Stantec (2019).
[22] https://theconversation.com/a-shift-to-coastal-shipping-and-rail-could-cut-nzs-freight-transport-emissions-why-arent-we-doing-it-204023
[23] External Costs of Transport in Europe. CE Delft (2008).

Increasing the freight moved on rail and coastal shipping will reduce the impacts of some of these externalities, including both environmental and social costs. The significant externalities are discussed further in this section.

3.1 Environmental

3.1.1 Carbon

Figure 15 illustrates the relative emissions, per tonne kilometre, of domestic freight modes in NZ. Rail has the lowest emissions, followed by coastal shipping. Road freight has significantly higher emissions relative to other modes, and this is driven by internal combustion engine trucks.

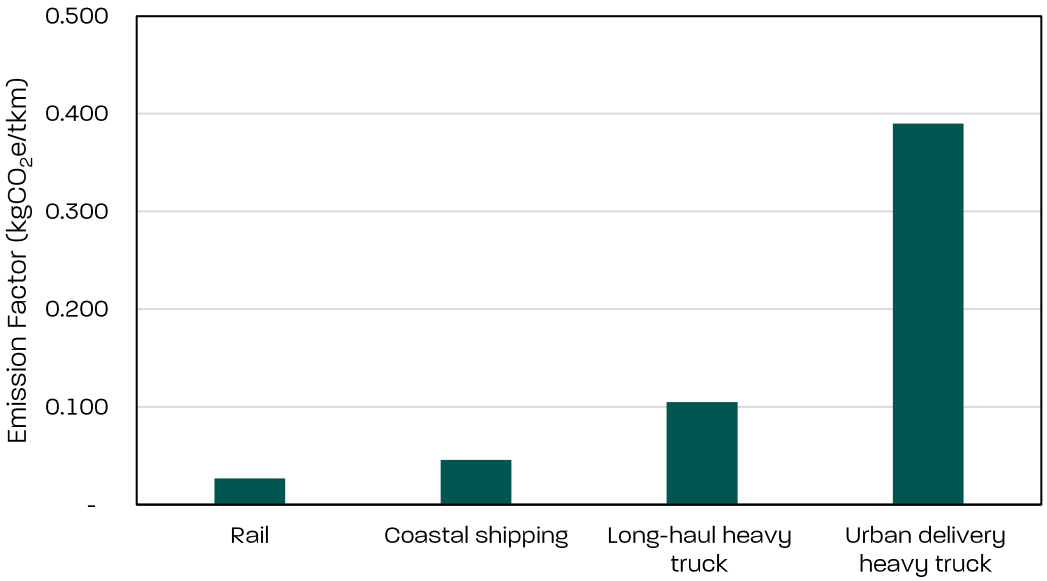


Figure 15: Emissions Factors of Freight Modes in NZ[24]

Increasing freight moved on rail or coastal shipping will therefore have a significant impact on emissions from the freight industry. There are costs of carbon emissions, including elements such as avoidance costs to reduce the risk of climate change and damage costs of increasing average temperature and sea level rise.

3.1.2 Air Pollution

A paper completed as part of the OECD programme on trade and environment[25] reports the air pollution figures in Table 6. As the table shows, despite significant variation in estimates, internal combustion engine trucks emit more air pollution (per tkm) than trains or ships, across all pollutants. There are no significant differences between rail and shipping.

[24] Measuring Emissions: A Guideline for Organisations. Ministry for the Environment (2023).
[25] The Environmental Effects of Freight. OECD (1997).

Table 6: Air emissions ranges for truck, rail and shipping in grams per tkm

Pollutant	Truck	Rail	Ship
CO	0.25 – 2.40	0.02 – 0.15	0.018 – 0.20
HC	0.30 – 1.57	0.01 -0.07	0.04 – 0.08
NOx	1.85 – 5.65	0.20 – 1.01	0.26 – 0.58
SO_2	0.10 – 0.43	0.07 – 0.18	0.02 – 0.05
Particulates	0.04 – 0.90	0.01 – 0.08	0.02 – 0.04
VOC	1.10	0.08	0.04 – 0.11

There are costs associated with air pollution, including health costs, crop losses, building damages and biodiversity losses.

3.2 Accidents and Road Death Toll

Increasing vehicle numbers and distances travelled on roads increases the likelihood of vehicle crashes. In 2022, there were 51 fatal crashes in which 62 people died, 166 serious injury crashes, and 539 minor injury crashes where trucks were involved. This was 16.5% of total road deaths in 2022.

Accidents impose a range of social and financial costs on society. These include medical and healthcare costs, lost economic output, material damage, police and fire service costs, insurance administration, legal and court costs and social costs such as pain, grief and suffering.

Average annual social costs of road crashes, including loss of life, reduced output due to injury, medical, legal and vehicle damage costs are around $4.9 billion. Note that this includes all crashes, not solely truck-related crashes[26].

Reducing the number of vehicles on the road, and the distances travelled, can help to reduce accidents, minimising actual and social costs.

3.3 Congestion

Figure 16 shows that the number of heavy vehicles in NZ increased by more than 70% from 2000 to 2022 (this vehicle category includes motor caravans, passenger vans, goods vans and trucks), which is in line with the percentage increase of total vehicles in NZ. About 30,000 trucks are used for commercial freight, and almost all of those involved in long distance trips will also tow heavy trailers[27].

Heavy trucks collectively travel about 3 billion kilometres per year in NZ, with one-third of the kilometres generated through freight and customer deliveries taking place in the urban environment and the balance servicing the wider inter-regional and rural economy.

[26] Safety – Annual Statistics. Ministry of Transport (2023).
[27] New Zealand's Truck Fleet. Transporting Aotearoa (2024).

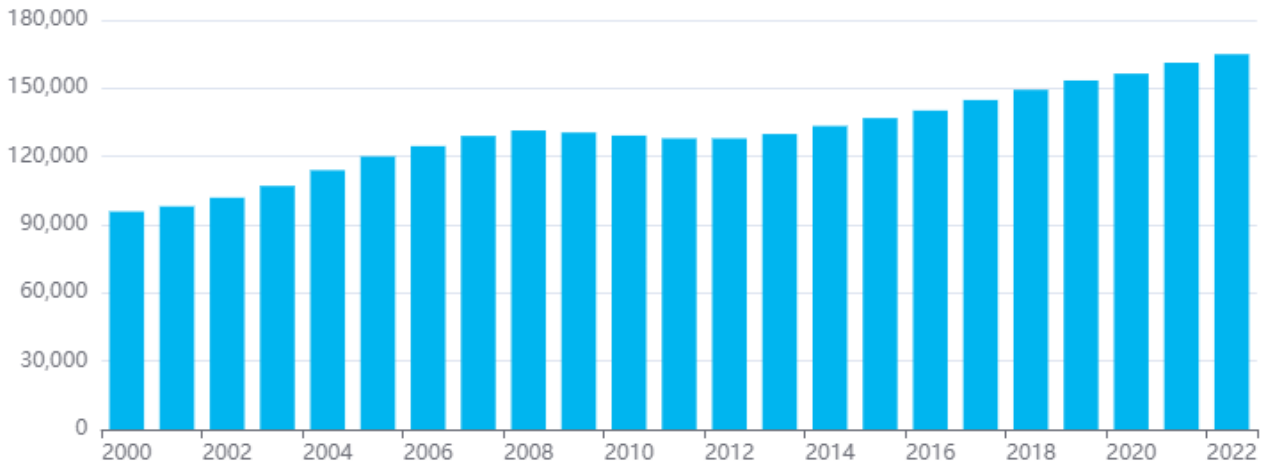


Figure 16: Number of Trucks in NZ Fleet 2000 – 2022[28]

Commercial freight trucks make up only ~0.7% of the vehicle fleet in NZ (total of 4.4 million licensed vehicles in NZ[29]), and they travel ~6.4% of total kilometres travelled (circa 47 billion vehicle kilometres travelled in 2021[30]).

The NZ Transport Agency reports state highway traffic monitoring publicly[31]. On State Highway 1 between Auckland and Hamilton, 12-15% of vehicles are heavy vehicles, and between Hamilton and Palmerston North, 20-25% of vehicles are heavy vehicles. Between Picton and Christchurch, heavy vehicle percentages are similar at 19-23%. On State Highway 2 between Auckland and Tauranga, 11-16% of vehicles are heavy vehicles.

When additional vehicles use NZ roads, they impose costs on all users due to longer journeys. The reduction in speed affects operating costs, both fuel and labour costs. Additionally, acceleration and deceleration increase fuel consumption. Increased traffic also increases the variability of journey speeds, reducing the reliability of journey times.

3.4 Road Maintenance

Various studies have identified a rule known as "the Fourth Power" law[32]. This states that the damage to the road increases in proportion to the fourth power of the axel load. For example, a truck with an average load of 5 tonne/axle would cause 625 times the level of damage when compared to a car with an average load of 1 tonne/axle.

As such, moving trucks (or any vehicle) off the road helps to reduce road maintenance required.

[28] Annual Motor Vehicle Fleet Statistics. Ministry of Transport (2022).
[29] New Zealand's Truck Fleet. Transporting Aotearoa (2024).
[30] Road Transport: Vehicle Kilometres Travelled. Ministry of Transport (2022).
[31] State highway traffic monitoring – annual average daily traffic. Waka Kotahi NZ Transport Agency.
[32] https://en.wikipedia.org/wiki/Fourth_power_law

4. Common Barriers to Mode Shift

Increased modal diversity is a key pillar in optimising the freight system. However, in order to drive this, customer perceptions need to change, and additional investment is required in various networks to ensure timely, efficient and cost-effective delivery. Road, rail and coastal shipping all need to integrate to operate as a cohesive transport system, in order to move less time-constrained freight to other modes.

4.1 Lack of Information

While many large organisations are aware of the benefits and requirements of utilising rail and shipping, many organisations are not, and there is a significant lack of readily available information for freight users, including:

- The benefits of mode shift, including the reduction of externalities such as carbon emissions, congestion, road maintenance and accidents.
- What specific freight movements are suited to what modes.
- How to go about mode shift and what organisations to talk to.
- How the benefits of mode shift can be seen by their organisation.

Providing information regarding these benefits is crucial to driving the demand for mode shift from users. Increasing awareness around the how and why of this can help create a more transparent market and match freight tasks with optimal freight provision.

4.2 Trucking Benefits

Trucking is particularly suited and cost effective for a wide range of requirements, including time critical, short haul and general freight services. For many parts of the transport and freight industry, speed and cost requirements will drive them to use road freight for suitable loads. For several businesses in the South Island in particular, backfill freight (which utilises north-bound trucks that have brought goods south, which would otherwise return empty) prices are significantly beneficial, which other modes cannot compete with.

Additional study into the benefits of trucking, and how these characteristics could be incorporated into other modes should be undertaken. Anecdotally these benefits include pricing, reliability, point to point collection/delivery and overall ease of use, and robust systems should be implemented to help address these. Note that the increasing use of 3PL/4PL freighting providers are key to the creation of a cohesive and integrated freight network, and many are currently providing services to help provide the above benefits to users across multimodal freight networks. Having customers realise the impact they are making by the freight choices is a key foundation of change.

As covered in other sections of this report, there are also a range of drawbacks to using trucking in its current form, in particular the impact on the environment.

4.3 Intermodal Interface

Coastal shipping and rail share similar frustrations with intermodal interfaces, such as road congestion (for example, around ports or rail heads) and limited rail capacity.

Rail logistics in regard to freight volumes, loading and container terminal locations may also be a barrier for businesses. For many businesses, rail is only used where railhead (supplier) to railhead (customer) is available, or where the businesses have private rail sidings, as multiple touch points increase the cost and time for delivery. Some third-party logistics providers have private rail sidings, which can make rail more accessible to customers, as these businesses can enable door-to-door delivery utilising multiple modes. It should be noted that there are a wide range of freight forwarders and 3PL companies who operate to provide clients with a seamless door to door freight service, no matter the mode, and will arrange access to the rail and shipping networks.

Recent investment and opening of inland ports and freight hubs at locations such as Ruakura (in Hamilton) and Fairfield (in Ashburton) will enable greater use of rail by businesses and a seamless transfer of freight from road to rail.

Additionally, a key challenge for modal diversity is inconsistent infrastructure across modes. For example, freight modes have differing length, width, and height constraints for movements. Rail is capable of standard container sizes only, due to the width and height constraints of tunnels on the network and having to utilise the narrow-gauge network. Coastal shippers have typically only shipped standard 20-foot and 40-foot containers, however, are starting to investigate irregular sizes as they become more common. Trucking is capable of catering to larger load sizes. This can limit intermodal freight availability.

The additional time and loading required for use of intermodal interfaces will typically be worthwhile for larger distances and bulk freight, or where freight can move directly from rail sidings (such as ports or industrial facilities) to siding to provide a streamlined effective service over short distances.

4.4 Cost

Rail is competitive against road, particularly for larger freight users who get capacity pricing. Some businesses have disclosed that the greater the distance, the closer the rail price is to road pricing. Further, coastal shipping can have very competitive pricing.

Depending on loads and locations, on an all-inclusive $/m³ rate, shipping and rail can be lower cost than road options. However, while the rail and coastal shipping component can be cheaper, using rail or coastal shipping can also mean additional costs due to handling of freight, the cost of the mode service and the first and last mile costs. These additional costs determine the viable freight catchment area of a rail terminal and a port. The lower the handling and first/last mile costs, the larger the freight catchment area.

Additionally, the shorter the journey, the smaller the viable catchment area is. As the proportion of handling, intermodal integration and first/last mile costs compared to the total movement cost is larger, it creates a bigger barrier.

In 1994, international shipping lines became able to undertake coastal shipping services as opportune to them on their international routes to New Zealand. While reducing the cargo reshipment rates for NZ industry, this was an issue for local operators, who specialised in coastal shipping only and were less able to achieve the costs savings of large lines – the large lines can generally operate profitably even without cargo on NZ-internal legs of their routes. Further, these shippers are often not exposed to NZ GST and ETS charges. With these considerations, they are therefore often able to undercut local providers.

4.4.1 Externality Costs

Another issue is that externality costs, as described in Section 3, are typically not accounted for by businesses when selecting freight modes. Only the dollar value they are charged is considered.

It is challenging to account for the externality costs, however, there are metrics such as the MAC (marginal abatement cost), which is an economic concept that measures the cost of reducing environmental impact. For example, the marginal carbon abatement cost is the cost of a change that will reduce greenhouse gas emissions of an operation by one tonne of carbon.

4.5 Customer Delivery Expectations

Customer expectations for delivery timeframes are very demanding, and customers expect to pay relatively little for extremely short delivery times and a high level of service. This has driven a 'just-in-time' regime that has become routine, even when their true need is not 'just-in-time'.

Just-in-time efficiency is prioritised over spare capacity. Many companies adopt just-in-time logistics models with limited inventory to increase efficiency and reduce warehousing costs. It is also commercially difficult to justify the costs of spare capacity. However, this means there is little margin to absorb disruptions.

Due to these demanding customer expectations, frequency, reliability and speed are important factors in the freight sector.

4.5.1 Frequency

KiwiRail has a capacity management system which requests customers to confirm freight volumes the Thursday in advance for the following week to ensure there is sufficient capacity available. Bookings can be made up to the night before (or the day of, in the case of later trains), subject to capacity being available. It can be challenging for customers to accurately forecast freight demands, and it is common for forecasting to be accurate only for the coming 24 hours.

Given the bulk freight nature of rail and coasting shipping, there are naturally fewer service options when compared to road transport. This can require careful planning and system changes from customers in order to move freight on these transport modes. For example, there may only be

one or two trains per day from a location, so the freight user must adhere to these timings, whereas using trucking they can dispatch freight whenever required. Use of different modes of freight transport is relevant for different customers and types of product dependent on the circumstances.

4.5.2 Reliability

KiwiRail has a larger focus on export rather than domestic freight, as this is the freight market in which the most tonnage is moved, and is often "bulk" freight, which is ideally suited to the rail network.

A significant barrier some businesses perceive in using rail is the threat of failure, due to weather risks, aged equipment breakdowns (for example, the locomotives and ferries), or other issues. After a 30-year period of limited investment into the rail network, more funds have been made available for renewals and track maintenance. From 2022 to 2024, over $145 million was invested into renewals on the rail lines from Auckland to Christchurch. As a result, KiwiRail is delivering improved reliability across the rail network, with a particular focus on key freight routes such as Auckland to Christchurch and Auckland to Tauranga. Since January 2023, reliability has risen to around 90% on KiwiRail's main freight Auckland to Christchurch route.

4.5.3 Speed

Speed of delivery is important in the freight sector, both for product type (e.g., for perishable product) and customer expectations. In general, delivery by rail takes longer than road freight. Significant historical investment into the roading network has been instrumental in increasing the speed of road freight. Recent investment in rail has led to demonstrable increases in reliability and on time performance on key routes.

For rail, track speeds are regulated to provide optimum train efficiency and maintain track quality, condition and resilience, resulting in lower running speeds and reduced carbon emissions in comparison to major road freight corridors.

It is part of the expectation of the service offering that coastal shipping has a longer delivery time frame, and therefore, speed of delivery is not as large an issue for coastal shipping freight customers. Coastal shipping is not used for perishable products or for goods with short delivery timeframes. Rail can offer overnight delivery on key routes (such as Auckland to Palmerston North), however for domestic customers, the need to transport freight to and from a rail siding by truck may add time to the overall delivery.

4.6 Volume

For both rail and coastal shipping, it is important to maximise the capacities in order to minimise the number of journeys, as this will reduce crew costs and provide benefits to rolling stock utilisation.

Pacifica and KiwiRail will only take full container loads (FCL), not less than container load (LCL). This can be a barrier for smaller businesses in using coastal shipping or rail. It can also be a barrier for larger businesses, due to the labour required to pack and unpack containers to get to FCL.

However, there are opportunities here for businesses to work together or engage third party logistics (3PL) companies to amalgamate product, to obtain the benefits of economies of scale.

4.7 International Shipping Carriers & Port Efficiencies

New Zealand coastal ships have staff pay rates that are much higher than the international ships they are competing with. Domestic coastal shipping operators also pay emissions trading scheme (ETS) levies that are not imposed on competing international carriers.

International lines move about 75% of domestic coastal cargo, meaning that domestic freight is susceptible to the operating decisions of international lines. NZ has little influence over these decisions. For example, international ships will sometimes skip certain ports that are not on their route, which results in freight being unloaded at a later port and then trucked back to the destination. Relying on international shipping lines can mean New Zealand's freight needs are not prioritised. NZ is geographically distant from major markets and not the most profitable trade lane. NZ also relies on Singapore and Malaysia as trans-shipment hubs to connect to the main international shipping routes. This significantly reduces the reliability and resilience of domestic freight shipping.

Additionally, coastal shipping carriers can struggle to get consistent berth windows and productivity from ports, who need to prioritise international / larger ships. The coastal ships have more capacity than what the ports are providing productivity for. Pacifica has two coastal shipping vessels. The Moana Chief has a capacity of 1,740 TEU (twenty-foot container equivalent). The Takutai Chief has a nominal capacity of 1,340 TEU. Prioritising access for coast shippers would enhance domestic freight system and greatly help with reliability and resilience.

4.8 Infrastructure

Rail sidings are an efficient solution for many large exporters, manufacturers and freight forwarders, allowing them to load freight directly onto rail, saving multiple lift costs and time. A dedicated rail siding increases efficiency and control by connecting export manufacturing or warehousing directly to NZ's ports. However, installation costs of rail sidings are significant, and this can be a barrier particularly for smaller businesses. Ongoing and consistent funding into rail through the Rail Network Investment Programme is needed to provide businesses with confidence to make such significant investments.

Another key issue is lack of consistent infrastructure across modes. As discussed in Section 4.3, all freight modes have differing freight load size constraints. To achieve infrastructure that can function across all modes, there must be consideration of the constraint of each mode in decision-making, which requires involvement from all key stakeholders.

There are volume constraints due to larger infrastructure also, such as:

- Berth space in ports, which limits the number of ships docking and the time available to ships for loading and unloading.
- The fact a significant portion of the NZ rail network is singletrack, which limits the number of trains using a portion of the network.
- KiwiRail can move high cube ISO containers on most of the network but cannot double-stack containers due to the narrow-gauge network and related constraints. Oversize freight cannot be carried due to the tunnels and bridges.
- A constraint for KiwiRail in terms of running more frequent freight services within Auckland is the capacity of the tracks themselves. As freight and passenger services operate on the same lines there can be limited track availability. Building additional main lines would increase the ability to run more freight services in future.

Recent investment in locomotive replenishment and renewal programmes by KiwiRail means that there are sufficient locomotives and wagons to cater to current demand and future growth.

These larger infrastructure challenges would require significant investment to increase capacity of the coastal shipping and rail networks. There are opportunities for optimisation, which will likely require less capital investment. These are discussed in the following section.

5. Mode Shift Opportunities

To achieve the greater modal diversity, there are several opportunities to investigate.

5.1 Resilience of Core Offering

The first step is to build the resilience of the core offering, with solutions suited for each area across NZ. The use of rail for key land routes (discussed further in Section 6), and the use of coastal shipping for interisland shipments (particularly between Auckland and Christchurch), would help provide an optimised freight network and enhance modal diversity. Therefore, it is essential to create reliability, resilience and frequency of the rail lines between major cities and of coastal shipping routes between major ports.

5.1.1 Rail

Some customers feel more confidence in delivery is required from rail services. The frequency and perceived reliability of the rail system and service is currently a primary constraint for businesses to mode shift from road to rail. Particularly, improving the frequency and timing of services from Auckland to Palmerston North (and on to Wellington) would be beneficial for a range of businesses. Customers require a consistent, guaranteed route operating on a regular basis, particularly for time sensitive products.

KiwiRail is addressing some of these issues, through investment in increasing the reliability of their service over the coming five years by upgrading to more robust assets as shown in Table 7. New assets include 16 electric shunt vehicles, 15 electric locomotives, 1,500 wagons, and 57 diesel locomotives for the South Island.

Table 7: KiwiRail Asset Investment Plan

New Asset	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
16 x Electric (battery) shunt vehicles	2022								
15 x Electric locos refurbished	2022 - 2025								
1,500 x Wagons			2024 - 2027						
66 x more efficient diesel locos				2024 - 2028					
24 x hybrid yard shunt locos						2027 - 2030			
11 x heavy electric shunt vehicles				2025 - 2026					

In the five years following the listed upgrades, KiwiRail is planning to optimise utilisation of equipment to increase capacity of the rail network and maximise the number and utilisation of wagons, which will in turn make rail more economic for freight users.

There should also be a drive to increase the transit speed and productivity of trains. This could be through an assessment of the line speed and route clearances of various routes. Upgrades should be reviewed to assess improvements on the line, such as braking technologies, curve

speed assessment and rail realignments may help in localised (or greater) improvements. However, rail realignments would require additional investment to occur.

5.1.2 Coastal Shipping

Pacifica has two fixed day interisland services that depart from Auckland on Mondays and Thursdays and arrive in Christchurch on Thursdays and Saturdays. Typical timeframes for coastal shipping are five to six days from supplier to customer, when pickup and delivery is included, and is ideally suited to organisations with large onshore inventories or goods that are not time sensitive.

Dedicated coastal ships that solely service core NZ ports would be valuable to many freight users. Particularly, additional services between Auckland, Tauranga and Christchurch.

5.1.3 Backfill

Current assets across multiple transport operators are underutilised, meaning they are not operating at maximum capacity. Trucks are generally full heading southwards, then some empties come north. Ideally, south-bound freight could move to other modes, taking trucks off the road, resulting in fewer trucks operating in total, and fewer empty back loads (note that empty backloads are an issue across all modes and this is difficult to address without changing the port that the freight arrives into from overseas). KiwiRail and coastal shippers have the capacity to carry backload, the challenge is being able to attract freight.

There is significant interest from freight users to understand the capacity of backloads for rail, to take advantage of empty north-bound carriages, similar to trucking backfill capacities.

5.1.4 Load Sharing

There are freight users with lighter and heavier freight. Due to container tonnage allowances on rail and trucks, heavier freight often does not fill an entire container. In this scenario, more volume (using lightweight freight) could be placed on existing movements that contain heavy freight, allowing businesses to share the cost, while decreasing the number of containers required.

Minimum and maximum volumes and pricing structures would need to be assessed to determine a tipping point for which a load sharing scenario would become economically appealing for heavy freight movers. Additionally, businesses would need to work together with the freight forwarder, to find partnering businesses for load sharing and to determine pricing models. This would enable businesses to test if rail and coastal shipping will fulfil their needs while reducing emissions.

5.2 Key Freight Corridors

Table 8 and Table 9 show the annual inter-regional freight volumes (in tonnes and tonne kilometres respectively) moved between NZ regions. The darker green cells indicate the largest volumes of freight moved. Significant freight volumes are moved between Waikato, Auckland and Bay of Plenty. However, when distances between regions are considered, the greatest tonne-kilometres are moved between Auckland and Palmerston North, Auckland and Wellington, and Auckland and Canterbury.

Table 8: Total annual inter-regional road freight volumes (in million tonnes).

		Destination														
		Northland	Auckland	Waikato	BOP	Gisborne	Hawke's Bay	Taranaki	Mana/Wang	Wellington	TNM	West Coast	Canterbury	Otago	Southland	Total
Origin	Northland		1.0	0.1	0.2								0.3			1.6
	Auckland	1.2		4.3	0.6	0.2	0.5	0.6	1.4	1.2	0.3	0.1	0.4	0.4	0.2	11.4
	Waikato	0.1	3.0		5.7		0.1	0.4	0.1	0.1			0.1			9.6
	BOP	0.1	1.5	2.6		0.1	0.1	0.1	0.2	0.1						4.8
	Gisborne		0.1	0.1	0.1		0.2	0.0	0.1							0.6
	Hawke's Bay		0.4	0.1	0.4	0.2		0.0	0.5	0.1			0.1			1.8
	Taranaki		0.3	0.2	0.2		0.2		0.5	0.0						1.4
	Mana/Wang		0.5	0.1	0.2		1.1	1.6		1.8						5.3
	Wellington		0.9	0.1			0.1		1.0				0.1			2.2
	TNM		0.1		0.1					0.1		0.1	0.5			0.9
	West Coast												0.3			0.3
	Canterbury		0.6						0.1	0.1	0.9	0.7		0.9	0.3	3.6
	Otago		0.1										0.6		1.3	2.0
	Southland		0.1										0.3	1.2		1.6
	Total	1.4	8.6	7.6	7.5	0.5	2.3	2.7	3.9	3.5	1.2	0.9	2.7	2.5	1.8	47

Table 9: Total annual inter-regional road freight tonne kilometres (millions)

		Destination														
		Northland	Auckland	Waikato	BOP	Gisborne	Hawke's Bay	Taranaki	Mana/Wang	Wellington	TNM	West Coast	Canterbury	Otago	Southland	Total
Origin	Northland		165	30	74								348			617
	Auckland	198		533	127	96	206	214	640	774	194	99	393	535	308	4317
	Waikato	30	372		599		29	92	33	52			86			1293
	BOP	37	317	273		27	29	31	78	52						844
	Gisborne		48	37	27		43		39							194
	Hawke's Bay		165	29	115	43			89	32			65			537
	Taranaki		107	46	62		82		117							414
	Mana/Wang		229	33	78		196	373		254						1162
	Wellington		581	52			32		141				34			839
	TNM		65		52							35	169			320
	West Coast												73			73
	Canterbury		589						48	34	303	171		325	170	1640
	Otago		134										217		267	617
	Southland		154										170	246		570
	Total	265	2,924	1,034	1,134	166	616	711	1,184	1,197	497	305	1,554	1,106	745	13,436

Table 10 provides the approximate volumes of cumulative road freight (based on figures in Table 8 and Table 9) between major freight hubs in NZ. A significant portion of total tonne-kilometres travelled are between Auckland and Palmerston North, at 32% of total freight tkms travelled nationally, followed by freight between Picton and Christchurch, at 9%. Freight moving between Auckland and Christchurch has been included in Auckland / Palmerston North, Palmerston North / Wellington and Picton / Christchurch routes. Total freight between Auckland and Christchurch on the road is one million tonnes (2.1% of interregional freight) and 982 tonne kilometres (7.3% of interregional tkms).

Table 10: Volumes of Freight Shifted between Key Freight Hubs in NZ via Road Freight[33]

Freight Corridor	Weight (million tonnes)	Million tkms	% of Inter-regional Road TKMs	% of Total Road TKMs
Auckland / Waikato	13.8	1,711	13%	8%
Waikato / Palmerston North	6.5	2,600	19%	11%
Palmerston North / Wellington	7.7	1,090	8%	5%
Picton / Christchurch	5.9	1,980	15%	9%
Christchurch / Otago	2.1	760	6%	3%
Auckland / Tauranga	2.1	440	3%	2%
Waikato / Tauranga	8.3	940	7%	4%

These tables show that there are several key routes in particular where large freight volumes and distances travelled make the impact of mode changes the most significant. These are:

- Additional volume moved on rail between Auckland and Palmerston North and between Picton and Christchurch. Pending ferry upgrades/capacity, this could be incorporated into a single route from Auckland to Christchurch. Auckland to Tauranga is also an important import/export route and is often rail served at both ends making for easier implementation.
- Increased volumes via coastal shipping between Auckland, Tauranga and Christchurch.

The impacts of enabling mode shift on these key modes are discussed further in Section 6.

5.3 Deep Collaboration and Partnerships

Collaboration between ports and hubs, between sea, road and rail freight providers, and between freight users (major importers and exporters) is important to enhance modal choice and improve outcomes. For this, significant data sharing through the development of cross-modal tools is required.

However, it should be noted that there are considerable privacy and commercial sensitivity concerns around collaboration and data sharing, which can make the below challenging. As outlined below, utilising independent 3PL and 4PL freighting organisations can help assist with this.

[33] Using data from the National Freight Demand Study 2017/18. Ministry of Transport (2019).

5.3.1 Freight Corridors & Working Groups

The focus for increased modal diversity should be on the key freight corridors identified. Therefore, there should be an effort to enable collaboration between the key freight users and providers on these routes.

- Rail: Large businesses could combine freight for full container loads and for a daily full train load between Auckland and Palmerston North. Businesses that can combine freight to generate the scale (volume and weight) required, with the same origin and destination, to fill an entire train load, should be identified and connected.
- Coastal shipping: Larger volume of freight on the weekly shipping service will require Port of Auckland, Port of Tauranga and Lyttleton Port working closely with shippers to open capacity on berths and make productivity available, at a regular time each week, as well as identifying additional freight which can be moved to shipping.

We believe there would be significant benefits from setting up working groups on key routes, such as those identified in Section 6. For example, KiwiRail and large freight users on the Auckland to Palmerston North route could collaborate in order to provide further load for rail, enabling additional services to be provided, with timing and conditions which are suitable for both the freight providers and KiwiRail. This would likely require additional rail services on this route, and potentially changes to the operational practices of the freight users.

5.3.2 Ports Collaboration

The competition settings of New Zealand ports are not optimal and there are opportunities for the port sector to be better coordinated. The sector could achieve economies of scale, greater capacities, and other efficiencies through better cooperation and specialisation, instead of duplicating infrastructure.

For example, currently, the main import port is Port of Auckland, and therefore significant freight is moved from North to South. There is the possibility that additional import freight arriving in the South Island, rather than in Auckland or Tauranga, could utilise backfilling of coastal ships, rail and road freight networks.

The National Freight Strategy details actions required to develop port connections by identifying strategic freight corridors and alternative port models.

5.3.3 Data Sharing

Limited data on the freight sector is available. This lack of data hinders accurate and dynamic modelling, evidence-based decision-making, and the monitoring of how the freight and supply chain sector is performing against historical or international benchmarks. Data sensitivity, competition and corporate privacy means that most businesses in the sector are averse to sharing information.

The Ministry of Transport maintains a Freight Information Gathering System (FIGS), which provides an overview of rail and sea freight movements around New Zealand. However, there is room to improve on the performance indicators featured in FIGS, especially for road freight data.

Better data collection, sharing, and analysis across the sector can present a more comprehensive picture across all freight modes which will help improve operations, aid policy and investment decisions.

The National Freight Strategy details actions required to identify and invest in freight data needs, for both domestic and international freight resilience, using key stakeholders within the freight sector.

5.3.4 Utilisation of 3PL and 4PL organisations

Third- and fourth-party logistics organisations assist companies by facilitating and directing the movement of freight. This allows economies of scale to be realised, along with incorporating diversified freight needs into a single system, increasing the average utilisation of assets and minimising costs. Centralised data analysis and optimisation within these organisations drives overall efficiencies and can help mitigate commercial sensitivity issues.

Increasing the freight moved by 3PL and 4PL organisations will help to drive overall efficiencies within the freight system, including seamlessly incorporating mode shift as able.

5.4 Additional Services

There are several services that freight forwarders could offer to increase the adoption of alternate freight modes, and to enable consumer-driven modal shift. Currently, consumers pay relatively little for extremely fast turnaround times. This has driven a 'just-in-time' regime that is undervalued by the market and has in fact become the consumer's expectation.

There may be a market for "low-carbon" service offerings. This would be a lower carbon offering, but with a slightly longer delivery time and a cost that may be higher or lower than the trucking alternative, depending on a range of factors. This would require end-to-end solutions to ensure customers have access to real-time information on the status of their goods, the mode via which they are being freighted, and the carbon savings being achieved.

Coastal shipping has evolved to include a service offering that delivers the first/last-mile (via electric trucks), demonstrating how coastal shipping can be better integrated into the multi-modal transport network for goods that are not required just-in-time (KiwiRail can also provide pickup and delivery services).

There are additional opportunities, as discussed, for KiwiRail, Pacifica or 3PL providers to offer a pricing model to combine clients' product into shared containers (groupage containers) allowing smaller shipments to be combined, thereby generating efficiency and cost savings.

5.5 Intermodal Hubs

Inland ports have shown proven success in becoming multi-modal freight hubs, utilising coastal ships, rail and road, to best match each mode to the route and timeframes required by customers. Inland ports and major freight hubs achieve more efficient and lower cost intermodal interfaces.

The ideal NZ low carbon freight network would consist of two rail networks, one on each island, which are connected to frequent and reliable ferry and coastal network services, and trucks for the first and last mile, through ports and inland ports. Effective utilisation of Port of Tauranga's MetroPort and Ruakura Inland Port, Port of Auckland's freight hubs (including Northgate in Waikato) and Wellington's CentrePort will be essential to enable and increase multi-modal freight, which will be achieved through consistent infrastructure at these freight hubs across all modes they service.

The low carbon network would include utilisation of zero emissions (from the tailpipe) trucks and could include electrification and/or biofuels for rail and shipping also. For example, it is mostly likely rail would be further electrified, and if KiwiRail electrified the rail line from Auckland to Tauranga, this could decrease their emissions from rail freight by approximately 38% (alongside other initiatives they are delivering such as more efficient diesel locomotives).

5.6 Modal Diversity Targets and Incentives

The Climate Change Commission's (CCC's) targets are recommendations only, presented in its advice to Government. The Government has not formally committed to any modal diversity targets or legislation, or provided advice as to how targets will be achieved and who is responsible.

By focussing on key freight corridors alone (to be discussed in Section 6), the CCC's targets are largely met. The targets could be more ambitious, which will encourage the suggested key freight corridors to be well established, as well as encouraging mode shift on other routes. There are large opportunities for carbon savings in freight, and this should be a key focus in transport emissions reduction planning.

Government incentive and direction will be essential to enable businesses to mode shift. Targets need to be mapped for NZ overall and for business – businesses require support for this transition, and there is a large opportunity for impact in the freight space, if the government is willing to play a contributing role.

5.7 Information Provision

Provision of information to companies around how to undertake mode shift, and the benefits of doing so, should be prioritised. This includes likely freight types, routes and time requirement assessments, along with a summary of infrastructure locations and industry participants. Further, ideally organisations will be requesting summaries of the effects of their mode choices from freighting providers, such as the amount of freight moved on other modes and the carbon impact of this.

One of the key items with this is the consideration of cost - rather than looking at just base cost, the marginal abatement cost needs to be assessed to help account for the benefit of reduced carbon emissions. This takes the cost difference between the base option (nominally road) and the low carbon option and makes an effective cost of carbon. This can then be compared to other

carbon mitigation costs (in terms of $/tCO$_2$e) to ascertain the best investment for enabling decarbonisation.

5.8 Pricing of Externalities

Charges levied on road transport do not fully cover the costs associated with them, especially when quantifying externalities, and there is scope to levy these more accurately on the emitters. It should be noted that these costs would ultimately be borne by customers of freight haulage.

However, it should be noted that no form of land transport fully covers the costs associated with its operation and requires public funding to make up the difference[34]. As such, public and private person transport, road freight and rail freight all gain subsidies from the government/taxpayer to fund infrastructure and externalities, as appropriate.

Given this, making users aware of the costs and externalities associated with each transport medium is a potential impartial method of improving the decision-making methodologies of users.

[34] MoT – Domestic Transport Costs and Charges Study (June 2023)
https://www.transport.govt.nz/assets/Uploads/DTCC-Main-Report-June-2023.pdf

6. Impact of Mode Shift of Key Freight Corridors

6.1 Assumptions

Two scenarios have been modelled. The first demonstrates a lower impact scenario (Scenario 1: Minimal Mode Shift), with one additional daily train between Auckland and Palmerston North, an additional train between Picton and Christchurch every second day, and shift of 10% of road freight between Auckland and Christchurch to coastal shipping.

The second scenario demonstrates a higher impact scenario (Scenario 2: High Impact), which models two additional daily trains between Auckland and Palmerston North, one additional daily train between Picton and Christchurch, and shift of 25% of road freight between Auckland and Christchurch to coastal shipping.

The modelling assumes that:

- There are 36 wagons per train, with two containers of 13 tonnes each per wagon.
- In the North Island the trains are 80% full heading south, 40% full heading north.
- In the South Island the trains are 80% full in both directions.
- The additional train will run six days per week.
- Average of 15 tonnes per 20-foot container on coastal ships.
- It has been assumed that ship will move from Auckland to Tauranga to Christchurch (as well as all the BAU ports currently visited), and return via the same path, within one week.
- To understand the number of trucks that the mode shift will take off the road, it has been assumed that the average weight on freight trucks is 25 tonnes (assuming typically truck and trailer for inter-regional movements).
- In estimates of carbon emissions savings, the emissions of road transportation of freight from the freight origin to the rail head / port and from the rail head / port to the destination has not been accounted for, as there are too many unknowns. However, most freight will still require a first and last mile using trucking. Therefore, emissions savings may be slightly lower than those reported.

6.2 Externality Impacts

Table 11 presents the impacts of the two mode shift scenarios on freight volumes, carbon emissions, national targets, number of trucks on roads, and on the rail and coastal shipping networks.

Table 11: Externality Impacts of Two Mode Shift Scenarios

Externality	Scenario 1: Minimal Mode Shift	Scenario 2: High Impact
Volume	This scenario results in 1.0 million tonnes less volume shifted via trucks (0.6 million additional tonnes onto rail and 0.4 million tonnes onto ships). This is equivalent to 340 million tkms shifted to rail (182 tkms onto the Auckland / Palmerston North route) and 70 million tkms shifted to shipping. As a percentage of road freight, this is: • 3% of road freight between Auckland and Palmerston North onto rail • 4% of road freight between Picton and Christchurch onto rail • 10% of road freight between Auckland and Tauranga onto coastal shipping • 10% of road freight between Auckland and Christchurch onto coastal shipping	This scenario results in 2.3 million tonnes less volume shifted via trucks (1.3 million additional tonnes onto rail and 1.0 million tonnes onto ships). This is equivalent to 580 million tkms shifted to rail (425 tkms onto the Auckland / Palmerston North route) and 160 million tkms shifted to shipping. As a percentage of road freight, this is: • 6% of road freight between Auckland and Palmerston North onto rail • 8% of road freight between Picton and Christchurch onto rail • 25% of road freight between Auckland and Tauranga onto coastal shipping • 25% of road freight between Auckland and Christchurch onto coastal shipping
Carbon	25,000 tCO_2e of carbon per year would be saved due to the shift of these volumes (20,500 tCO_2e due to shift to rail, and 4,500 tCO_2e due to shift to coastal shipping). This represents approximately 0.6% of total emissions from the freight sector. At a price of \$55/tCO_2e, annual carbon savings amount to ~\$1.4M.	57,000 tCO_2e of carbon per year would be saved due to the shift of these volumes (45,500 tCO_2e due to shift to rail, and 11,500 tCO_2e due to shift to coastal shipping). This represents approximately 1.5% of total emissions from the freight sector. At a price of \$55/tCO_2e, annual carbon savings amount to ~\$3.1M
CCC Targets	This would result in 1.5% of current road tkms shifted to other modes, compared to the Climate Change Commission's demonstration path action requirement of shifting 4.7% of road freight tonne-kilometres to rail or sea (Section 2.6).	This would result in 3.1% of current road tkms shifted to other modes, compared to the Climate Change Commission's demonstration path action requirement of shifting 4.7% of road freight tonne-kilometres to rail or sea (Section 2.6).
Number of trucks on roads	Decreasing the trucks on roads has numerous benefits, as discussed in Section 3	
	This scenario would take approximately 45 trucks off the road between Auckland and Palmerston North, 30 trucks off the road between Picton and Christchurch, 55 trucks off the road between Auckland and Tauranga, and 11 trucks off the road between Auckland and Christchurch.	This scenario would take approximately 90 trucks off the road between Auckland and Palmerston North, 60 trucks off the road between Picton and Christchurch, 140 trucks off the road between Auckland and Tauranga, and 30 trucks off the road between Auckland and Christchurch.
Impact on rail network	This scenario will require one additional daily train between Auckland and Palmerston North, and an additional train every second day between Picton and Christchurch.	This scenario will require two additional daily trains between Auckland and Palmerston North, and an additional daily train between Picton and Christchurch.

Externality	Scenario 1: Minimal Mode Shift	Scenario 2: High Impact
	It is likely that these scenarios can be achieved by collaboration between large businesses in Auckland and Palmerston North, who could combine freight for full container loads and for a daily full train load between Auckland and Palmerston North. Businesses that can combine freight to generate the scale (volume and weight) required, with the same origin and destination, to fill an entire train load, should be identified and connected.	
Impact on coastal shipping	Pacifica has two coastal shipping vessels. The Moana Chief has a capacity of 1,740 TEU (twenty-foot container equivalent). The Takutai Chief has a nominal capacity of 1340 TEU and has been used for modelling as this is the smaller of the two ships. The Takutai Chief currently operates at an average of approximately 52% of capacity southbound, and 20% northbound.	
	Shift of 10% of the road freight between Auckland and Tauranga and Auckland and Christchurch onto the Takutai Chief, would result in the following ship loading rates: • 62% capacity from Auckland to Tauranga • 56% capacity from Tauranga to Christchurch • 26% capacity from Christchurch to Tauranga • 40% capacity from Tauranga to Auckland	Shift of 25% of the road freight between Auckland and Tauranga and Auckland and Christchurch onto the Takutai Chief, would result in the following ship loading rates: • 76% capacity from Auckland to Tauranga • 62% capacity from Tauranga to Christchurch • 35% capacity from Christchurch to Tauranga • 70% capacity from Tauranga to Auckland
	This shows that there would not be a need for any additional weekly shipping routes, for either Scenario. However, Pacifica would require additional berthing time and productivity at the Port of Auckland, Port of Tauranga and Lyttleton Port to enable this.	

7. Supporting Documents

7.1 Guidance and "How to" guide

A planned deliverable of this project was a "how to" guide for mode shifting, outlining the benefits of utilising other modes, details of providers who can assist, advice around freight which is ideally suited to shifting and a calculation sheet outlining the costs and benefits of mode shifting.

Unfortunately, this document has not been able to be created at this time due to confidentiality considerations, mode choice complexity and incomplete data sets. However, a short brochure has been created that could be used in its place.

One of the Key Actions identified of this study is to increase data provision to organisations to enable informed decision making – we believe a comprehensive "how to" document should be prepared as part of this work.

7.2 Discussion Document

A discussion document has been prepared and submitted to programme participants which outlines key opportunities identified by freight users and freight providers in New Zealand. This document is designed to providing talking points for use by participants in discussions with governmental departments and national bodies in the freight sector

8. Conclusions

There are a range of opportunities to help enable further modal diversity:

- Provision of information to small and medium companies around how to approach mode shift. One of the key items with this is the consideration of cost - rather than looking at just base cost, the Marginal Abatement Cost needs to be assessed to help account for the benefit of reduced carbon emissions. Other costs (such as externalities) should be communicated so more educated decisions can be made.
- Some businesses feel more confidence in delivery is required from the rail network - the frequency, timing and perceived reliability of the rail system and service is currently a primary constraint for them to mode shift from road to rail. In particular, improving the frequency and timing of services on key routes (such as from Auckland to Palmerston North/Wellington, Auckland to Tauranga and Auckland to Christchurch) would be beneficial for a range of businesses.
- Additional coastal services that solely service core NZ ports would be valuable to many freight users. Particularly, making available additional services for ships travelling between Auckland, Tauranga, and Christchurch. Pacifica is the only dedicated coastal service, and they have recently increased their Auckland to Christchurch operation from once per week, to twice per week. Additionally, creating a door-to-door service makes for a seamless user experience, helping to increase uptake.
- There is significant interest from freight users to understand the capacity of backloads for rail, to take advantage of empty north-bound carriages, similar to trucking backfill capacities. However, with more freight moving south compared to north overall, this is a complex challenge.
- More volume (using lightweight freight) could be placed on existing movements that contain heavy freight, allowing businesses to share the cost of a movement, while decreasing the number of containers required. This is a service already provided by freight forwarders, but there is further scope for utilisation.
- Collaboration between KiwiRail, coastal shippers and freight owners around the timing and type of services provided that would help create a seamless freight service between the modes.
- Increased use of 3PL and 4PL organisations would drive increased seamless modal diversity as able. This is ideally driven by the freight services user, once they understand the benefits and constraints of the freight modes, and provision of information to the wider market is crucial to enable this.

In terms of service improvements, there should be a focus on key freight corridors, minimising overall investment in infrastructure while catering to significant freight volumes. There are a number of key routes, for which mode shift makes the most sense due to the significant volumes of freight being shifted via the road on these routes. These are:

- Additional volume moved on rail between Auckland and Palmerston North/Wellington, Auckland to Christchurch and Auckland and Tauranga, through maximisation of existing services, and additional daily rail services, as required. This will require large businesses in each location collaborating to provide additional load, and asset management from KiwiRail to make the locomotives and wagons available for additional freight movements. Ongoing investment into the North Island Main Trunk Line and feeder routes will also be required to ensure this rail line remains reliable
- Increased volumes via coastal shipping between Auckland, Tauranga and Christchurch. This will require investigation from coastal shippers, to understand businesses that have freight suited to coastal shipping in each location. This will also require the Port of Auckland, Port of Tauranga, and Lyttleton Port providing additional berth time and productivity to coastal ships to enable them to load larger capacities on the weekly shipping route.

Government incentives and direction will be essential to increase modal diversity, along with funding directed to allow businesses to mode shift with less risk. Businesses require support for this transition, and there is a large opportunity for impact in the freight space, if the government is willing to play a contributing role.

Provision of information is a key aspect increasing modal diversity, and is important to:

- Make organisations and users aware of the benefits of mode shift.
- Outline where mode shift is most likely to be successful.
- Provide an avenue for users to access mode shift while not complicating their operation.

Overall, modal diversity is ideally driven by the users of freight services – if they are aware of the benefits and specifics of each mode type, and these can be meshed with their organisational requirements, material mode shift will be easier to embed into operations.

Key Actions

Key actions that should be undertaken include:

- Short Term – Immediate Actions:
    - Setting up working groups on key specific routes, such as those identified in Section 6. For example, KiwiRail and large freight users on the Auckland to Palmerston North route could collaborate in order to provide further load for rail, enabling additional services to be provided, with timing and conditions which are suitable for both the freight providers and KiwiRail.
    - Overarching collaboration and partnerships between KiwiRail, Pacifica, freight owners, trucking and logistics companies to share information and create opportunities for increased services on key networks and increasing freight moved on these services.
    - Increased, targeted and specific data provision to companies to enable them to make informed distribution choices to increase their utilisation of rail and shipping. In particular, how access to rail and shipping services can occur, and how the benefits of these can be realised and reported, and what costs can be avoided by their decision making.
- Medium Term
    - Adoption of ambitious targets for modal diversity, and provision of incentives from government to improve modal diversity.
    - Adjust cost recovery for international shipping lines, when compared to NZ flagged vessels (i.e. recovery of GST and ETS charges), to enable additional dedicated coastal services.
- Long Term (ongoing):
    - Increased and investment in the rail network, specifically the track infrastructure and rail sidings, on key routes.